

Continue



















## Piping isometric drawing standards

Once a 3D model is established in software like PDS, PDMS, or SP3D, piping designers/engineers must convey that information to the yard for fabrication and the site for construction. The transferred info must be sufficient for fabricators with a clear vision of what needs to be fabricated, how it should be connected with other elements, and exact dimensions. This is where Piping Isometric Drawings play a crucial role. These drawings are used in various situations: during construction services, marking up deviations during site modifications, as-built documentation, and stress analysis modeling. They also help calculate parameters required during project execution, such as pipe length, weight, and insulation area. Additionally, these drawings serve purposes like maintenance planning, fabrication accuracy, engineering design, and understanding existing piping layouts. Built-up isometric drawings provide a detailed 3D representation of a piping system, allowing for visualization and understanding of its layout, components, and flow paths. 1. Piping systems require precise measurements, including dimensions and distances between components. 2. Piping isometric drawings are widely used due to their efficiency in conveying complex information despite being simple. 3. They were initially hand-drawn but now created with software like AutoCAD/Microstation. 4. With the digital age, it's possible to automatically extract isometrics from 3D models with a single click. 5. Piping isometric drawing templates help standardize processes and ensure consistent accuracy. 6. However, these templates may vary between organizations. 7. Pressure testing piping systems can expose potential hazards, such as offset configurations. 8. In complex piping systems, "rolling" refers to pipe changes in direction across multiple planes. 9. Piping isometrics include a North arrow for orientation and coordinates/elevation details for accurate pipe length measurements. From the pipe centreline, not from the outer diameter of the pipe. Piping Dimensions in Isometrics With technological advancements, there's minimal possibility that North arrows, coordinates, and elevation in Isometric would differ from the actual piping arrangement; hence, dimensions and Material Take Offs (MTO) must match exactly if using the same 3D model source. However, it is always advisable to double-check as discrepancies can arise due to issues with the modeling process that might affect material quantities. Isometric pipe drawings inform which pipes should be constructed in the fabrication shop and which for assembly at the construction site. The complete piping system is divided into smaller pieces known as piping spools, each transported to the site for installation. Each weld made between spools during construction is called a field weld (FW), while another type of weld, known as a field-fit weld (FFW), has its tolerance defined by the designer, if needed. Piping Spool In an assembled drawing, it should be possible to see the whole piping system after installation. For reading and understanding isometric pipe drawings, learning the symbols thoroughly is essential. Most piping and pipeline symbols are similar across organizations and don't deviate much from one another, so familiarizing yourself with these symbols helps in recognizing various components like: Piping joints Fittings and components Instrument items Equipment connections Knowing the symbols for Isometric drawings can be useful when preparing MTO/BOMs. Commonly used piping isometric drawing symbols are shown below. The use of detailed isometric drawings in piping systems has become a crucial tool for designers, providing a 3D representation of pipe layouts, dimensions, fittings, valves, and other components. These drawings are generated using specialized software programs that have made the job of piping designers much easier. The market offers both 2D and 3D software options, with 3D software capable of automatic isometric generation, whereas 2D software requires manual input. When selecting a suitable tool, factors such as complexity, cost, and client requirements are considered. Popular choices among design consultancies include AutoCAD for its flexibility in modifying piping layouts, AutoDesk Plant 3D for industry-standard piping design, and CADWorx for integrating piping designs with equipment modeling and structural design. Other notable tools include AVEVA E3D for multidisciplinary plant design, SmartPlant 3D for detailed piping layouts and isometric drawings, and Pipe-Flo Professional for assessing hydraulic performance in piping systems. Isometric drawings play a crucial role in plant design, especially when combined with other Bentley software solutions. PDS, or Plant Design Software, is a comprehensive suite that includes tools for creating isometric drawings, 3D modeling, and engineering analysis for piping and equipment. However, it's often overlooked in favor of more specialized tools. Bentley AutoPIPE offers a robust solution for piping analysis and design, including features for creating isometric drawings and analyzing stress and load conditions. CAESAR II, on the other hand, is primarily used for pipe stress analysis but can generate isometric drawings as part of its output, ensuring structural integrity of piping systems. For those looking to delve deeper into piping isometrics, online resources like video courses and tutorials are available. Key points to consider when reviewing isometric drawings include checking dimensions, material specifications, and equipment coordinates against plant layouts. Piping isometric drawings provide critical information for fabrication and erection, including bill of materials and MTO requirements. These drawings typically cover a single line as per the line list and P&ID, showing necessary details for construction. While they're not drawn to scale, proportionate dimensions are provided relative to piping centerlines. Essential information included in isometric drawings includes reference numbers for PEFS (P&ID), GA drawings, line numbers, flow direction, insulation tracing, design pressures, temperatures, and other relevant specifications. Equipment layouts, coordinates, and changes in line specifications or directions should also be clearly noted. All piping instruments are correctly labeled and aligned with standard symbols. Location and identification of all equipment are accurately provided. Upstream and downstream straight lengths meet requirements. Insulation specifications follow PEFS (P&ID) guidelines. Isometric details and section identification match, including "match line" provisions for accuracy. BOM in Isometrics is accurate. Weld points and field welds are indicated. Insulation class, thickness, and flow direction are provided. If the specification differs from connecting piping, flange information on equipment is detailed. Valve sizes and operation directions are listed. Control valve size and tag are provided. Field weld locations are marked. High-point vents and low-point drains are included for hydro-tested lines. Special supports like flange or welded supports details are shown. Stress analysis results are incorporated for stress-critical lines. All symbols follow the Legend. Slope is indicated according to P&ID/PEFS guidelines. Spectacle blind, spacer, and blind open/close position follow PEFS/P&ID specifications. High-point vents and low-point drains are provided for hydro-tested lines (e.g., Instrument Air, Flare, and Nitrogen lines may not be hydro tested but pneumatically tested). Orifice tapping orientation follows instrument standards for gas and liquid lines. Flow direction is clearly marked for items like check valves, globe valves, strainers, etc. Isometric issued for Re-IFC to be marked with cloud and revision triangle. Insulation gasket demarcation is shown. General notes and Bill of Material are included. Tie-in numbers are provided. Piping Isometric Drawings are thoroughly checked by Senior Piping Checkers before release to the Construction team, minimizing errors and improving quality. Please note that I did not remove any spam or junk content as per your request. Instrument connectionFlow arrowHigh point vent. low point drainHydro test vent and drainEquipment nozzle connectionNozzle numbers.Equipment numbers.Coordinates and elevationsNorth directionBill of materialValve tag numbers.Sample Piping IsometricInstrument tag numbers.Continuation sheets or isometric numbers.Grid location and numbers.Tag numbers of special items (if applicable).Slope/no pocket/free draining requirement, if any.Minimum or Maximum distance, straight length requirements, etc. as specified in P&ID.Close/open position for spectacle blind or spacer & blind.Removable spool pipe requirement, if any.The sequence of branch connections (as agreed with Process in case of any changes).The special feature of valves (e.g. LO, LC, etc.).Insulation symbol for insulated lines.Insulating gaskets are selected as shown in P&IDsSpecific requirements mentioned in applicable P&ID notes (if any) have been compiled with.Before starting the piping isometric checking activity, the engineer must be ready with the following drawings or documentsPiping and instrument diagram (P&ID): From this drawing, we will get information like line number, line size, insulation, fluid commodity, special notes (like no pocket, requirement of spectacle blind in equipment nozzles, pressure head, specific straight length requirement for instrument connections), etc.Piping layouts and Sectional Drawings: Piping layouts will provide information on the pipe route, dimension, elevation, valve orientation, and coordinates.Equipment drawings: To check details of lines connected to equipment nozzles, their elevations, etc.Nozzle orientations: To ensure the nozzle elevation and orientation is proper.Piping material specification: for checking piping materials and based on that if any special requirement is there. For example, piping supports in galvanized or internally PE or ROTO-lined pipes should not be welded.Piping support standard: To understand and check proper support selection in the piping isometric drawing.Special items drawings: For verifying the dimensions of special items.Stress analysis report: To review if all the stress comments have been updated in piping isometric or not.Instrument Hook-up Details: To ensure the end connection requirements for mounting the instruments are in order.The pump suction is bigger than the discharge line (Refer to P&ID)The eccentric reducer (flat side top) used for the pump suction line is used for avoiding the air block in pump suction.The pump suction line and compressor suction line keep always a downward position. Avoid loops in pump suction.The "Continuation on ..." description correctly appears at each end of the line isometric which is continued in another sheet.PSV outlet is always in a rising position.Check the valve accessibility for maintenance purposes. The valve operating height min 250 mm to 1200 mm from floor level.Lift check valve always horizontally using. Swing check valve vertically and horizontally using.Isometric number change is made preferably at a flange joint/valve (not at a weld joint). Operating conditions: - Height limit: 500 mm - 750 mm from floor level - No pipe shoe needed for trunion; insulated lines require one. - Minimum headroom clearance is 2.2m above ground. Pipe and equipment requirements: - Drip leg required for steam lines, but a shoe required for insulated lines (including steam, chilled water, brine, and condensate). - Nozzle orientations to be followed as per the piping design. - Maintain clear and obstacle-free routing. - Control stations near walls or columns; support both sides of control valves. - Dike wall placement around equipment for liquid containment; 1.5 times more volume than equipment capacity. - Weld neck flange required for pressure piping. Pipe and valve details: - Isometric numbering following approved project format. - Adequate spool lengths provided for wafer butterfly valves. - Properly marked platform/grade/building wall/dike or bund floor penetrations and road crossings limits. - Insulation limits specified for heat conservation and personal protection. - Electrical tracing requirements specified, along with its limits. - Wrapping and coating requirements specified for u/g lines. - Minimum weld distance 50mm or five times the wall thickness; exceptions may apply. Pipe supports - Regular intervals of unions in straight pipe runs (e.g., 24m). - Full couplings provided where applicable for small-bore piping. - No direct welding to socket welded fittings below 2". PE pipes not directly welded with swaged reducers, using pipe couplings instead. - Break-up flanges provided for piping with internal lining and hot-dip galvanized piping. - Lifting lugs on removable spools as required. Pipe support and equipment clearance: - Adequate space between pipe support and adjacent components for bolt removal and valve operation. - Valve stem orientation angle indicated where necessary. Items, as well as in-line instrument items, are designed according to approved vendor drawings.The instrument connections are verified with Piping-Instrument interface drawings/Instrument hook-up drawings.These rotameters are installed vertically in the flow direction from top to bottom.The orifice tapping orientation is carried out based on liquid or gas flow conditions and follows the BOM as per the piping-instrument interface diagram.Flow meters, for example, have straight length requirements (e.g. flow orifices, flow nozzles) with specifications following Project standards/Vendor requirements.Line configuration for lines containing magnetic flowmeters is such that these always remain flooded.This allows easy removal of spectacle blinds/spacers & blinds and valves at RTJ flange joints.Flanged spools are available in conical strainers to make removal easier.Valve handwheel/lever orientation is checked in the model for proper access, with comments added accordingly.Model routing visually checks general requirements like accessibility, supporting clearances, obstructions, consistency, aesthetics etc.The branches of drains and drip legs are placed at sufficient distances from supports, steel or other obstructions to avoid clashes during expansion or contraction.Drip leg size and dimensions match Standard drawings for steam lines.Weep hole requirement for atm vent lines is indicated.The drawing border complies with Project specifications or Company standards as applicable.The correct isometric revision number is noted in the title block.The printed pipe class at the bottom of the drawing matches that in line number.Line data, such as process parameters and P&ID no., match with Line List if provided.Isometric reference documents like Pipe Supports Spec are mentioned.Data such as inch-dia, inch-meter etc. appear at the bottom of the isometric.The print should be readable (if required, it may need to be split into multiple sheets).Dimensions and elevations are properly provided.At least one elevation is shown and WP elevations for sloped lines are marked.There are no HOLDs in the isometric. Piping Isometric Drawings Paraphrased Text Isometric drawings of piping systems provide detailed information on pipe sizes and types, fluid flow directions, valve locations, and equipment placement. These 3D representations are typically generated from CAD software or created manually using AutoCAD with general arrangements drawings. Key components of a piping isometric drawing include pipes, fittings, valves, instruments, and accessories, as well as support locations and material specifications. A bill of materials list is also included to specify the required materials and components for construction. Pipe fittings like tees, elbows, and couplings are commonly used. Valves control fluid flow in pipes and have various symbols depending on their type, such as ball valves, gate valves, or globe valves. Nozzles connect pipes to other pipes or equipment, with symbol size and type indicating nozzle specifics. Labels identify piping system components, while notes provide additional information. The legend is a table showing the key to used symbols in piping isometric drawings. Standards like ANSI/ASME Y14.2M-1994, Y14.3M-1994, and B31.3-2019 govern piping drawing creation and usage across industries such as oil, gas, chemical, and manufacturing. Piping isometrics are detailed engineering drawings used in constructing piping systems. They show the precise location, size, and shape of components and can contain a bill of materials list for fabrication and erection purposes. This piping isometric drawing serves as a comprehensive guide, outlining key components such as valves, fittings, and pipe details, along with flow directions and annotations. The document also includes essential measurements like component spacing and bend angles. Utilizing this bill of materials helps streamline material procurement from storage, while pre-fabrication of piping spools in the workshop is facilitated.

Piping isometric drawing standards pdf. Iso piping drawing. Piping isometric drawing dimensions. Piping isometric standards. Standard isometric piping symbols. Isometric piping drawing. Isometric drawing piping pdf. Piping isometric drawing examples. Piping isometric rules.