



PIPA

PLASTICS INDUSTRY
PIPE ASSOCIATION
OF AUSTRALIA LIMITED

INDUSTRY GUIDELINES POP002

Polyethylene (PE) Pipes and
Fittings for Compressed Air

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Polyethylene (PE) Pipes and Fittings for Compressed Air

This document contains guidelines for the use of PE pipes and fittings in compressed air applications and should be read in conjunction with POP001 and POP003. For the use of other plastic pipe systems in these applications, reference should be made to the manufacturer.

ATTRIBUTES

PE has a number of attributes which make it ideally suited to compressed air applications:

FRACTURE RESISTANCE

High resistance to fracture propagation limits the extent of fracture in the event of external damage. This feature means that PE, unlike some other thermoplastics, will present minimal hazard in the event of accidental damage and the pipe system would not normally require additional protection.

ULTRAVIOLET LIGHT RESISTANCE

Black PE materials may be used if exposed to UV radiation, but consideration may need to be given to temperature effects.

For coloured products, PE is specified to contain UV stabiliser. However, UV stabilisers are not as effective as carbon black, and the advice of the manufacturer may be appropriate.

CORROSION RESISTANCE

Unlike metallic pipework, PE will not corrode.

CHEMICAL RESISTANCE

PE has excellent chemical resistance and is suitable for use in contact with compressor oils, whereas some other thermoplastics have limited or poor resistance to compressor oils. Some synthetic oils, including aromatic, polyester, and di-ester types, may not be suitable. If in doubt, the advice of the manufacturer should be sought.

IMPACT RESISTANCE

PE has high impact strength compared with other thermoplastics, which maximises resistance to external damage.

COLOUR AND IDENTIFICATION MARKING

May be coloured for identification purposes. The manufacturer may be contacted to determine what options may be available.

In the context of compressed air installations there is often reference made to AS 1345 "Identification of the contents of pipes, conduits and ducts". Whilst this Standard nominates specific base identification colours as part of the identification marking requirements, it must be understood that this does not mean that the entire pipe is required to be the nominated base colour. The Standard initially states ... "The natural or as-manufactured colour of the pipe need not necessarily comply with this Standard, except where a potentially hazardous conflict might arise, e.g., the use of a green pipe to carry a corrosive substance". It then goes on to nominate a series of options for marking including applying the base identification colour to the entire pipe length, using base colour identification

bands at intervals along the pipe, use a pipe marker identification block in the appropriate base colour or some combinations of the above.

LOW NOISE/VIBRATION TRANSMISSION

Vibrations can cause problems in compressed air systems. PE pipes with their flexibility will not transmit vibrations to other structures.

LIGHT WEIGHT

The light weight of PE pipe facilitates quick and easy installation. Combined with the benefits of prefabrication, this enables installation costs to be reduced.

Light weight enables the PE compressed air system to be fixed into or onto cable trays, further reducing costs. The pipelines can be secured with pipe clips or cable ties depending on the pipe sizes. Since plastics do not conduct electricity, it is safe to install them in cable trays alongside electrical cables.

MANUFACTURING STANDARDS

PE - PIPES

AS/NZS 4130 Polyethylene (PE) pipes for pressure applications

PE – FITTINGS

AS/NZS 4129 Fittings for polyethylene (PE) pipes for pressure applications

PE pipe for compressed air has dimensions to Series 1 pipe requirements of AS/NZS 4130.

PRECAUTIONS

Compressed air systems contain substantial stored energy, which, if released suddenly, could cause injury. It is recommended that pipe system design, installation and maintenance be conducted by those with appropriate knowledge and experience. Care is needed to avoid unplanned overheating of the system. Air compressors will produce air which may be considerably above ambient temperature. Connection between a piston compressor and receiver should not be in plastics due to the likelihood of unacceptably high temperatures.

Industry best practice of shielding equipment and pipework from direct heat sources, e.g., sunlight, should be adopted to prevent excessive heat build-up. It is also recommended that oil traps be fitted immediately downstream of the compressor.

JOINTING

It is especially important that installation be carried out by qualified and experienced operators under controlled conditions. All jointing should be conducted in accordance with the manufacturer's recommendations.

There are two jointing methods:

1. Fusion Joints
2. Mechanical Joints

ALLOWABLE PIPE SYSTEM WORKING PRESSURES

The following tables list maximum operating pressures, in kPa. For continuous operating temperature up to 40°C the system life is expected to be in excess of 50 years

For continuous operation at temperatures above 40°C, life expectancy may be reduced. However, for normal operation, including operation for limited periods at temperatures up to 60°C i.e., variable operating temperatures, the system life would not be reduced. Specific design data may be obtained from PIPA members.

System pressure capabilities have been derived using a design factor of 2. The energy stored in compressed air and the potential for pressure spikes means that the pressure rating is less for compressed air pipes than for water pipes, for which the safety factor is 1.25.

Table 1
Maximum Allowable Operating Pressure (kPa) – PE80

OPERATING TEMPERATURE	YEAR/ MIN LIFE	DESIGN FACTOR	SDR17 /PN10	SDR13.6 /PN12.5	SDR11 /PN16	SDR9 /PN20	SDR7.4 /PN25
20	100	1	500	635	800	1000	1250
25		1	500	635	800	1000	1250
30		1.2	417	529	667	833	1042
35		1.3	385	488	615	769	962
40		1.3	385	488	615	769	962
45		1.4	357	454	571	714	893
50	36	1.6	313	397	500	625	781
55	24	1.7	294	373	471	588	735
60	12	1.8	278	353	444	556	694

Note: the minimum life periods may be considered to be the minimum potential service lives and represent the maximum extrapolated periods permitted by the ISO 9080 extrapolation rules given the available test data.

Table 2
Maximum Allowable Operating Pressure (kPa) – PE100

OPERATING TEMPERATURE	YEAR/ MIN LIFE	DESIGN FACTOR	SDR17 /PN10	SDR13.6 /PN12.5	SDR11 /PN16	SDR9 /PN20	SDR7.4 /PN25
20	100	1	625	794	1000	1250	1563
25	100	1.1	568	722	909	1136	1420
30	100	1.1	568	722	909	1136	1420
35	50	1.2	521	661	833	1042	1302
40	50	1.2	521	661	833	1042	1302
45	35	1.3	481	611	769	962	1202
50	22	1.4	446	567	714	893	1116
55	15	1.4	446	567	714	893	1116
60	7	1.5	417	529	667	833	1042

Note: the minimum life periods may be considered to be the minimum potential service lives and represent the maximum extrapolated periods permitted by the ISO 9080 extrapolation rules given the available test data.

CALCULATION OF MAXIMUM ALLOWABLE OPERATING PRESSURE (MAOP)

$$MAOP = 2 \times MRS / (c \times f1 \times (SDR-1))$$

Where:

Minimum Required Strength (MRS) is a material property defined in AS/NZS 4130,

c = 2 (safety factor for compressed air)

f1 = temperature design rating factor (taken from the tables above).

PIPE MARKINGS

Marking of PE pipes manufactured specifically for compressed air, should show the following details.

1. Manufacturer's name or registered trademark, and pipe series 1 number.
2. Nominal diameter, nominal pressure classification and SDR
3. Operating pressure at 20°C
4. PE material classification i.e., PE100 or PE80
5. The words, 'Compressed Air'
6. Date of manufacture in the form YR/MN/DY i.e., "140723".
7. Identification of the manufacturing site
8. The standard number, AS/NZS 4130

Example of marking:

TRADEMARK S1 DN32 PN16 SDR11 1000KPa at 20°C PE100 COMPRESSED AIR 140723 F1 AS/NZS4130

FITTINGS AND VALVES

Reference should be made to PIPA members for recommended pressure limitations, for their range of products, but as a general guide:

- PE moulded fusion fittings are suitable for use at the operating pressures shown in the tables.
- PE mechanical fittings are suitable for use at operating pressures up to PN16 or PN20. Check the operating pressure with the fitting's manufacturer.
- Fabricated fittings should not be used.

In order for PE mechanical fittings to comply with the requirements of AS/NZS 4129, it is normally considered necessary to provide reinforcement to female threads larger than 25mm. This reinforcement should also be corrosion resistant and is normally provided in the form of a stainless-steel ring. Threaded outlets larger than 50mm should be avoided. The use of PTFE (Teflon) tape only is recommended for all fittings with plastics threads.



PIPA

PLASTICS INDUSTRY
PIPE ASSOCIATION
OF AUSTRALIA LIMITED

PO Box 957 North Lakes Q 4509

E plasticpipe@pipa.com.au

P +61 (0) 459 919 437

pipa.com.au

Disclaimer

In formulating this guideline PIPA has relied upon the advice of its members and, where appropriate, independent testing.

Notwithstanding, users of the guidelines are advised to seek their own independent advice and, where appropriate, to conduct their own testing and assessment of matters contained in the guidelines, and to not rely solely on the guidelines in relation to any matter that may risk loss or damage.

PIPA gives no warranty concerning the correctness or accuracy of the information, opinions and recommendations contained in the guidelines. Users of the guidelines are advised that their reliance on any matter contained in the guidelines is at their own risk.