



Piping Engineering Department

EIED

Introduction to Piping Material Activities

**A description of the current practices within the Materials
Section of the Piping Engineering Department**

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1. General

1.1 Purpose and Scope

This document describes the general activities of the piping materials section within the piping department. Each project will have some specific requirements in addition to the general procedures outlined below, which will also form part of the activities.

The purpose of this document is to provide information on the general procedure followed for any project, so that detailed methods can be devised for controlling the quality of output.

1.2 List of Activities

The main activities of this section are to prepare specifications in accordance with the customer's requirements, and to implement their compliance. These functions are performed by the issue of documents as follows:

- Preparation of a list of documents to be prepared for a project based on the project size.
- Preparation of project specification documents as listed in section 2.2.5 below.
- Designation of pipe connection details or Assemblies for instruments and other items being connected to a pipe, based on assembly specification documents.
- Mechanization of Piping and Instrument Diagrams as described in section 3.2.
- Preparation of a Line List, a tabulated list of all pipe lines in the project, based on the piping instrument diagram as described in section 3.4
- Preparation of Material Take-off as described in sections 3.6 and 3.7.
- Preparation of Materials Requisition based on material take-off.
- Preparation of quantitative material requisition lists (Bill of Materials, Materials described in section 3.9 , and Indent) through which bids for the procurement of piping items can be obtained.
- Evaluation of bids obtained and recommendation of suppliers and manufacturers to the client when required.

In the materials department each pipe route is subdivided into pipe sections based on changes of size, pressure, temperature, branching and fluid control & measurement devices along the route.



The information received from the process department is used to determine the pressure/temperature rating for each flange and pipe section in accordance with the governing specification for the particular piping conditions. Each pipe section is then numbered in accordance with the line numbering procedure of the project piping specifications.

1.3 Responsibilities

Each document produced for circulation has a cover sheet identifying its author(s), the person(s) who has checked the document and the person responsible for its approval. Responsibility is placed at all levels on individuals' output and is accumulative with hierarchy.

The head of section assigns work and responsibility thereof to the section members. The section engineers and senior engineers are professionally responsible for their own work and for the work of their subordinates. The section head holds responsibility for the section's output within the department and the department head is formally responsible for the departmental output.

2. Required Information

2.1 Contractual and reference information

Document	From
Design philosophies criteria and specifications	The client
Preliminary Site Layout	The client
Equipment Specifications	Archive

2.2 Information from the Engineering Departments/Sections

The following information are generally required, in addition to those listed in section 2.1, from other engineering departments for piping material activities:

Document	From
Fluid List	Process Engineering Department
Process Flow Diagram	Process Engineering Department
Process Flow Diagram Legend	Process Engineering Department
Preliminary Piping and Instrument Diagram (P&ID)	Process Engineering Department
P&ID Legend	Process Engineering Department
Vessel Data Sheets	Mechanical Engineering Department



Introduction to Piping Material Activities

The information received from the process department as an input to the materials section, is the fluid list, the process flow diagram (PFD) and the preliminary Piping and instrumentation diagram (P&ID). These items are illustrated below:

2.2.1 The Fluid List

The fluid list consists of a table which gives the following information for each route:

- the fluid to be carried along the route
- the base material from which the pipe is to be made (but not the exact properties or composition)
- the corrosion allowance
- the maximum service pressure, and
- the maximum service temperature

A sample fluid list is illustrated below

Table 1: Sample Fluid List Before Piping Department Activities

Class	Rating/ Facing	Base Material	C.A (mm)	Max. Pressure Limit (BARG)	Temperature Range min./max. °C	Service
		C.S.	1.0	27.2	-19/85	NGL FROM DEWPOINTING
		C.S.	1.0		-19/85	NGL TO 1-V-93101
		C.S.	1.0	77	-19/85	HP SWEET MAKEUP
		C.S.	1.0	26.4	-19/85	HP SWEET MAKEUP
		C.S.	1.0	26.4	-19/85	MP GAS TO SUPER HEATER
		C.S.	1.0	25.6	-19/85	MP FUEL GAS TO POWER GEN.
		C.S.	1.0	26.4	-19/85	MP NGL
		C.S.	1.0	10.7	-19/85	LP NGL TO 1-E-93102
		C.S.	1.0	10	-19/85	VAPORIZED LP NGL
		C.S.	1.0	100 (HOLD)	-19/85	SWEET HP MAKEUP

The size of the pipe sections is indicated by the process department on the partial line numbers shown on the preliminary Piping and Instrument Diagram.

2.2.2 The Process Flow Diagram

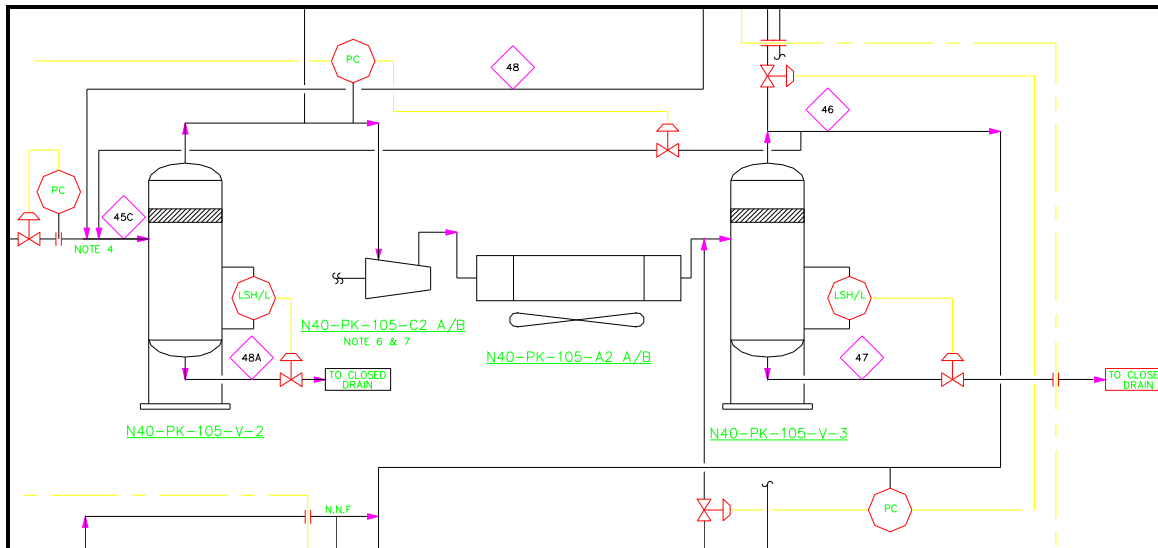
The process flow diagram is a schematic representation of the flow of fluids within the process as they travel between processing units. This diagram shows flow direction, but has no indication of the instruments and devices needed to control the process or to ensure safe operation.

An example of a process flow diagram (PFD) is shown below. A base drawing called the Process Flow Diagram Legend accompanied the PFD and describes the meaning of all



Introduction to Piping Material Activities

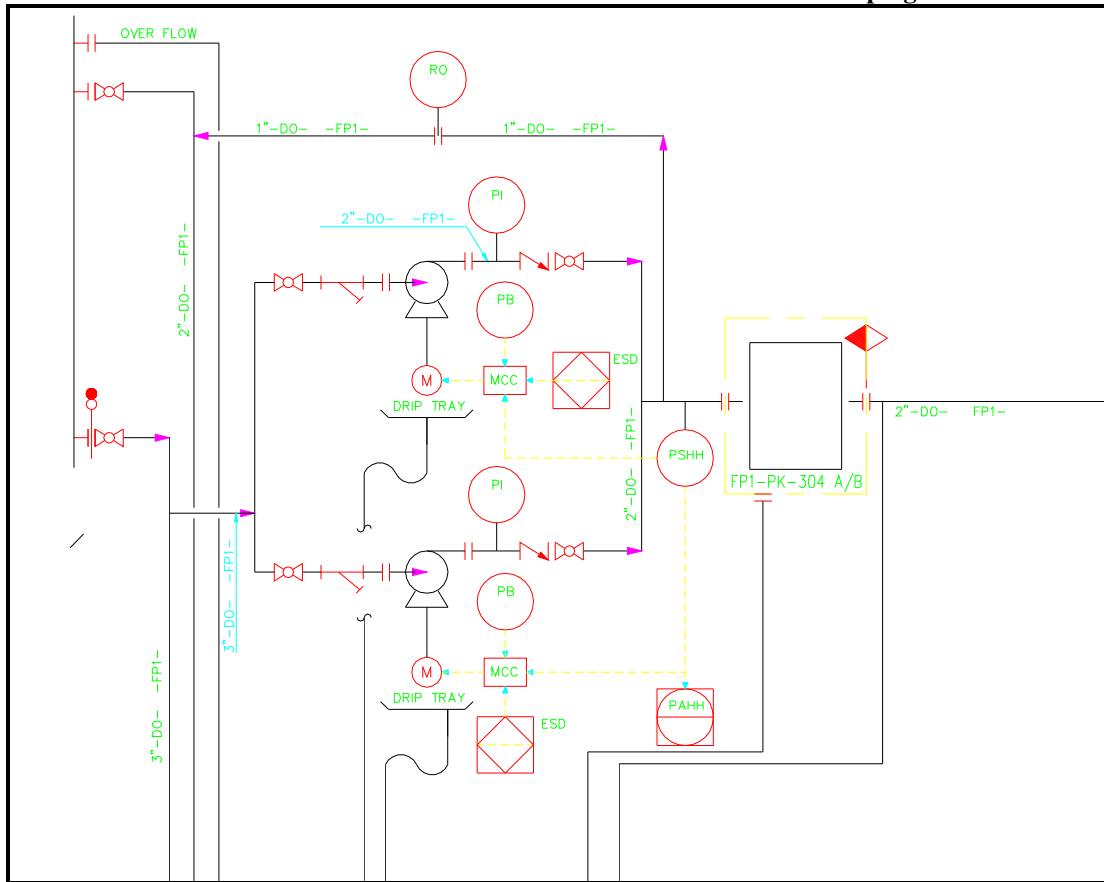
drawing symbols. Fluid lines are numbered in rhombus shapes and below each item of equipment, such as a vessel, there is a unit number. A brief description of the unit (size, pressure, temperature, fluid) is given on the perimeter of the drawing.



2.2.3 The Preliminary Piping And Instrument Diagram

The initial P&ID is a rough guide to how the pipe is to run its course. It has to show all the pipe branches, junctions, location of instruments, by-pass lines, drains, vents, overflow pipes and partial line numbering.

Part of a preliminary piping and instrument diagram (P&ID) before mechanization is shown below as an example. All the symbols used on a P&ID are described on a base drawing called the Piping And Instrument Diagram Legend and both items are received from the process engineering department as input to the piping materials section.



2.2.4 Piping and Instrument Diagram Legend

This legend, normally in the form of a drawing sheet, explains all the symbols, line types, abbreviations, instrument indicators, and schematics shown on a P&ID. Users of all P&IDs use the legend as a reference to the meaning of its symbols.

2.2.5 Vessel Data Sheets

Vessel data sheets contain detailed mechanical information about each vessel. For piping considerations, the data sheets show the inch size and number of connections, number of nozzles, flanges and flange facings, the pressure and temperature rating and fluid details for each inlet and outlet of all vessels.

3. Output Documents

Output from the materials section can be broadly divided into the preparation of piping specifications and non-specification work, which includes activities such as mechanization, preparation of the piping material index, the line list, assemblies, material



take-off, bill of materials bid requisition, analysis and bid evaluation. Those activities which result in an output document are described in the following sub-sections.

3.1 Specifications

The number of specification documents to be prepared for each project is determined at preliminary stages from the information supplied by the client. The following documents are commonly prepared for most projects in which they apply. It should be noted that the same documents may appear in different projects under slightly different names, though the general content will be the same.

3.1.1 Specification for Line Numbering Procedure

This document describes the various parts of the multi-part line number (see section 3.4.1). It concludes with a list of allowable project abbreviations

3.1.2 Specification for RTRP, Flanges and Fittings

This specification concerns pipes, flanges and fittings made of Reinforced Thermoplastic Resin. It defines the requirement for materials, mechanical properties, type, test methods, marking, inspection and packaging of Pipes made from this material (thus RTRP), flanges and fittings.

3.1.3 Specification For Field Pressure Testing

This document specifies the field testing parameters including the fluid to be used, calculation of the test pressure and preparations for testing. This specification normally covers tanks, heat exchangers and safety relief valves as well as pipes.

3.1.4 Specification for Painting

This document specifies the various coating systems to be applied on different structures (such as platforms, pipes, tanks, heaters and heat exchangers), in different environmental conditions. It specifies the primer, the sealing coat, the intermediate coat, the finish and the color. Storage, site preparation of coating, surface preparation and methods of application are also specified.

3.1.5 Specification for Insulation

Insulation is specified in this document for each temperature range by way of method, thickness, material, application, support and inspection.

Note that in some projects, the specification for painting and insulation may be combined into one document.



3.1.6 Specification for Pipeline Coat & Wrap and Field Joint Coatings

In this document, coating materials are specified by their required properties. Test methods for the material and surface preparation are also specified for factory and site application of coatings.

3.1.7 Specification for the Protection of Underground Steel Piping

This specification covers materials, procedures, application and inspection of pipe protection wrap systems.

3.1.8 Specification for Material Supply of Expansion Joints

Basic design, materials, fabrication, inspection, testing and markings are covered by this document.

3.1.9 Specification for General Piping, Process and Utility Field Installation.

This document covers the field assembly and installation of all refinery plant processes and utility piping.

3.1.10 Specification for Utility Pipe Work

This specification covers the design, supply, erection and testing of utility pipe work. The piping materials are specified by standard and grade number. Branch tables in this document show how pipes of different size must be connected by the use of reducers and couplings.

3.1.11 Specification for Pipe Line Welding and NDE

Welding of pipes and connections, together with non-destructive examination (NDE) of the welded joints is covered by this standard. It includes filler material, preparation for welding, alignment, welding, heat treatment, inspection, radiographic & hardness examination and the repair of defects.

3.1.12 Specification for General Piping, Process and Utility Fabrication

This specification covers the standards to which pipeline materials must be made. It includes welding codes, fabrication tolerances testing and inspection.

3.1.13 Specification for Welding Shop and/or Field Fabricated Piping

The welding of shop and field fabricated items is covered by this specification, whereas pipeline welding covered elsewhere. This specification covers the standards to which



pipeline materials must be made. It includes welding codes, fabrication tolerances testing and inspection.

3.1.14 Piping Material Specification

This document contains detailed information about each Line Class. It includes a list of project piping abbreviations and information about the base material, the corrosion allowance, allowable temperature and pressure range and the following information:

- The size, type, material, thickness and required standard for the gaskets to be used on the line.
- The size, type, material, applicable standard and number of nuts for bolting, where bolting is required.
- Details about all valves that can be used on the line.
- Specification of all fittings such as elbows, couplings, plugs and nipples that can be used on the line.
- Flange details of size, type, material, thickness and required standard



A sample Piping Material Specification is shown below:

CLASS	:	1B2A
SERVICE	:	OILY WATER, FUEL GAS, L.P. STEAM, ALL PROCESS FLUIDS, L.P. CONDENSATE, NITROGEN PLANT AIR, DRAIN, DRINKING WATER
BASE MATERIAL	:	CARBON STEEL
C.A.	:	1.6 MM
RATING & FACING	:	CL 150 RAISED FACE (SERRATED FINISH) SERVICE LIMIT (NOTE: 1)
TEMP. °C	:	-29/38 50 100 150 200 250
PRESS. BARG	:	19.6 19.2 17.7 15.8 14.0 12.1

ITEM	SIZE RANGE		DESCRIPTION
	INCH		
PIPE			ASTM A53 GR. B SMLS PER ANSI B36.10
	1/2	1 1/2	SCH 80 PE
	2	6	SCH 40 BE
	8	24	SCH 20 BE
	28	32	API 5L GR. B, EFW (SAW), SCH STD, BE, 100% RADIOGRAPHED
FITTINGS	1/2	1 1/2	ASTM A105, SOCKET WELD, CL 3000, PER ANSI B16.11 90 DEG ELBOW 45 DEG ELBOW TEE (EQ. OR RED.) CAP COUPLING SOCKOLET UNION
	1/2	1 1/2	ASTM A105, THREADED NPT, PER ANSI B16.11 PLUG ROUND HEAD COUPLING THREDOLET CAP
	2	32	ASTM A234 GR. WPB SMLS. BW. PER ANSI B16.9 SCH SAME AS PIPE 90 DEG ELBOW LR 45 DEG ELBOW LR TEE (EQ. OR RED.) REDUCER (CONC OR ECC) CAP
NIPPLE			BARREL NIPPLE: ASTM A53 GR. B, SMLS
	1/2	1 1/2	SCH 80, TBE, LENGTH 100 MM SWAGED NIPPLE: ASTM A105
	1/2	1 1/2	PE (L) - PE (S) SCH 80
	1/2	1 1/2	PE (L) - NPT (S) SCH 80
FLANGES			ASTM A105, CL150 RF PER ANSI B16.5 BORE SAME AS PIPE
	1/2	1 1/2	SOCKET WELD
	2	24	WELDING NECK
	1/2	1 1/2	LONG WELDING NECK
	28	32	CL 150 RF, WN, PER ANSI B16.47 (SERIES A)
	1/2	32	BLIND
			ASTM A105, CL 150, RF ANSI B16.5



3.1.15 Specification for Pipe Fabrication and Inspection

This specification has the general requirements of welding, pipe connections, hangers, supports, anchors, guides, inspection and testing. The welding requirements include qualification of welders, specific requirements when using various methods of welding, the weld quality, repair and heat treatment. The method of making flanged connections and the design of hangers and supports is specified by reference.

3.1.16 Specification for Pig Traps

Pigs are instruments designed to travel internally along pipes as they make measurements of flow, temperature, pressure, pipe thickness, corrosion, curvature and alike. Pigs (also known as scrapers) normally have an external brush to clean the pipe's internal surface as they so.

Pigs are introduced into the pipeline through pig launchers and they are received in pig traps. Pig receivers are located long the pipe to receive pigs and the debris they have collected at the end of their journey.

This specification covers supports, fabrication, inspection and testing of pig launchers and receivers.

3.1.17 Specification for Insulating Joints and Flanges

One way to prevent corrosion, is by electrical insulation of the anode and cathode from each other. In pipelines, this is achieved through insulating joints and flanges which are specified in this document.

In this specification, the design pressure and temperature, required material properties, manufacture, tests, inspection and markings are specified.

3.1.18 Specification for Heat Tracing

In cold environments, some fluids may need to be kept warm or prevented from freezing. This is normally achieved by placing an external steam pipe or a heating element in contact with the pipe to maintain it at a required temperature.

This specification covers the design, methods, pipe size, objective temperature, construction, installation and materials for heat tracing.

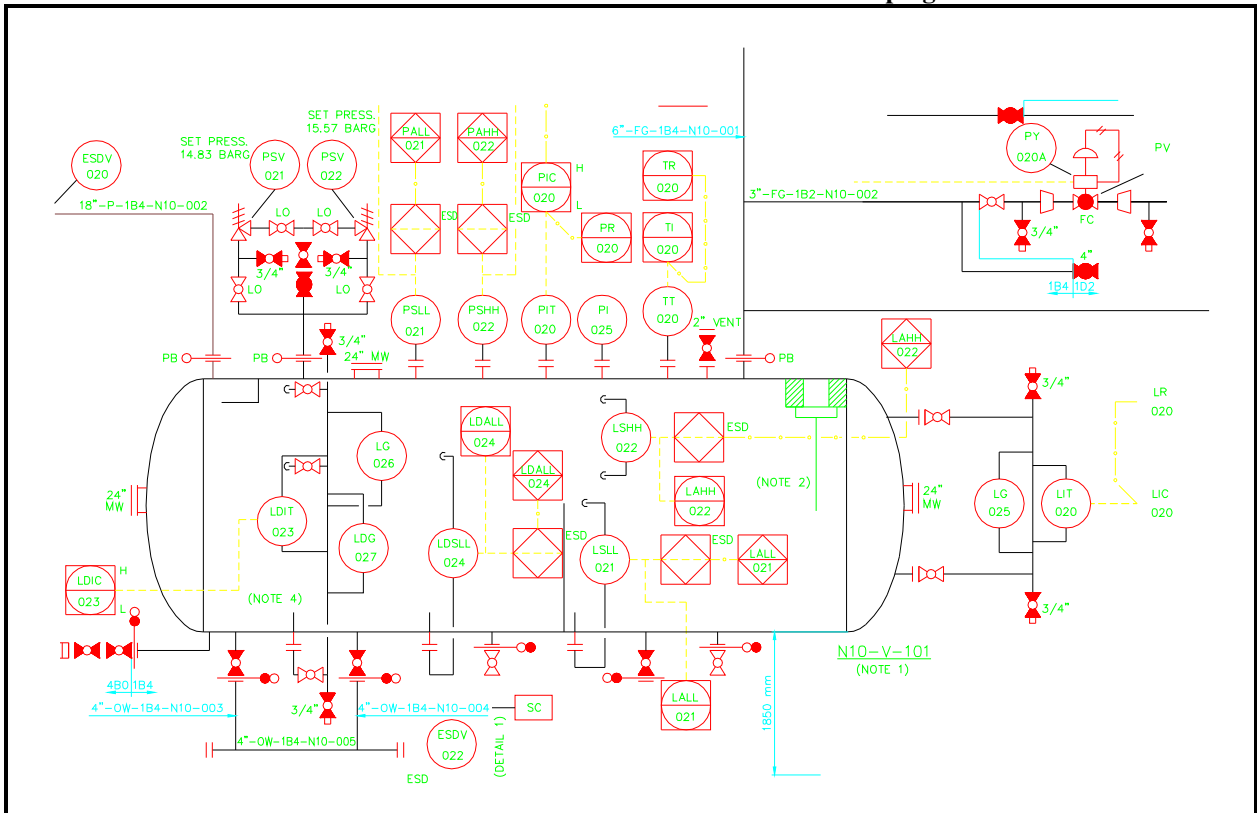
3.2 Mechanization

Mechanization of a preliminary Piping and instrument diagram is a process that involves checking all of its piping details:



- confirmation of all valve types according to their location and the piping material specification.
- identification and removal of redundant pipe sections where such savings can be made.
- review and advisory comments on limits assigned to a battery of related units.
- examination and balance-checking of line pressure/temperature rating or classes for all pipe sections and the preparation of advisory comments where necessary.
- assignment of assembly mechanisms for all instruments, taps, vents, drains and alike connected to each pipe run in accordance with the document entitled “Assemblies” which is based on the line class number, the corrosion allowance and the fluid.
- cross-checking of unit numbers to/from which pipes are shown to run on the diagrams with vessel data sheets received from the Mechanical Engineering department.
- examination and advisory comments on route design in order to ensure that all pipe sections are isolateable and serviceable. This is done by checking that the number of blinds, valves and drains is adequate and that they are correctly located.
- review and comments on valve selection, drainability and provisions for by-pass lines where necessary.
- review and comments on the existence and selection of block valves on either side of control valves and the suitability of by-pass valves for the pipe section being controlled.
- specification of reducers to accommodate valve and instrument sizes specified by the process department.

A sample section of a Piping and Instrument Diagram after mechanization is shown below. All the symbols and abbreviations used on a P&ID are described on a base drawing called the Piping And Instrument Diagram Legend.



An example of a mechanized piping and instrument diagram

3.3 Piping Material Index

This is a tabulated list of piping class codes (see section 3.3.1) with pressure/temperature ratings, flange type, base material, corrosion allowance and service. This list is based on the fluid list and the design criteria.

CLASS	RATING FACING	GENERAL MATERIAL	DES. TEMP (°C)	DES. PRESS. (BARG)	C.A. (mm)	Service
1B2A	# 150 RF	C.S.	-29/235	B16.5	1.6	Oily Water-Fuel Gas-L.P. Steam-All Process Fluids-L.P. Condensate-Nitrogen Plant Air-Drain, Drinking Water
1B2B	# 150 RF	C.S. (Galvanized)	-29/85	B16.5	1.6	Drinking Water-Plant Air-Instrument Air
1B2C	# 150 RF	C.S. (Killed)	-29/200	B16.5	1.6	Fuel Gas-Chemicals-All Process Fluids-Drain
1B2D	# 150 RF	L.T.C.S	-45/85	13.1	1.6	All Process Fluids-Drain.



CLASS	RATING FACING	GENERAL MATERIAL	DES. TEMP (°C)	DES. PRESS. (BARG)	C.A. (mm)	Service
1B4A	# 150 RF	C.S.	-29/320	B16.5	3	Plant Water-L.P. Steam-Water-L.P. Condensate-M.p. Steam-Diesel Oil-Sewers (Non Oily)-Blow Down-Boiler Feed Water-Chemical Sewer, Drain
1B4B	# 150 RF	C.S. (Killed)	-29/85	B16.5	3	Oily Water-Caustic Soda-Water-Chemical Sewer-Diesel Oil
1B8A	# 150 RF	C.S.	-29/85	B16.5	6	Sulphuric Acid-Chemicals.
3B0A	# 150 RF	S.S.	-29/85	B16.5	0	Demineralized Water Desalinated Water, Chemical sewer
9B0A	# 150 RF	C.R.A	-29/155	B16.5	0	All Process Fluids-Sour Water-Acid Gas-Water
1D2A	# 300 RF	C.S.	-29/235	B16.5	1.6	All Process Fluids-Fuel Gas
1D2B	# 300 RF	C.S. (Killed)	-29/163	B16.5	1.6	All Process Fluids-Oily Drainage-
1D2C	# 300 RF	L.T.C.S.	-45/121	37	1.6	All Process Fluids-Sour Water-Drain.
3D0A	# 300 RF	S.S.	-29/85	B16.5	0	CHEMICAL
1D4A	# 300 RF	C.S.	-29/320	B16.5	3	Boiler Feed Water-Blow Down-M.P. Steam
1F2A	# 600 R.F.S.F.	C.S.	-29/85	B16.5	1.6	All Process Fluids-Fuel Gas-Nitrogen.

3.3.1 The Piping Class

This piping class is a code which forms the first part of the line numbering system. This code is made up of 3 to 5 characters, depending on the project definition for each character of the code. Characters which make-up the code are normally defined at the end of the Piping Material Index table. For example the first character of the piping class code may indicate the base material which can be 1 for carbon steel, 2 for alloy steel, 3 for stainless steel and so on. The second character in this example may be a letter which indicates the pipe pressure rating, the third character may be a number indicating the corrosion allowance and the last character is usually a progressive letter for coding the class of similar pipe sections having different forms of the same base material.

3.4 The Line List

The line list is a tabulated list of all pipe lines in the project. This table contains the following information for each line section.



3.4.1 The Line Number

1) This multi-part number, as defined in the line numbering procedure, indicates the fluid being carried, the serial number of the pipe line, the piping class as defined in the document entitled Piping Material Index (see section 3.3) and the nominal pipe size. The line number as listed in this table does not include the line finish (insulation) code letter. This item is described in later columns of the table.

2) The line description

The line description is made up of Five parts as follows:

- (a) the source unit identification number
- (b) the destination unit
- (c) the fluid phase (liquid, gas, ...)
- (d) the fluid density
- (e) the pipe wall thickness (schedule)

3) The design temperature and pressure

4) The operating temperature and pressure

5) The test temperature and pressure

6) The Finish

This column of the table indicates the pipeline finish; the coating or insulation and the temperature at which the insulation (if any) is to keep the pipe at.

7) The intended minimum and maximum temperature of the insulated pipe

8) The Piping and instrument diagram number on which the pipe section appears.



A sample of the line list is given below:

LINE CONTENT: ALL PROCESS FLUIDS										UNIT NUMBER: 5600											
LINE NUMBER			LINE DESCRIPTION						DESIGN		OPERATION		TEST		LINE FINISH		P.A.D. DRAWING NUMBER	REMARKS	REVISION		
CONTENT	SERIAL NUMBER	SPEC	SIZE (INCHES)	FROM	TO	FLUID PHASE	DENSITY KG/m ³	SCHEDULE	PRESSURE (BARG)	TEMP. °C	PRESSURE (BARG)	TEMP. °C	MEDIUM	PRESSURE (BARG)	TYPE	INSULATOR THICKNESS (mm)				HOLD TEMP. °C	HIGH / LOW TEMP. °C
P	014	1D2C	6	1-V-56007	1-E-56005	L	436.7	40	22.9	-45/85	19.5	55.0							004/006		B4
P	015	1D2C	6	1-E-56005	LV-15	L	463.2	40	22.9	-45/85	18.5	41.4							004/007		
P	016	1D2C	10	LV-15	1-V-56005	V/L		30	22.9	-45/85	5.0	6.0							007	VAP=12.76 LIQ=521.2	
P	017	1D2C	10	1-V-56008	1-V-56004	V	12.8	30	22.9	-45/121	5.0	6.4							007/005		
P	018	1D2C	10	1-V-56004	1-C-56001	V	11.4	30	22.9	-45/121	4.4	5.4							005/008		
P	019	1D2C	6	1-V-56005	LV-05	L	521.2	40	22.9	-45/85	5.0	5.5							007/003		
P	020	1D2C	6	LV-05	1-E-56004	V/L	68.6	30	22.9	-45/85	0.7	-30.2							003	VAP=12.76 LIQ=521.2	

3.5 Assemblies

The document entitles Assemblies gives details of how each type of instrument such as vents, drains, valves, pressure taps, temperature taps, flange taps and steam traps for control and measurement of processes are to be connected to pipes, depending on the line size, the pressure/temperature rating, the materials involved, the fluid and the connection orientation.

A sample assembly is shown below.

VENTS - DRAINS ASSEMBLY

ASSEMBLY 12	ALL LINES	MATERIAL SPECIFICATION CONCERNED
<p>SCR'D. PLUG</p> <p>3/4" BALL VALVE S.W./N.P.T.</p> <p>NIPPLE "P.B.E." L=100</p> <p>INTERSECTION</p>		<p>1B2A, 1B2C, 1B2D, 1B4A, 1D2A, 1D2B, 1D2C, 1D4A, 1F2A, 1F2B, 1F2C, 1F4A, 2F2A</p>



ASSEMBLY 13	ALL LINES	MATERIAL SPECIFICATION CONCERNED
<p>Labels in diagram: BLIND FLANGE 3/4" FLANGED BALL VALVE NIPPLE "P.B.E." L=100 INTERSECTION</p>		<p>1G2A, 1G2B, 1G2C</p>
ASSEMBLY 14	ALL LINES	MATERIAL SPECIFICATION CONCERNED
<p>Labels in diagram: SCR'D PLUG 3/4" GATE VALVE SW/N.P.T. NIPPLE "P.B.E." L=100 INTERSECTION</p>		<p>1B2A, 1B2C, 1B2D, 1B4A, 1B4B, 1B8A, 3B0A, 9B0A, 1D4A, 3D0A, 1F4A</p>

3.6 First Piping Material Take-Off (1st M.T.O.)

The first material take-off is a provisional list of all the required piping items of a project in tabulated form. The information for this first version of the Materials Take-off is extracted from the piping and instrument diagram and the plot plan.



3.8 Final Material Take-Off

The final material take-off is more refined and more accurate on its estimate of the quantity of each item required, as it is based on isometric drawings of the piping plan.

3.9 Bill Of Materials (B.O.M.)

This output document is a detailed item by item tabulated list of the project requirements for piping. It specifies the required item by the reference grade and standard to which it must be made, by the size and its rating. The information on this table is entirely extracted from the material take-off documents.

3.10 Painting and Insulation

The final part of the multi-part line number indicates the type of external covering for each pipe section. Whether any line class requires an internal coating is indicated in the coatings specification for the project, the preparation of which is based on the design criteria.

The project painting specification and the insulation specification, together determine the coating and insulation type and thickness for each pipe section depending on the fluid carried, the line temperature, the pipe material, the external environment to the pipe and whether personnel may come in contact with the pipe.

The coating and insulation activities of the materials section not only covers pipes, but also the internal and external coating and insulation of tanks and vessels in the project as specified in the painting and insulation specifications.

3.11 Circulating Documents

DOCUMENT GROUP AND TITLE	Circulation I= Internal, C= Client, V= Vendor
Piping Classes Specifications	C
Special Items Specification	C
Drawings of Assemblies	IC
P & ID Schedules and Mechanization	I
Line List Schedules	IC
P& ID, Hydrotest	C
Piping Bulk Materials	IC
Special Items Schedule	IC
First M.T.O.	C
Second M.T.O.	C
Final M.T.O.	C
Bill Of Materials	C



DOCUMENT GROUP AND TITLE	Circulation I= Internal, C= Client, V= Vendor
Inquiry Requisitions For Pipe, Fittings, Flanges, Gaskets, Stud Bolts & Nuts, Valves, Special Items, Coat & Wrap, General Welding Electrodes, RTRP Pipe, Fitting & Flanges	VC
Technical Bid Analysis For Pipes, Fittings, Flanges, Gaskets, Stud Bolts & Nuts, Valves, Special Items, Coat & Wrap, General Welding Electrodes, RTRP Pipe, Fitting & Flanges	C
Purchase Requisitions For, Pipe, Fittings, Flanges, Gaskets, Stud Bolts & Nuts, Valves, Special Items, Coat & Wrap, General Welding Electrodes, RTRP Pipe, Fitting & Flanges	VC
Vendor Data Review For Valves, Special Items	C
Insulation & Painting Specification	C
Inquiry Requisitions For Insulation & Painting	V
Technical Bid Analysis For Insulation & Painting	C
Purchase Order Requisitions For Insulation & Painting	VC

3.12 Final Documents

The following table shows a sample set of final project documents. The actual final documents for each project will of course depend on the requirements of the client.

Final Documents
Specification for Line numbering procedure
Specification for materials supply of RTRP pipes
Specification for field pressure testing
Specification for painting
Specification for insulation
Specification for pipeline coat & wrap and field joint coatings
Specification for protection of underground steel piping
Specification for materials supply of expansion joints
Specification for general piping process and utility field installation
Specification for Pipe Line Welding and NDE
Specification for General Piping, Process and Utility Fabrication
Specification for Pig Traps
Specification for Insulating Joints and Flanges
Specification for Heat Tracing
Piping class specification
Piping material specification
Piping material index



Final Documents
Piping first MTO
Piping second MTO
Bill of materials
Line list

Appendix 1: List of Documents Commonly Referenced in Piping Specifications

The following documents are commonly referenced directly or indirectly in part or completely, when piping specifications are prepared.

[List of documents to be added here]