

Piping Component File Reference Guide



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Preface

This document is a reference guide for integrating Personal Isogen with piping design software. It provides rules and conventions for Piping Component File (PCF) syntax, layout, and content, as well as recommended techniques used to describe a variety of common scenarios. This document also includes a comprehensive listing of all allowable data that you can use to describe pipelines.

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Definitions

The following terms are used throughout this document and are explained here in order to clarify their meaning.

Pipeline - A set of components, each of which is connected to at least one of the other components in the set. Components are connected if their coordinates match within the tolerance currently defined.

Component - A physical, or real, item that can be assembled into a piping system. Components include pipe, valves, gaskets, flanges, instruments, supports, bolts and fittings, such as tees, olets and elbows. Usually, a component has one or more coordinates, which can be thought of as connection points that define how they connect with other components. In some cases, the component is associated with, but not connected into, the pipeline. Associated components are additional items needed to complete the pipeline, such as a chain for a valve operator, or quantities of paint.

Material - In many cases, components of the same type share properties. At a minimum, they have the same item code and description, but can also share other properties. A material is a "typical" component. The PCF has syntax for describing material properties.

Information Item - An annotation that is required to be output on the isometric drawing. Information items include user-defined messages, connection data (connections between the current pipeline and other pipelines or equipment), reference dimensions, spool data and many other examples. While a component is a physical item that you can purchase, an information item is something that adds to the isometric drawing generated by Isogen.

Attribute - Data that defines a property of a pipeline, component, information item or material object in the PCF. An attribute consists of a name and associated value, which can be a string or a number.

System - In some cases, a PCF can contain more than one pipeline. Each pipeline must be connected to one or more of the other pipelines in the PCF. This set of connected pipelines is known as a system.

Spool - A grouping of pipe and components that can be conveniently assembled in a workshop. Personal Isogen has an inherent set of rules that drive the identification of spools and automatically splits the components in a PCF pipeline into a set of spools. You can think of a spool, as a sub-set of a pipeline, although some components, such as Erection items that are connected in to the pipeline at the work site, may not be allocated to a spool.

Style - The settings that control how Isogen formats the drawing it generates from the data in the PCF. The style is independent of the PCF, meaning that you can process the same PCF through different styles to produce a different drawing each time.

What's New in the PCF Reference Guide

The following changes have been made to the *Piping Component File Reference Guide*.

Version 2016

- The Piping Component File (PCF) syntax has been extended to support an additional 35 pipeline header attributes. For more information, see *Miscellaneous Attributes* in the table located in *Pipeline Header Information* (on page 20). (P2 AL:15205)

SECTION 1

The Piping Component File

A Piping Component File (PCF) is a simple, text-based, English language style file that supports the transfer of pipeline content and configuration information between a 3D piping design system and Isogen, the leading system for the production of piping isometrics.

Despite the simplicity and compact nature of its syntax, as shown in the following example PCF, the PCF is capable of handling virtually all configurations encountered in the modeling of piping systems.

```
ISOGEN-FILES          ISOGEN.FLS
UNITS-BORE            INCH
UNITS-CO-ORDS         MM
UNITS-BOLT-LENGTH    MM
UNITS-BOLT-DIA        MM
UNITS-WEIGHT          KGS
PIPELINE-REFERENCE    P-1
    PIPING-SPEC        CS150
GASKET
    COMPONENT-IDENTIFIER 1
    MASTER-COMPONENT-IDENTIFIER 2
    END-POINT          1.5700      0.0000      0.0000 4.0000
    END-POINT          0.0000      0.0000      0.0000 4.0000
    MATERIAL-IDENTIFIER 1
    CATEGORY            ERECTION
    PIPING-SPEC          CS150
    UCI                 7AB4F37C-B1D4-4570-B10E-A598E7D1EF73
```

FLANGE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 2 | | | |
| END-POINT | 1.5700 | 0.0000 | 0.0000 | 4.0000 |
| END-POINT | 7.9200 | 0.0000 | 0.0000 | 4.0000 |
| SKEY | FLSO | | | |
| MATERIAL-IDENTIFIER | 2 | | | |
| CATEGORY | FABRICATION | | | |
| FLANGE-LEFT-LOOSE | OFF | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 2058CE4D-BD71-4294-86FC-713669204161 | | | |

BOLT

| | | | | |
|-----------------------------|--------------------------------------|--------|--------|--|
| COMPONENT-IDENTIFIER | 3 | | | |
| MASTER-COMPONENT-IDENTIFIER | 2 | | | |
| CO-ORDS | 1.5700 | 0.0000 | 0.0000 | |
| BOLT-DIA | 15.88 | | | |
| BOLT-LENGTH | 95.25 | | | |
| BOLT-QUANTITY | 8 | | | |
| CATEGORY | ERECTION | | | |
| MATERIAL-IDENTIFIER | 5 | | | |
| UCI | 13B3E138-B885-4761-AD9F-5ACA7BA0FDAB | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 4 | | | |
| END-POINT | 7.9200 | 0.0000 | 0.0000 | 4.0000 |
| END-POINT | 1007.9200 | 0.0000 | 0.0000 | 4.0000 |
| MATERIAL-IDENTIFIER | 3 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 1F965688-1E61-4E27-B91F-A1A94846BD42 | | | |

FLANGE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 5 | | | |
| END-POINT | 1014.2700 | 0.0000 | 0.0000 | 4.0000 |
| END-POINT | 1007.9200 | 0.0000 | 0.0000 | 4.0000 |
| SKEY | FLSO | | | |
| MATERIAL-IDENTIFIER | 2 | | | |
| CATEGORY | FABRICATION | | | |
| FLANGE-LEFT-LOOSE | OFF | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | D56050FB-0CED-49D3-BAD1-D21BF4B739A1 | | | |

BOLT

| | | | | |
|-----------------------------|--------------------------------------|--------|--------|--|
| COMPONENT-IDENTIFIER | 6 | | | |
| MASTER-COMPONENT-IDENTIFIER | 5 | | | |
| CO-ORDS | 1014.2700 | 0.0000 | 0.0000 | |
| BOLT-DIA | 15.88 | | | |
| BOLT-LENGTH | 95.25 | | | |
| BOLT-QUANTITY | 8 | | | |
| CATEGORY | ERECTION | | | |
| MATERIAL-IDENTIFIER | 5 | | | |
| UCI | 93ABEE38-76A4-4F75-A2B9-2662050695AB | | | |

GASKET

| | | | | |
|-----------------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 7 | | | |
| MASTER-COMPONENT-IDENTIFIER | 5 | | | |
| END-POINT | 1014.2700 | 0.0000 | 0.0000 | 4.0000 |
| END-POINT | 1015.8400 | 0.0000 | 0.0000 | 4.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 303F7D22-8C4D-4124-8927-E6895DD8BB4F | | | |

VALVE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | V1 (7) | | | |
| END-POINT | 1015.8400 | 0.0000 | 0.0000 | 4.0000 |
| END-POINT | 1307.9400 | 0.0000 | 0.0000 | 4.0000 |
| SKEY | VGFL | | | |
| MATERIAL-IDENTIFIER | 4 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| SPINDLE-DIRECTION | UP | | | |
| UCI | A6CEDB6A-A9F5-477D-810B-F205BA775911 | | | |

BOLT

| | | | | |
|-----------------------------|--------------------------------------|--------|--------|--|
| COMPONENT-IDENTIFIER | 8 | | | |
| MASTER-COMPONENT-IDENTIFIER | 10 | | | |
| CO-ORDS | 1307.9400 | 0.0000 | 0.0000 | |
| BOLT-DIA | 15.88 | | | |
| BOLT-LENGTH | 95.25 | | | |
| BOLT-QUANTITY | 8 | | | |
| CATEGORY | ERECTION | | | |
| MATERIAL-IDENTIFIER | 5 | | | |
| UCI | 9F4DA178-77CD-429C-8340-74C67D1F0F2F | | | |

GASKET

| | | | | |
|-----------------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 9 | | | |
| MASTER-COMPONENT-IDENTIFIER | 10 | | | |
| END-POINT | 1309.5100 | 0.0000 | 0.0000 | 4.0000 |
| END-POINT | 1307.9400 | 0.0000 | 0.0000 | 4.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 3F71D8B9-93CD-4C84-BC0C-4057276AE7E1 | | | |

FLANGE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 10 | | | |
| END-POINT | 1309.5100 | 0.0000 | 0.0000 | 4.0000 |
| END-POINT | 1315.8600 | 0.0000 | 0.0000 | 4.0000 |
| SKEY | FLSO | | | |
| MATERIAL-IDENTIFIER | 2 | | | |
| CATEGORY | FABRICATION | | | |
| FLANGE-LEFT-LOOSE | OFF | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 46938A51-0E87-453A-BD2A-2241701B9DCC | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 11 | | | |
| END-POINT | 1315.8600 | 0.0000 | 0.0000 | 4.0000 |
| END-POINT | 2315.8600 | 0.0000 | 0.0000 | 4.0000 |
| MATERIAL-IDENTIFIER | 3 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | B45195EE-ED2A-4529-AEB2-EA8A5EF4E066 | | | |

FLANGE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 12 | | | |
| END-POINT | 2322.2100 | 0.0000 | 0.0000 | 4.0000 |
| END-POINT | 2315.8600 | 0.0000 | 0.0000 | 4.0000 |
| SKEY | FLSO | | | |
| MATERIAL-IDENTIFIER | 2 | | | |
| CATEGORY | FABRICATION | | | |
| FLANGE-LEFT-LOOSE | OFF | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 5B31C12F-FD9E-42A9-9577-400812FA0A6D | | | |

BOLT

COMPONENT-IDENTIFIER 13
 MASTER-COMPONENT-IDENTIFIER 12
 CO-ORDS 2322.2100 0.0000 0.0000
 BOLT-DIA 15.88
 BOLT-LENGTH 95.25
 BOLT-QUANTITY 8
 CATEGORY ERECTION
 MATERIAL-IDENTIFIER 5
 UCI E03520C4-51CF-4D84-B2C4-20BAC44AF9C6

GASKET

COMPONENT-IDENTIFIER 14
 MASTER-COMPONENT-IDENTIFIER 12
 END-POINT 2322.2100 0.0000 0.0000 4.0000
 END-POINT 2323.7800 0.0000 0.0000 4.0000
 MATERIAL-IDENTIFIER 1
 CATEGORY ERECTION
 PIPING-SPEC CS150
 UCI C7D039C0-7ABF-4754-8102-FB5FC5E41001

MATERIALS

MATERIAL-IDENTIFIER 1

ITEM-CODE GCA150-RG2
 DESCRIPTION GASKET, CAF, 150#, RING, 1/16 IN

MATERIAL-IDENTIFIER 2

ITEM-CODE FCD150-SOR
 DESCRIPTION FLANGE, CS ASTM A105, 150#, SO, RF

MATERIAL-IDENTIFIER 3

ITEM-CODE PA5BSTD
 DESCRIPTION PIPE, CS API 5L SML, GRD B, STD WT

MATERIAL-IDENTIFIER 4

ITEM-CODE VVGCF150-FLO
 DESCRIPTION VALVE, GLOBE, CS ASTM A234, 150#, FL, OS&Y

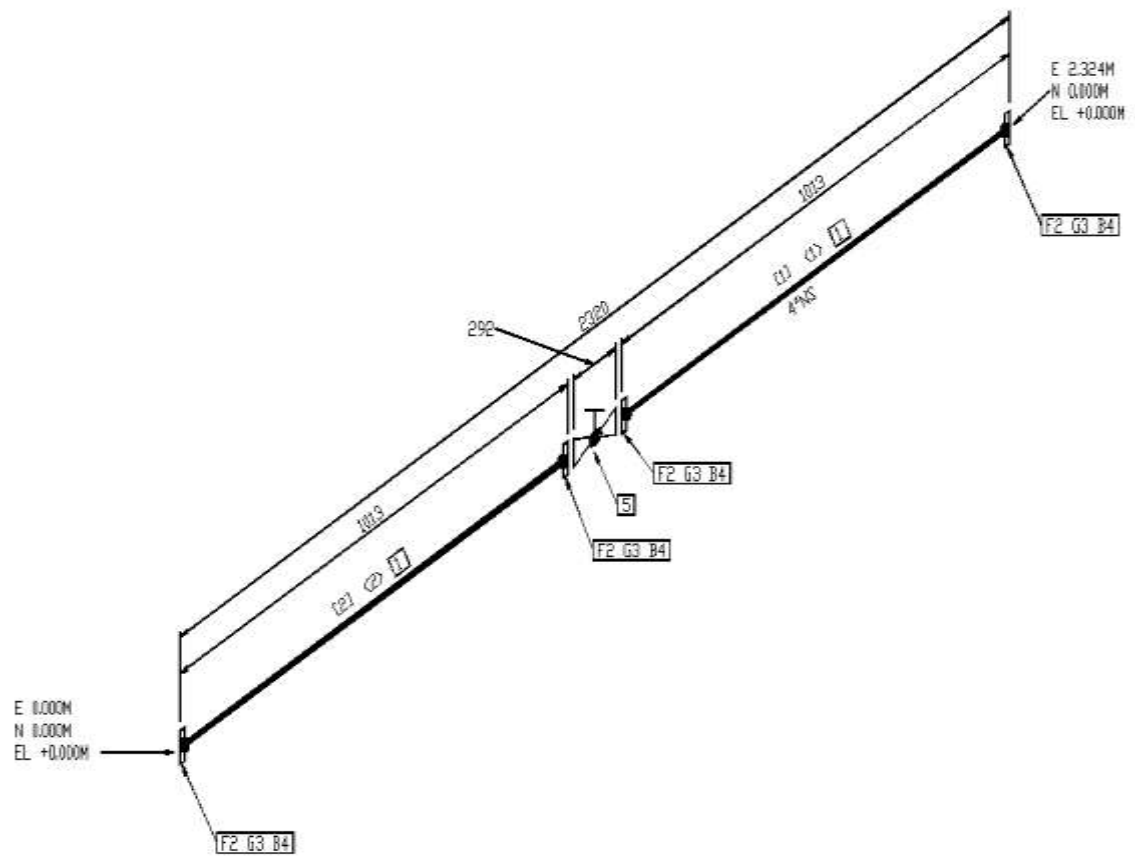
MATERIAL-IDENTIFIER 5

ITEM-CODE BSBS0.625X3.75
 DESCRIPTION STUD BOLT, SS 1% CR MO, EACH WITH TWO WASHERS AND HEAVY

HEX NUTS

DESCRIPTION 0.625 X 3.75

The following illustration shows the result of processing the PCF through Isogen:



Piping Component File Content and Syntax

When you create a PCF, you must follow specific rules regarding its content and syntax.

Mandatory PCF Content

A PCF must contain the following items as a minimum:

- Header information, which is data that relates to the PCF and usually includes such items as the units used for the data within it.
- One pipeline identifier (`PIPELINE-REFERENCE`).
- One component with mandatory attributes.
- Material data.

Optional PCF Content

In addition to the mandatory content, a PCF can also contain the following:

- One or more connected pipelines that form a system.
- One or more information items that provide more detail.
- Optional attributes for each pipeline.
- Optional attributes for each component.
- Additional components that are associated with the pipeline or individual components.

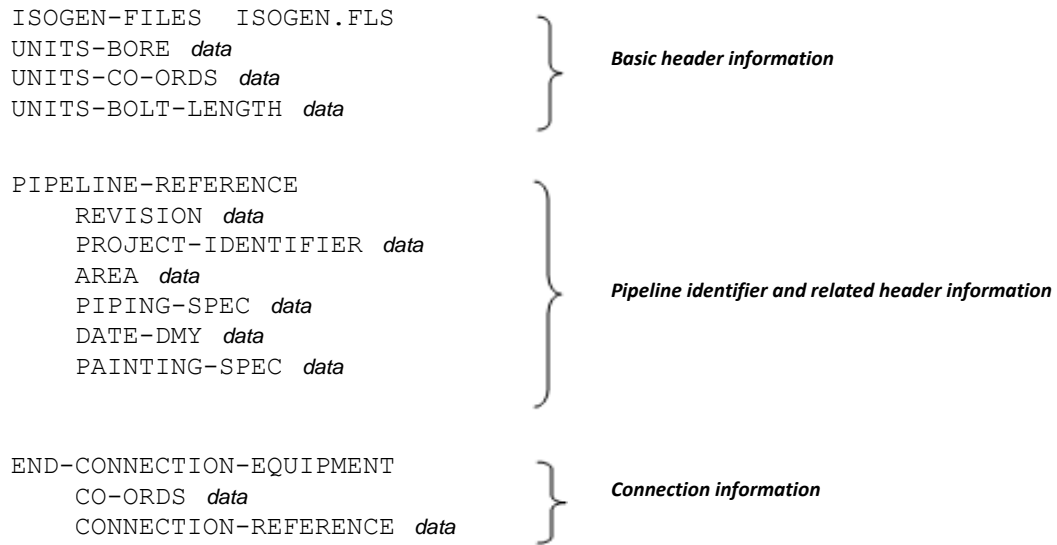
PCF Syntax

The PCF is a text file. The following formatting rules must be obeyed if it is to be properly interpreted by Isogen.

- All header information must start in column position one (1) and must precede any other entries.
- The `PIPELINE-REFERENCE` attribute must start in column position one (1).
- Pipeline data must precede any component data.
- Component, connection and information item data can be presented in any order.
- Pipe, component and connection identifiers must start in column position one (1).
- Pipe, component and connection attributes must start in column position five (5).
- The MATERIALS section, which includes component material data, must start in column position one (1) and must be the last section in the PCF.
- In the MATERIALS section, the material identifier pointer for each `MATERIAL-IDENTIFIER` attribute must start in column position one (1).
- The item code and description entries for each `MATERIAL-IDENTIFIER` attribute must start in column position five (5).

- All data entries must be separated from the attribute identifier by at least one blank character.
- The length of any line in the PCF must not exceed 1024 characters.
- No TAB spaces can be present in the file.

The following diagram shows the basic layout for a single pipeline PCF:



| | | | |
|-------------------------|------|--|--|
| GASKET | | | |
| END-POINT | data | | |
| END-POINT | data | | |
| MATERIAL-IDENTIFIER | n | | |
| CATEGORY-ERECTION | | | |
| BOLT | | | |
| CO-ORDS | data | | |
| BOLT-DIA | data | | |
| BOLT-LENGTH | data | | |
| BOLT-QUANTITY | data | | |
| MATERIAL-IDENTIFIER | n | | |
| CATEGORY-ERECTION | | | |
| VALVE | | | |
| END-POINT | data | | |
| END-POINT | data | | |
| MATERIAL-IDENTIFIER | n | | |
| SKEY | data | | |
| CATEGORY-ERECTION | | | |
| SPINDLE-DIRECTION | data | | |
| FLANGE | | | |
| END-POINT | data | | |
| END-POINT | data | | |
| MATERIAL-IDENTIFIER | n | | |
| SKEY | data | | |
| CATEGORY-FABRICATION | | | |
| END-CONNECTION-PIPELINE | | | |
| CO-ORDS | data | | |
| PIPELINE-REFERENCE | data | | |
| MATERIALS | | | |
| MATERIAL-IDENTIFIER | n | | |
| ITEM-CODE | data | | |
| DESCRIPTION | data | | |
| MATERIAL-IDENTIFIER | n | | |
| ITEM-CODE | data | | |
| DESCRIPTION | data | | |

Pipeline components information

Connection information

Material item codes and descriptions

SECTION 2

Piping Component File Header Syntax

The first part of the PCF consists of data describing the PCF itself and typically includes such items as the units of coordinates, pipe nominal sizes and weights in the file. All of the keywords listed in the table below are mandatory, with the exception of `UNITS-STIFFNESS`, `UNITS-ROTATION`, and `UNITS-WEIGHT-LENGTH`, and must appear in column one (1) of the PCF.

NOTE The units defined in the header do not control the units that are displayed on the Isogen drawing. The units that are displayed in the drawing are the subject of style settings

| Keyword | Acceptable Values | Description |
|--------------------------------|---|---|
| <code>ISOGEN-FILES</code> | <code>ISOGEN.FLS</code> | Identifies the file that specifies all of the input and output filenames used during an Isogen run to generate an isometric drawing. It must appear as the first line in the PCF. |
| <code>UNITS-BORE</code> | <code>INCH</code> <code>MM</code> <code>INCH-SIXTEENTH</code> | Defines the units for component nominal sizes. NOTE <code>INCH-SIXTEENTH</code> data specifies nominal sizes in multiples of 1/16". For example, 96=6", 32=2", and so on. |
| <code>UNITS-CO-ORDS</code> | <code>INCH</code> <code>MM</code> <code>MM-HUNDREDTHS</code> | Defines the units for all coordinates. NOTE <code>MM-HUNDREDTHS</code> specifies coordinates in multiples of 0.01 mm and should be expressed as integers. |
| <code>UNITS-BOLT-DIA</code> | <code>INCH</code> <code>MM</code> <code>INCH-SIXTEENTH</code> | Defines the units for bolt diameters. |
| <code>UNITS-BOLT-LENGTH</code> | <code>INCH</code> <code>MM</code> <code>MM-HUNDREDTHS</code> | Defines the units for bolt lengths. |
| <code>UNITS-ROTATION</code> | <code>DEGREES</code> <code>RADIANS</code> | Defines the units for rotational gap entries in support attributes. |
| <code>UNITS-STIFFNESS</code> | <code>NM</code> <code>LB.FT</code> | Defines the units for stiffness entries in support attributes. |

| Keyword | Acceptable Values | Description |
|---------------------|----------------------------------|---|
| UNITS-WEIGHT | KGS LBS | Defines the units for component weights. |
| UNITS-WEIGHT-LENGTH | INCH METER (or METRE) FEET | <p>Defines the units for component weight/unit length. For example, to express pipe weight data in LBS/FT, you can use the following syntax:</p> <p>UNITS-WEIGHT LBS UNITS-WEIGHT-LENGTH FEET</p> |

SECTION 3

Pipeline Header Information

Each pipeline in the PCF has a set of attributes and at least one component. Some of these attributes are significant to Isogen behavior. For example, the various specification attributes can trigger the display of a "specification change" message on the isometric drawing. In all cases, the attribute can be plotted on the face of the isometric drawing.

NOTE All pipeline attributes must start in column five (5), with the exception of the PIPELINE-REFERENCE attribute, which must precede all other attributes.

| Keyword | Acceptable Values | Description |
|--|-------------------|--|
| PIPELINE-REFERENCE | String | The line reference or ID. IMPORTANT PIPELINE-REFERENCE is the only mandatory attribute and must be placed in column one (1). |
| Specification Attributes: NOTE Each component can override the default set for the pipeline, which causes a specification change indication to appear on the isometric drawing. | | |
| PIPING-SPEC | String | Specifies the default piping specification or material class for the components in the PCF. |
| TRACING-SPEC | String | Specifies the default tracing specification for the components in the PCF. |
| INSULATION-SPEC | String | Specifies the default insulation specification for the components in the PCF. |
| PAINTING-SPEC | String | Specifies the default painting specification for the components in the PCF. |

| Keyword | Acceptable Values | Description |
|--|-------------------|---|
| MISC-SPEC1 MISC-SPEC2 MISC-SPEC3 MISC-SPEC4 MISC-SPEC5 | String | Specifies a specification that can hold additional, arbitrary data. NOTE You can specify up to five miscellaneous specifications. |
| JACKET-SPEC | String | Specifies the default piping specification for the components in the PCF that form part of the jacket. |
| Miscellaneous Attributes: | | |
| REVISION | String | Specifies the revision identifier for the pipeline. |
| PROJECT-IDENTIFIER | String | Specifies the project name or identifier. |
| AREA or BATCH | String | Specifies the area of the plant to which the pipeline belongs. |
| DATE-DMY | String | Specifies the date associated with the PCF; D =date, M =month, and Y =year, as in 03/02/2009. |
| NOMINAL-CLASS or NOMINAL-RATING | String | Defines the pressure rating for the pipeline. This value has no significance to Isogen. |
| BEND-RADIUS | Number | Defines the standard pulled bend radius. |
| ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE9 | String | Provides up to ten user-defined attributes for use where component material descriptions are broken down into a series of short elements where data is defined in dynamic keywords, such as MATL, RATING, SPEC, THKS, and so on. This provides an alternative method to having a single long material description in a component DESCRIPTION attribute. |

| Keyword | Acceptable Values | Description |
|------------------|-------------------|--|
| PIPELINE-TEMP | String | Defines the design or operating temperature for the pipeline. |
| PIPELINE-TYPE | F1, FP, FX and FZ | <ul style="list-style-type: none"> ▪ F1 identifies normally fabricated, hygienic pipe work. ▪ FP identifies normal fixed length type piping, such as lined, where the material item code identifiers for straight sections of pipe are basic ones to which the software appends the length -- in mm or 1/16-inch units -- to make the code unique. ▪ FX identifies normal fixed length type piping, such as lined, where the material item code for straight sections of pipe are user-defined. ▪ FZ identifies fixed length type hygienic pipe work. <p>NOTE Although you can use the PIPELINE-TYPE attribute to trigger special behavior, it is not usually required. As such, use of this attribute is not recommended without first consulting Alias.</p> |
| SPECIFIC-GRAVITY | String | Defines the specific gravity of the pipeline fluid. |
| SPOOL-PREFIX | String | <p>Specifies the string to be used when creating spool identifiers.</p> <p>NOTE You can override this attribute using style settings.</p> |

| Keyword | Acceptable Values | Description |
|-------------------------------|--------------------------|---|
| ATTRIBUTE0 to ATTRIBUTE199 | String | Provides up to 200 user-defined general purpose pipeline attributes that can be passed in the PCF and output in reports or plotted in drawings. NOTE These user-defined attributes are given the names ATTRIBUTE0, ATTRIBUTE1, ATTRIBUTE2, ATTRIBUTE150, ATTRIBUTE199, and so on. |
| CLEANING-REQUIREMENT | String | Specifies the cleaning requirement for the pipeline after testing. |
| PAINT-COLOUR | String | Defines the colour for the coating. You can specify the colour name or colour code, such as A11-Fire Red or 2C . |
| CONSTRUCTION-TYPE | New, Demolish, Future | Indicates the equipment construction status. This information can determine whether to buy a new item or reuse an existing item. |
| DESIGN-PRESSURE | String | Specifies the pressure that the pipeline is designed to handle. The pressure is based on the normal operating case of the process stream plus a safety factor. |
| DESIGN-TEMPERATURE | String | Specifies the temperature that the pipeline segment is designed to handle. |
| ENGINEERING-WORK-PACKAGE | String | Specifies an identification code for a collection of pipelines and associated engineering activities. |
| INSTALLATION-WORK-PACKAGE | String | Specifies an identification code for a collection of pipelines and associated installation activities. |

| Keyword | Acceptable Values | Description |
|----------------------|-------------------|---|
| FLUID-CODE | String | Specifies the short code for the fluid type intended to flow through the pipeline. |
| HANDOVER-SYSTEM-ID | String | Specifies the unique identification number for the handover system. |
| TRACING-REQUIRMENT | Yes, No | Indicates whether the pipeline requires heat-tracing. |
| TEST-PRESSURE | String | Specifies the test pressure for the pipeline. This value indicates the pressure applied to water in the line to test for leaks or other failure. |
| INSULATION-THICKNESS | Number | Specifies the thickness of the insulation. This value is the width of the insulation from the internal surface to the external surface. |
| MAIN-NS | Number | Specifies the size of the main segment of the pipeline. |
| OPERATING-PRESSURE | String | Specifies the pressure at which the pipeline service fluid operates. For example, you can enter a value such as 5BAR or 10BAR. |
| PID-DRAWING-NUMBER | String | Indicates the piping and instrumentation diagram (P&ID) from which the pipeline originates. |
| LINE-ID | String | Specifies the identifier for the pipeline. The value you enter must be unique with the context of the plant model. NOTE This number is similar to a tag number. |
| ALT-DESIGN-PRESSURE | String | Specifies an alternative pressure that the pipeline is designed to handle. |

| Keyword | Acceptable Values | Description |
|--------------------------|----------------------------------|--|
| ALT-DESIGN-TEMPERATURE | String | Specifies an alternative temperature that the pipeline is designed to handle. |
| DESIGN-CODE | String | Specifies the design code for the pipeline. The design code is a published specification that controls construction materials and methods, such as ASME B31.3 or ASME B31.1. |
| FLUID-PHASE | String | Specifies the phase of the fluid material that the pipeline supports. The fluid phase can be gas or liquid. |
| FROM | String | Provides a description of the main source of the pipeline. This can be a line number or an equipment or instrument tag. |
| HANDOVER-SUBSYSTEM-ID | String | Specifies the unique identification number of the handover sub-system. |
| INSULATION-SPEC-NUMBER | String | Specifies the identification code for the insulation specification. |
| NDT-REQUIREMENT | String | Indicates whether non-destructive testing is required. |
| PID-REVISION | Number | Specifies the revision of the piping and instrumentation diagram on which the pipeline is represented. |
| PROCUREMENT-WORK-PACKAGE | String | Specifies the priority setting for the work package. |
| STRESS-CATEGORY | Yes, No, Visual, Simple, 1, 2, 3 | Specifies the category for the stress calculation. |
| STRESS-PACKAGE | String | Identifies a grouping of pipelines that require stress analysis. Typically, this value is in the form Area-Seq No. |

| Keyword | Acceptable Values | Description |
|---------------------------|-------------------|---|
| TEST-MEDIUM | String | Specifies the type of fluid used to pressure test the pipeline, such as gas or water. |
| TO | String | Specifies the line number, equipment tag, or instrument tag at which the pipeline terminates. |
| PWHT-REQUIREMENT | Yes, No | Indicates the pipeline's requirements for stress relief. Typically, this requirement is satisfied by heat treatment. |
| SEQUENCE-NUMBER | Number | Specifies the identification number assigned to the pipeline by the piping designer. |
| CONSTRUCTION-WORK-PACKAGE | Number | Specifies an identification code for a collection of pipelines and associated construction activities. |
| MATERIAL-OF-CONSTRUCTION | String | Specifies the pipe material type, such as carbon steel or iron. |
| Weld Prefixes: | | |
| WELD-PREFIX-GENERAL | String | <p>Specifies the string that Isogen uses to override the default weld number prefix for the pipeline. For example, if you set the value to WX, welds are numbered as WX1, WX2, WX3, and so on.</p> <p>NOTE The weld number prefix is usually defined using a style setting; consequently, use of this pipeline attribute is not recommended.</p> |
| WELD-PREFIX-FABRICATION | String | Same as WELD-PREFIX-GENERAL, but applies specifically to fabrication welds. |
| WELD-PREFIX-ERECTION | String | Same as WELD-PREFIX-GENERAL, but applies specifically to erection welds. |

| Keyword | Acceptable Values | Description |
|------------------------------------|-------------------|--|
| WELD-PREFIX-OFFSHORE | String | Same as WELD-PREFIX-GENERAL, but applies specifically to offshore welds. |
| SUPPORT-WELD-PREFIX-FABRICATION | String | Same as WELD-PREFIX-GENERAL, but applies specifically to fabrication welds. |
| SUPPORT-WELD-PREFIX-ERECTION | String | Same as WELD-PREFIX-GENERAL, but applies specifically to erection support welds. |
| SUPPORT-WELD-PREFIX-OFFSHORE | String | Same as WELD-PREFIX-GENERAL, but applies specifically to offshore support welds. |
| Drawing Control Parameters: | | |
| START-CO-ORDS | E/W N/S Elev | <p>Defines the point that Isogen uses as the start of the pipeline. The start point determines the start of weld and part number sequences.</p> <p>NOTES</p> <ul style="list-style-type: none"> ▪ If you omit START-CO-ORDS, Isogen uses internal logic to determine the best start point, such as an open end. ▪ The coordinate that you define must match a suitable component coordinate in the PCF, such as an open, external keypoint. |

| Keyword | Acceptable Values | Description |
|---------------------------|-------------------|--|
| HIGHEST-PART-NUMBER | M N | <p>Specifies the highest part number generated during the previous run of the pipeline. Isogen generates new part numbers for any component without one, starting with N+1.</p> <ul style="list-style-type: none"> ▪ M = sheet number ▪ N = part number <p>For example, HIGHEST-PART-NUMBER110 starts numbering part numbers on sheet 111.</p> |
| HIGHEST-UNIQUE-IDENTIFIER | M N O | <p>Specifies the highest unique part number that was generated during the previous run of the pipeline when unique part numbering is specified.</p> <ul style="list-style-type: none"> ▪ M = sheet number ▪ N = part number ▪ O = unique ID <p>In this situation, Isogen allocates part numbers in the form x.y where x is a number shared by all components with the same material, and y is a sequence number. For example, valves might be numbered 2.1, 2.2, 2.3 while flanges are numbered 3.1, 3.2, 3.3, and so on.</p> |
| HIGHEST-SPOOL-NUMBER | N | <p>Specifies the highest spool number that was generated during the previous run of the pipeline. Any new spools are numbered N+1, N+2, and so on.</p> <ul style="list-style-type: none"> ▪ N = spool number |

| Keyword | Acceptable Values | Description |
|----------------------------------|-------------------|--|
| HIGHEST-WELD-NUMBER | M N | <p>Specifies the highest weld number that was generated during the previous run of the pipeline. Any new welds are numbered N+1, N+2, and so on.</p> <ul style="list-style-type: none"> ▪ M = sheet number ▪ N = part number |
| HIGHEST-WELD-SUPPORT-NUMBER | M N | <p>Specifies the highest weld support number that was generated during the previous run of the pipeline. Any new support welds are numbered N+1, N+2, and so on.</p> <ul style="list-style-type: none"> ▪ M = sheet number ▪ N = support number |
| HIGHEST-ASSEMBLY-NUMBER | M N | <p>Isogen identifies site assemblies (bolted connections) and allocate numbers. New assemblies are numbered N+1, N+2, and so on.</p> <ul style="list-style-type: none"> ▪ M = sheet number ▪ N = assembly number |
| Coordinate Offset: | | |
| OFFSET-IMPERIAL OFFSET-METRIC | E/W N/S Elev | <p>Defines the transform in meters (OFFSET-METRIC) or feet (OFFSET-IMPERIAL).</p> <p>For example, <code>OFFSET-METRIC100 0 0</code> adds 100m to every East value in the PCF. When the PCF is run through Isogen, the coordinate <code>END-POINT100 200 300 4</code> is interpreted as <code>END-POINT100100 200 300 4</code>.</p> |

| Keyword | Acceptable Values | Description |
|---|-------------------|---|
| <i>Attributes No Longer Supported:</i> | | |
| REPLOT | NUMBER | Do not use. |
| OUTPUT-FILE-NAME | STRING | <p>Overrides the default name given to the Isogen-generated drawing file.</p> <p>NOTE Because this is usually defined with the style settings, Use of this attribute is not recommended.</p> |

SECTION 4

Component Attributes

Each component is described by a number of lines of data in the file. The following table displays syntax that is used to describe a component.

| Category | Column | Mandatory | Example |
|------------------|--------|-----------|---|
| Component type | 1 | Y | ELBOW VALVE FLANGE |
| SKEY | 5 | Y | SKEY ELBW SKEY VBFL SKEY FLWN |
| Coordinates | 5 | Y | END-POINT E/W N/S Elev Size BRANCH-POINT1 E/W N/S Elev Size |
| Material data | 1 | Y | MATERIAL-IDENTIFIER 3 ITEM-CODE PA5BSTD DESCRIPTION PIPE, CS API 5L SML, GRD B, STD WT |
| Attributes | 5 | N | PIPING-SPEC CS150 COMPONENT-ATTRIBUTE1 ABC |
| Associated Items | 5 | N | MESSAGE Here's some text ADDITIONAL-ITEM |

NOTES

- PIPE, BOLT and GASKET components do not require an SKEY
- For details about all supported components, see Component Information Sheets.

Component Types and SKEYS

The PCF supports a range of generic component types, such as FLANGE, VALVE and INSTRUMENT. When you create a PCF, you are creating a mapping between a component type in the PCF and specific objects in the 3D plant design system. The PCF also requires an SKEY value. The SKEY, or symbol key, is a more specific definition of the item. For example, a VALVE can have an SKEY of VBFL to define a ball valve or VGFL to define a gate valve.

The creation of a realistic drawing requires an additional mapping between objects in the 3D plant design system and one of the SKEYs that can be used in conjunction with the component type. For more detailed information, refer to the component information sheets.

The SKEY is also significant in defining the end connection of a component, such as whether the connection between it and an adjacent component is, for example, welded, flanged, or screwed and so on. Usually, the third and fourth characters of many SKEYs are used to define the end connection type of all the external keypoints on the component. For example, an SKEY ending FL indicates a flanged connection, whereas one ending BW indicates a butt-welded connection.

Materials

Each component in the PCF is linked to an associated material entry, which is located at the end of the file. The material data can contain attributes that are shared by all the components with the same material link. The link between the component and its material is defined by a MATERIAL-IDENTIFIER attribute. For more information, see *Material Attributes* (on page 70).

When IDFGEN encounters a component that has no item code specified, by default the component is excluded from the material list. However, you can use Option Switch 74 to override this behavior. When this option is in effect, components with no item code in the PCF are assigned a blank item code and description and displayed on the material list.

NOTES

- To be displayed on the material list, a weld must be assigned an item code in the PCF.
- For more information about option switches, see the *Isogen Option Switches Reference Guide*.
- You can control whether components are output to the material list with the NOT-ON-MATERIAL-LIST attribute. For more information, see *Material Information Attributes* (on page 329).

Coordinates

Components have two types of coordinate data

- **External keypoints** – Points at which the component connects to other components of the pipeline or at which the pipeline terminates – vents, drains, offline instruments, blank flanges, or caps.
- **Internal keypoints** – Points needed to completely define the geometry of the component, such as the center point of a bend.

NOTE For information regarding the full set of keypoints required for an individual component, see Component Information Sheets.

External Keypoints

The following examples show the different types of external keypoints that can appear in a PCF:

- END-POINT 1000.00 2000.00 3000.00 4 PF FEMALE
- BRANCH1-POINT 1234.56 78910.1 1121.31 100
- END-POINT 59166.0000 119808.0000 1464.4375 18 BW INSULATION-SINGLE

| | |
|------------------------|---|
| Name | Specifies the type of external keypoint. <ul style="list-style-type: none">▪ END-POINT▪ BRANCH1-POINT▪ BRANCH2-POINT▪ PORT-POINT |
| Coordinate | Defines the X, Y, Z coordinates in the units of <code>UNITS-CO-ORDS</code> . |
| Nominal size | Defines the nominal size (N) in the units of <code>UNITS-BORE</code> . |
| Connection type | Defines the connection at this point using a two-character code. This information is optional. Examples include the following: <ul style="list-style-type: none">▪ FL (flanged)▪ PF (push fit)▪ BW (butt-weld)▪ SC (screwed) |
| Gender | Distinguishes the joint as MALE , FEMALE , or UNSPECIFIED on the isometric drawing. This information is optional. |

| | |
|---------------------------------------|--|
| Insulation and/or Tracing type | <p>Indicates the insulation/tracing type at this point. You can use the following keywords:</p> <ul style="list-style-type: none"> ▪ INSULATION-SINGLE ▪ INSULATION-ON ▪ INSULATION-OFF ▪ TRACING-SINGLE ▪ TRACING-DOUBLE ▪ TRACING-TREBLE ▪ TRACING-QUADRUPLE ▪ TRACING-ON ▪ TRACING-OFF |
|---------------------------------------|--|

NOTES

- **Connection type** and **Gender** are only required if the connection type differs from that implied by the SKEY, such as a component that has two flanged ends and one welded end.
- The `INSULATION` and `TRACING` keywords are used if it is necessary to override the status of the component, as indicated by the `INSULATION` and/or `TRACING` keywords. For example, a TEE component can have its branch leg double-traced, while the main run is single-traced. It is permissible to have both `INSULATION-*` and `TRACING-*` on the external keypoint line.
- The optional parameters can appear in any order. The following line is valid, indicating a keypoint with a female, socket- welded end, insulated with no tracing.

END-POINT co-ords bore INSULATION-SINGLE FEMALE TRACING-OFF SW

Internal Keypoints

Internal keypoints are expressed using the following syntax:

CENTRE-POINT 1000.00 2000.00 3000.00
CO-ORDS 1234.56 78910.1 1121.31

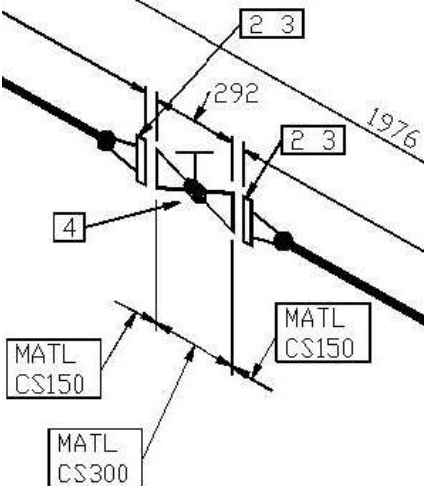
| | |
|-------------------|---|
| Name | <p>Specifies the type of internal keypoint:</p> <ul style="list-style-type: none"> ▪ CENTRE-POINT ▪ CO-ORDS |
| Coordinate | <p>Defines the X, Y, Z coordinates in the units of <code>UNITS-CO-ORDS</code>.</p> |

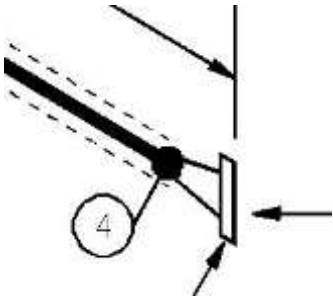
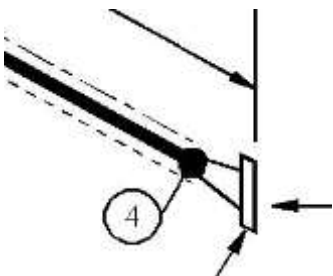
Allowable Attributes

Allowable attributes vary from one component type to another. Likewise, identical component types can have different attributes defined. For complete details about the attributes that are allowed for various component types, see *Component Attributes and Data Requirements* (on page **Error! Bookmark not defined.**). For a complete list of allowable attributes on each individual component, see Component Information Sheets.

The following table lists some of the more commonly used attributes:

| Keyword | Allowable Values | Description |
|----------|-------------------------------------|---|
| CATEGORY | FABRICATION ERECTION OFFSHORE | <p>Indicates where the component is assembled with other components to form a spool or pipeline.</p> <ul style="list-style-type: none">▪ FABRICATION components are assembled together in a fabrication workshop, usually to form a spool. The spool is then transported to site and erected as a unit.▪ ERECTION components are delivered to the site individually and connected to other components in place.▪ OFFSHORE components are typically assembled into a complete unit or module at one location, then the entire unit is transported somewhere. This category is often used in offshore projects.▪ CATEGORY strongly influences Isogen behavior. For example, it is used when allocating items to the Fabrication and Erection subsections of a material list. It also governs Isogen logic for splitting pipelines into spools. For example, an ERECTION or OFFSHORE category item is one trigger to indicate the end of one spool. |

| Keyword | Allowable Values | Description |
|---|---|--|
| STATUS | STANDARD DOTTED-DIMENSIONED DOTTED-UNDIMENSIONED UNDIMENSIONED | <p>Controls the appearance (solid or dotted) of a component in the Isogen-generated drawing and whether or not it is dimensioned.</p> <ul style="list-style-type: none"> STANDARD – Component is shown solid and is subject to the style dimensioning rules DOTTED-DIMENSIONED – Component is shown dotted and is subject to the style dimensioning rules. DOTTED-UNDIMENSIONED – Component is shown dotted and dimensioning is suppressed UNDIMENSIONED – Component is shown solid but dimensioning is suppressed. This is a special setting that applies to only certain items, such as MESSAGE and SUPPORT. |
| PIPING-SPEC TRACING-SPEC INSULATION-SPEC PAINTING-SPEC MISC-SPEC1 MISC-SPEC2 MISC-SPEC3 MISC-SPEC4 MISC-SPEC5 | String | <p>Overrides the default values defined in the pipeline. When the specification changes between adjacent components, Isogen optionally displays a message showing the change.</p>  |

| Keyword | Allowable Values | Description |
|------------|--|---|
| INSULATION | OFF ON | <p>Specifies whether the component is insulated against heat gain/loss or for personnel protection. Isogen shows insulation on the generated drawing if <code>INSULATION</code> is ON.</p>  |
| TRACING | OFF ON SINGLE DOUBLE TREBLE QUADRUPLE | <p>Specifies whether the component is electrically or steam traced against heat gain/loss. Isogen shows tracing on the generated drawing if <code>TRACING</code> is not OFF. In the following illustration, both <code>INSULATION</code> and <code>TRACING</code> are ON</p>  |
| FLOW | 1 2 3 | <p>Indicates the direction of flow through the component.</p> <ul style="list-style-type: none"> 1 – Flow direction is from end 1 to end 2 2 – Flow direction is from end 2 to end 1 3 – Flow is bidirectional <p>NOTE Some components show a flow arrow indicating direction of flow.</p> |

| Keyword | Allowable Values | Description |
|-----------------------------|--|---|
| UNIQUE-COMPONENT-IDENTIFIER | String | <p>Carries the 3D system database identifier for the object that has mapped to the component in the PCF.</p> <p>IMPORTANT</p> <p>Because the UCI is extremely valuable in linking the generated drawing back to the original 3D data, we recommend that this value be set for all components.</p> <p>Despite its name, the UCI does not have to be unique in the PCF, although this is recommended. This situation can occur where a pipe object in the 3D system is mapped to more than one pipe object in the PCF.</p> |
| MATERIAL-LIST | INCLUDE EXCLUDE INCLUDE-WITH-ISO | <p>Suppresses inclusion of the component in the material list. MATERIAL-LIST INCLUDE is the default, so is not normally required.</p> <p>INCLUDE-WITH-ISO additionally shows the component item code local to the symbol on the face of the drawing.</p> |

Associated Components

In the PCF, a component can have associated components, such as gaskets, bolts, reinforcement pads, welds, and so forth. There are various methods for defining these parent/child relationships in the PCF. For example, you can link items using the `UNIQUE-COMPONENT-IDENTIFIER` attribute. You can also link items on the basis of coordinate data. Another method is to indent the child item within the parent item.

NOTE For more information about using the alternative indentation method for associating items within the PCF, see *Appendix: Superseded PCF Syntax* (on page 377).

While each of these methods is sufficient for standard situations, the complex requirements of other situations dictate a more explicit method of associating items in the PCF so that parent and child relationships are clearly defined. For example, if there are two welds located on a reinforced set-on tee, the relationship between items must be clearly, and unambiguously, indicated so that Isogen is able to determine the appropriate information on each weld. Gaskets and bolts that are associated with a flange should be kept with that flange if the pipeline is split into separate drawings, which again requires a clearly defined parent/child relationship.

To establish a clear hierarchy of parent/child relationships within the PCF, the recommended best practice is to use the `COMPONENT-IDENTIFIER` and `MASTER-COMPONENT-IDENTIFIER` attributes. Assigning the `COMPONENT-IDENTIFIER` attribute to an item distinguishes it uniquely within the PCF. In turn, all items that have a parent, or master item, are assigned a `MASTER-COMPONENT-IDENTIFIER` attribute, being the identifier borne by their parent item. In the following example, the `MASTER-COMPONENT-IDENTIFIER` attribute (1) defines both the bolt and the gasket as child items of the flange.

FLANGE

```
COMPONENT-IDENTIFIER 1
END-POINT 1014.2700 0.0000 0.0000 4.0000
END-POINT 1007.9200 0.0000 0.0000 4.0000
SKEY FLSO
MATERIAL-IDENTIFIER 1
CATEGORY FABRICATION
FLANGE-LEFT-LOOSE OFF
PIPING-SPEC CS150
UCI D56050FB-0CED-49D3-BAD1-D21BF4B739A1
```

BOLT

```
COMPONENT-IDENTIFIER 2
MASTER-COMPONENT-IDENTIFIER 1
CO-ORDS 1014.2700 0.0000 0.0000
BOLT-DIA 15.88
BOLT-LENGTH 95.25
BOLT-QUANTITY 8
CATEGORY ERECTION
MATERIAL-IDENTIFIER 2
UCI 93ABEE38-76A4-4F75-A2B9-2662050695AB
```

GASKET

```
COMPONENT-IDENTIFIER 3
MASTER-COMPONENT-IDENTIFIER 1
END-POINT 1014.2700 0.0000 0.0000 4.0000
END-POINT 1015.8400 0.0000 0.0000 4.0000
MATERIAL-IDENTIFIER 3
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI 303F7D22-8C4D-4124-8927-E6895DD8BB4F
```

Associated Components: Additional Items

Associated additional items are the types of items that are associated with a parent component that directly forms part of the pipeline and include the following:

- Chains for chain operated valves
- Jacking bolts for flanges
- Valve interlock mechanisms
- Flange drip rings

Attributes and Data Requirements

The following example illustrates the typical data input for an additional item associated with an elbow:

ELBOW

```
COMPONENT-IDENTIFIER 1
END-POINT 100.0000 100.0000 -282.5400 0.5000
END-POINT 117.4600 100.0000 -300.0000 0.5000
CENTRE-POINT 100.0000 100.0000 -300.0000
SKEY ELSW
MATERIAL-IDENTIFIER 3
ANGLE 9000
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI A1E0CAC5-5FC9-4518-8064-12384DDABC4E
```

ADDITIONAL-ITEM

```
COMPONENT-IDENTIFIER 2
MASTER-COMPONENT-IDENTIFIER 1
MATERIAL-IDENTIFIER 5
BOLT-DIA 0
CATEGORY ERECTION
ITEM-GROUP MISC
LENGTH 100
SIZE 3
```

| Keyword | Allowable Values | Description |
|--------------------|------------------|--|
| ADDITIONAL-ITEM | N/A | Indicates start of the Additional Item data |
| SIZE | Number | Defines the nominal size of the component in current UNITS-BORE units. Multiple SIZE entries are allowed. For example, the following syntax defines a 4x2 reducer: SIZE 4 SIZE 2 |
| ITEM-CODE | String | Specifies the component item/commodity code. |
| REPEAT-PART-NUMBER | Number | Specifies the part number to be assigned to the item. |
| UCI | String | Specifies the unique identifier for the item (optional). |
| WEIGHT | Number | Specifies the weight of the component in UNITS-WEIGHT units. |
| QUANTITY | Number | Specifies the number of items to be associated. For example, if two items are needed type QUANTITY 2. |
| LENGTH | Number | Defines the length (in UNITS-CO-ORDS) of associated pipe. Use only for items with ITEM-GROUP = PIPE or ITEM-GROUP = MISC. Both QUANTITY and LENGTH can be set. For example, to associate 2 x 1000mm lengths of pipe type QUANTITY 2 LENGTH 1000 |

| Keyword | Allowable Values | Description |
|------------|--|--|
| CATEGORY | FABRICATION ERECTION OFFSHORE | <p>Indicates where the component is assembled with other components to form a spool or pipeline.</p> <ul style="list-style-type: none"> ▪ FABRICATION components are assembled together in a fabrication workshop, usually to form a spool. The spool is then transported to site and erected as a unit. ▪ ERECTION components are delivered to the site individually and connected to other components in place. ▪ OFFSHORE components are typically assembled into a complete unit or module at one location, then the entire unit is transported. This category is often used in offshore projects. ▪ CATEGORY strongly influences ISOGEN behavior. For example, it is used when allocating items to the Fabrication and Erection subsections of a material list. It also governs ISOGEN logic for splitting pipelines into spools. For example, an ERECTION category item is one trigger to indicate the end of one spool. |
| ITEM-GROUP | BOLT FITT MISC FLAN GASK INST PIPE SUPP VALV LUGG | <p>Allocates the component to the relevant section of the Material List.</p> <p>NOTE ITEM-GROUP LUGG is used for support lugs. These are used on certain types of pipe support to prevent the support from moving along the pipe. They are always used in conjunction with the associated additional items facility.</p> |

| Keyword | Allowable Values | Description |
|--|--|---|
| END-PREPARATION-1 END-PREPARATION-2 | SQUARE-CUT BEVEL SCREWED SHAPED MITRED GROOVED FLARED SCREWED-FEMALE SOCKET-FEMALE | Allows the end preparations of PIPE and MISC additional items to be specified for output to the Cut Pipe List/Report. |
| MATERIAL-IDENTIFIER | Number | Defines the link between a component and its material. |
| COMPONENT-IDENTIFIER | String | Distinguishes the item uniquely within the PCF The COMPONENT-IDENTIFIER attribute is used in conjunction with the MASTER-COMPONENT--IDENTIFIER attribute to define the relationships between parent and child items. |
| MASTER-COMPONENT-IDENTIFIER | String | Associates the item as a child of another component. For example, an item with a MASTER-COMPONENT-IDENTIFIER attribute of 1 is associated to the component whose COMPONENT-IDENTIFIER attribute is also 1. |

NOTE Although bolts can be expressed in the PCF using the ADDITIONAL-ITEM attribute, the recommended best practice is to use a bolt component entry (BOLT) with coordinates matching those of one end of a component in the pipeline, usually a flange or a gasket. While it is possible to define a bolt as an associated component, doing so is not the recommended practice.

Associated Components: Bolts

The example below shows the syntax used to associate a bolt with a gasket. The parent/child relationship between the two components is defined using the how the **COMPONENT-IDENTIFIER** and **MASTER-COMPONENT-IDENTIFIER** attributes

```
GASKET
  COMPONENT-IDENTIFIER 1
  END-POINT  data
  END-POINT  data
  MATERIAL-IDENTIFIER  data
BOLT
  COMPONENT-IDENTIFIER 2
  MASTER-COMPONENT-IDENTIFIER 1
  BOLT-DIA  data
  BOLT-LENGTH  data
  MATERIAL-IDENTIFIER  data
```

NOTES

- The **CATEGORY** attribute is only required when including bolts with a nozzle component.
- Bolts included with a gasket use the **CATEGORY** attribute that has been set for the main component.

Associated Components: Welds

The PCF syntax for some components allows the association with welds to be expressed by outputting the weld information as a child of the component itself. In all cases, any number of associated welds is permitted.

Supports (Support Welds)

Although the following example shows only one, any number of weld entries is permitted in association with a support.

```
SUPPORT
  COMPONENT-IDENTIFIER 1
  CO-ORDS 2002000.000 0.000 10.0000 6.0000
  MATERIAL-IDENTIFIER 5
  SKEY 01HG
  UNIQUE-COMPONENT-IDENTIFIER 00004
  CATEGORY FABRICATION
WELD
  COMPONENT-IDENTIFIER 2
  MASTER-COMPONENT-IDENTIFIER 1
  END-POINT 2002000.0000 0.0000 10.0000 6.0000
  END-POINT 2002000.0000 0.000 10.0000 6.0000
  SKEY ZSP1
  UNIQUE-COMPONENT-IDENTIFIER WELD-2
  CATEGORY FABRICATION
```

Set on Tee, Set On Cross, Y-Piece Fabricated

These component welds are identical to support welds, with the exception that you can use a **LOCATION** attribute to define a precise position for a given weld. The **LOCATION** attribute is set to **CP**, **B1P**, **B2P**. If the **LOCATION** attribute is neither defined nor recognized, the WELD is presumed to be at the center point, unless the end-point coordinates indicate a branch point position.

In the following example, the syntax defines a weld at the branch point of the set-on tee.

```
TEE-SET-ON
  COMPONENT-IDENTIFIER 6
  CENTRE-POINT 2228812.3100 1330744.3100 11070.4100
  BRANCH1-POINT 2228812.3100 1330745.8800 11070.4100 6.0000
  MATERIAL-IDENTIFIER 5
  SKEY TESO
  CATEGORY FABRICATION
  PIPING-SPEC CS150
  UCI 67A43A2B-4C2B-11D4-8133-00C04F218FEE
WELD
  COMPONENT-IDENTIFIER 7
  MASTER-COMPONENT-IDENTIFIER 6
  END-POINT 2228812.3100 1330744.3100 11070.4100 6.0000
  END-POINT 2228812.3100 1330744.3100 11070.4100 6.0000
  SKEY WW
  CATEGORY FABRICATION
  LOCATION B1P
```

Olet

Where there is more than one olet at a position on a pipe, it is sometimes necessary to associate a weld to the appropriate item.

```
OLET
  COMPONENT-IDENTIFIER 3
  CENTRE-POINT 330500.0000 6400.0000 -2097.0000 3.0000
  BRANCH1-POINT 330500.0000 6647.6200 -2097.0000 3.0000
  SKEY WTBW
  MATERIAL-IDENTIFIER 4
  INSULATION-SPEC N
  MISC-SPEC1 C
  PIPING-SPEC AYD
  UNIQUE-COMPONENT-IDENTIFIER F255A7F8-6106-4497-8253-67A5C366CB3C
  CATEGORY FABRICATION
WELD
  COMPONENT-IDENTIFIER 5
  MASTER-COMPONENT-IDENTIFIER 3
  END-POINT 330500.0000 6400.0000 -2097.0000 3.0000
  END-POINT 330500.0000 6400.0000 -2097.0000 3.0000
  SKEY WW
  INSULATION-SPECK N
  MISC-SPEC1 C
  PIPING-SPEC AUD
  CATEGORY FABRICATION
```

Weld

In some cases, it is necessary to be able to associate a secondary weld with a primary weld, such as, for example, at a slip-on flange. You can use the same syntax, as shown in the following example.

```
WELD
  COMPONENT-IDENTIFIER  2
  END-POINT  -10171.4500  1228.6000  830.1400  4.0000
  END-POINT  -10171.4500  1228.6000  830.1400  4.0000
  SKEY  WW
  MATERIAL-IDENTIFIER  5
  CATEGORY  FABRICATION
  REPEAT-WELD-IDENTIFIER  6
WELD
  COMPONENT-IDENTIFIER  3
  MASTER-COMPONENT-IDENTIFIER  2
  END-POINT  -10171.4500  1228.6000  830.1400  4.0000
  END-POINT  -10171.4500  1228.6000  830.1400  4.0000
  SKEY  WW
  CATEGORY  FABRICATION
  REPEAT-WELD-IDENTIFIER  7
```

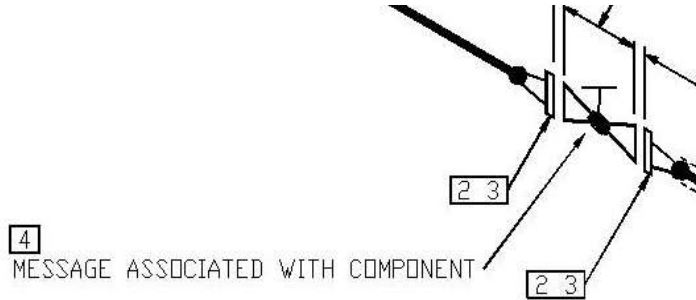
Clamp

A clamp can also have associated welds.

```
CLAMP
  COMPONENT-IDENTIFIER  1
  END-POINT  190000  910700  556200  48  MALE
  PIPING-SPEC  XALP
  MATERIAL-IDENTIFIER  1
  SKEY  CLVT
  CATEGORY  ERECTION
WELD
  COMPONENT-IDENTIFIER  2
  MASTER-COMPONENT-IDENTIFIER  1
  END-POINT  190000  910700  556200  48
  END-POINT  190000  910700  556200  48
  SKEY  WW
  CATEGORY  FABRICATION
  REPEAT-WELD-IDENTIFIER  8
```

Associated Information Items

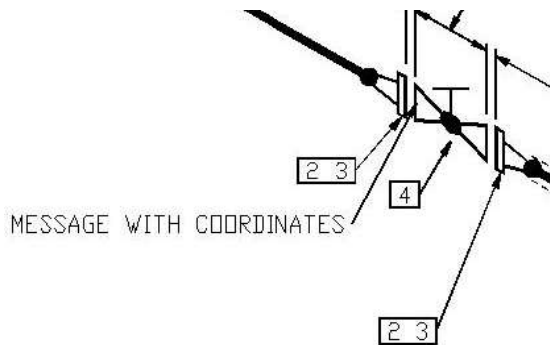
Components can have information items, such as messages, associated with them. An associated message in the PCF always has a leader pointing to the center of the component, as shown in the following illustration.



VALVE

```
END-POINT 1265.8400 0.0000 0.0000 4.0000
END-POINT 1557.9400 0.0000 0.0000 4.0000
SKEY VGFL
MATERIAL-IDENTIFIER 2
CATEGORY ERECTION
PIPING-SPEC CS150
SPINDLE-DIRECTION UP
UCI CF0ADE1A-B411-4DCF-B582-505F01326CE9
MESSAGE
TEXT MESSAGE ASSOCIATED WITH COMPONENT
```

If a message is required that points to a particular end of a component, then it must be entered in the PCF as a stand-alone entry, with coordinates.



VALVE

```
END-POINT 1265.8400 0.0000 0.0000 4.0000
END-POINT 1557.9400 0.0000 0.0000 4.0000
SKEY VGFL
MATERIAL-IDENTIFIER 2
CATEGORY ERECTION
PIPING-SPEC CS150
SPINDLE-DIRECTION UP
UCI CF0ADE1A-B411-4DCF-B582-505F01326CE9
```

MESSAGE

```
CO-ORDS 1557.9400 0.0000 0.0000
STATUS DIMENSIONED
TEXT MESSAGE WITH COORDINATES
```

The other type of information item that can be associated with a component is a termination reference, which contains information about connections to other pipelines, equipment, or about end points of the pipeline. This category includes the following:

- END-CONNECTION-PIPELINE
- END-CONNECTION-EQUIPMENT
- END-POSITION-OPEN
- END-POSITION-CLOSED
- END-POSITION-VENT
- END-POSITION-DRAIN
- END-POSITION-NULL

NOTE For detailed information, see Component Information Sheets.

In each case, the information item can be associated by starting in column five (5) and omitting a co-ordinate entry.

PIPE

```
END-POINT data
END-POINT data
MATERIAL-IDENTIFIER n
END-CONNECTION-EQUIPMENT
PIPELINE-REFERENCE data
```

SECTION 5

Information Items

Information items are entries in the PCF that define annotations to be displayed by Isogen on the isometric drawing.

The following examples show the basic syntax for an information item (**Example 1**) and a sample entry from a PCF (**Example 2**).

Example 1:

```
ITEM-TYPE
  CO-ORDS
  DATA
```



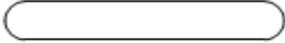





Example 2:

```
MESSAGE
  CO-ORDS  x  y  z
  TEXT  Here is a message
END-CONNECTION-EQUIPMENT
  CO-ORDS  x  y  z
  CONNECTION-REFERENCE  E100/N1
```

Messages

Isogen supports several message enclosure box types that can be positioned on the isometric drawing. Each type has a unique attribute identifier. Also, to give flexibility in the data extraction process, you can either associate a message with a pipeline component or enter it in the PCF as a separate entry.

The following table lists the available message types:

| Attribute | Isometric Presentation |
|---|---|
| MESSAGE | Un-boxed |
| MESSAGE-SQUARE |  |
| MESSAGE-POINTED |  |
| MESSAGE-ROUND |  |
| MESSAGE-CIRCLE |  |
| MESSAGE-TRIANGLE (2 characters recommended maximum) |  |
| MESSAGE-DIAMOND (3 characters recommended maximum) |  |
| MESSAGE-DOUBLE-CIRCLE |  |
| MESSAGE-ELLIPSE |  |

The following is an example of a typical message associated with a component:

```
VALVE
  MESSAGE-SQUARE
  TEXT data
```

The following is an example of a typical message included as a separate entry and not associated with a component:

```
MESSAGE-ROUND
  CO-ORDS  E/W N/S ELEV
  TEXT data
  UNDIMENSIONED
```

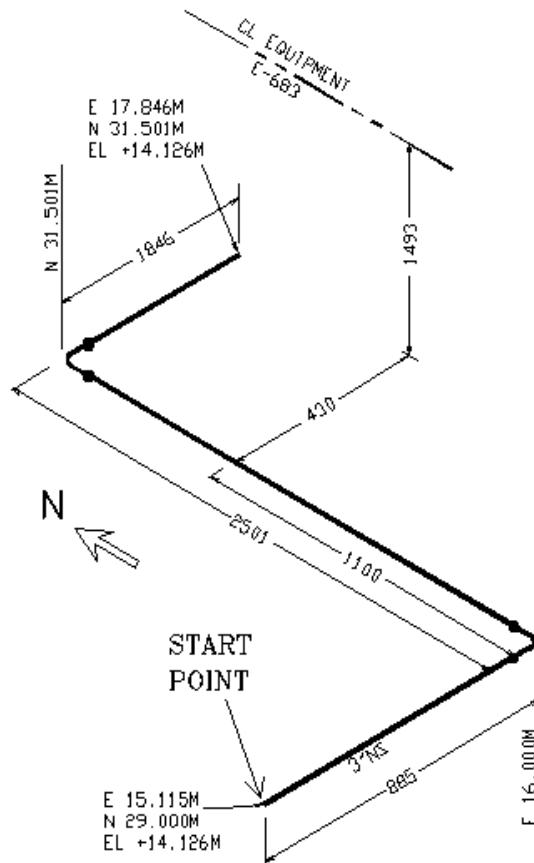
NOTES

- MESSAGE attribute types must be positioned in column position five (5) for associated occurrences and in position one (1) for separate occurrences.
- All other attributes must start in column position five (5).
- Data associated with any attribute must be separated from the attribute name by at least one (1) blank character.
- Use the \$ character in any TEXT *data* line to signal a new line, such as when a message is output over two lines. When this feature is used on square, pointed, round and circle type messages, the box enclosure dynamically expands both horizontally and vertically to enclose the message.
- A single @ character can be used at the start or end of any TEXT *data* line to obtain leading or trailing blanks.
- The STATUS attribute is used to determine whether the message is dimensioned. Messages placed on a PIPE or BEND component are dimensioned, unless STATUS UNDIMENSIONED is set.

Reference Dimensions

The Isogen system provides a facility that allows reference dimensions between the pipeline and the center/datum line of a variety of project elements to be included on the plotted isometric drawing.

The following sketch indicates a typical example:



In the previous sketch, there is a pair of reference dimensions, 430 and 1493 MM, indicating the distance between the pipe and the centerline of the referenced item, Vessel E-683. The direction of the vessel centerline is also indicated.

The following examples illustrate two typical reference dimension data layouts.

- **Primary Reference Dimension**

Referenced equipment in primary direction using simple ITEM-DIRECTION to orient:

```
REFERENCE-DIMENSION (Item Identifier)
REFERENCE-POINT-LOCATION
CO-ORDS  E/W  N/S  ELEV
UNDIMENSIONED (Optional input - default is Dimensioned)
REFERENCE-DIMENSION-PRIME
CO-ORDS  E/W  N/S  ELEV
ITEM-DIRECTION  data
SKEY  data
MESSAGE  type
TEXT  data
```

- **Skewed Reference Dimension**

Referenced equipment in primary direction using two CO-ORDS entries to orient:

```
REFERENCE-DIMENSION (Item Identifier)
REFERENCE-POINT-LOCATION
CO-ORDS  E/W  N/S  ELEV
UNDIMENSIONED (Optional input - default is Dimensioned)
REFERENCE-DIMENSION-SKEWED
CO-ORDS  E/W  N/S  ELEV
REFERENCED-ITEM
CO-ORDS  E/W  N/S  ELEV
CO-ORDS  E/W  N/S  ELEV
SKEY  data
MESSAGE  type
TEXT  data
```

The attributes and data entries shown in the previous lists have the following meanings:

| Attribute | Remarks |
|---|--|
| REFERENCE-POINT-LOCATION CO-ORDS E/W N/S ELEV | Defines from which point on the pipeline the reference dimension starts. Coordinate location of start point. |
| REFERENCE-DIMENSION-PRIME CO-ORDS E/W N/S ELEV | Identifies a reference dimension lying in a primary direction. Coordinate location of the point on the referenced item (Equipment, Steelwork, and so on.) where the reference dimension ends. |
| REFERENCE-DIMENSION-SKEWED CO-ORDS E/W N/S ELEV | Identifies a reference dimension in a skewed direction. Coordinate location of the point on the referenced item (Equipment, Steelwork, and so on.) where the reference dimension ends. |

| Attribute | Remarks |
|-----------------------------|--|
| ITEM-DIRECTION <i>data</i> | Specifies the direction of the referenced item. Primary direction only. Allowable values are NORTH , SOUTH , EAST , WEST , UP , or DOWN . |
| REFERENCED-ITEM | Identifies the input of coordinates to give the direction of the centerline of the referenced item. Mainly used for skewed items but can be used for primary directions as an alternative to the ITEM-DIRECTION input. |
| CO-ORDS <i>E/W N/S ELEV</i> | Specifies the coordinate location of one end of the centerline. |
| CO-ORDS <i>E/W N/S ELEV</i> | Specifies the coordinate location of the other end of the centerline. |
| SKEY <i>data</i> | Identifies the category of the referenced item. For more information, refer to the Valid SKEY Data for Referenced Item Identification table that follows. |
| MESSAGE <i>type</i> | <p>Specifies the type of box enclosure for the output of the referenced item identifier.</p> <p>NOTE For information about message box types, see <i>Messages</i> (on page 50).</p> <p>The MESSAGE attribute can be input without a type if an unboxed message is required.</p> |
| TEXT | The referenced item identification text. |

Valid SKEY Data for Referenced Item Identification:

| SKEY | Item Category | Default Dotted Line No. | Default Plotted Line Type |
|-------------|---------------------------------------|--------------------------------|----------------------------------|
| BLD* | Building | 2 | — . . — . . — . . — |
| EQU* | Equipment Item | 2 | — . . — . . — . . — |
| FLR* | Floor Level | 3 | |
| GRD* | Grid Line | 3 | |
| HST* | Horizontal Steelwork element | 1 | - - - - - |
| PIP* | Pipeline | 4 | - - - - - |
| VST* | Vertical Steelwork element | 1 | - - - - - |
| WAL* | Wall | 3 | |
| XXX* | Miscellaneous category (User-defined) | Normal | - - - - - |

NOTE The * character in the SKEY is used to specify that the normal dotted line type should be used for the referenced item centerline depiction on the plotted isometric. You can replace this character with the following:

- A single blank character to indicate that the default dashed/dotted line type associated with a particular SKEY is to be used.
- A single digit (1 to 4) to indicate that one of the four numbered dashed/dotted line numbers should be used.

Example Reference Dimension Input Data

The following is an example pipeline isometric containing the reference dimension in the previous sketch.

```
REFERENCE-DIMENSION
  REFERENCE-POINT-LOCATION
  CO-ORDS  1600000  3010000  1412600
  REFERENCE-DIMENSION-PRIME
  CO-ORDS  1643000  3010000  1561900
  REFERENCED-ITEM
  CO-ORDS  1643000  3010000  1561900
  CO-ORDS  1643000  4010000  1561900
  SKEY  EQU4
  MESSAGE
  TEXT  E-683
```

Thickness Measurement Location

A TML, or Thickness Measurement Location, identifies the location on a piping system that requires inspection on a regular basis. Although the TML is basically a message that is output on the isometric drawing, it carries additional attributes relevant to inspection, such as a tag that uniquely identifies the TML (and is used as the content of the message) and an enclosure style, which controls how the TML is plotted. All of the supported TML attributes are listed in the table below.

| Attribute | Remarks |
|--|---|
| CO-ORDS <i>E/W N/S ELEV</i> | Defines the point in the pipeline where the TML is taken. |
| ENCLOSURE | <p>Specifies the type of enclosure output on the isometric drawing with unique identifiers and supplementary text. Allowable values are:</p> <ul style="list-style-type: none">▪ NONE▪ SQUARE▪ POINTED▪ CIRCLE▪ TRIANGLE▪ DIAMOND▪ HEXAGONAL▪ ELLIPSE <p>NOTE You can output an enclosure with a double-line boundary using the prefix DOUBLE, such as DOUBLE-SQUARE or DOUBLE-CIRCLE.</p> |
| INFORMATION-ATTRIBUTE1 <i>to</i> INFORMATION-ATTRIBUTE100 | Specifies up to 100 user-defined information attributes. This value must be a text string. |
| MEASUREMENT-POINTS | Defines the number of placement points. This value must be a number. |
| MEASUREMENT-TYPE | Specifies the type of measurement. This value must be a text string. |
| NAME <i>or</i> TAG | Specifies a unique identifier for the TML. |
| STATUS | Specifies whether the TML is dimensioned. By default, TML is dimensioned where appropriate unless STATUS is set to UNDIMENSIONED . |

| Attribute | Remarks |
|------------------|---|
| TEXT <i>data</i> | Specifies the supplementary text that is output along with the tag data on the isometric drawing. |

The example below shows a section of the PCF that defines three Thickness Measurement Locations along a section pipe, followed by the resulting isometric output.

```

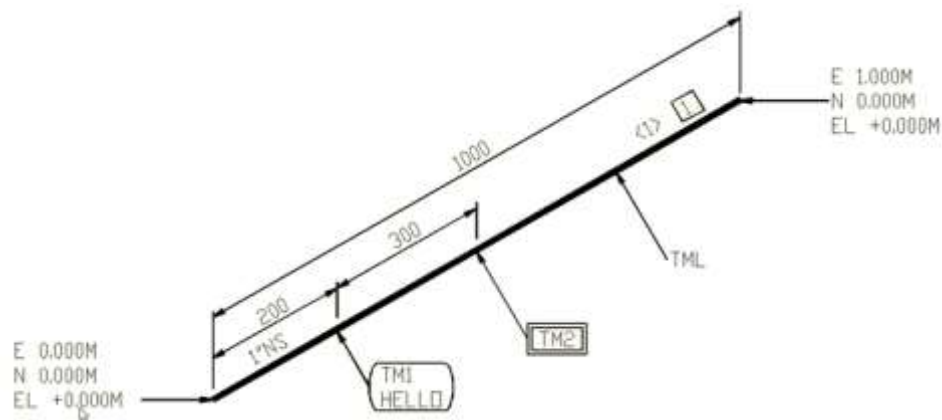
PIPE
  END-POINT          0.0000    0.0000    0.0000    0.5000
  END-POINT          1000.0000  0.0000    0.0000    0.5000
  ITEM-CODE           PA5BSTD
  CATEGORY            FABRICATION
  PIPING-SPEC         CS150
  UCI                 77344CBD-F6B6-46D2-8DF4-E4382C2ACD80
  CUT-PIECE-LENGTH   1100.0

TML
  CO-ORDS             200.0000    0.0000    0.0000
  TAG                 TM1
  TEXT                HELLO
  ENCLOSURE           ROUND
  MEASSUREMENT-TYPE   ABC
  MEASUREMENT-POINTS  1
  INFORMATION-ATTRIBUTE1 AA
  INFORMATION-ATTRIBUTE2 BB

TML
  CO-ORDS             500.0000    0.0000    0.0000
  TAG                 TM2
  ENCLOSURE           DOUBLE-SQUARE
  MEASSUREMENT-TYPE   XYZZ
  MEASUREMENT-POINTS  2
  INFORMATION-ATTRIBUTE15 XXX

TML
  CO-ORDS             800.0000    0.0000    0.0000
  STATUS              UNDIMENSIONED

```

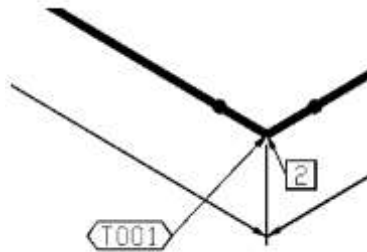


NOTE The examples below further clarify the relationship between the TAG, TEXT, and ENCLOSURE attributes in the PCF and the resulting isometric drawing output.

Example 1:

```
TML
CO-ORDS  100.0000  0.0000  0.0000
TAG       001
ENCLOSURE POINTED
```

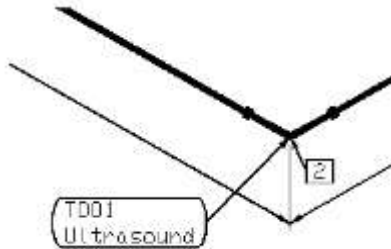
The contents of TAG are plotted in an enclosure of the appropriate style.



Example 2:

```
TML
CO-ORDS  100.0000  0.0000  0.0000
TAG       T001
TEXT      ULTRASOUND
ENCLOSURE ROUND
```

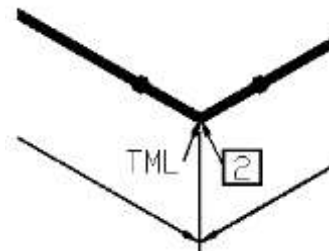
If TEXT is set, a two-line message is output in an enclosure of the appropriate style



Example 3:

```
TML
CO-ORDS  100.0000  0.0000  0.0000
ENCLOSURE NONE
```

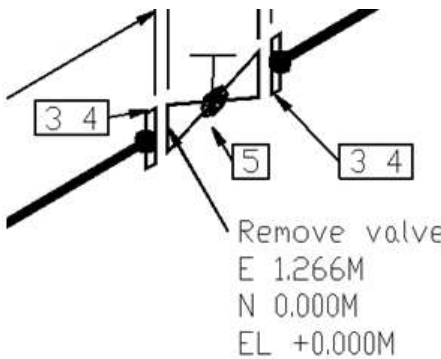
If TAG is not set, Isogen outputs a default string specified by AText -556. In the example below, AText -556 is set as **TML**.

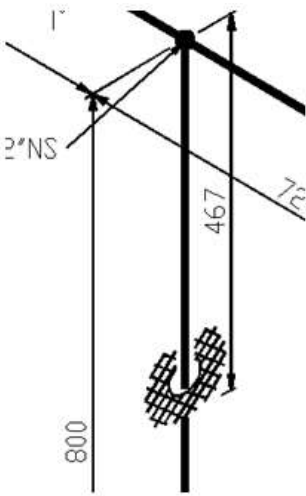
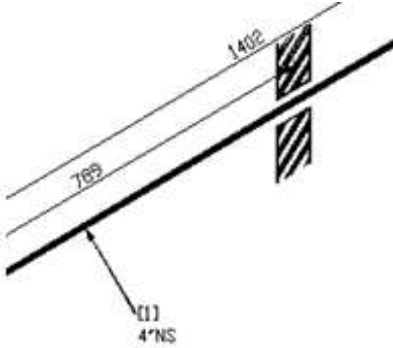


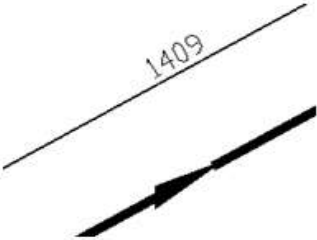
Other Information Items

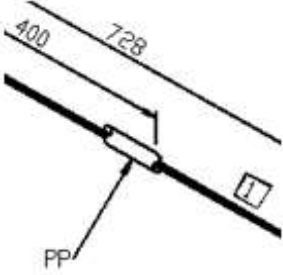
The table below shows a range of information items related to a pipeline that can be included in a PCF. They are not piping components, but each one fulfills a particular function, that, when included, add to the overall detailed information that is output on the generated isometric drawing. Mandatory attributes for each information item are listed under **Item Identifier**. Optional attributes, if applicable, are listed under **Remarks**.

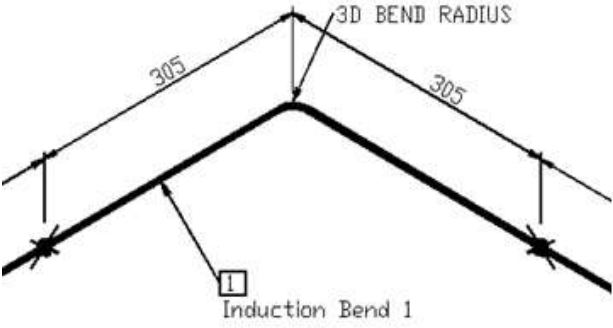
NOTE In the PCF, each information item is treated on an individual basis. Any number of each type can be included in an individual file.

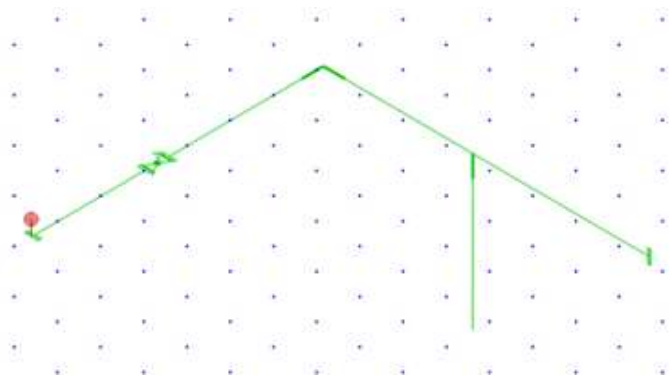
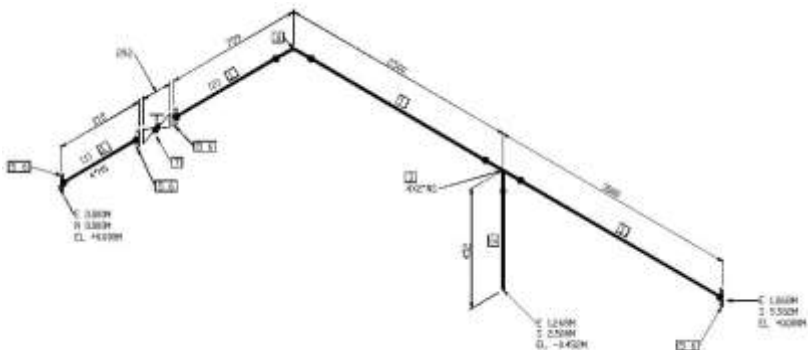
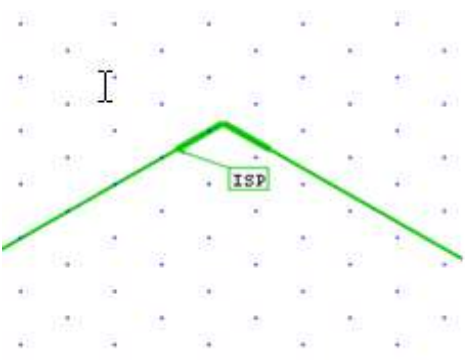
| Item Identifier | Remarks |
|---|---|
| BIP-IDENTIFIER CO-ORDS <i>data</i> TEXT <i>data</i> | <p>User-defined break-in point identifier and location. Used to indicate break-in points to existing pipelines when doing re-vamp type projects.</p>  <p>Remove valve E 1.266M N 0.000M EL +0.000M</p> <p>BIP-IDENTIFIER CO-ORDS 1265.8400 0.0000 0.0000 TEXT Remove valve</p> <p>NOTES</p> <ul style="list-style-type: none"> Co-ordinates are optional according to the style setting. Optionally, you can include the MESSAGE-[<i>type</i>] and ADDITIONAL-ITEM attributes. |

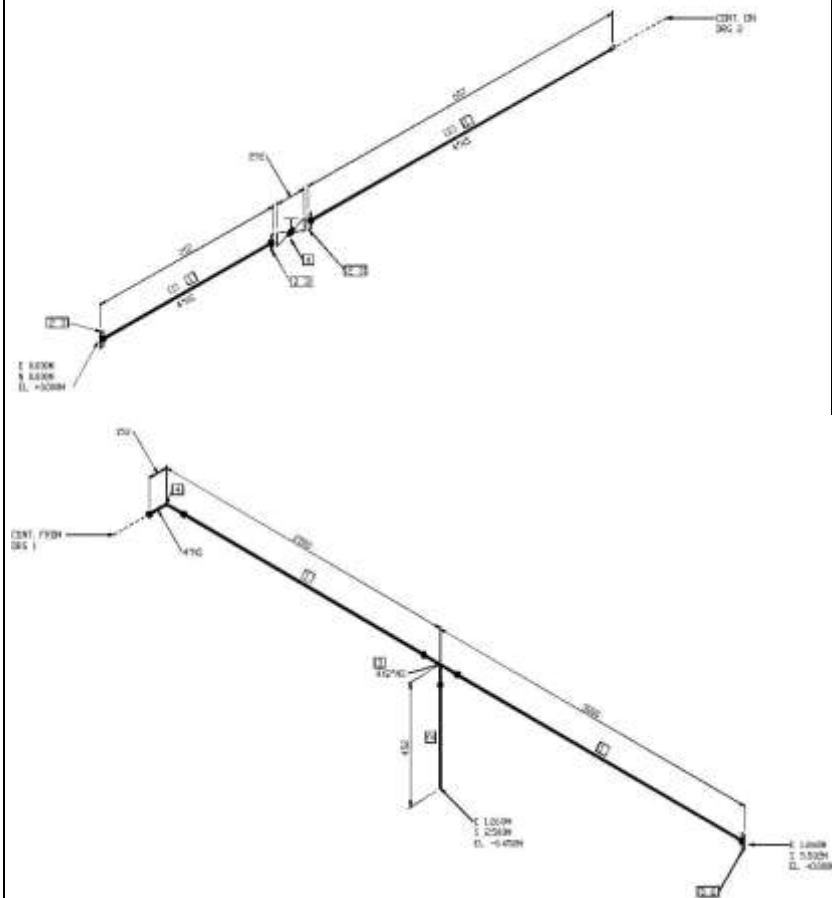
| Item Identifier | Remarks |
|--|--|
| FLOOR-SYMBOL CO-ORDS <i>data</i> SKEY FLOR | <p>Used to request and position a floor penetration (hole) symbol in vertical sections of a pipeline.</p>  <p>FLOOR-SYMBOL CO-ORDS 2968.2600 -680.2563 -467.0000 2.0000 SKEY FLOR</p> <p>NOTE Optionally, you can include the MESSAGE-<i>[type]</i>, ADDITIONAL-ITEM, and STATUS attributes.</p> |
| WALL-SYMBOL CO-ORDS <i>data</i> SKEY WALL | <p>Used to request and position a wall penetration (hole) symbol in horizontal sections of a pipeline.</p>  <p>WALL-SYMBOL CO-ORDS 789.0000 0.0000 0.0000 4.0000 SKEY WALL</p> <p>NOTE Optionally, you can include the MESSAGE-<i>[type]</i>, ADDITIONAL-ITEM, and STATUS attributes.</p> |

| Item Identifier | Remarks |
|--|---|
| FLOW-ARROW CO-ORDS <i>data</i> FLOW <i>data</i> SKEY FLOW | <p>Used to request and position a fluid/gas flow symbol at user-selected locations along the pipeline.</p> <p>Input data associated with the FLOW attribute is a single digit indicator to identify the flow direction.</p> <ul style="list-style-type: none">▪ 1 - Flow is from first to second end of the component on which the flow arrow is positioned.▪ 2 - Flow is the reverse of 1.▪ 3 - Flow is bi-directional.  <p>First and second ends are as determined by the sequence of END-POINT entries on the associated component.</p> <p>PIPE END-POINT 1565.8600 0.0000 0.0000 4.0000 END-POINT 2815.8600 0.0000 0.0000 4.0000 MATERIAL-IDENTIFIER 1 CATEGORY FABRICATION PIPING-SPEC CS150 UCI 1654F69E-786E-4CA9-9954-3D9BBA29581C</p> <p>FLOW-ARROW CO-ORDS 2293.8600 0.0000 0.0000 4.0000 SKEY FLOW FLOW 1</p> <p>NOTE Optionally, you can include the MESSAGE-<i>[type]</i>, ADDITIONAL-ITEM, and STATUS attributes.</p> |

| Item Identifier | Remarks |
|---|---|
| INSULATION-SYMBOL CO-ORDS <i>data</i> SKEY INPP | <p>Used to request and position an insulation symbol at user-selected locations along the pipeline. Must be located on pipe (tube).</p>  <p>INSULATION-SYMBOL CO-ORDS 2968.2600 -1080.3500 0.0000 4.0000 SKEY INPP</p> <p>NOTE Optionally, you can include the MESSAGE-<i>[type]</i>, ADDITIONAL-ITEM, and STATUS attributes.</p> |

| Item Identifier | Remarks |
|--|--|
| INDUCTION-START CO-ORDS <i>data</i> TEXT <i>data</i> | User-defined identification tag for an induction bend coordinate position that identifies the extent of the induction bend. Used as a pair of entries. |
| INDUCTION-END CO-ORDS <i>data</i> |  <p>INDUCTION-START CO-ORDS 1250.0000 0.0000 0.0000 TEXT Induction Bend 1</p> <p>BEND END-POINT 1250.0000 0.0000 0.0000 4.0000 END-POINT 1554.8000 -304.8000 0.0000 4.0000 CENTRE-POINT 1554.8000 0.0000 0.0000 SKEY PB MATERIAL-IDENTIFIER 3 ANGLE 9000 BEND-RADIUS 3D CATEGORY FABRICATION PIPING-SPEC CS150 UCI 57529632-7E18-4C0D-8251-FACB55980CA7</p> <p>PIPE END-POINT 1554.8000 -304.8000 0.0000 4.0000 END-POINT 1554.8000 -1554.8000 0.0000 4.0000 MATERIAL-IDENTIFIER 3 CATEGORY FABRICATION PIPING-SPEC CS150 UCI 5DD0DCB3-C539-4E83-AC0A-40CFA9DDAD8D</p> <p>INDUCTION-END CO-ORDS 1554.8000 -304.8000 0.0000 TEXT Induction start</p> <p>NOTES</p> <ul style="list-style-type: none">▪ Optionally, you can include the MESSAGE-<i>[type]</i> and ADDITIONAL-ITEM attributes.▪ Use the INDUCTION-START and INDUCTION-END attributes in pairs. |

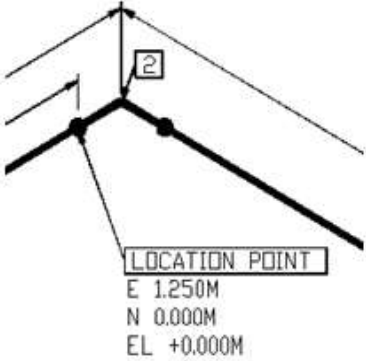
| Item Identifier | Remarks |
|--|---|
| ISO-SPLIT-POINT CO-ORDS <i>data</i> | <p>Used to indicate a user-selected isometric split point. Can also be included to position a previously positioned split point when using the Isogen repeatability facility.</p> <p>The following shows a pipeline with no split point:</p>  <p>Isogen creates a single drawing if it can be fitted on the user-specified sheet (set in style).</p>  <p>The split point is positioned as shown in the following illustration:</p>  <p>Isogen splits the drawing into two separate sheets:</p> |

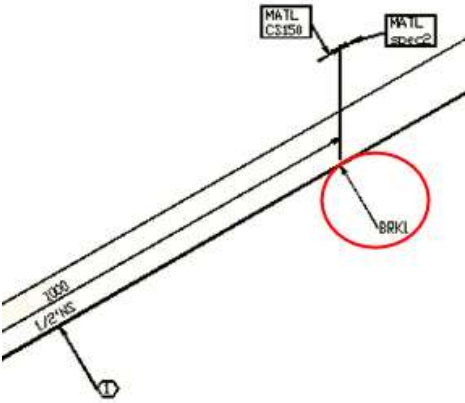
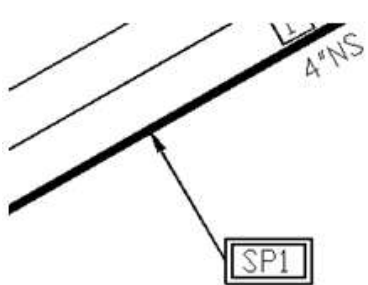


ISO-SPLIT-POINT

CO-ORDS 2815.8600 0.0000 0.0000

NOTE Optionally, you can include the MESSAGE-[type] and ADDITIONAL-ITEM attributes.

| Item Identifier | Remarks |
|--|--|
| LOCATION-POINT CO-ORDS <i>data</i> SKEY LOPT | <p>Used to request and position a location point symbol at user-selected locations along the pipeline. For complete details, see Development Specification No. 71A.</p>  <p>LOCATION-POINT CO-ORDS 1250.0000 0.0000 0.0000 SKEY LOPT STATUS DIMENSIONED</p> <p>Location points are usually used in conjunction with the Isogen reference planes facility, where Isogen expresses coordinates relative to a system defined in an external file. The format of the location point label is defined by style properties.</p> <p>NOTE Optionally, you can include the MESSAGE-<i>[type]</i>, ADDITIONAL-ITEM, and STATUS attributes.</p> |

| Item Identifier | Remarks |
|---|---|
| PIPE-BREAK CO-ORDS <i>data</i> SKEY PBRK MESSAGE-[<i>type</i>] | <p>Identifies the position at which attributes change along a single section of pipe.</p> <p>NOTE Where a pipe break is positioned between sections of pipe, any cut length assigned to the adjoining pipe sections are accumulated in the resulting MTO.</p>  <p>PIPE-BREAK CO-ORDS 1000.0000 0.0000 0.0000 0.5000 SKEY PBRK MESSAGE TEXT BRK1</p> <p>NOTE Optionally, you can include the MESSAGE-[<i>type</i>] and ADDITIONAL-ITEM attributes.</p> |
| SPOOL-IDENTIFIER CO-ORDS <i>data</i> TEXT <i>data</i> | <p>User-defined and positioned spool identifier. Can also be included to indicate a previously allocated spool identifier when using the Isogen Repeatability facility.</p>  <p>SPOOL-IDENTIFIER CO-ORDS 0.0000 0.0000 0.0000 TEXT SP1</p> <p>NOTE Optionally, you can include the MESSAGE-[<i>type</i>] and ADDITIONAL-ITEM attributes.</p> |

| Item Identifier | Remarks |
|-------------------------------------|--|
| SYSTEM-SPLIT CO-ORDS <i>data</i> | Used to indicate a user-selected system isometric split point. NOTE Optionally, you can include the MESSAGE- <i>[type]</i> and ADDITIONAL-ITEM attributes. |

NOTES

- All item identifiers must start in column position one (1).
- All secondary attributes are entered one per line and must start in column position five (5).
- The input data must be separated from the attribute identifier by at least one blank character.

SECTION 6

Material Attributes

A material entry holds a set of attributes that are shared by all the components that are linked to the same material. In the PCF, the link between the component and its material is defined by the MATERIAL-IDENTIFIER attribute. This stand-alone attribute allows the unique specification of a material and mirrors the combination of item code, description and material attributes. The MATERIAL-IDENTIFIER attribute is added at the component level to specify a unique material pointer.

NOTE The material pointer can be any string that is unique within the PCF and need not be anything more sophisticated than an index number, such as 1, 2, 3, and so forth.

ELBOW

```
COMPONENT-IDENTIFIER 3
SKEY ELBW
UNIQUE-COMPONENT-IDENTIFIER 2CWC-2023-PIPE
CENTRE-POINT 132343.0000 56421.0000 11131.0625
END-POINT 132364.0000 56421.0000 11131.0625 14
END-POINT 132343.0000 56421.0000 11152.0625 14
PIPING-SPEC 2CWC- L-CSAF
INSULATION-SPEC 01400
FABRICATION-ITEM
TRACING-ON
MATERIAL-IDENTIFIER 1
ANGLE 9000
SPOOL-IDENTIFIER 2CWC- PSP-11
```

ELBOW

```
COMPONENT-IDENTIFIER 4
SKEY ELBW
UNIQUE-COMPONENT-IDENTIFIER 2CWC-2024-PIPE
CENTRE-POINT 132343.0000 56421.0000 11173.0625
END-POINT 132343.0000 56421.0000 11152.0625 14
END-POINT 132343.0000 56400.0000 11173.0625 14
PIPING-SPEC 2CWC- L-CSAF
INSULATION-SPEC 01400
FABRICATION-ITEM
TRACING-ON
MATERIAL-IDENTIFIER 1
ANGLE 9000
```

PIPE

```
COMPONENT-IDENTIFIER 5
UNIQUE-COMPONENT-IDENTIFIER 2CWC-2025-PIPE
END-POINT 132364.0000 56421.0000 11131.0625 14
END-POINT 132380.0000 56421.0000 11131.0625 14
PIPING-SPEC 2CWC- L-CSAF
INSULATION-SPEC 01400
FABRICATION-ITEM
TRACING-ON
MATERIAL-IDENTIFIER 2
```

The make-up of these material "pointers" is defined in the MATERIALS section of the PCF:

MATERIALS

MATERIAL-IDENTIFIER 1

ITEM-CODE N.A.-001

DESCRIPTION 14" STD, LR 90 ELL, A234 WPB

PURCHASE-SPEC 62.2201

MATERIAL-IDENTIFIER 2

ITEM-CODE N.A.-002

DESCRIPTION 14" STD, A106 GR B, CC173

PURCHASE-SPEC 62.2201

NOTE For components, such as tees and crosses, that have separate materials specified for the branch legs, use the MATERIAL-IDENTIFIER-BRANCH1 and MATERIAL-IDENTIFIER-BRANCH2 attributes. For more information, see *Material Information Attributes* (on page 329).

Recommended Best Practice

Although the PCF allows a great deal of flexibility in defining materials, including the omission of a MATERIALS section altogether, the following is regarded as "best practice":

- Include the MATERIAL-IDENTIFIER attribute with each component.
- Include a MATERIALS section at the end of the PCF that defines the make-up of each material pointer.
- In situations where you cannot use the MATERIAL-IDENTIFIER attribute, the following best practices apply:
 - Include both ITEM-CODE and ITEM-DESCRIPTION attributes with each component.
 - If additional material attributes are required, declare them as part of the PIPELINE HEADER using ITEM-ATTRIBUTE statements and then enter values for them in the MATERIALS section.
 - Include a MATERIALS section at the end of the PCF.
 - As a minimum, enter ITEM-CODE and ITEM-DESCRIPTION attributes for each material referenced in the PCF.

NOTE For more information about using the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTES attributes, see *Appendix: Superseded PCF Syntax* (on page 377).

Additional Material Attributes

The PCF syntax supports up to ten user-defined attributes that can be attached to each material entry. You can use these attributes to map properties that are available in the host system reference data. These properties can be plotted on the material list and output in Isogen generated reports.

You enter user-defined material attributes in the MATERIALS section. However, in order to ensure a consistent treatment of these attributes across a set of PCFs, declare the field in the PIPELINE HEADER section of the PCF using the following syntax:

```
ITEM-ATTRIBUTE0  attribute_name
ITEM-ATTRIBUTE1  attribute_name
ITEM-ATTRIBUTE2  attribute_name
ITEM-ATTRIBUTE3  attribute_name
```

Each ITEM-ATTRIBUTE contains the name for the user attribute that is used in the PCF. For example, to declare the CLASS, MATERIAL, SCHEDULE and GEOMSTD user attributes, use the following syntax:

```
PIPELINE-REFERENCE  P100
  <PIPELINE ATTRIBUTES>
    ITEM-ATTRIBUTE0  CLASS
    ITEM-ATTRIBUTE1  MATERIAL
    ITEM-ATTRIBUTE2  SCHEDULE
    ITEM-ATTRIBUTE3  GEOMSTD
  <COMPONENTS>
```

The actual values for these attributes for each material are defined in the MATERIALS section

```
MATERIALS
ITEM-CODE  FCD150-WNRSTD
  DESCRIPTION  FLANGE, CS ASTM A105, 150#, WN, RF, STD WT
  SCHEDULE  1
  MATERIAL  CS
ITEM-CODE  PA5BSTD
  DESCRIPTION  PIPE, CS API 5L SML, GRD B, STD WT
  GEOMSTD  ANSI
  CLASS  400#
```

NOTE For more information about PCF syntax for user-defined attributes, see *Linking Components with Materials* (on page 382) in the *Appendix: Superseded PCF Syntax*.

SECTION 7

Extraction Techniques

This section of the document discusses common piping configurations and provides best practices for representing them in the PCF.

- *Bends* (on page 73)
- *Fixed Pipe with Change of Status* (on page 77)
- *Main Nominal Size on Olets and Set-On Tees* (on page 77)
- *Olets* (on page 78)
- *Penetration Plates* (on page 79)
- *Supports* (on page 83)
- *Tap Connections* (on page 87)
- *Tees - Fabricated* (on page 89)
- *Welds* (on page 102)
- *Jacket and Core Pipelines* (on page 96)

Bends

There are two basic categories of bends:

- Pulled/Fabricated Bends (manufactured from pipe)
- Fitting Bends

Each category consists of the following variations of the standard bend type.

- Flanged bends
- Return bends
- Lobster back bends
- Mitre bends
- Long radius bends (curved pipe)
- Multi-axis bends

IMPORTANT These bend types must be specified by the correct SKEY in the PCF.

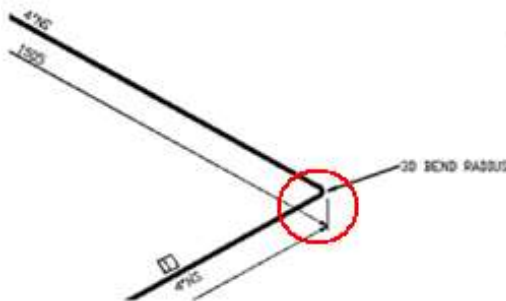
Pulled Bends

In the PCF, a pulled (or pipe) bend is usually modeled as a separate component (a bend). In reality, though, a single length of pipe consists of a pulled (or pipe) bend with sections of straight pipe on either side.

BEND

```
COMPONENT-IDENTIFIER 2
END-POINT 0.0000 -1200.0000 0.0000 4.0000
END-POINT -304.8000 -1504.8000 0.0000 4.0000
CENTRE-POINT 0.0000 -1504.8000 0.0000
SKEY PB
MATERIAL-IDENTIFIER 3
ANGLE 9000
BEND-RADIUS 3D
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI CDB716B1-06C8-4531-BF6B-8AC9CB283957
```

In the following Isogen-generated graphic, note that no welds are shown, and the dimension is given to the center of the bend.



The bend does not appear separately in the material take-off (MTO), but its length is added to the length of pipe, presuming that the bend **ITEM-CODE** is set correctly

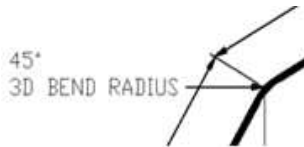
| MATERIAL LIST - FABRICATION | | | | |
|-----------------------------|------|-----------|------------------------------------|-------|
| PT.NO | SIZE | ITEM CODE | DESCRIPTION | QTY |
| 1 | 4 | PASBSTD | PIPE, CS API 5L SML, GRD B, STD WT | 2.9 M |

NOTE In the PCF, the bend `ITEM-CODE` should match that of the pipe from which the bend is formed.

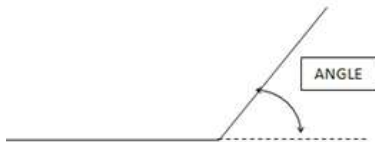
BEND-RADIUS and ANGLE

BEND-RADIUS can be given as a multiplying factor for the pipe nominal size, such as 1D, 1.5D, 3D or 5D, or as an actual bend radius in the units of UNITS-CO-ORDS. This figure is used to calculate the arc length of the bend.

ANGLE is given in units of 1/100th degrees (90-degrees= 9000). Isogen displays angles other than 90-degrees on the drawing.

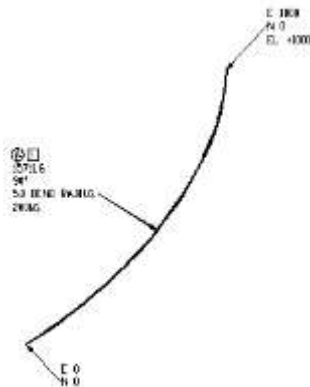


The convention for `ANGLE` in the PCF is shown in the following illustration.



NOTE The recommended SKEY for a pulled or pipe bend is PB.

In addition to the standard representation of a bend shown in the previous illustration, Isogen is also capable of drawing long radius bends as sections of curved pipe, as shown in the following illustration. Drawing bends as curved pipe is particularly useful for representing ring mains.



No additional syntax is required in the PCF over and above a standard pipe bend, as the drawing appearance depends solely on an ISOGEN control facility based on a threshold value of BEND-RADIUS.

Fitting Bends

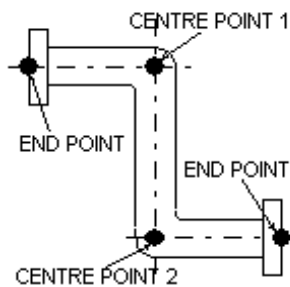
Bends can also be pre-fabricated fitting components. In the PCF, these types of bends are still defined with two `END-POINT` attributes and a `CENTRE-POINT` attribute. Additionally, though, their end types and welding are specified according to the `SKEY`, such as `PBFL`, `PBSW`, and so forth.

Multi-Axis Pipe

Fitting bends that have two changes of direction are referred to as multi-axis pipes. You can define a multi-axis pipe in the PCF using a standard `BEND` component entry with a second `CENTRE-POINT` attribute and the `SKEY` `BM**`, where `**` represents any of the standard end types, such as, for example, flanged, screwed, or socket.

```
BEND
  COMPONENT-IDENTIFIER 4
  END-POINT 475000 910000 750000 64
  END-POINT 525000 910000 675000 64
  CENTRE-POINT 500000 910000 750000
  CENTRE-POINT 500000 910000 675000
  SKEY BMFL
```

The following diagram illustrates the output from the previous PCF entry.



Return Bends

Return, or "U", bends are also defined with two `CENTRE-POINT` attributes, and are distinguished by the use of `SKEY` `BE**` or `BU+D`.

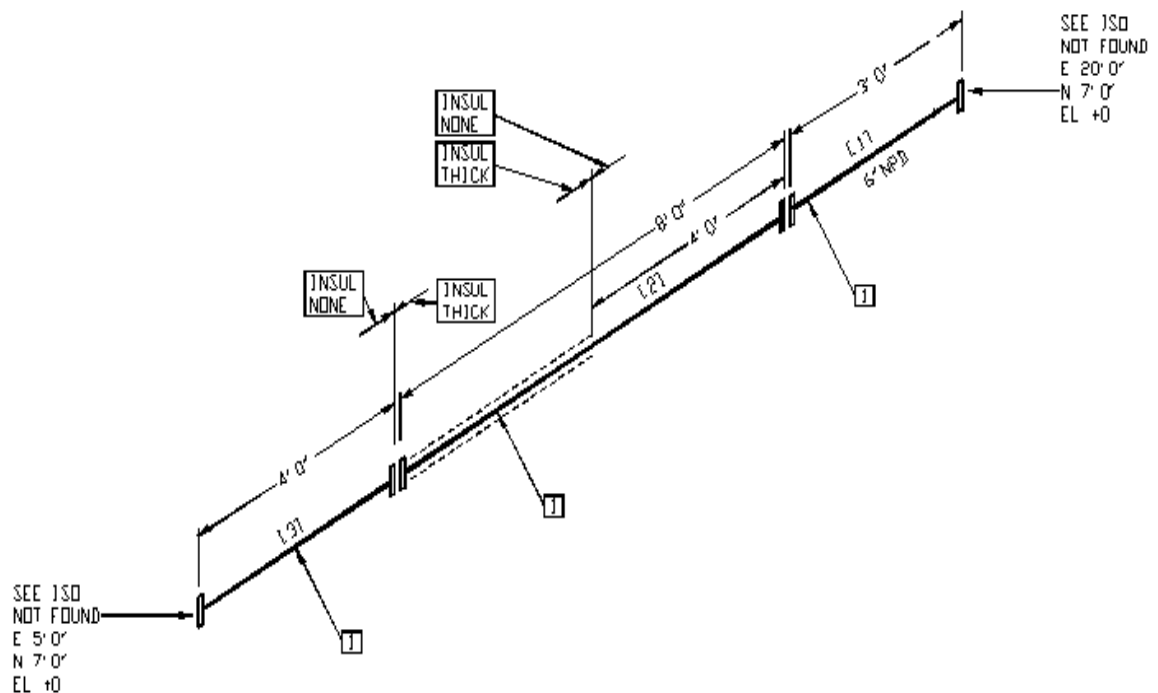
Fixed Pipe with Change of Status

When representing a change of status, such as Tracing, Insulation, Piping or other specification, at a location along a fixed pipe, you must include two adjacent fixed pipes in the PCF, with each bearing the same UCI:

```

PIPE-FIXED
  END-POINT  396239  213359  0  96
  END-POINT  274319  213359  0  96
  SKEY  FPPL
  MATERIAL-IDENTIFIER  2
  UCI  {00013885-0000-0000-4D56-0C784548C605}
  INSULATION-SPEC  THICK
PIPE-FIXED
  END-POINT  274319  213359  0  96
  END-POINT  152399  213359  0  96
  SKEY  FPPL
  MATERIAL-IDENTIFIER  2
  UCI  {00013885-0000-0000-4D56-0C784548C605}
  INSULATION-SPEC  NONE
  
```

Isogen is able to detect the above situation (based on matching UCI) and will draw a single length of fixed pipe with no flanged end connections between the two components, as shown in the following illustration:



Main Nominal Size on Olets and Set-On Tees

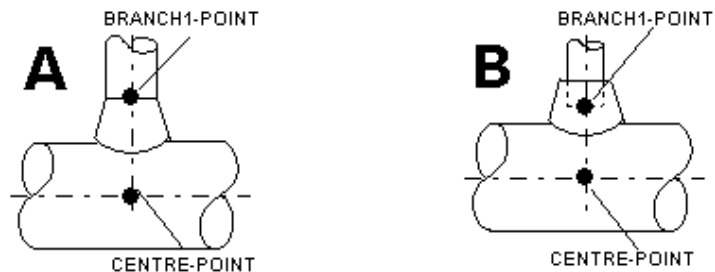
When an olet or set-on (or stub) tee is included in the PCF, but the corresponding "main" pipe into which the component "tees" is not included in the PCF, it is necessary to specify the nominal size of the main pipe by placing the nominal size at the end of the `CENTRE-POINT` record:

```
TEE-SET-ON
COMPONENT-IDENTIFIER 3
BRANCH1-POINT 3436.306 7870.261 0.000 100
CENTRE-POINT 3436.306 7927.411 0.000 200
SKEY TESO
MATERIAL-IDENTIFIER 5
PIPING-SPEC MCS150
```

Olets

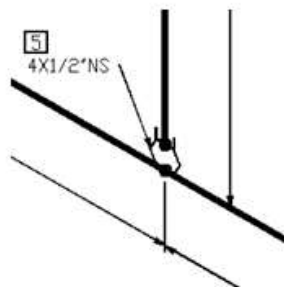
An olet is a special type of fitting that provides a self-reinforced branch welded to the side of a pipe. The branch connection can be of any type, such as welded, screwed, and so forth. In the PCF, a `CENTRE-POINT` and `BRANCH1-POINT` coordinate is required. The `CENTRE-POINT` must lie on the center-line of the main pipe.

The following two drawings show the connection points on a butt weld type of olet (A) and a socket type olet (B).



IMPORTANT The distance between the `CENTRE-POINT` and `BRANCH1-POINT` coordinates is not the length of the fitting.

The following illustration depicts the Isogen representation of an olet with a socket weld connection (a sockolet).



Associated Welds on Olets

In the previous illustration, two welds are shown: one between the main pipe and the olet, and the other between the olet and the branch pipe. When these welds are specified in the PCF, they must be associated with the olet. For more information, see *Associated Components--Welds* in *Associated Components* (on page 39).

OLET

COMPONENT-IDENTIFIER 2
CENTRE-POINT 330500.0000 6400.0000 -2097.0000 3.000
BRANCH1-POINT 330500.0000 6647.6200 -2097.0000 3.000
MATERIAL-IDENTIFIER 3
SKEY SKSW
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI 0DD07D35-84BC-4708-B893-06F81C186FF1

WELD

COMPONENT-IDENTIFIER 3
MASTER-COMPONENT-IDENTIFIER 2
END-POINT 330500.0000 6400.0000 -2097.0000 3.0000
END-POINT 330500.0000 6400.0000 -2097.0000 3.0000
SKEY WW
CATEGORY FABRICATION
REPEAT-WELD-IDENTIFIER 2
LOCATION CP

WELD

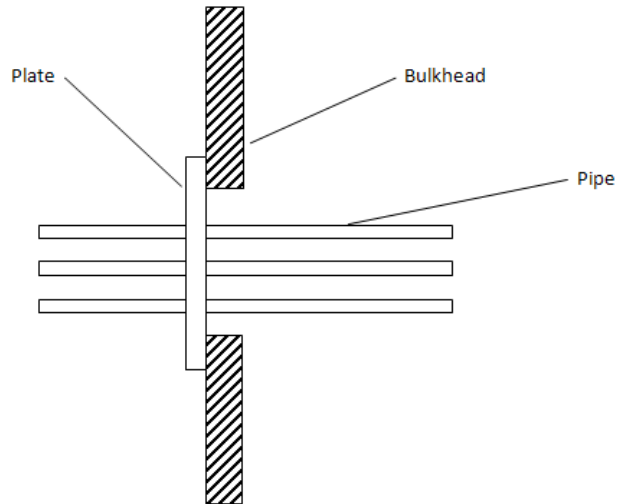
COMPONENT-IDENTIFIER 4
MASTER-COMPONENT-IDENTIFIER 2
END-POINT 330500.0000 6647.6200 -2097.0000 3.0000
END-POINT 330500.0000 6647.6200 -2097.0000 3.0000
SKEY WW
CATEGORY FABRICATION
REPEAT-WELD-IDENTIFIER 1
LOCATION B1P

NOTES

- In the previous PCF, the main pipe/olet weld is given a location at the center point (LOCATION CP), and the olet/branch weld is given a location at the branch point (LOCATION B1P).
- When the PCF contains a definition of the main pipe, it is not necessary to split the main PIPE element at the olet. Instead, it should be passed in the PCF as a single item.

Penetration Plates

A penetration plate is a specialized item used in shipbuilding applications. Where one or more pipes pass through a bulkhead or deck, it is common to fabricate a single assembly (the penetration spool) that consists of sections of pipe, plus a plate through which they all pass. The penetration spool is fabricated from the plate and pipe sections and then the assembly is welded into place as a single unit in the ship.



In the previous illustration, three separate pipes form a single spool. Because this configuration violates the basic rule that all components must be connected in a PCF, a special component, PENETRATION-PLATE, is used to link the pipes together to form a spool.

To describe a penetration spool in the PCF, there must be at least one PIPE and one PENETRATION-PLATE, and the PENETRATION-PLATE must possess all of the following:

- A CENTRE-POINT attribute that lies on the center line of the PIPE
- **NOTE** It is not necessary to split the pipe into two sections.
- A PLATE-DIRECTION attribute that defines the orientation of the plate in the Isogen-generated drawing.
- A PLATE-THICKNESS attribute that defines the thickness of the plate.

PIPE

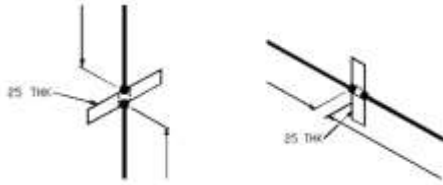
```
COMPONENT-IDENTIFIER 3
END-POINT 0.0000 0.0000 1000.0000 4.0000
END-POINT 0.0000 0.0000 0.0000 4.0000
MATERIAL-IDENTIFIER 1
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI C8BFA80D-ECCA-498A-B005-5D085EBB1C85
```

PENETRATION-PLATE

```
COMPONENT-IDENTIFIER 4
CENTRE-POINT 0.0000 0.0000 500.0000 4.0000
PLATE-THICKNESS 25.000
PLATE-DIRECTION EAST
SKEY CRPP
```

Plate Direction

Isogen draws a schematic representation of the plate, and it is aligned in one of the principal directions: E-W, N-S or U-D.



Penetration plates have many different forms. If the plate is rectangular, or has one obvious principal axis, the `PLATE-DIRECTION` attribute is relatively easy to determine. If the plate is circular, or symmetrical, then an arbitrary choice must be made. Provided the direction is orthogonal to the PIPE running through the plate, any suitable direction can be chosen. However, if the penetration plate has multiple pipes, then the `PLATE-DIRECTION` should be chosen to align with the piping layout; if not, a confusing drawing may result. For example, if the pipes are aligned along the E-W axis, set the `PLATE-DIRECTION` attribute the same axis (EAST or WEST).

Penetration Plates with Multiple Pipes

To represent a penetration spool with more than one pipe, add a `CENTRE-POINT` attribute to the `PENETRATION-PLATE` for each pipe, as shown in the following PCF entry.

IMPORTANT In each instance, the `CENTRE-POINT` of the `PENETRATION-PLATE` element must lie on the center line of one of the `PIPE` elements.

PIPE

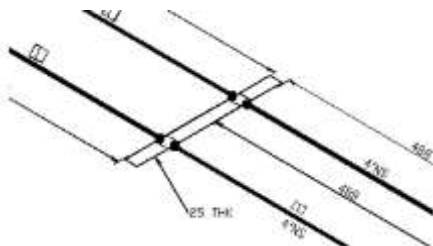
```
END-POINT 0.0000 0.0000 0.0000 4.0000
END-POINT 0.0000 1000.0000 0.0000 4.0000
MATERIAL-IDENTIFIER 3
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI C8BFA80D-ECCA-498A-B005-5D085EBB1C85
```

PIPE

```
END-POINT 100.0000 0.0000 0.0000 4.0000
END-POINT 100.0000 1000.0000 0.0000 4.0000
MATERIAL-IDENTIFIER 3
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI C8BFA80D-ECCA-498A-B005-5D085EBB1C85
```

PENETRATION-PLATE

```
CENTRE-POINT 0.0000 500.0000 0.0000 4.0000
CENTRE-POINT 100.0000 500.0000 0.0000 4.0000
PLATE-THICKNESS 25.000
PLATE-DIRECTION EAST
SKEY CRPP
```



The best results are obtained if all `CENTRE-POINT` attributes lie on a common vector and that vector is used as the `PLATE-DIRECTION`. Otherwise, Isogen draws one or more pipes on top of the other, resulting in the creation of confusing drawing.

NOTES

- Because of the complexity of these spools, a detailed sketch is recommended to clarify fabrication details.
- If not present in the PCF, Isogen implies the existence of welds at the edges of the plate, as shown in the previous examples.

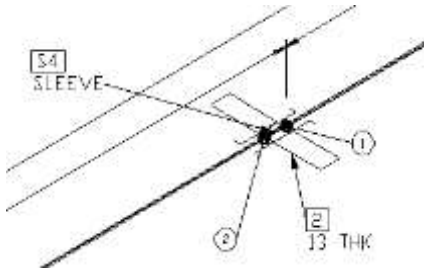
Penetration Sleeves

In some cases, the pipe is not attached directly to the plate but passes through a sleeve that is in turn-welded, clamped, or bolted to the plate. There are many different styles of attachment. The recommended modeling procedure for this situation is to represent the sleeve as a `SUPPORT` positioned at the `CENTRE-POINT` of the `PENETRATION-PLATE` element.

Penetration sleeves that have been modeled as supports are displayed on the isometric drawing. Use support `SKEY SLVE`, and position the support at the appropriate penetration plate center points. The following examples show a section of the PCF containing the necessary syntax for a penetration part sleeve and the resulting isometric output.

```
PENETRATION-PLATE
  CENTRE-POINT  4811.685  3  414.506  4398.250
  PLATE-THICKNESS  15
  PLATE-DIRECTION  EAST
  MATERIAL-IDENTIFIER  3

SUPPORT
  CENTRE-POINT  4536.567  3  414.506  4398.250
  CATEGORY  FABRICATION
  SKEY  SLVE
  MATERIAL-IDENTIFIER  4
```



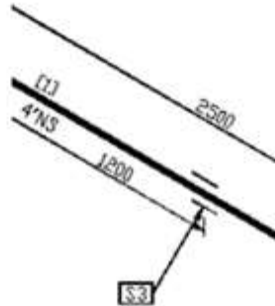
Supports

A pipe support, such as a hanger or a guide, is represented in the PCF as a component with a single coordinate. Although the support is not regarded as being part of the piping network, it must be positioned on the centerline of another component, which is typically a pipe.

```
SUPPORT
CO-ORDS  0.0000  -1200.0000  0.0000  4.0000
SKEY  01HG
MATERIAL-IDENTIFIER  5
CATEGORY  ERECTION
PIPING-SPEC  CS150
UCI  F238F20C-B65E-482A-A2B8-4C36863E1A7C
```

NOTES

- Pipe supports carry a nominal size since they are typically manufactured to fit the pipe they are supporting.
- The default SKEY for an Isogen pipe support is 01HG, which generates the standard double parallel lines support representation:



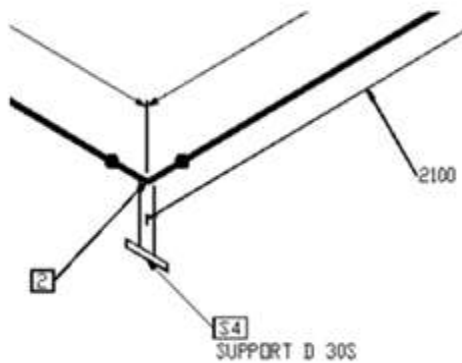
A number of the Isogen-standard supports are directional, and the PCF must include a **SUPPORT-DIRECTION** attribute that specifies the orientation of the support on the drawing. You must define **SUPPORT-DIRECTION** using one of the six standard primary directions: EAST, NORTH, UP, WEST, SOUTH, or DOWN.

```
SUPPORT
CO-ORDS  0.0000  -2500.0000  0.0000  4.0000
SKEY  DUCK
MATERIAL-IDENTIFIER  5
CATEGORY  ERECTION
DIRECTION  DOWN
PIPING-SPEC  CS150
SUPPORT-DIRECTION  DOWN
UCI  045C771D-FEA4-4910-92FD-D557731A435C
```

If the support is non-primary, you can use the associated `DIRECTION` attribute to specify an actual direction for the support.

```
SUPPORT
CO-ORDS  0.0000  -2500.0000  0.0000  4.0000
SKEY  DUCK
MATERIAL-IDENTIFIER  5
CATEGORY  ERECTION
DIRECTION  D 30S
PIPING-SPEC  CS150
SUPPORT-DIRECTION  DOWN
UCI  045C771D-FEA4-4910-92FD-D557731A435C
```

The direction specified in the PCF is output on the drawing as a message, as shown in the following illustration:



In the previous illustration, the duck foot support is shown attached to another component (the elbow). The default support, 01HG, is not drawn if it is positioned on another component.

Supports can carry a set of additional attributes that can be used to pass additional detail to pipe stress software, such as CAESAR II, that can read a PCF. For more detailed information, see the component data sheet for SUPPORT.

NOTE Multiple supports can be present at the same point.

Support Welds

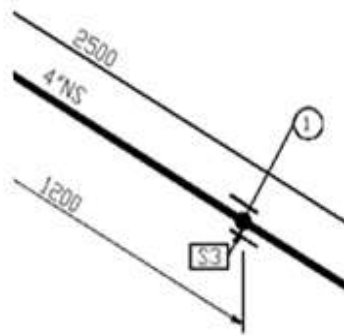
Support welds are welds that are associated with the construction of the support itself or the attachment of the support to the pipe or structure. Support welds can appear in the ISGOEN-generated weld report and can be assigned numbers. Support welds should always appear in the PCF as *associated welds* (see "Associated Components" on page 39). You can associate any number of support welds with a single support. Because the support weld has only one coordinate, it is not necessary to define a `LOCATION` attribute.

SUPPORT

```
COMPONENT-IDENTIFIER 1
CO-ORDS 0.0000 -1200.0000 0.0000 4.0000
SKEY 01HG
MATERIAL-IDENTIFIER 1
CATEGORY ERECTION
PIPING-SPEC CS150
UCI F238F20C-B65E-482A-A2B8-4C36863E1A7C
```

WELD

```
COMPONENT-IDENTIFIER 2
MASTER-COMPONENT-IDENTIFIER 1
END-POINT 0.0000 -1200.0000 0.0000 4.0000
END-POINT 0.0000 -1200.0000 0.0000 4.0000
SKEY ZSP1
```



Pipe Trunnions

A trunnion is a pipe support formed from pipe. Usually, a trunnion is welded to the pipe or other component that it supports, but no connection for fluid flow is made. However, since the pipe used is identical to that used for the process fluid, there is often a requirement for the material/quantity to appear in the isometric material take-off (MTO).

If the requirement is that the trunnion appears on the isometric, then you must model it as a pipe with coordinates to define length and orientation. To ensure that the software correctly handles welds and the cut-piece end preparations, model the trunnion as attached to other pipe using the TEE-SET-ON component.

A trunnion connected to a component (such as an elbow) should be connected using a tap connection. In the special case of a pipe support at the center point of an elbow, you can use a teed-elbow with the trunnion pipe as the branch pipe of the teed elbow.

NOTE In each of the previous three cases, you can position the support in the PCF on the trunnion pipe with an associated message instructing that the main pipe should not be holed.

If the pipe material is to appear in the MTO but is not required on the isometric drawing, then you can add it to the PCF as a pipe additional item on the support. In this case, the support in the PCF needs to be positioned directly onto the main pipe or fitting.

In all cases, the support can bear special trunnion welds. Trunnion welds are support welds with an SKEY of ZTN1, 2, 3 or ZTR1, 2, 3, depending on how many welds are needed. To refer to welding of any end plate at the other end of the trunnion pipe, use SKEY ZEP1, 2, again depending on how many welds are needed.

Support Attributes

In the PCF, the following keywords are reserved as specific support attributes:

| Keyword | Remarks |
|----------------------------|---|
| STIFFNESS-PLUS | Refers to the East , North , and Up directions. You must specify a value for each direction. Unit value is as specified by the UNITS-STIFFNESS entry. |
| STIFFNESS-MINUS | Refers to the West , South , and Down directions. You must specify a value for each direction. Unit value is as specified by the UNITS-STIFFNESS entry. |
| ROTATIONAL-STIFFNESS-PLUS | Refers to the East , North , and Up directions. You must specify a value for each direction. Unit value is as specified by the UNITS-STIFFNESS entry. |
| ROTATIONAL-STIFFNESS-MINUS | Refers to the West , South , and Down directions. You must specify a value for each direction. Unit value is as specified by the UNITS-STIFFNESS entry. |
| GAP-PLUS | Refers to the East , North , and Up directions relative to the support origin. You must specify a value for each direction. Unit value is as specified by the CO-ORDS entry. |
| GAP-MINUS | Refers to the West , South , and Down directions relative to the support origin. You must specify a value for each direction. Unit value is as specified by the CO-ORDS entry. |
| ROTATIONAL-GAP-PLUS | Refers to the East , North , and Up directions relative to the support origin. You must specify a value for each direction. Unit value is as specified by the UNITS-ROTATION entry. |

| Keyword | Remarks |
|-------------------------|---|
| ROTATIONAL-GAP-MINUS | Refers to the West , South , and Down directions relative to the support origin. You must specify a value for each direction. Unit value is as specified by the UNITS-ROTATION entry. |
| COEFFICIENT-OF-FRICTION | Refers to the primary planes East/West , North/South , and Up/Down . You must specify a value for each primary plane. |
| SELECTSPRING | Acceptable values are Yes and No . |
| VARIABILITY | |
| ALLOWSHORTSPRINGS | Acceptable values are Yes and No . |
| MAXTRAVEL | Unit value are as those specified by the CO-ORDS entry. |
| NUMBEROFSPRINGS | |
| MANUFACTURER | |

The following is an example of a support entry in the PCF:

```

SUPPORT
  COMPONENT-IDENTIFIER 8
  SKEY 01HG
  NAME SP01
  MATERIAL-IDENTIFIER 6
  CATEGORY FABRICATION
  STIFFNESS-PLUS 33.50 25.00 100.25
  STIFFNESS-MINUS 33.50 25.00 100.25
  ROTATIONAL-STIFFNESS-PLUS 10.5 10.5 50.0
  ROTATIONAL-STIFFNESS-MINUS 10.5 10.5 50.0
  GAP-PLUS 15.0 10.0 25.0
  GAP-MINUS 30.0 20.0 50.0
  ROTATIONAL-GAP-PLUS 25.0 30.0 45.0
  ROTATIONAL-GAP-MINUS 25.0 30.0 45.0
  COEFFICIENT-OF-FRICTION 0.7 0.7 0.83
  SELECTSPRING YES
  VARIABILITY 1.56
  ALLOWSHORTSPRINGS NO
  MAXTRAVEL 150
  NUMBEROFSPRINGS 8
  MANUFACTURER SUPERSPRINGS

```

Tap Connections

In a pipeline, a tap connection is usually a connection between a component and a small bore pipe, such as an instrument line. The connection point is not predefined so that the start point of the branch does not coincide with any of the component coordinates.

Because the PCF must be completely connected, there must be an association between the tap branch and the tapped component. You can achieve this connection in one of two ways, either by associating the tap with a component or by associating the tap through a `UNIQUE-COMPONENT-IDENTIFIER (UCI)` attribute.

NOTE Other than the mandatory `CO-ORDS` and the optional `UCI` attributes, the only other attribute that can be specified on a tap connection is `CATEGORY`.

Tap Associated with a Component

The component contains an embedded declaration of a tap. This is the recommended method.

```
VALVE
  COMPONENT-IDENTIFIER 3
  END-POINT 1265.8400 0.0000 0.0000 4.0000
  END-POINT 1557.9400 0.0000 0.0000 4.0000
  SKEY VGFL
  MATERIAL-IDENTIFIER 4
  CATEGORY ERECTION
  PIPING-SPEC CS150
  SPINDLE-DIRECTION UP
  UCI AC6C341F-F18B-4BE4-9CA3-8E84AC06D8D5
  TAP-CONNECTION
  CO-ORDS 1461.8900 0.0000 -40.0000 0.5000 SC
```

Tap Associated Through UCI

The tap data is output with a UCI pointing to the tapped component, as shown in the following example.

```
VALVE
  COMPONENT-IDENTIFIER 5
  END-POINT 0.00 -865.84 0.00 4.0000
  END-POINT 0.00 -1157.94 0.00 4.0000
  SKEY VGFL
  MATERIAL-IDENTIFIER 2
  SPINDLE-DIRECTION UP
  CATEGORY ERECTION
  UNIQUE-COMPONENT-IDENTIFIER A73D4CF5-29BC-4275-A6CC-C6BC80D3A189
  TAP-CONNECTION
  CO-ORDS 0.00 -1107.94 0.00 0.7500 SW
  UNIQUE-COMPONENT-IDENTIFIER A73D4CF5-29BC-4275-A6CC-C6BC80D3A189
```

IMPORTANT Use of this method is not recommended unless associating the tap with a component is impractical.

Tap Connection to Multi-Legged Components

When a tap connection is made to a multi-legged component, such as an elbow, tee, cross, and so forth, use the additional keyword **CP**, **EP1**, **EP2**, **EP3** (or **BP1**), or **EP4** (or **BP2**) to fix the location of the tap connection so that it is either off the center point or along any of the individual legs. In the following example, the additional keyword **CP** is used (**TAP-CONNECTION CP**).

```
TEE
  COMPONENT-IDENTIFIER 6
  END-POINT  4400.0  7600.0  0.0  00
  END-POINT  4400.0  7810.0  0.0  100
  CENTRE-POINT  4400.0  7705.0  0.0
  BRANCH1-POINT  4400.0  7705.0  98.0  80
  SKEY  TEBW
  MATERIAL-IDENTIFIER 4
  FABRICATION-ITEM
  TAP-CONNECTION  CP
  CO-ORDS  4400.0  7705.0  -50.0  15
```

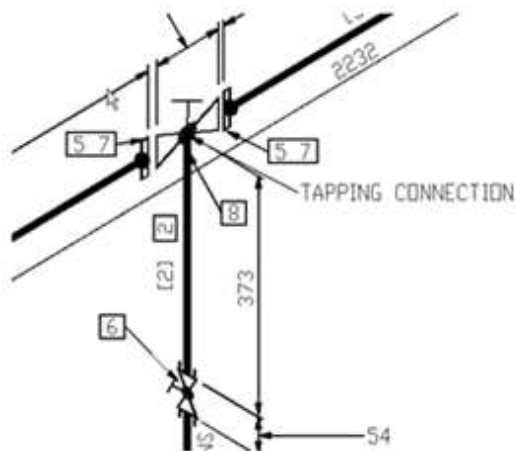
Tap Connections to Pipe

NOTE Tap connections to pipe are intended for use only in special situations, such as jacketed pipe. Their use is not recommended for situations in which a standard tee can be used instead.

Connections to pipe are handled exactly as connections to components. The start coordinate of the tap branch does not have to lie on the centerline of the pipe. However, it is important that the projection of the tap coordinate on to the pipe centerline lies within the end points of the pipe.

Tap Connections in Isogen

The graphical representation of the tap connection in an Isogen-generated drawing is usually similar to that shown in the following illustration. That is, the tap is shown drawn to the center of the tapped component. If the component symbol, as specified by the **SKEY**, is defined with tapping points, the software selects the most appropriate point to attach the tap branch.



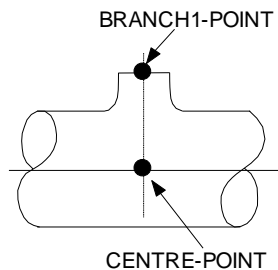
Tees - Fabricated

Fabricated tees include the following types:

- *Pulled Tees* (on page 90)
- *Reinforced Tees* (on page 90)
- *Set-On Tees* (on page 91)
- *Stub-In Tees* (on page 93)
- *Tangential and Offset Tees* (on page 93)
- *Y-Type Tees* (on page 95)

Pulled Tees

A pulled tee configuration consists of a hole cut in the main pipe with a ball pulled through to form a branch.



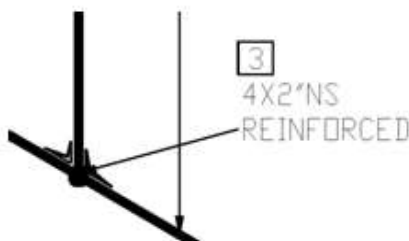
You can specify a pulled tee in the PCF file as `TEE-SET-ON` or `TEE-STUB` with its `SKEY` set to `TPUL`

Reinforced Tees

A reinforced tee is a fabricated tee with an additional reinforcement pad welded to the pipe at the connection point. A reinforcement tee can be any of the following types of fabricated tee:

- Set-On
- Stub-In
- Tangential
- Offset

The reinforcement pad is a catalog item selected from the piping specification, as shown in the following illustration.



Reinforcement pads are specified as a separate component entry positioned at the center point coordinates of the tee, with either an **SKEY** set to **RPAD** or a redefined **SKEY** based on **RPAD**.

NOTE The recommended best practice is to use the **MASTER-COMPONENT-IDENTIFIER** attribute to associate the reinforcement pad to the tee, thus eliminating any ambiguities.

```
TEE-SET-ON
  COMPONENT-IDENTIFIER 1
  CENTRE-POINT 2228812.3100 1330744.3100 11070.4100
  BRANCH1-POINT 2228812.3100 1330745.8800 11070.4100 6.0000
  MATERIAL-IDENTIFIER 1
  SKEY TERF
  CATEGORY FABRICATION
  PIPING-SPEC CS150
  UCI DBF9EF72-ECC6-4F39-A7DB-AE6A0BC7A79E
REINFORCEMENT-PAD
  COMPONENT-IDENTIFIER 2
  MASTER-COMPONENT-IDENTIFIER 1
  CO-ORDS 2228812.3100 1330744.3100 11070.4100 6.000
  SKEY RPAD
  MATERIAL-IDENTIFIER 3
  CATEGORY ERECTION
  PIPING-SPEC CS150
  UCI EFE60905-85C4-4A0B-85FA-EABF5D45DE5F
```

Associated Welds on Fabricated Tees

If you specify a weld at the tee, it should be associated with the tee. For more information, see **Associated Components: Welds** in *Associated Components* (on page 39).

```
TEE-SET-ON
  COMPONENT-IDENTIFIER 1
  CENTRE-POINT 2228812.3100 1330744.3100 11070.4100
  BRANCH1-POINT 2228812.3100 1330745.8800 11070.4100 6.0000
  MATERIAL-IDENTIFIER 2
  SKEY TESO
  CATEGORY FABRICATION
  PIPING-SPEC CS150
  UCI 0DD07D35-84BC-4708-B893-06F81C186FF1
WELD
  COMPONENT-IDENTIFIER 2
  MASTER-COMPONENT-IDENTIFIER 1
  EMD-POINT 2228812.3100 1330745.8800 11070.4100 6.0000
  END-POINT 2228812.3100 1330745.8800 11070.4100 6.0000
  SKEY WW
  CATEGORY FABRICATION
  REPEAT-WELD-IDENTIFIER 1
  LOCATION B1P
  UCI 3985C3FB-7170-42DF-9A80-F6AB9A0CCF6F
```

NOTE Where the PCF contains a definition of the main pipe, it is not necessary to split the main PIPE element at the tee. Instead, it should be passed in the PCF as a single item.

Set-On Tees

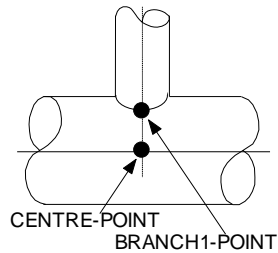
In the set-on tee configuration, one pipe is welded to another. A hole is cut in the main pipe, and the end of the branch is shaped to match the profile. The following example illustrates a basic entry in the PCF.

```
TEE-SET-ON
COMPONENT-IDENTIFIER 2
CENTRE-POINT    0.0000  -1250.0000   0.0000  2.0000
BRANCH1-POINT   0.0000  -1250.0000   53.3000  2.0000
MATERIAL-IDENTIFIER 1
SKEY    TESO
CATEGORY FABRICATION
PIPING-SPEC    CS150
UCI    DB09AB28-31F8-48E8-9335-A9E8A8838DB1
```

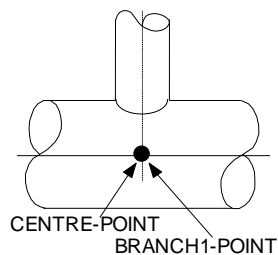
NOTE In the PCF, you can specify a set-on tee as either `TEE-SET-ON` or `TEE-STUB`.

The `CENTRE-POINT` coordinate must be a point on the center-line of the main pipe, which is the point at which the center-line of the branch pipe intersects. The `BRANCH1-POINT` coordinate is calculated according to one of the following scenarios :

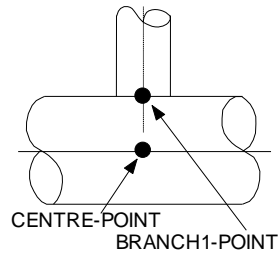
1. To give an accurate cut length for the branch pipe by setting `BRANCH-POINT1` to be the actual end point determined by the nominal size of the branch pipe.



2. Where `BRANCH1-POINT` cannot be accurately determined, and the branch has adjoining pipe, set the location of `BRANCH1-POINT` to that of `CENTRE-POINT`.



3. Where **BRANCH1-POINT** cannot be accurately determined and the branch has no adjoining pipe, set **BRANCH1-POINT** as a point on the surface of the main pipe regardless of the branch size.



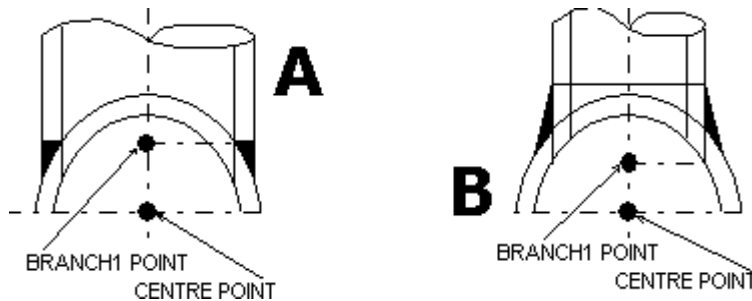
Stub-In Tees

A stub-in tee configuration is very similar to that of a set-on tee, with the exception of the **BRANCH1-POINT** coordinates. As with the set-on tee, you can specify the stub-in tee in the PCF as **TEE-SET-ON** or **TEE-STUB**. The following SKEYs define the alternative stub-in tees:

- **TSSO** - Stub-in tee
- **TSRF** - Reinforced stub-in tee

Specify the **BRANCH1-POINT** coordinate for this type of tee, where the branch is inserted into a hole in the main pipe, as a point on the centerline that is perpendicular to where the pipe inside diameters intersect.

The difference in exact positioning of **BRANCH1-POINT** for a set-on tee (**A**) and a stub-in tee (**B**) is shown in the following two diagrams:

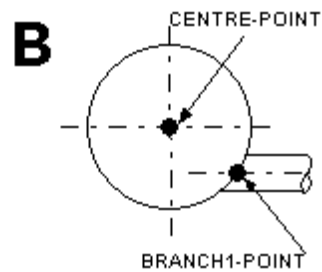
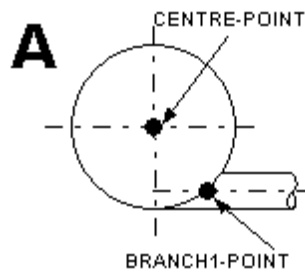


Tangential and Offset Tees

You can specify tangential tees in the PCF as `TEE-SET-ON` or `TEE-STUB`. The following SKEYs define the alternative tangential and offset tees:

- **TTSO** - Tangential set-on tee
- **TTRF** - Tangential reinforced set-on tee
- **TOSO** - Offset set-on tee
- **TORF** - Offset reinforced set-on tee

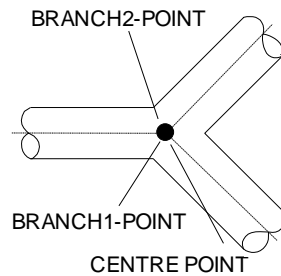
The connection points on a tangential tee (**A**) and on an offset tee (**B**) are depicted in the following illustrations.



Y-Type Tees

A fabricated Y-type tee is constructed by welding together three pipes. You can specify a fabricated Y-type tee in the PCF as `Y-PIECE-FABRICATED` with its `SKEY` set to `TYSO`.

NOTE The manufacture of this type of tee is complicated. Unless pipe profiling can be accurately calculated, set the locations for the `BRANCH1-POINT` and `BRANCH2-POINT` coordinates to the same location as the `CENTRE-POINT`.



Jacket and Core Pipelines

A jacketed pipeline consists of an internal pipe, referred to as the core, and external pipes, known as the jackets. When processed through Isogen, the jacketed pipeline is extracted as separate pipes (jacket and core) for which isometric drawings can be independently created.

In the PCF, corresponding core and jacket pipelines are made possible by bridging components, whereby a component is simultaneously connected to the core and the jacket pipeline. Currently, the only bridging component supported in the PCF is the 3-port jacket flange.

Core Pipelines

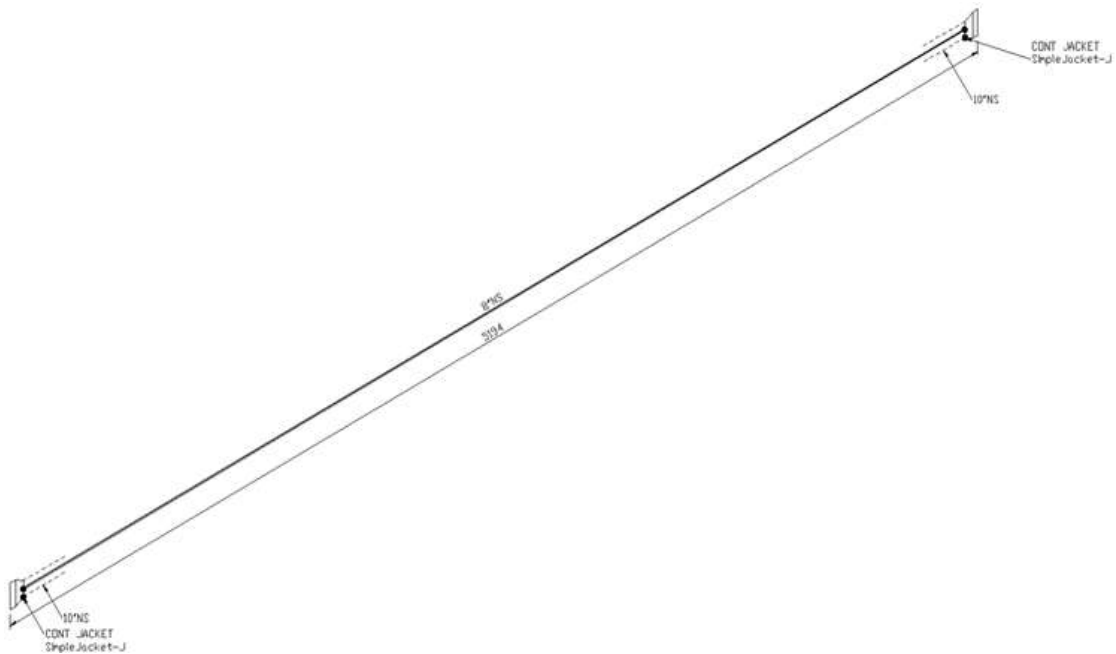
The PCF definition of a core pipeline contains only the core pipeline components, which includes the bridging jacket flange components. An example of the required syntax for a simple core section and the resulting isometric output is shown below.

```
FLANGE
  COMPONENT-IDENTIFIER  1
  MATERIAL-IDENTIFIER   1
  END-POINT  -14903.226 -45000.000  0.000  8
  END-POINT  -15000.000 -45000.000  0.000  8
  JACKET-POINT -14971.552 -45000.000  0.000  10
  SKEY  JFWN
WELD
  COMPONENT-IDENTIFIER  2
  MASTER-COMPONENT-IDENTIFIER  1
  END-POINT  -14971.552 -45000.000  0.000  10
  END-POINT  -14971.552 -45000.000  0.000  10
  SKEY  WWJ
PIPE
  COMPONENT-IDENTIFIER  3
  MATERIAL-IDENTIFIER   2
  END-POINT  -20000.000 -45000.000  0.000  8
  END-POINT  -15000.000 -45000.000  0.000
WELD
  COMPONENT-IDENTIFIER  4
  MASTER-COMPONENT-IDENTIFIER  3
  END-POINT  -15000.000 -45000.000  0.000  8
  END-POINT  -15000.000 -45000.000  0.000  8
  SKEY  WW
FLANGE
  COMPONENT-IDENTIFIER  5
  MATERIAL-IDENTIFIER   1
  END-POINT  -20096.774 -45000.000  0.000  8
  END-POINT  -20000.000 -45000.000  0.000  8
  JACKET-POINT -20028.448 -45000.000  0.000  10
  SKEY  JFWN
WELD
  COMPONENT-IDENTIFIER  6
  MASTER-COMPONENT-IDENTIFIER  5
  END-POINT  -20028.448 -45000.000  0.000  10
  END-POINT  -20028.448 -45000.000  0.000  10
  SKEY  WWJ
```

```

WELD
  COMPONENT-IDENTIFIER  7
  MASTER-COMPONENT-IDENTIFIER  5
  END-POINT  -20000.000  -45000.000  0.000  8
  END-POINT  -20000.000  -45000.000  0.000  8
  SKEY  WW
END-POSITION-OPEN
  CO-ORDS  -14903.226  -45000.000  0.000
END-CONNECTION-JACKET
  CO-ORDS  -14971.552  -45000.000  0.000
  CONNECTION-REFERENCE  SimpleJacket-J
END-POSITION-OPEN
  CO-ORDS  -20096.774  -45000.000  0.000
END-CONNECTION-JACKET
  CO-ORDS  -20028.448  -45000.000  0.000
  CONNECTION-REFERENCE  SimpleJacket-J

```



Jacket Pipelines

In the PCF, the definition of a jacket pipeline contains the core pipeline components, immediately followed by a JACKET-COMPONENTS section. For each component that is listed in core pipeline example above, you must set the **STATUS** attribute to **DOTTED-UNDIMENSIONED** and the **MATERIAL-LIST** attribute to **EXCLUDE**. Doing so keeps the focus of the isometric output on the jacket pipe by ensuring that none of the core materials appear annotated in the isometric drawing or in material list and that all dimensioning on the drawing refers only to the jacket components.

NOTE All welds, both core and jacket welds in both core and jacket pipelines, can be dotted or solid as needed.

An example of the recommended syntax for the JACKET-COMPONENTS section is shown below, followed by the resulting isometric output.

JACKET-COMPONENTS

PIPE

```

COMPONENT-IDENTIFIER 8
MATERIAL-IDENTIFIER 3
END-POINT -14971.552 -45000.000 0.000 10
END-POINT -20028.448 -45000.000 0.000 10

```

WELD

```

COMPONENT-IDENTIFIER 2
MASTER-COMPONENT-IDENTIFIER 1
END-POINT -14971.552 -45000.000 0.000 10
END-POINT -14971.552 -45000.000 0.000 10
SKEY WWJ
STATUS DOTTED-UNDIMENSIONED
MATERIAL-LIST EXCLUDE

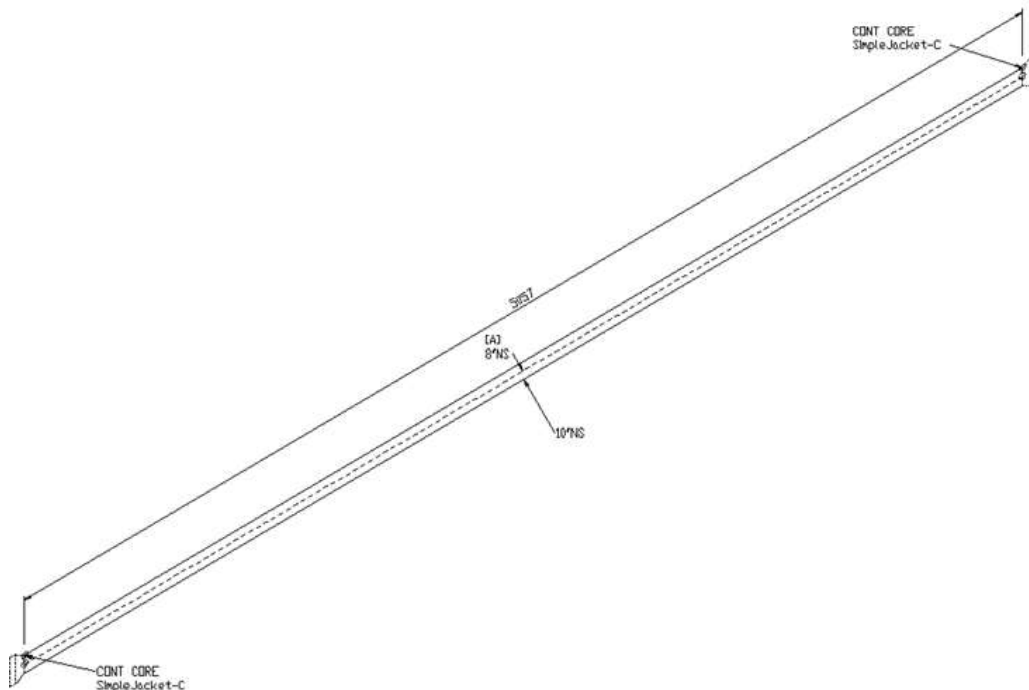
```

WELD

```

COMPONENT-IDENTIFIER 4
MASTER-COMPONENT-IDENTIFIER 3
END-POINT -20028.448 -45000.000 0.000 10
END-POINT -20028.448 -45000.000 0.000 10
SKEY WWJ
STATUS DOTTED-UNDIMENSIONED
MATERIAL-LIST EXCLUDE

```

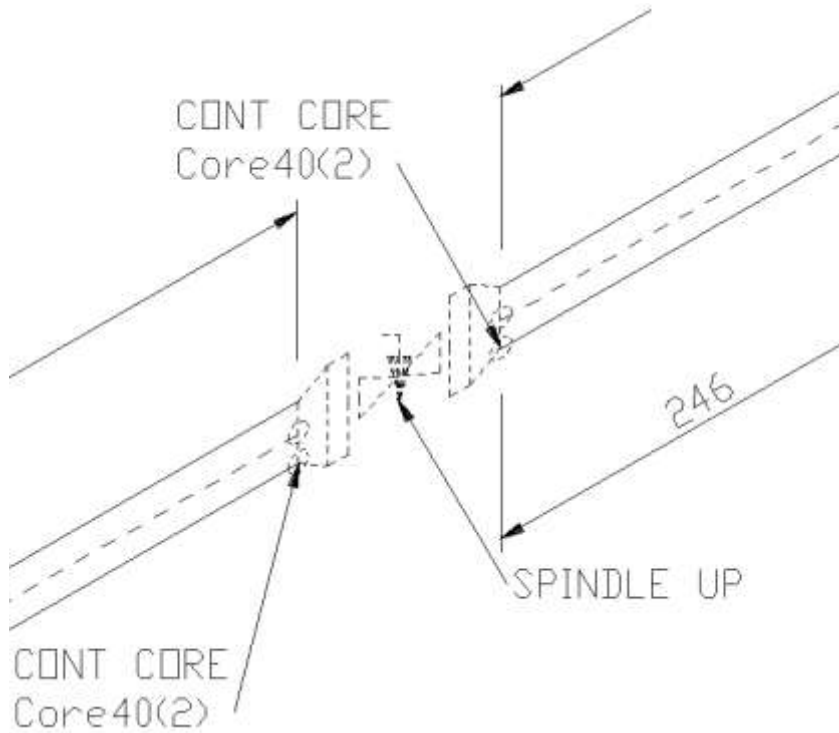


NOTE Any jacketed section should be complete, that is, terminated with 3-port flanges or with standard 2-port flanges or caps acceptable in fully jacketed pipelines.

[illegible]

The diagram illustrates a repair method for a crack intersection in a concrete structure. It shows two intersecting cracks forming a 'Y' shape. The repair material, labeled 'CONT CORE Jacketsl-Core', is applied in a continuous, shaded region that follows the path of the cracks. Arrows indicate the extent of the repair area along the cracks.

Optionally, sections can be connected with any amount of bridging core components, such as a valve.



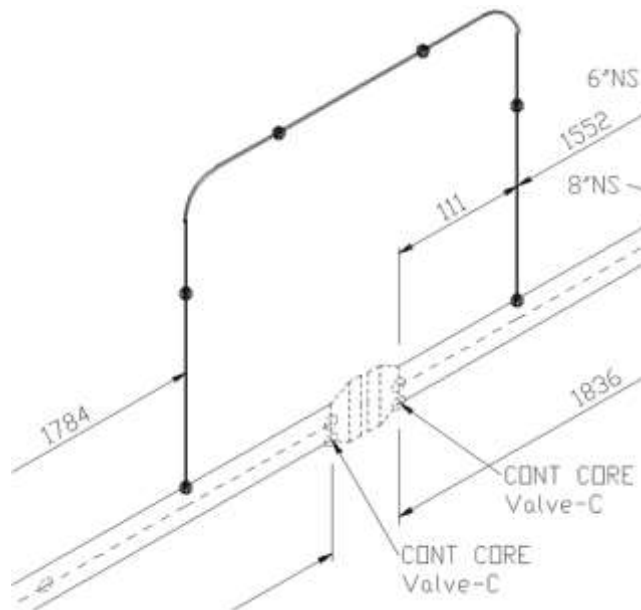
Jumpers

Multiple jacketed sections can be connected using jacket "jumpers", which are smaller bore pipelines consisting only of *jacketed* components. To specify the start and finish of a jumper, the `JACKET-CONNECTION` attribute is used on the component (typically, a pipe) to which the connection is made. An example of the PCF syntax, which is similar to a `TAP-CONNECTION` in a standard pipeline, is shown below.

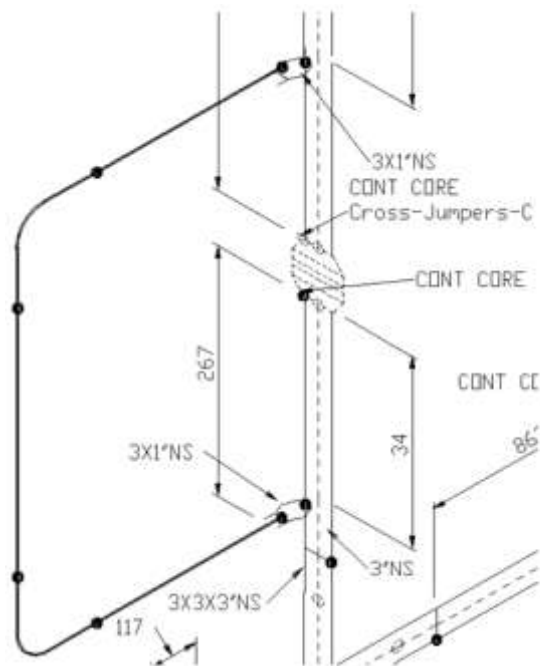
```
PIPE
COMPONENT-IDENTIFIER 135
MATERIAL-IDENTIFIER 6
END-POINT -9918.298 -67753.018 -11298.828 3
END-POINT -9918.298 -67753.018 -11325.295 3
JACKET-CONNECTION
CO-ORDS -9962.748 -67753.018 -11298.828 3
```

Currently, only the two arrangements listed below are supported for jacket connections.

4. Direct connection to the pipe, typically using a weld at the connection point.



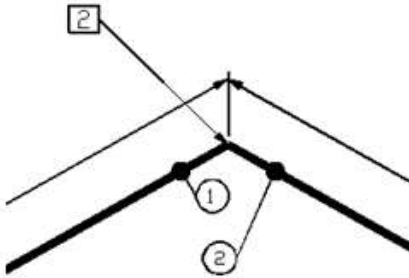
5. Connection to an olet as the first component in the jumper section.



Welds

There are two basic strategies for managing welds in the PCF. In the first strategy, WELD components are not included at all or they are only included in special cases. In this situation, Isogen implies the existence of a weld based on its extensive built-in rule base. In the second strategy, welds are managed in the model, and a WELD entry is created in the PCF for each occurrence. If Isogen identifies that a weld has been supplied in the PCF at the expected location, it does not imply a weld at that point. In addition, Isogen-implied weld behavior can be suppressed explicitly by a setting in the style.

With either strategy, Isogen can create unique weld numbers for each weld, or it can respect those provided in the PCF. Welds can be reported in summary tables on the drawing and/or in file based reports.



Example PCF with no Welds

In the following example, there are no welds present in the PCF. As such, Isogen implies the existence of welds between the PIPE and ELBOW because it is given an SKEY of ELBW, with the BW indicating butt-welded end connections.

IMPORTANT Isogen also implies the type of weld from its location and the properties of the welded components. For example, a weld between two components that each has its CATEGORY attribute set to ERECTION is an erection weld. This is equivalent to placing a WELD with SKEY WS in the PCF.

```
PIPE
  COMPONENT-IDENTIFIER 1
  END-POINT 0.0000 0.0000 0.0000 4.0000
  END-POINT 2500.0000 0.0000 0.0000 4.0000
  MATERIAL-IDENTIFIER 1
  CATEGORY FABRICATION
  PIPING-SPEC CS150
  UCI 5BD9AB4E-5468-41D8-866F-CA79A5C9A5FC
```

ELBOW

```
COMPONENT-IDENTIFIER 2
END-POINT 2500.0000 0.0000 0.0000 4.0000
END-POINT 2652.4000 152.4000 0.0000 4.0000
CENTRE-POINT 2652.4000 0.0000 0.0000
SKEY ELBW
MATERIAL-IDENTIFIER 2
ANGLE 9000
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI 2DA795F1-A36C-4E94-8CC7-C1B0EA83040F
```

PIPE

```
COMPONENT-IDENTIFIER 3
END-POINT 2652.4000 -152.4000 0.0000 4.0000
END-POINT 2652.4000 -2652.4000 0.0000 4.0000
MATERIAL-IDENTIFIER 1
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI FD3F7653-073E-48E7-A449-59C68ED61F7C
```

Example PCF with no Welds--End Conditions Assigned to Components

An alternative method can be used to create welds by setting the end condition at the appropriate `END-POINT` attribute of a component. In the following example, a screwed valve is located between two sections of pipe. Setting the appropriate end condition on the valve to `BW` introduces a weld at this point.

PIPE

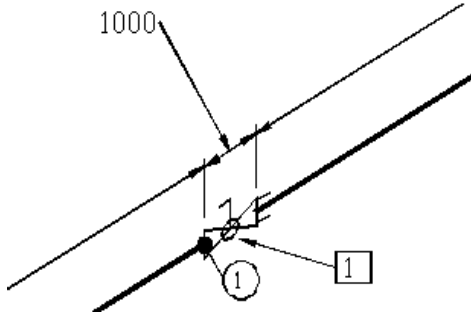
```
COMPONENT-IDENTIFIER 1
END-POINT 0.0000 0.0000 0.0000 4.0000
END-POINT 2500.0000 0.0000 0.0000 4.0000
MATERIAL-IDENTIFIER 1
CATEGORY FABRICATION
```

VALVE

```
COMPONENT-IDENTIFIER 2
END-POINT 2500.0000 0.0000 0.0000 4.0000 BW
END-POINT 3500.0000 0.0000 0.0000 4.0000
SKEY VBSC
MATERIAL-IDENTIFIER 2
CATEGORY FABRICATION
SPINDLE-DIRECTION UP
```

PIPE

```
COMPONENT-IDENTIFIER 3
END-POINT 3500.0000 0.0000 0.0000 4.0000
END-POINT 5500.0000 0.0000 0.0000 4.0000
MATERIAL-IDENTIFIER 1
CATEGORY FABRICATION
```



Example PCF with Explicit Welds

In the next example, which produces almost identical output, the two welds are explicitly included in the PCF. Isogen's weld numbering algorithm is overridden by setting the `REPEAT-WELD-IDENTIFIER` attribute on the weld.

PIPE

```
COMPONENT-IDENTIFIER 1
END-POINT 0.0000 0.0000 0.0000 4.0000
END-POINT 2500.0000 0.0000 0.0000 4.0000
MATERIAL-IDENTIFIER 1
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI 5BD9AB4E-5468-41D8-866F-CA79A5C9A5FC
```

WELD

```
COMPONENT-IDENTIFIER 2
END-POINT 2500.0000 0.0000 0.0000 4.0000
END-POINT 2500.0000 0.0000 0.0000 4.0000
SKEY WW
CATEGORY FABRICATION
REPEAT-WELD-IDENTIFIER 5
UCI 5013D7D8-5EB4-4817-907C-ACCD F C D F 7 E 4 2
```

ELBOW

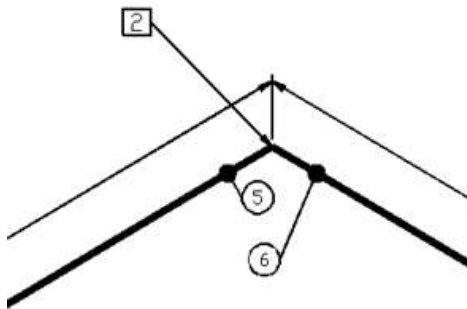
```
COMPONENT-IDENTIFIER 3
END-POINT 2500.0000 0.0000 0.0000 4.0000
END-POINT 2652.4000 -152.4000 0.0000 4.0000
CENTRE-POINT 2652.4000 0.0000 0.0000
SKEY ELBW
MATERIAL-IDENTIFIER 2
ANGLE 9000
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI 2DA795F1-A36C-4E94-8CC7-C1B0EA83040F
```

WELD

```
COMPONENT-IDENTIFIER 4
END-POINT 2652.4000 -152.4000 0.0000 4.0000
END-POINT 2652.4000 -152.4000 0.0000 4.0000
SKEY WW
CATEGORY FABRICATION
REPEAT-WELD-IDENTIFIER 6
UCI E15747C8-45D8-4FDB-9FE1-42CB3D174DD1
```

PIPE

```
COMPONENT-IDENTIFIER 5
END-POINT 2652.4000 -152.4000 0.0000 4.0000
END-POINT 2652.4000 -2652.4000 0.0000 4.0000
MATERIAL-IDENTIFIER 1
CATEGORY FABRICATION
PIPING-SPEC CS150
UCI FD3F7653-073E-48E7-A449-59C68ED61F7C
```



Associated Welds





You can specify explicit welds in the PCF file as associated with fabricated tees/crosses, olets and supports. This method is recommended as it ensures welds are correctly assigned at ambiguous locations. For more information, see **Associated Components--Welds** in *Associated Components* (on page 39).

Weld Properties

Weld SKEY

One of the most significant properties of the explicit weld is the SKEY. The SKEY controls the graphic symbol used in the drawing and, in some cases, special behavior associated with the weld type. Isogen supports many different types of weld SKEY. Most of these SKEYS are used when describing welds for fabrication and/or construction of the pipeline.

The following table lists the main types of weld SKEYs that are likely to be used in the PCF to cover virtually all requirements:

| Weld SKEY | Category | Description | Symbol |
|-----------|-------------|--|--|
| WW | FABRICATION | Workshop weld |  |
| WS | ERECTION | Site (field) weld |  |
| WO | OFFSHORE | Offshore weld NOTE An offshore weld is used to flag a weld made during module assembly prior to shipping as a single unit containing many pipelines. |  |
| WF | ERECTION | Field fit weld NOTE A field fit weld may trigger additional quantities of pipe depending on Style settings. |  |

NOTE For a complete description of all available weld SKEYs, see the document *Isogen Symbol Key (SKEY) Definitions*.

Weld CATEGORY

The `CATEGORY` attribute for a weld should normally be set. Ensure that its setting, `FABRICATION`, `ERECTION`, `OFFSHORE`, matches the assigned SKEY, as outlined in the previous table.

Weld Movement

A weld can have movement, or length. In these instances, a weld is treated like any other component when Isogen calculates the connectivity of the system. That is, the `END-POINT` attribute of the weld must match the `END-POINT` attribute of the connected component. A zero length weld simply has two `END-POINT` attributes with the same values.

Mitre Welds

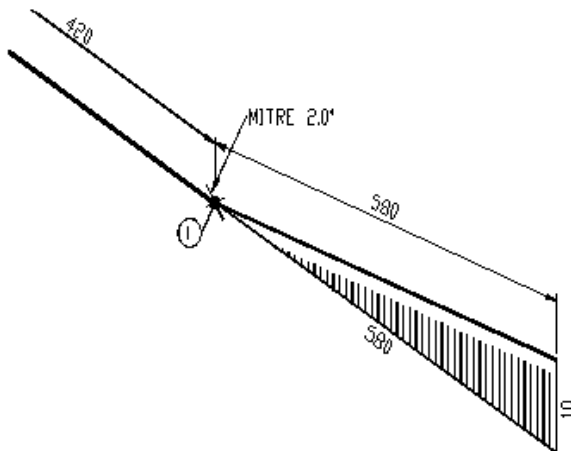
A mitre weld is used when there is a change in direction between adjoining components. When you use a mitre weld, always set the **ANGLE** and **CATEGORY** attributes. In the example below, a section of pipe is welded to an elbow with a mitred weld that introduces a change of direction

```

PIPE
  COMPONENT-ATTRIBUTE 3
  END-POINT  0.0000  0.0000  0.0000  4.0000
  END-POINT  0.0000 -420.0000  0.0000  4.0000
  MATERIAL-IDENTIFIER 1
  CATEGORY   FABRICATION

WELD
  COMPONENT-ATTRIBUTE 4
  END-POINT  0.0000 -420.0000  0.0000  4.0000
  END-POINT  0.0000 -420.0000  0.0000  4.0000
  SKEY       MW
  ANGLE      200
  CATEGORY   ERECTION

PIPE
  COMPONENT-ATTRIBUTE 5
  END-POINT  0.0000 -420.0000  0.0000  4.0000
  END-POINT  0.0000 -1000.0000 10.0000  4.0000
  MATERIAL-IDENTIFIER 1
  CATEGORY   FABRICATION
  
```



The following table lists the main types of mitre weld SKEYs that are likely to be used in the PCF to cover virtually all requirements:

| Weld SKEY | Description | Symbol |
|-----------|---------------------|--------|
| WM | Mitre weld | |
| WMS | Erection mitre weld | |
| WMO | Offshore mitre weld | |
| WMF | | |

Non Cut Piece Breaking Welds

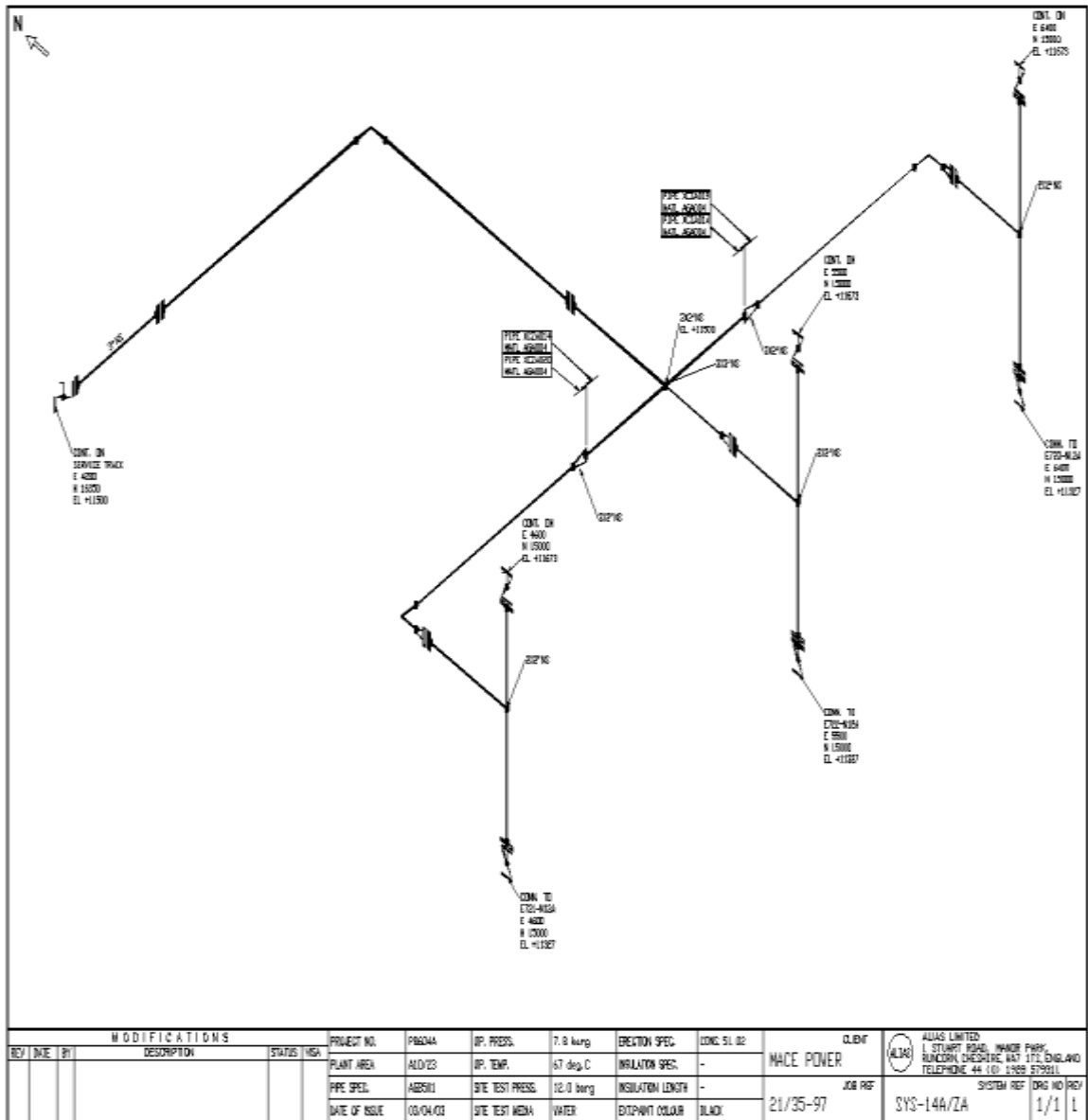
By default, Isogen creates an additional cut piece when it encounters a weld positioned along a section of pipe. If it is required to place a weld in pipe without causing it to be broken into two cut pieces, use weld SKEYs WWCP, WSCP, or WOCP (for FABRICATION, ERECTION, or OFFSHORE categories, respectively).

SECTION 8

System Isometrics

Within the context of Isogen, a system isometric is defined as a drawing that contains a number of individual pipelines that are physically connected so that they form a network. The network, such as that for a steam distribution system, can consist of any number of pipelines with any number of connections to equipment and possibly to other pipelines that are part of an adjacent system.

The following illustration depicts a typical system isometric drawing.



The internal boundaries between the pipelines that make up the system are clearly indicated, as are the connections at the external boundaries of the system.

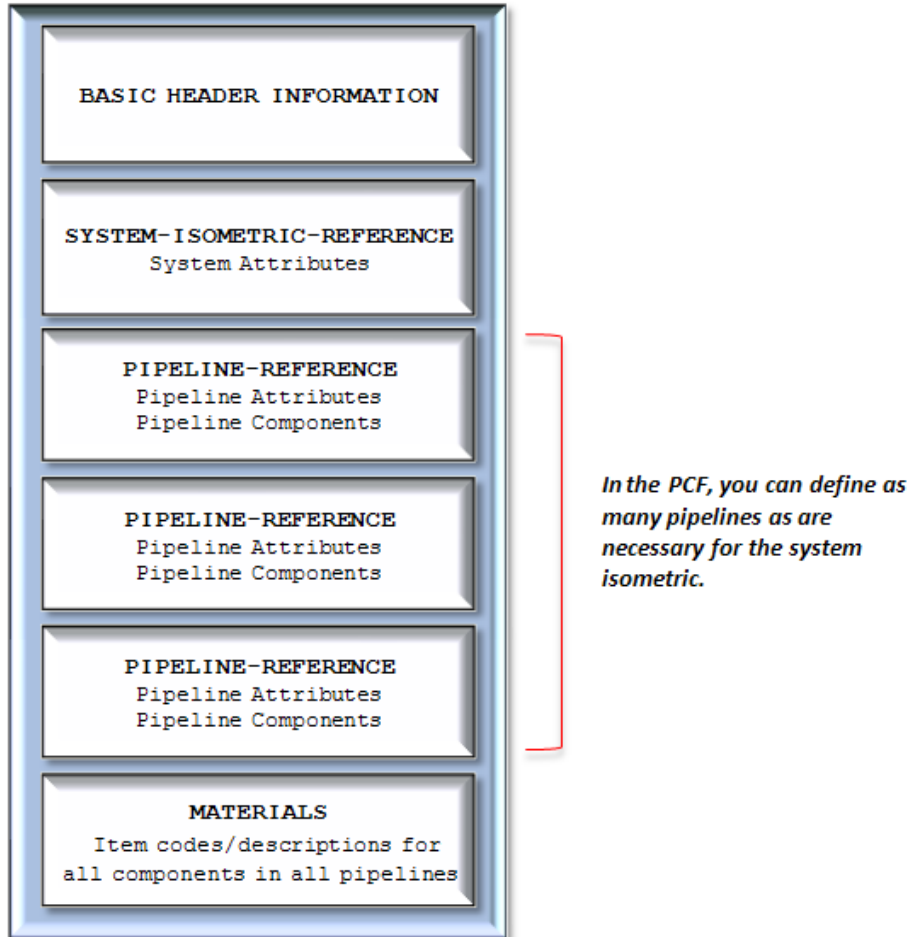
SYSTEM-ISOMETRIC-REFERENCE *data*
 AREA *data*
 DATE *data*
 PROJECT-IDENTIFIER *data*
 REVISION *data*

NOTE The available attributes and data requirements are the same as those listed for a pipeline. For more information, see *Pipeline Header Information* (on page 20).

SYSTEM-ISOMETRIC-REFERENCE SYS-14A/ZA
AREA A10/23
DATE-DMY 03/02/99
PROJECT-IDENTIFIER P8604A
REVISION 1

[illegible]

the Basic Header Information and System Identifier blocks, data for each pipeline is included using the same rules for the layout and content that are used for a pipeline PCF. Material descriptions--item codes and descriptions for all components in each of the pipelines that make up the system--are entered following the block that contains the last component of the last pipeline:



NOTES

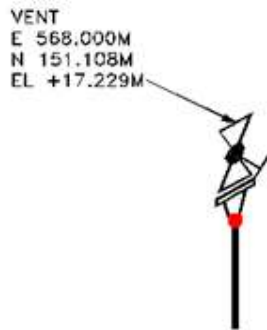
- You can include any number of pipelines in a system; however, only the pipeline reference and specification type pipeline header attributes are output on the generated isometric. All others are ignored.
- All the rules for the input of pipeline references, pipeline header attributes, component identifiers and related attributes that are used for the input of individual pipelines also apply when creating a system PCF.
- No components are allowed at the SYSTEM-ISOMETRIC level. All components must lay within a parent PIPELINE section.
- Connections between pipelines within the system must be omitted.
- You can use a GAP component to connect two related, but unconnected, pipelines that would not normally be allowed as part of the system isometric.

SECTION 9

End Connection and Position Types

Isogen supports nine end connection/position message types that can be used at any end positions on a pipeline, such as start, end, or any branch end. Each type is designed to deal with a different situation and to generate appropriate information on the isometric.

The following example illustrates a vent position:



The full list of the various end connection types is shown in the following table:

| Keyword | Connection/Position Type | Default Text Output |
|--------------------------|---|---------------------|
| END-CONNECTION-PIPELINE | Continued on another pipeline | CONT ON |
| END-CONNECTION-EQUIPMENT | Connected to equipment | CONN TO |
| END-CONNECTION-CORE | Continuation of jacket pipe with core components | CONT CORE |
| END-CONNECTION-JACKET | Continuation of core pipe with jacket connections | CONT JACKET |
| END-POSITION-OPEN | Open end | Blank |
| END-POSITION-CLOSED | Closed end | Blank |
| END-POSITION-VENT | Vent position | VENT |
| END-POSITION-DRAIN | Drain position | DRAIN |
| END-POSITION-NULL | Unclassified | Blank |

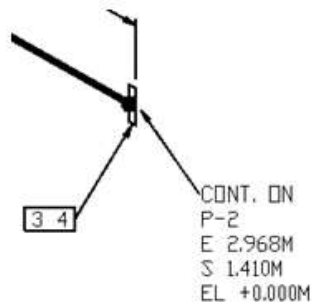
In those cases where the pipeline is continued on another pipeline or is connected to an equipment item, each connection/position identifier must have specified with it any identification text that is required for output.

To give flexibility in the data extraction process, end connection/position attributes can be associated with a pipeline component or entered into the PCF as a separate entity in the ways described in the following sections.

Connection to another Pipeline

```
END-CONNECTION-PIPELINE
CO-ORDS  E/W  N/S  ELEV
PIPELINE-REFERENCE  data
```

The data related to the PIPELINE-REFERENCE must be the complete reference that you want to see output on the isometric. Additional text, controlled by the isometric drawing style settings, is added by Isogen. In the following example, CONT. ON is output by default, followed by the PIPELINE-REFERENCE data, and then the coordinate data (if not suppressed in the isometric style settings).

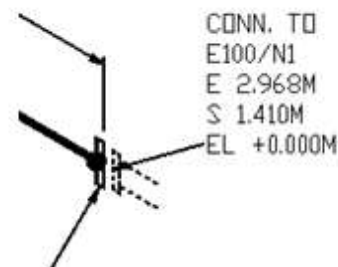


```
END-CONNECTION-PIPELINE
CO-ORDS  2968.2600  -1410.3200  0.0000
PIPELINE-REFERENCE  P-2
```

Connection to Plant Equipment

```
END-CONNECTION-EQUIPMENT
CO-ORDS  E/W  N/S  ELEV
CONNECTION-REFERENCE  data
```

The data relating to the CONNECTION-REFERENCE must be the complete reference that you want to see output on the isometric. Additional text, controlled by the isometric style settings, is added by Isogen. In the following example, CONN. TO is output by default, followed by the CONNECTION-REFERENCE data, and then the coordinate data, if not suppressed in the isometric style settings.



```
END-CONNECTION-EQUIPMENT
CO-ORDS  2968.2600  -1410.3200  0.0000
CONNECTION-REFERENCE  E100/N1
```

Connection to Plant Equipment Using a Nozzle

As an alternative to the `END-CONNECTION-EQUIPMENT` attribute, systems that use a `NOZZLE` component for equipment connections can include the relevant information in the PCF in the following way:

```
NOZZLE
  CO-ORDS  E/W  N/S  ELEV
  CONNECTION-REFERENCE  data
```

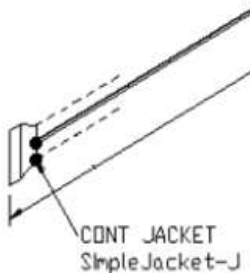
This method is the direct equivalent of the `END-CONNECTION-EQUIPMENT` method and is processed in the same way.

Core Pipe with Jacket Connections

```
END-CONNECTION-JACKET
  CO-ORDS  E/W  N/S  ELEV
  CONNECTION-REFERENCE  data
```

The data relating to the `CONNECTION-REFERENCE` must be the jacket pipeline name. Additional text, controlled by the isometric drawing style settings, is added by Isogen. In the example below, `CONT JACKET` is output by default, followed by the `CONNECTION-REFERENCE` data (the core pipeline), and then the coordinate data, if it is not suppressed in the isometric style settings.

```
END-CONNECTION-JACKET
  CO-ORDS  -20028.448  -45000.000  0.000
  CONNECTION-REFERENCE  SimpleJacket-J
```

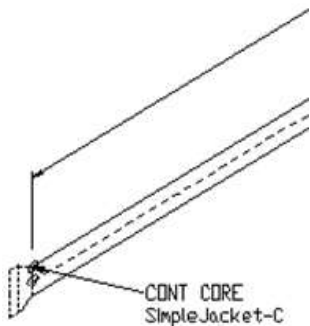


Jacket Pipe with Core Components

```
END-CONNECTION-CORE
  CO-ORDS  E/W  N/S  ELEV
  CONNECTION-REFERENCE  data
```

The data relating to the CONNECTION-REFERENCE must be the jacket pipeline name. Additional text, controlled by the isometric drawing style settings, is added by Isogen. In the example below, CONT CORE is output by default, followed by the CONNECTION-REFERENCE data (the jacket pipeline), and then the coordinate data, if it is not suppressed in the isometric style settings.

```
END-CONNECTION-CORE
  CO-ORDS  -20028.448  -45000.000  0.000
  CONNECTION-REFERENCE  SimpleJacket-C
```



Other End Position Types

```
END-POSITION-OPEN
  CO-ORDS  E/W  N/S  ELEV
END-POSITION-CLOSED
  CO-ORDS  E/W  N/S  ELEV
END-POSITION-VENT
  CO-ORDS  E/W  N/S  ELEV
END-POSITION-DRAIN
  CO-ORDS  E/W  N/S  ELEV
END-POSITION-NULL
  CO-ORDS  E/W  N/S  ELEV
```

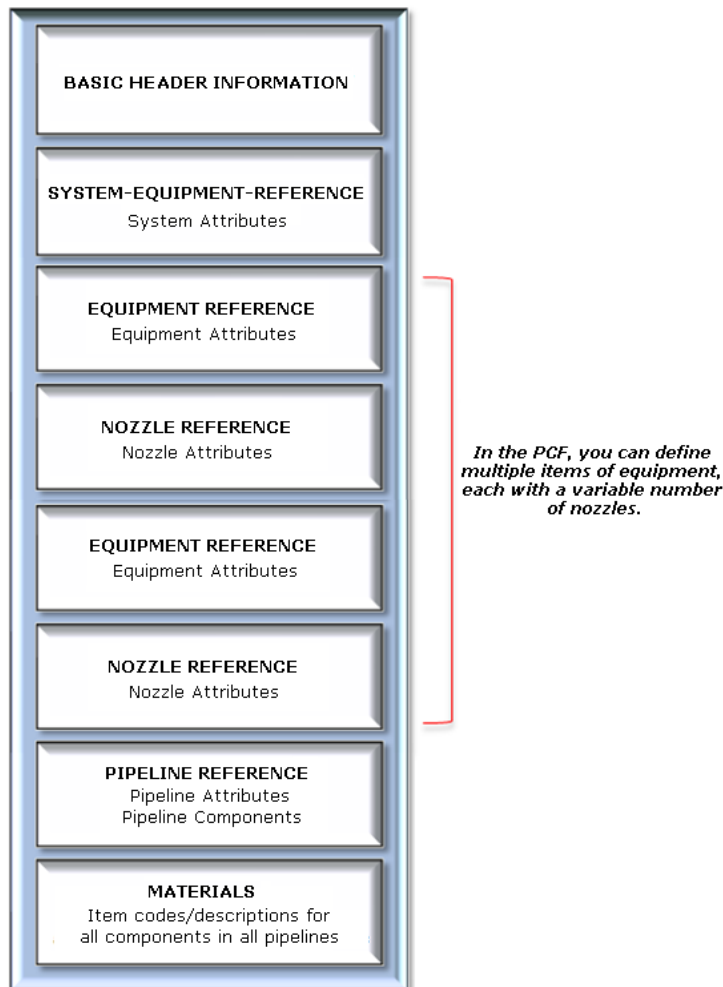
SECTION 10

Equipment Isometrics

As with a basic pipeline system, Isogen is able to produce an isometric drawing that contains a pictorial representation of equipment items together with all piping components. Materials are grouped either on a drawing or pipeline basis. This is achieved by defining equipment items in terms of their size, shape, location, and so forth, along with details of their nozzle connections in the PCF.

Equipment/Nozzle Definition

In the PCF, equipment items can have a variable number of nozzle entries. The basic layout of the PCF is as follows:



The following example depicts a section of PCF data with equipment/nozzles information:

```
ISOGEN-FILES ISOGEN.FLS
UNITS-BORE INCH
UNITS-CO-ORDS MM
UNITS-BOLT-LENGTH MM
UNITS-BOLT-DIA INCH
UNITS-WEIGHT KGS
SYSTEM-ISOMETRIC-REFERENCE ET03
EQUIPMENT-REFERENCE EQ3
    LOCATION 1000.00 1000.00 1000.00
    CENTRE-POINT 1000.00 1000.00 1500.00
    ORIENTATION UP
    SHAPE XC
    NOZZLE
    REFERENCE EQ3N1
    DIRECTION EAST
    CO-ORDS 1200.00 1500.00 1000.00 4 FL
    POSITION EDGE
    NOZZLE
    REFERENCE EQ3N2
    DIRECTION WEST
    CO-ORDS 800.00 1500.00 1500.00 4 FL
    POSITION EDGE
    NOZZLE
    REFERENCE EQ3N3
    DIRECTION EAST
    CO-ORDS 1200.00 1500.00 2000.00 4 FL
    POSITION EDGE
PIPELINE-REFERENCE PIPE1
END-CONNECTION-EQUIPMENT
    END-POINT 1200.0000 1500.0000 1000.0000 4.0000
    CONNECTION-REFERENCE EQ3N1
PIPE
    COMPONENT-IDENTIFIER 1
    END-POINT 1212.0000 1500.0000 1000.0000 4.0000
    END-POINT 2212.0000 1500.0000 1000.0000 4.0000
    MATERIAL-IDENTIFIER 1
    CATEGORY FABRICATION
FLANGE
    COMPONENT-IDENTIFIER 2
    END-POINT 1202.0000 1500.0000 1000.0000 4.0000
    END-POINT 1212.0000 1500.0000 1000.0000 4.0000
    SKEY FLSO
    MATERIAL-IDENTIFIER 2
    CATEGORY FABRICATION
GASKET
    COMPONENT-IDENTIFIER 3
    MASTER-COMPONENT-IDENTIFIER 2
    END-POINT 1200.0000 1500.0000 1000.0000 4.0000
    END-POINT 1202.0000 1500.0000 1000.0000 4.0000
    MATERIAL-IDENTIFIER 3
    CATEGORY ERECTION
```

PIPELINE-REFERENCE PIPE2
END-CONNECTION-EQUIPMENT
 END-POINT 800.0000 1500.0000 1500.0000 4.0000
 CONNECTION-REFERENCE EQ3N2
PIPE
 COMPONENT-IDENTIFIER 4
 END-POINT 788.0000 1500.0000 1500.0000 4.0000
 END-POINT 288.0000 1500.0000 1500.0000 4.0000
 MATERIAL-IDENTIFIER 1
 CATEGORY FABRICATION
FLANGE
 COMPONENT-IDENTIFIER 5
 END-POINT 798.0000 1500.0000 1500.0000 4.0000
 END-POINT 788.0000 1500.0000 1500.0000 4.0000
 SKEY FL50
 MATERIAL-IDENTIFIER 2
 CATEGORY FABRICATION
GASKET
 COMPONENT-IDENTIFIER 6
 MASTER-COMPONENT-IDENTIFIER 5
 END-POINT 800.0000 1500.0000 1500.0000 4.0000
 END-POINT 798.0000 1500.0000 1500.0000 4.0000
 MATERIAL-IDENTIFIER 3
 CATEGORY ERECTION
PIPELINE-REFERENCE PIPE3
END-CONNECTION-EQUIPMENT
 END-POINT 1200.0000 1500.0000 2000.0000 4.0000
 CONNECTION-REFERENCE EQ3N3
PIPE
 COMPONENT-IDENTIFIER 7
 END-POINT 1212.0000 1500.0000 2000.0000 4.0000
 END-POINT 2212.0000 1500.0000 2000.0000 4.0000
 MATERIAL-IDENTIFIER 1
 CATEGORY FABRICATION
FLANGE
 COMPONENT-IDENTIFIER 8
 END-POINT 1202.0000 1500.0000 2000.0000 4.0000
 END-POINT 1212.0000 1500.0000 2000.0000 4.0000
 SKEY FL50
 MATERIAL-IDENTIFIER 2
 CATEGORY FABRICATION
GASKET
 COMPONENT-IDENTIFIER 9
 MASTER-COMPONENT-IDENTIFIER 8
 END-POINT 1200.0000 1500.0000 2000.0000 4.0000
 END-POINT 1202.0000 1500.0000 2000.0000 4.0000
 MATERIAL-IDENTIFIER 3
 CATEGORY ERECTION

MATERIALS

MATERIAL-IDENTIFIER 1

ITEM-CODE PA5BSTD

DESCRIPTION PIPE, CS API 5L SML, GRD B, STD WT

MATERIAL-IDENTIFIER 2

ITEM-CODE FCD150-SOR

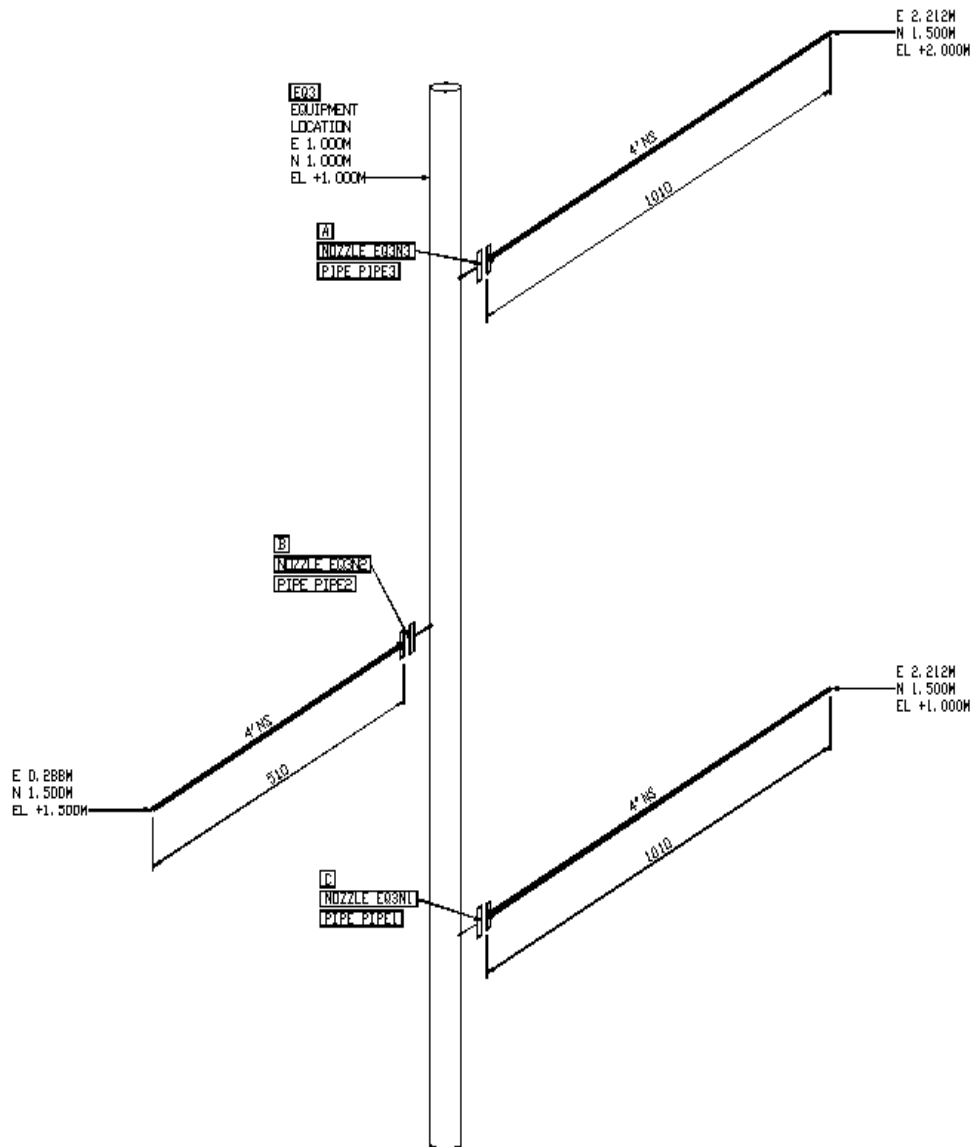
DESCRIPTION FLANGE, CS ASTM A105, 150#, SO, RF

MATERIAL-IDENTIFIER 3

ITEM-CODE GCA150-RG2

DESCRIPTION GASKET, CAF, 150#, RING, 1/16 IN

The next example shows the resulting isometric drawing:



Pipeline Connections

For each nozzle, there can be a single pipeline connection. The pipelines that connect to nozzles can contain a group of components that are connected together. Each pipeline should be self-contained, having only components that belong to that pipeline. Pipelines should contain an end connection entry (END-CONNECTION-EQUIPMENT) with the appropriate reference that matches that used in the equipment/nozzle definition.

The following example shows a PCF entry for a pipeline / nozzle connection:

```
PIPELINE-REFERENCE PIPE1
END-CONNECTION-EQUIPMENT
    END-POINT 300.0000 300.0000 1000.0000 4.0000
    CONNECTION-REFERENCE EQ1NOZ1
GASKET
    END-POINT 300.0000 300.0000 1000.0000 4.0000
    END-POINT 298.0000 300.0000 1000.0000 4.0000
    ITEM-CODE GCA150-RG2
FLANGE
    END-POINT 298.0000 300.0000 1000.0000 4.0000
    END-POINT 290.0000 300.0000 1000.0000 4.0000
    SKEY FL50
    ITEM-CODE FCD150-SOR
PIPE
    END-POINT 290.0000 300.0000 1000.0000 4.0000
    END-POINT 0.0000 300.0000 1000.0000 4.0000
    ITEM-CODE PA5BSTD
```

If necessary, you can omit piping components, leaving only the pipeline reference and end connection specification. Furthermore, you can also omit the pipeline reference and end connection specification, leaving the nozzle completely bare. In this situation, however, it is not possible to indicate the name of the connecting pipeline on the drawing.

Equipment Attributes

Each equipment definition in the PCF has a set of attributes and a variable number of nozzle entries. Some of these attributes are significant to Isogen behavior.

NOTES

- All equipment attributes must start in column five (5), with the exception of the `EQUIPMENT-REFERENCE` attribute, which must precede all other attributes.
- Some equipment and nozzle connection attributes are mandatory while others are not.

| Keyword | Acceptable Values | Description |
|--|--|--|
| <i>The following attributes are available for equipment definitions:</i> | | |
| <code>EQUIPMENT-REFERENCE</code> | String | Specifies the name of the equipment. This attribute is mandatory when defining an equipment item. |
| <code>LOCATION</code> | Number | Specifies the plant location point (E/W, N/S, and Elev) on equipment. This attribute is mandatory when defining an equipment item. |
| <code>ORIENTATION</code> | NORTH SOUTH EAST WEST UP DOWN | Specifies the direction of the equipment. This attribute is mandatory when defining an equipment item. |
| <code>CENTRE-POINT</code> | Number | Specifies the center point (E/W, N/S, Elev) of the nominal center-line of the equipment. This attribute is mandatory when defining an equipment item. |
| <code>CATEGORY</code> | FABRICATION ERECTION OFFSHORE | Indicates where the equipment item is assembled. Unless specified otherwise, it is assumed that the equipment is a Fabrication item. This attribute is optional when defining an equipment item. |
| <code>DIAMETER</code> | Number | Specifies the diameter of a cylindrical-shaped equipment item. Size is specified in either inches or millimeters, depending upon the units defined in the PCF header. This attribute is optional when defining an equipment item. |
| <code>SIZE</code> | Number | Specifies the size of rectangular-shaped equipment (cross-section). Size is specified in either inches or millimeters, depending upon the units defined in the PCF header. This attribute is optional when defining an equipment item. |

| Keyword | Acceptable Values | Description |
|--|--|---|
| SHAPE | XC XD XB | <p>Defines the shape of the equipment item that is output on the isometric drawing. This attribute is mandatory when defining an equipment item.</p> <ul style="list-style-type: none"> ▪ SKEY set to XC - Outputs a cylinder with no flat ends. ▪ SKEY set to XD - Outputs a cylinder with domed ends. ▪ SKEY set to XB - Outputs a boxed, or rectangular, shape. <p>NOTE The SKEYs indicated will draw the requested equipment shapes together with the nozzles specified.</p> |
| SHAPE2 | XC XD XC | <p>Defines the shape plotted at the exit end of a piece of equipment.</p> <p>NOTE This entry is only required for a cylindrical-shaped equipment item that has different end shapes (flat/domed).</p> |
| The following attributes are available for nozzle connection definitions: | | |
| REFERENCE | String | Specifies the name of the nozzle on the equipment. This attribute is mandatory when defining a nozzle connection. |
| CO-ORDS | Number / String | <p>Specifies the coordinate position of the nozzle (E/W, N/S, and Elev), bore size and end type, as shown in the following example:</p> <p>CO-ORDS 5000 0 10000 1.0 FL</p> <p>This attribute is mandatory when defining a nozzle connection.</p> |
| POSITION | EDGE END | <p>Specifies the relative position of the nozzle in relation to the equipment.</p> <ul style="list-style-type: none"> ▪ EDGE - Positioned on the equipment edge/sides. ▪ END - Position on the equipment ends. <p>This attribute is mandatory when defining a nozzle connection.</p> |
| DIRECTION | NORTH SOUTH EAST WEST UP DOWN | Specifies the direction of the nozzle. This attribute is mandatory when defining a nozzle connection. |
| CATEGORY | FABRICATION ERECTION OFFSHORE | Indicates the assembly location. This attribute is optional when defining a nozzle connection. If left undefined, it is assumed that the nozzle connection is the same as the equipment category. |

IMPORTANT The following text should be used only to describe equipment and nozzle direction: NORTH, SOUTH, EAST, WEST, UP, and DOWN.

The following is an example of an equipment/nozzle connection moving in a single direction (SOUTH):

```
EQUIPMENT-REFERENCE  EQ1
ORIENTATION  SOUTH
NOZZLE
REFERENCE  NOZ1
DIRECTION  SOUTH
```

In the next example, the equipment/nozzle connection is moving in two directions (SOUTH and 30-degrees EAST)

```
EQUIPMENT-REFERENCE  EQ1
ORIENTATION  SOUTH  30 EAST
NOZZLE
REFERENCE  NOZ1
DIRECTION  SOUTH  30 EAST
```

In the final example, the equipment/nozzle connection is moving in three directions (SOUTH, 30-degrees EAST, and 10-degrees DOWN)

```
EQUIPMENT-REFERENCE  EQ1
ORIENTATION  SOUTH  30 EAST  10 DOWN
NOZZLE
REFERENCE  NOZ1
DIRECTION  SOUTH  30 EAST  10 DOWN
```

SECTION 11

Special Types of Joint

This section examines the special considerations needed in the following joint types:

- *Clamped Joints* (on page 124)
- *Flared / Clamped Piping Systems* (on page 126)
- *Compression Sleeve Piping Systems* (on page 126)
- *Glued (Fusion) Piping Systems* (on page 126)
- *Push Fit (Spigot and Socket) Piping Systems* (on page 127)
- *Victaulic® and Grayloc® Jointing Systems* (on page 128)

Clamped Joints

Clamped joints provide an alternative to traditional flanged or welded joints. The pipe and fittings are either supplied with end preparations (grooves or rings) or use connectors. Clamped joints offer high integrity connections which can be rapidly assembled on site. As such, they are particularly popular in offshore projects.

To model this in the PCF, set the 3rd and 4th position of the fitting SKEY to CL. For example, ELBOW is set to ELCL, TEE is set to TECL, and so on.

NOTE When this method is adopted, the bill of material (BOM) does not contain a separate listing for the clamps.

For an ELBOW to PIPE connection, ensure that the PCF includes the following records:

- **ELBOW** - Clamp-type elbow with SKEY ELCL set with male-ends.
- **GASKET** - Gasket.
- **PIPE** - Pipe set with male-ends
- **GASKET** - Gasket.
- **TEE** - Clamp-type tee with SKEY TECL set with male-ends.

NOTE The GASKET record is included only if a separate gasket listing is required.

Flared / Clamped Piping Systems

In a flared / clamped piping system, the pipe ends are flared to form a jointing face. On construction, the joint is then held together with a clamping device similar to that used on Victaulic® piping. With this type of piping, the 3rd and 4th position of the component SKEY is set to FA. For example, **ELBOW** is set to **ELFA**, **TEE** is set to **TEFA**, and so on.

For a BEND to PIPE connection, ensure that the PCF includes the following records:

- **BEND** - Flared type bend with SKEY BEFA set with male-ends.
- **GASKET** - Gasket.
- **BOLT** - Bolt.
- **CLAMP** - Clamp with SKEY CLMP set with male-ends.
- **PIPE** - Pipe set with male-ends.
- **GASKET** - Gasket.
- **BOLT** - Bolt.
- **CLAMP** - Clamp with SKEY CLMP set with male-ends.

NOTE The GASKET record is included only if a separate gasket listing is required. Likewise with the BOLT record--include only if separate bolt listing is required.

Compression Sleeve Piping Systems

The joint construction on a compression sleeve piping system consists of a plain sleeve that is compressed externally onto the outside of the joined pipes by bolts. An in-built gasket located at the sleeve ends makes contact between the sleeve and pipe surfaces when compression takes place. A clamp with an SKEY of CLCS is placed at the appropriate points in the piping configuration.

For a PIPE to PIPE connection, ensure that the PCF includes the following records:

- **PIPE** - Pipe set with male-ends
- **CLAMP** - Clamp with SKEY CLCS set with male-ends.
- **PIPE** - Pipe set with male-ends.

Glued (Fusion) Piping Systems

This piping consists of plastic fittings with male / female-ends that are fused together by either a chemical media or welding. To distinguish this type of piping on the isometric, the 3rd and 4th positions of the SKEY are set to GL. For example, the SKEY for an ELBOW component is ELGL.

For an ELBOW to PIPE to TEE arrangement, ensure that the PCF includes the following records:

- **ELBOW** - Glued type elbow with SKEY ELGL set with female-ends.
- **PIPE** - Pipe set with male-ends.
- **TEE** - Glued type tee with SKEY TEGL set with female-ends.

The isometric drawing graphically shows welds of the type relating to the component category, such as Fabrication, Erection, and so on, but no weld numbers are generated.

NOTE If fittings have a mixture of male and female-ends, then the previously specified rules defining female / male connections apply.

Push Fit (Spigot and Socket) Piping Systems

Push Fit piping systems, commonly known as Spigot and Socket, can be constructed of either plastic or cast-iron. The components are connected by pushing two mating fittings together, with the connection being male-to-female. In this type of piping, the component end condition uses the characters PF in the 3rd and 4th positions of the SKEY. For example, the SKEY for an ELBOW component is ELPF.

In plastic systems, which generally have lengths of PIPE with male-ends mating to fittings with female-ends, the PCF should include the following records:

- **ELBOW** - Push fit type elbow with SKEY ELPF set with female-ends.
- **PIPE** - Pipe set with male-ends.
- **TEE** - Push fit type tee with SKEY TEPF set with female-ends.

Cast-iron systems of the Spigot and Socket type are treated as fixed length piping systems, and a PIPE-FIXED PIPE record is used in place of a PIPE record. The components can consist of one male-end and one female-end, and you must ensure that the correct end is specified in accordance with the aforementioned rules.

Ensure that the PCF includes the following records:

- **Case 1** (Piping that consists of fittings of the same connection types)
 - **ELBOW** - Push fit elbow with SKEY ELPF set with female-ends
 - **PIPE-FIXED** - Fixed length pipe set with male-ends
 - **TEE** - Push fit tee with SKEY TEPF set with female-ends.
- **Case 2** (Piping that consists of fittings with mixed connection types)
 - **ELBOW** - Push fit elbow with SKEY ELPF set with one female-end and one male-end
 - **PIPE-FIXED** - Fixed length pipe set with one male-end and one female-end
 - **TEE** - Push fit tee with SKEY TEPF set with one female-end and one male-end

Victaulic and Grayloc® Jointing Systems

Victaulic (<http://www.victaulic.com>) and Grayloc (<http://www.oceaneering.com/Grayloc.asp>)® are specialized piping connection systems. Both systems consist of fittings and pipe that are connected using a bolted-together split clamp and gasket. The actual clamping mechanism can be one of two alternative types as shown in the following table:

| Type of Joint | Description |
|---------------|---|
| Victaulic | Pipe/Fitting ends have special grooved preparation. Clamp and gasket slot into the grooves and the clamp is bolted tight. |
| Grayloc | Grayloc piping systems consist of fittings with pre-formed ends and connectors that are attached to the pipe ends. The connectors are attached to the pipe ends using butt weld, socket weld, or screwed connections. The fittings and tube are connected together with a bolted clamping device, and the fittings are always of the pre-formed type. |

Victaulic Joints

When specifying this type of piping system in a PCF, model all the fittings with clamped ends and set the 3rd and 4th of the SKEY to CL.

- **BECL** – Clamped bend component.
- **TECL** – Clamped tee component.

NOTES

- Between each fitting and pipe record, a CLAMP with the SKEY CLVT is placed.
- If a detailed gasket / bolt listing is required in the BOM, the appropriate GASKET/BOLT record must be placed with the CLAMP record.

For an ELBOW to PIPE connection, the PCF should include the following records:

- **ELBOW** - Clamp type elbow with SKEY ELCL set with male-ends.

ELBOW

```
COMPONENT-IDENTIFIER 6
END-POINT 45930000 129992500 10101500 12 MALE
END-POINT 45930000 130000000 10109000 12 MALE
CENTRE-POINT 45930000 130000000 10101500
PIPING-SPEC AA1
MATERIAL-IDENTIFIER 3
SKEY ELCL
ANGLE 9000
CATEGORY FABRICATION
```

- **CLAMP** - Clamp record with SKEY CLVT set with male-ends.

CLAMP

COMPONENT-IDENTIFIER 3
END-POINT 190000 910700 556200 48 MALE
PIPING-SPEC XALP
MATERIAL-IDENTIFIER 2
SKEY CLVT
CATEGORY ERECTION

- **PIPE** - Pipe record set with male-ends.

PIPE

COMPONENT-IDENTIFIER 1
END-POINT 90000 910700 574600 64 MALE
END-POINT 190000 910700 619100 64 MALE
PIPING-SPEC XALP
MATERIAL-IDENTIFIER 1
CATEGORY ERECTION

SECTION 12

Component Information Sheets

The following pages list all of the PCF components and their allowable attributes. Components are listed in alphabetical order.

NOTE For more information about component attributes and their associated data requirements, see the following sections:

- *Mandatory Attributes* (on page
- *Material Information Attributes* (on page
- *Connection and Continuation Attributes* (on page
- *Specification Attributes* (on page
- *Supplementary Attributes* (on page

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BEND

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------------------------------------|-------------------------|------------------|------------|--------------------------|---------------------|--------------------------|-----------|-------------------------------------|---------------|------------------|--------------------|--------------------------|--------------|------------|------------|------------------|--|--|------|--|--|--|--|--|
| <div><div>BEND</div></div> | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div>Mandatory Attributes</div> <table><tr><td>END-POINT</td><td>E/W co-ord</td><td>N/S co-ord</td><td>Elevation co-ord</td><td>Size</td><td>Supplementary Attributes</td></tr><tr><td>END-POINT</td><td>E/W co-ord</td><td>N/S co-ord</td><td>Elevation co-ord</td><td>Size</td><td>Supplementary Attributes</td></tr><tr><td>CENTRE-POINT</td><td>E/W co-ord</td><td>N/S co-ord</td><td>Elevation co-ord</td><td></td><td></td></tr><tr><td>SKEY</td><td></td><td></td><td></td><td></td><td></td></tr></table> | | END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | | SKEY | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | | | | | | | | | | | | | | | | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | | | | | | | | | | | | | | | | | | | | |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | | | | | | | | | | | | | | | | | | | | | |
| SKEY | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div>Valid SKEY Identifiers</div> <div>BE** L@** MI** PB PB+D PBBW</div> <div><div>NOTE</div>Substitute the ** characters with the required end type.</div> | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div>Material Information Attributes</div> <table><tr><td>COMPONENT-REMARK-NUMBER</td><td></td></tr><tr><td>CATEGORY</td><td>ITEM-CODE</td></tr><tr><td>MATERIAL-IDENTIFIER</td><td>or ITEM-DESCRIPTION</td></tr><tr><td></td><td>ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99</td></tr><tr><td>MATERIAL-LIST</td><td></td></tr><tr><td>REPEAT-PART-NUMBER</td><td></td></tr></table> <div><div>NOTE</div>Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32).</div> | | COMPONENT-REMARK-NUMBER | | CATEGORY | ITEM-CODE | MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | MATERIAL-LIST | | REPEAT-PART-NUMBER | | | | | | | | | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | | | | | | | | | | | | | | | | | | | | | |
| CATEGORY | ITEM-CODE | | | | | | | | | | | | | | | | | | | | | | | | |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION | | | | | | | | | | | | | | | | | | | | | | | | |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | | | | | | | | | | | | | | | | | | | | | | |
| MATERIAL-LIST | | | | | | | | | | | | | | | | | | | | | | | | | |
| REPEAT-PART-NUMBER | | | | | | | | | | | | | | | | | | | | | | | | | |

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BEND

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BEND-RADIUS
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
COMPONENT-IDENTIFIER
CUT-PIECE-ALLOWANCE
CUT-PIECE-LENGTH
DETAIL-SKETCH-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
PLANT-AREA
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WASTE
WEIGHT
WELDING-ALLOWANCE

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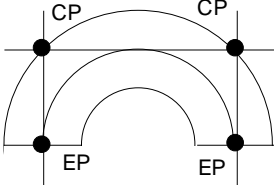
BEND

Associated Components

ADDITIONAL-ITEM

BEND (Return Bend)

BEND



Return Bend

Mandatory Attributes

| | | | | | |
|--------------|------------|------------|------------------|------|--------------------------|
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| SKEY | | | | | |

Valid SKEY Identifiers

BE** BU+D

NOTE

Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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BEND (Return Bend)

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BEND-RADIUS
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
COMPONENT-IDENTIFIER
CUT-PIECE-ALLOWANCE
CUT-PIECE-LENGTH
DETAIL-SKETCH-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
PLANT-AREA
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WASTE
WEIGHT
WELDING-ALLOWANCE

(continued on the following page)

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BEND (Return Bend)

Associated Components

ADDITIONAL-ITEM

(continued from the previous page)

BEND-TEED (Fabricated Type)

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BEND-RADIUS
BOP-ELEVATION
BRANCH1-DIRECTION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
COMPONENT-IDENTIFIER
DETAIL-SKETCH-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
ITEM-CODE-BRANCH1
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
PLANT-AREA
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WASTE
WEIGHT
WELDING-ALLOWANCE

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BEND-TEED (Fabricated Type)

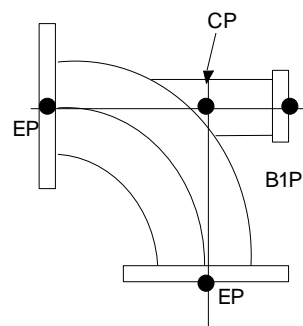
Associated Components

ADDITIONAL-ITEM

BEND-TEED (Flanged Type)

BEND-TEED

Flanged Type



Mandatory Attributes

| | | | | | |
|---------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | |
| BRANCH1-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

Valid SKEY Identifiers

| | | |
|------|------|------|
| BTFL | MTFL | T@FL |
|------|------|------|

Material Information Attributes

| COMPONENT-REMARK-NUMBER | ITEM-CODE |
|-------------------------|-------------------------------------|
| CATEGORY | ITEM-DESCRIPTION |
| MATERIAL-IDENTIFIER | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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BEND-TEED (FLANGED Type)

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 to MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 to ASSEMBLY-ATTRIBUTE99
BEND-RADIUS
BOP-ELEVATION
BRANCH1-DIRECTION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 to COMPONENT-ATTRIBUTE99
COMPONENT-IDENTIFIER
DETAIL-SKETCH-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
ITEM-CODE-BRANCH1
MESSAGE-[*type*]
NAME or TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
PLANT-AREA
REVISION
SPOOL-ATTRIBUTE1 to SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WASTE
WEIGHT
WELDING-ALLOWANCE

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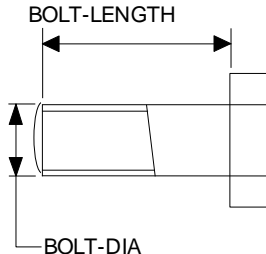
BEND-TEED (Flanged Type)

Associated Components

ADDITIONAL-ITEM

BOLT

IMPORTANT You can specify a **BOLT** component alone or by associating with a host component (**GASKET** or **NOZZLE**). When specifying a bolt by itself, use the attributes outlined in the following table.

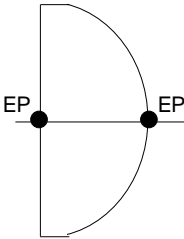
| | |
|---|---|
| <div><div><div>BOLT</div></div></div> |  |
| Mandatory Attributes | |
| CO-ORDS | <i>E/W co-ord N/S co-ord Elevation co-ord</i> |
| BOLT-DIA | |
| BOLT-ITEM-CODE | |
| BOLT-QUANTITY | |
| Valid SKEY Identifiers | |
| Not required for BOLT components. | |
| Material Information Attributes | |
| CATEGORY | |
| REPEAT-PART-NUMBER | |
| Connection / Continuation Attributes | |
| Not required for BOLT components. | |
| Specification Attributes | |
| Not required for BOLT components. | |

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Bolt

| |
|---|
| <p>Supplementary Information Attributes</p> <p>ASSEMBLY-ATTRIBUTE0 to ASSEMBLY-ATTRIBUTE99</p> <p>BOLT-LENGTH</p> <p>CLIENT-DRAWING-IDENTIFIER</p> <p>COMPONENT-ATTRIBUTE0 to COMPONENT-ATTRIBUTE99</p> <p>COMPONENT-IDENTIFIER</p> <p>INFORMATION-NOTE-IDENTIFIER</p> <p>PIPELINE-DRAWING-SEQUENCE-NUMBER</p> <p>MASTER-COMPONENT-IDENTIFIER</p> <p>REVISION</p> <p>SPOOL-ATTRIBUTE1 to SPOOL-ATTRIBUTE10</p> <p>SPOOL-DRAWING-SEQUENCE-NUMBER</p> <p>UNIQUE-COMPONENT-IDENTIFIER</p> <p>WEIGHT</p> |
| <p>Associated Components</p> <p>ADDITIONAL-ITEM</p> |



Mandatory Attributes

| | | | | | |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| SKEY | | | | | |

Valid SKEY Identifiers

KA**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

COMPONENT-REMARK-NUMBER
CATEGORY
MATERIAL-IDENTIFIER or ITEM-CODE
ITEM-DESCRIPTION
ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99
MATERIAL-LIST
REPEAT-PART-NUMBER

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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CAP

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

NOTE For more information, see Connection and Continuation Attributes.

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

NOTE For more information, see Specification Attributes.

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
COMPONENT-IDENTIFIER
DETAIL-SKETCH-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT


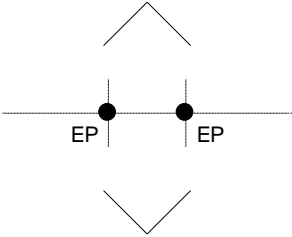
NOTE For more information, see Supplementary Information Attributes.

Associated Components

ADDITIONAL-ITEM

NOTE For more information, see Associated Components.

CLAMP (with Movement)

| | | |
|--|-------------------|---|
| <div></div> <div>With Movement</div> | |  |
| Mandatory Attributes | | |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> |
| END-POINT | <i>E/W co-ord</i> | <i>Elevation co-ord</i> |
| SKEY | <i>Size</i> | <i>Supplementary Attributes</i> |
| Valid SKEY Identifiers | | |
| CLCS | CLFA | CLGY |
| CLMP | CLVR | CLVT |
| Material Information Attributes | | |
| COMPONENT-REMARK-NUMBER | | |
| CATEGORY | | ITEM-CODE |
| MATERIAL-IDENTIFIER | or | ITEM-DESCRIPTION |
| | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | | |
| REPEAT-PART-NUMBER | | |
| NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | |
| Connection / Continuation Attributes | | |
| END-CONNECTION-[type] | | |
| END-POSITION-[type] | | |

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CLAMP (with Movement)

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC


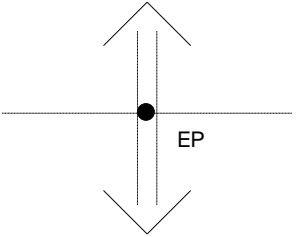
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOLT-DIA
BOLT-ITEM-CODE
BOLT-ITEM-DESCRIPTION
BOLT-LENGTH
BOLT-QUANTITY
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
MASTER-COMPONENT-IDENTIFIER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM
WELD

CLAMP (without Movement)

| | |
|--|---|
|  <p>Without Movement</p> |  |
| Mandatory Attributes END-POINT <i>E/W co-ord</i> <i>N/S co-ord</i> <i>Elevation co-ord</i> <i>Size</i> <i>Supplementary Attributes</i> SKEY | |
| Valid SKEY Identifiers CLCS CLFA CLGY CLMP CLVR CLVT | |
| Material Information Attributes COMPONENT-REMARK-NUMBER CATEGORY ITEM-CODE MATERIAL-IDENTIFIER <i>or</i> ITEM-DESCRIPTION ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 MATERIAL-LIST REPEAT-PART-NUMBER NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | |
| Connection / Continuation Attributes END-CONNECTION-[<i>type</i>] END-POSITION-[<i>type</i>] | |

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CLAMP (without Movement)

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOLT-DIA
BOLT-ITEM-CODE
BOLT-ITEM-DESCRIPTION
BOLT-LENGTH
BOLT-QUANTITY
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
MASTER-COMPONENT-IDENTIFIER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM
WELD

CONNECTOR (Expanded Type)

CONNECTOR

Expanded Type

Mandatory Attributes

| | | | | | |
|-----------|------------|------------|------------------|------|--------------------------|
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| SKEY | | | | | |

Valid SKEY Identifiers

| | | | |
|------|------|------|------|
| LNEX | LCEX | LREX | MPEX |
|------|------|------|------|

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

Connection / Continuation Attributes

| |
|-----------------------|
| END-CONNECTION-[type] |
| END-POSITION-[type] |

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CONNECTOR (Expanded Type)

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

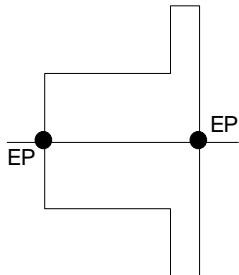
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

CONNECTOR (Welded Type)

| | | | | | |
|---|------------|-------------------------------------|------------------|---|--------------------------|
| <div>CONNECTOR</div> | | | |  | |
| | | | | Welded Type | |
| Mandatory Attributes | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| SKEY | | | | | |
| Valid SKEY Identifiers | | | | | |
| LNBW | LCBW | LRBW | MPBW | | |
| Material Information Attributes | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | |
| CATEGORY | | ITEM-CODE | | | |
| MATERIAL-IDENTIFIER | or | ITEM-DESCRIPTION | | | |
| | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | |
| MATERIAL-LIST | | | | | |
| REPEAT-PART-NUMBER | | | | | |
| <div><div>NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32).</div> | | | | | |
| Connection / Continuation Attributes | | | | | |
| END-CONNECTION-[type] | | | | | |
| END-POSITION-[type] | | | | | |

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CONNECTOR (Welded Type)

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

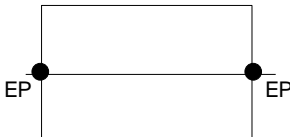
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

COUPLING

COUPLING



Mandatory Attributes

| | | | | | |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| SKEY | | | | | |

Valid SKEY Identifiers

| | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|
| COCN | COFA | COGL | COGY | COPF | COSC | COSW | COVR | COVT | CSCP | NBSC |
| NIFL | NRSC | | | | | | | | | |

Material Information Attributes

COMPONENT-REMARK-NUMBER

CATEGORY

MATERIAL-IDENTIFIER

or

ITEM-DESCRIPTION

ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99

MATERIAL-LIST

REPEAT-PART-NUMBER

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

Connection / Continuation Attributes

END-CONNECTION-[type]

END-POSITION-[type]

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COUPLING

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

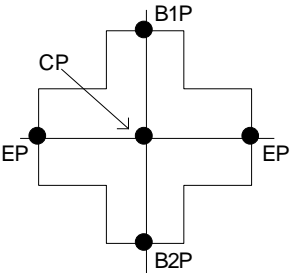
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

CROSS



Mandatory Attributes

| | | | | | |
|---------------|------------|------------|------------------|------|--------------------------|
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| BRANCH1-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| BRANCH2-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| SKEY | | | | | |

Valid SKEY Identifiers

CR** CY**

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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CROSS

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 to MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 to ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 to COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME or TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 to SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT
WEIGHT1
WEIGHT2

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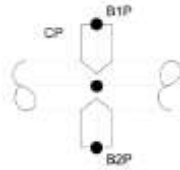
CROSS

Associated Components

ADDITIONAL-ITEM
WELD

CROSS-SET-ON

CROSS-SET-ON



Mandatory Attributes

| | | | | |
|---------------|-------------------|-------------------|-------------------------|-------------|
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | |
| BRANCH1-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> |
| BRANCH2-POINT | <i>E/W cord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> |
| SKEY | | | | |

Valid SKEY Identifiers

CRSO

CRRF

CYSO

Material Information Attributes

COMPONENT-REMARK-NUMBER

CATEGORY

MATERIAL-IDENTIFIER

or

ITEM-CODE

ITEM-DESCRIPTION

ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99

MATERIAL-IDENTIFIER-BRANCH1

or

ITEM-CODE-BRANCH1

MATERIAL-IDENTIFIER-BRANCH2

or

ITEM-CODE-BRANCH2

MATERIAL-LIST

REPEAT-PART-NUMBER

NOTE

Using MATERIAL-IDENTIFIER and MATERIAL-IDENTIFIER-BRANCH1 is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination along with ITEM-CODE-BRANCH1. For more information about specifying materials, see *Materials* (on page 32).

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CROSS-SET-ON

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

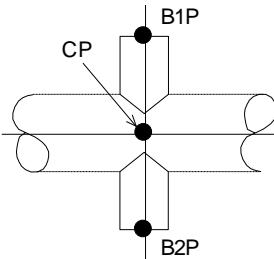
Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
PIPELINE-DRAWING-SEQUENCE-NUMBER
PLANT-AREA
REPEAT-PART-NUMBER-BRANCH1
REPEAT-PART-NUMBER-BRANCH2
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WASTE
WEIGHT
WEIGHT1
WEIGHT2

Associated Components

ADDITIONAL-ITEM
WELD

CROSS-STUB

| | | | | |
|--|--|---------------|-------------------------|-------------|
| <div>CROSS-STUB</div> |  | | | |
| Mandatory Attributes | | | | |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S</i> | <i>Elevation co-ord</i> | |
| BRANCH1-POINT | <i>E/W co-ord</i> | <i>co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> |
| BRANCH2-POINT | <i>E/W co-ord</i> | <i>N/S</i> | <i>Elevation co-ord</i> | <i>Size</i> |
| SKEY | | <i>co-ord</i> | | |
| | | <i>N/S</i> | | |
| | | <i>co-ord</i> | | |
| Valid SKEY Identifiers | | | | |
| CRSO | CRRF | CYSO | | |
| Material Information Attributes | | | | |
| COMPONENT-REMARK-NUMBER | | | | |
| CATEGORY | | | | |
| MATERIAL-IDENTIFIER <i>or</i> ITEM-CODE | | | | |
| ITEM-DESCRIPTION | | | | |
| ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | | |
| MATERIAL-IDENTIFIER-BRANCH1 <i>or</i> ITEM-CODE-BRANCH1 | | | | |
| MATERIAL-IDENTIFIER-BRANCH2 <i>or</i> ITEM-CODE-BRANCH2 | | | | |
| MATERIAL-LIST | | | | |
| REPEAT-PART-NUMBER | | | | |
| <div>NOTE Using MATERIAL-IDENTIFIER and MATERIAL-IDENTIFIER-BRANCH1 is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination along with ITEM-CODE-BRANCH1. For more information about specifying materials, see <i>Materials</i> (on page 32).</div> | | | | |

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CROSS-STUB

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
PIPELINE-DRAWING-SEQUENCE-NUMBER
PLANT-AREA
REPEAT-PART-NUMBER-BRANCH1
REPEAT-PART-NUMBER-BRANCH2
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WASTE
WEIGHT
WEIGHT1
WEIGHT2

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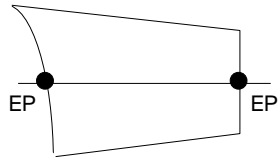
CROSS-STUB

Associated Components

ADDITIONAL-ITEM
WELD

ELBOLET

ELBOLET



Mandatory Attributes

| | | | | | |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| SKEY | | | | | |

Valid SKEY Identifiers

CEBW

CESC

CESW

Material Information Attributes

| | |
|-------------------------|---|
| COMPONENT-REMARK-NUMBER | <div>ITEM-CODE</div> <div>ITEM-DESCRIPTION</div> <div>ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99</div> |
| CATEGORY | |
| MATERIAL-IDENTIFIER or | |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

Connection / Continuation Attributes

| |
|-----------------------|
| END-CONNECTION-[type] |
| END-POSITION-[type] |

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ELBOLET

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

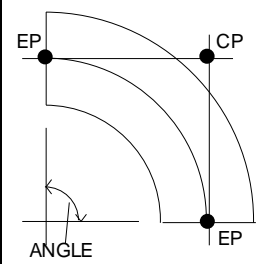
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

ELBOW

ELBOW



Mandatory Attributes

| | | | | | |
|--------------|------------|------------|------------------|------|--------------------------|
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| SKEY | | | | | |

Valid SKEY Identifiers

EBSC EL**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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ELBOW

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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ELBOW

Associated Components

ADDITIONAL-ITEM

(continued from the previous page)

ELBOW-REDUCING

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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ELBOW-REDUCING

Associated Components

ADDITIONAL-ITEM

(continued from the previous page)

ELBOW-TEED (Fabricated Type)

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
BRANCH1-DIRECTION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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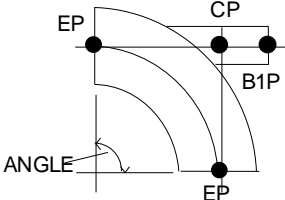
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ELBOW-TEED (Fabricated Type)

Associated Components

ADDITIONAL-ITEM

ELBOW-TEED (with Integral Ends)

| | | | | | |
|---|------------|------------|-------------------------------------|---|--------------------------|
| <div>ELBOW-TEED</div> | | | |  | |
| | | | | With Integral Ends | |
| Mandatory Attributes | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | |
| BRANCH1-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| SKEY | | | | | |
| Valid SKEY Identifiers | | | | | |
| ETCP | ETSC | ETSW | ETLN | ETLR | ETLC ETMP ETPL |
| Material Information Attributes | | | | | |
| COMPONENT-REMARK-NUMBER | | | ITEM-CODE | | |
| CATEGORY | | | ITEM-DESCRIPTION | | |
| MATERIAL-IDENTIFIER or | | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | |
| MATERIAL-LIST | | | | | |
| REPEAT-PART-NUMBER | | | | | |
| <div><div>NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32).</div> | | | | | |

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ELBOW-TEED (with Integral Ends)

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

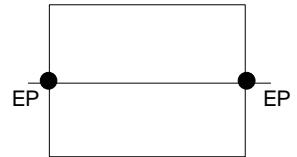
ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
BRANCH1-DIRECTION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

FILTER

FILTER



Mandatory Attributes

| | | | | | |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| SKEY | | | | | |

Valid SKEY Identifiers

FI**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

COMPONENT-REMARK-NUMBER
CATEGORY
MATERIAL-IDENTIFIER or ITEM-CODE
ITEM-DESCRIPTION
ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99
MATERIAL-LIST
REPEAT-PART-NUMBER

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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FILTER

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

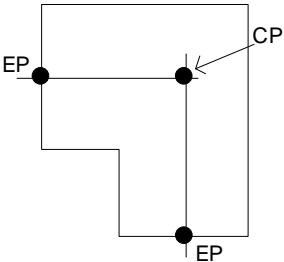
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

FILTER-ANGLE

FILTER-ANGLE



Mandatory Attributes

| | | | | | |
|--------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | | | |
| SKEY | | | | | |

Valid SKEY Identifiers

FA**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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FILTER-ANGLE

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

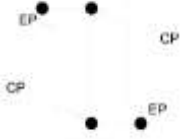
Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

FILTER-OFFSET

| | | |
|---|-------------------|---|
| <div>FILTER-OFFSET</div> | |  |
| Mandatory Attributes | | |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> |
| END-POINT | <i>E/W co-ord</i> | <i>Elevation co-ord</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>Elevation co-ord</i> |
| SKEY | | |
| <div>NOTE The two CENTRE-POINT attributes are optional but recommended for primary direction.</div> | | |
| Valid SKEY Identifiers | | |
| FO** | | |
| <div>NOTE Substitute the ** characters with the required end type.</div> | | |
| Material Information Attributes | | |
| COMPONENT-REMARK-NUMBER | | |
| CATEGORY | | ITEM-CODE |
| MATERIAL-IDENTIFIER | or | ITEM-DESCRIPTION |
| | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | | |
| REPEAT-PART-NUMBER | | |
| <div>NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32).</div> | | |

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FILTER-OFFSET

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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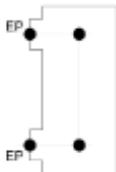
FILTER-OFFSET

Associated Components

ADDITIONAL-ITEM

FILTER-RETURN

FILTER-RETURN



Mandatory Attributes

END-POINT

E/W co-ord

N/S co-ord

Elevation co-ord

Size

Supplementary Attributes

END-POINT

E/W co-ord

N/S co-ord

Elevation co-ord

Size

Supplementary Attributes

CENTRE-POINT

E/W co-ord

N/S co-ord

Elevation co-ord

SKEY

NOTE

The CENTRE-POINT attribute is optional but recommended.

Valid SKEY Identifiers

FR**

NOTE

Substitute the ** characters with the required end type.

Material Information Attributes

COMPONENT-REMARK-NUMBER

CATEGORY

ITEM-CODE

MATERIAL-IDENTIFIER

or

ITEM-DESCRIPTION

ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99

MATERIAL-LIST

REPEAT-PART-NUMBER

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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FILTER-RETURN

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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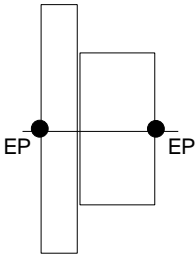
FILTER-RETURN

Associated Components

ADDITIONAL-ITEM

FLANGE

FLANGE



Mandatory Attributes

| | | | | | |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| SKEY | | | | | |

Valid SKEY Identifiers

| | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|
| FBSE | FLBS | FLFF | FLFL | FLFR | FLGF | FLGL | FLGM | FLLB | FLPF | FLSB |
| FLSC | FLSF | FLSM | FLSO | FLSW | FLWN | FOSO | FOWN | JFWN | JFSO | |

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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FLANGE

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
JACKET-POINT
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLANGE-CUT-MINUS
FLANGE-CUT-PLUS
FLANGE-CUT-LOOSE
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
LOOSE-FLANGE
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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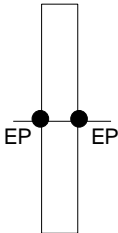
FLANGE

Associated Components

ADDITIONAL-ITEM

FLANGE-BLIND

FLANGE-BLIND



Mandatory Attributes

| | | | | | |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| SKEY | | | | | |

Valid SKEY Identifiers

FLBL

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE

 Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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FLANGE-BLIND

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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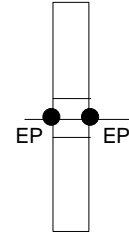
FLANGE-BLIND

Associated Components

ADDITIONAL-ITEM

FLANGE-REDUCING-CONCENTRIC

FLANGE-REDUCING-CONCENTRIC



Mandatory Attributes

| | | | | | |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| SKEY | | | | | |

Valid SKEY Identifiers

FLRC FC**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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FLANGE-REDUCING-CONCENTRIC

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 to MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 to ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 to COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLANGE-CUT-MINUS
FLANGE-CUT-PLUS
FLANGE-LEFT-LOOSE
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
LOOSE-FLANGE
MESSAGE-[*type*]
NAME or TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 to SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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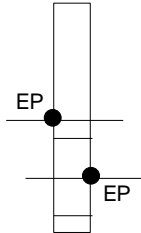
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FLANGE-REDUCING-CONCENTRIC

Associated Components

ADDITIONAL-ITEM
WELD

FLANGE-REDUCING-ECCENTRIC

| | | | | | |
|--------------------------------------|--|------------|-------------------------------------|------|---|
| <div>FLANGE-REDUCING-ECCENTRIC</div> | | | | |  |
| Mandatory Attributes | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| SKEY | | | | | |
| Valid SKEY Identifiers | | | | | |
| FLRE | FE** | | | | |
| NOTE | Substitute the ** characters with the required end type. | | | | |
| Material Information Attributes | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | |
| CATEGORY | | | ITEM-CODE | | |
| MATERIAL-IDENTIFIER | or | | ITEM-DESCRIPTION | | |
| | | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | |
| MATERIAL-LIST | | | | | |
| REPEAT-PART-NUMBER | | | | | |
| NOTE | Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | | | |

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FLANGE-REDUCING-ECCENTRIC

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLANGE-CUT-MINUS
FLANGE-CUT-PLUS
FLANGE-LEFT-LOOSE
FLAT-DIRECTION
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
LOOSE-FLANGE
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

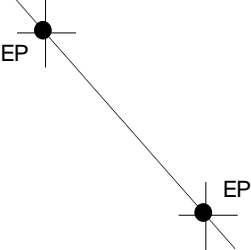
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FLANGE-REDUCING-ECCENTRIC

Associated Components

ADDITIONAL-ITEM

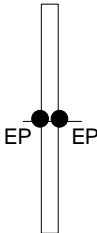
| | | | | | |
|---|-------------------|-------------------|-------------------------|-------------|---|
| <div><div>GAP</div></div> | | | | |  |
| Mandatory Attributes | | | | | |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| Valid SKEY Identifiers | | | | | |
| Not required for GAP components. | | | | | |
| Material Information Attributes | | | | | |
| Not required for GAP components. | | | | | |
| Connection / Continuation Attributes | | | | | |
| END-CONNECTION-[<i>type</i>] END-POSITION-[<i>type</i>] | | | | | |
| Specification Attributes | | | | | |
| INSULATION-SPEC MISC-SPEC1 to MISC-SPEC5 PAINTING SPEC PIPING SPEC TRACING-SPEC | | | | | |

(continued from the previous page)

GAP

| |
|---|
| <p>Supplementary Information Attributes</p> <p>ASSEMBLY-ATTRIBUTE0 to ASSEMBLY-ATTRIBUTE99</p> <p>CLIENT-DRAWING-IDENTIFIER</p> <p>COMPONENT-ATTRIBUTE0 to COMPONENT-ATTRIBUTE99</p> <p>DETAIL-SKETCH-IDENTIFIER</p> <p>COMPONENT-IDENTIFIER</p> <p>INFORMATION-NOTE-IDENTIFIER</p> <p>MESSAGE-[type]</p> <p>PIPELINE-DRAWING-SEQUENCE-NUMBER</p> <p>REVISION</p> <p>SPOOL-ATTRIBUTE1 to SPOOL-ATTRIBUTE10</p> <p>SPOOL-DRAWING-SEQUENCE-NUMBER</p> <p>STATUS</p> <p>UNDIMENSIONED</p> |
| <p>Associated Components</p> <p>Not required for GAP components.</p> |

GASKET

| | | | | | | |
|--|-------------------|-------------------|-------------------------------------|-------------|---|--|
| <div><div>GASKET</div></div> | | | | |  | |
| Mandatory Attributes | | | | | | |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> | |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> | |
| Valid SKEY Identifiers | | | | | | |
| Not required for GASKET components. | | | | | | |
| Material Information Attributes | | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | | |
| CATEGORY | | ITEM-CODE | | | | |
| MATERIAL-IDENTIFIER | | or | ITEM-DESCRIPTION | | | |
| | | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | |
| MATERIAL-LIST | | | | | | |
| REPEAT-PART-NUMBER | | | | | | |
| <div><div>NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32).</div> | | | | | | |
| Connection / Continuation Attributes | | | | | | |
| END-CONNECTION-[type] | | | | | | |
| END-POSITION-[type] | | | | | | |

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GASKET

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

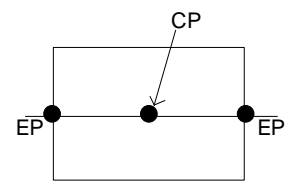
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOLT-DIA
BOLT-ITEM-CODE
BOLT-ITEM-DESCRIPTION
BOLT-LENGTH
BOLT-QUANTITY
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
GASKET-CLASS
GASKET-RATING
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
PIPELINE-DRAWING-SEQUENCE-NUMBER
MASTER-COMPONENT-IDENTIFIER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

INSTRUMENT

| | | | | | | |
|--|------------|--|------------------|------|--------------------------|---|
| <div>INSTRUMENT</div> | | | | | |  |
| Mandatory Attributes | | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | | |
| SKEY | | | | | | |
| <div>NOTE</div> The CENTRE-POINT attribute is optional but recommended. | | | | | | |
| Valid SKEY Identifiers | | | | | | |
| CV** | HV** | IG** | II** | MV** | RV** | SV** XV** ZV** |
| <div>NOTES</div> <ul style="list-style-type: none">On components that carry SKEYs DR, OP, and PR, do not set the end type parameters in any END-POINT attributeSubstitute the ** characters with the required end type. | | | | | | |
| Material Information Attributes | | | | | | |
| COMPONENT-REMARK-NUMBER | | ITEM-CODE ITEM-DESCRIPTION ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | | |
| CATEGORY | | | | | | |
| MATERIAL-IDENTIFIER or | | | | | | |
| MATERIAL-LIST | | | | | | |
| REPEAT-PART-NUMBER | | | | | | |
| <div>NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | | | | | |

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INSTRUMENT

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
FLOW
GEARBOX
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
MESSAGE-[*type*]
NAME *or* TAG
NAME-DIVIDER
ORIFICE-TAP-DIRECTION
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPINDLE-DIRECTION
SPINDLE-KEY
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
TAG-DIVIDER
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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INSTRUMENT

| |
|------------------------------|
| Associated Components |
| ADDITIONAL-ITEM |

INSTRUMENT-3WAY

INSTRUMENT-3 WAY

Mandatory Attributes

| | | | | | |
|--------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

Valid SKEY Identifiers

C3** H3** M3** S3**

NOTE

Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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INSTRUMENT-3WAY

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
GEARBOX
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
NAME-DIVIDER
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPINDLE-DIRECTION
SPINDLE-SKEY
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TAG-DIVIDER
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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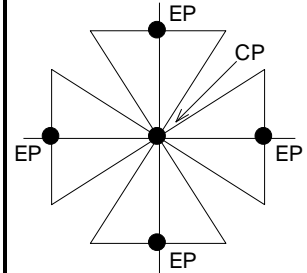
INSTRUMENT-3WAY

Associated Components

ADDITIONAL-ITEM

INSTRUMENT-4WAY

INSTRUMENT-4 WAY



Mandatory Attributes

| | | | | | |
|--------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | | | | | |
| SKEY | | | | | |

Valid SKEY Identifiers

C4** H4** M4** S4**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|--|
| COMPONENT-REMARK-NUMBER | ITEM-CODE ITEM-DESCRIPTION ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| CATEGORY | |
| MATERIAL-IDENTIFIER or | |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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INSTRUMENT-4WAY

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
GEARBOX
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
NAME-DIVIDER
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPINDLE-DIRECTION
SPINDLE-SKEY
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TAG-DIVIDER
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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INSTRUMENT-4WAY

Associated Components

ADDITIONAL-ITEM

INSTRUMENT-ANGLE

INSTRUMENT-ANGLE

Mandatory Attributes

| | | | | | |
|--------------|------------|------------|------------------|------|--------------------------|
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| SKEY | | | | | |

Valid SKEY Identifiers

| | | | | | | |
|------|------|------|------|------|------|------|
| CA** | HA** | IA** | MA** | RA** | SA** | XA** |
|------|------|------|------|------|------|------|

NOTE

Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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INSTRUMENT-ANGLE

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
GEARBOX
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
NAME-DIVIDER
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPINDLE-DIRECTION
SPINDLE-KEY
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TAG-DIVIDER
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

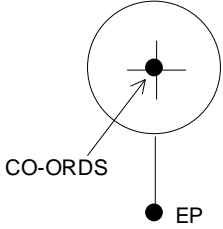
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INSTRUMENT-ANGLE

| |
|------------------------------|
| Associated Components |
| ADDITIONAL-ITEM |

INSTRUMENT-BALLOON

| | | | | | |
|--|-------------------|-------------------|-------------------------|---|---------------------------------|
| <div>INSTRUMENT-BALLOON</div> | | | |  | |
| Mandatory Attributes | | | | | |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CO-ORDS | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| NOTE The CO-ORDS attribute is optional but recommended. | | | | | |
| Valid SKEY Identifiers | | | | | |
| IB** | | | | | |
| NOTE Substitute the ** characters with the required end type. | | | | | |
| Material Information Attributes | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | |
| CATEGORY | | | | | |
| ITEM-CODE | | | | | |
| MATERIAL-IDENTIFIER or ITEM-DESCRIPTION | | | | | |
| ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | | | |
| MATERIAL-LIST | | | | | |
| REPEAT-PART-NUMBER | | | | | |
| NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | | | | |

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INSTRUMENT-BALLOON

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

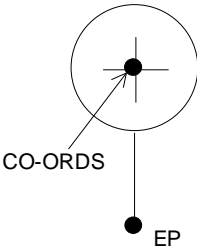
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIAL-FACE-DIRECTION
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
UNIQUE-COMPONENT-IDENTIFIER

Associated Components

ADDITIONAL-ITEM

INSTRUMENT-DIAL

INSTRUMENT-DIAL



Mandatory Attributes

| | | | | | |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CO-ORDS | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

NOTE

The **CO-ORDS** attribute is optional but recommended.

Valid SKEY Identifiers

ID**

NOTE

Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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INSTRUMENT-DIAL

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIAL-FACE-DIRECTION
DIRECTION
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
NAME-DIVIDER
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
TAG-DIVIDER
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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INSTRUMENT-DIAL

Associated Components

ADDITIONAL-ITEM

INSTRUMENT-EXTERNAL

| | | | | | |
|--|-------------------|-------------------|-------------------------------------|-------------|---------------------------------|
| <div>INSTRUMENT-EXTERNAL</div> | | | | | |
| Mandatory Attributes | | | | | |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CO-ORDS | <i>E/S co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |
| NOTE The CO-ORDS attribute is optional but recommended. | | | | | |
| Valid SKEY Identifiers | | | | | |
| IDFL | IDPL | | | | |
| Material Information Attributes | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | |
| CATEGORY | | | ITEM-CODE | | |
| MATERIAL-IDENTIFIER | or | | ITEM-DESCRIPTION | | |
| | | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | |
| MATERIAL-LIST | | | | | |
| REPEAT-PART-NUMBER | | | | | |
| NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | | | | |

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INSTRUMENT-EXTERNAL

Connection / Continuation Attributes

END-CONNECTION-[*type*]

END-POSITION-[*type*]

Specification Attributes

INSULATION-SPEC

MISC-SPEC1 *to* MISC-SPEC5

PAINTING SPEC

PIPING SPEC

TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99

CLIENT-DRAWING-IDENTIFIER

COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99

DETAIL-SKETCH-IDENTIFIER

DIAL-FACE-DIRECTION

COMPONENT-IDENTIFIER

INFORMATION-NOTE-IDENTIFIER

INSULATION

MESSAGE-[*type*]

NAME *or* TAG

NAME-DIVIDER

PIPELINE-DRAWING-SEQUENCE-NUMBER

REVISION

SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10

SPOOL-DRAWING-SEQUENCE-NUMBER

STATUS

TAG-DIVIDER

TRACING

UNIQUE-COMPONENT-IDENTIFIER

WEIGHT

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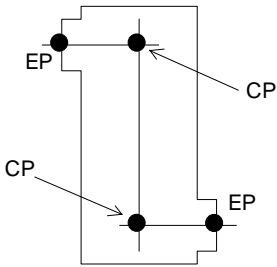
INSTRUMENT-EXTERNAL

Associated Components

ADDITIONAL-ITEM

INSTRUMENT-OFFSET

INSTRUMENT-OFFSET



Mandatory Attributes

| | | | | | |
|--------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

NOTE The two **CENTRE-POINT** attributes are optional but recommended for primary direction.

Valid SKEY Identifiers

IO**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER or | ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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INSTRUMENT-OFFSET (Non-Primary Direction)

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
NAME-DIVIDER
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TAG-DIVIDER
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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INSTRUMENT-OFFSET

| |
|------------------------------|
| Associated Components |
| ADDITIONAL-ITEM |

INSTRUMENT-RETURN

INSTRUMENT-RETURN

Mandatory Attributes

| | | | | | |
|--------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

NOTE

The CENTRE-POINT attribute is optional but recommended.

Valid SKEY Identifiers

IR**

NOTE

Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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INSTRUMENT-RETURN

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
NAME-DIVIDER
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TAG-DIVIDER
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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INSTRUMENT-RETURN

Associated Components

ADDITIONAL-ITEM

INSTRUMENT-TEE

INSTRUMENT-TEE

Mandatory Attributes

| | | | | | |
|---------------|------------|------------|------------------|------|--------------------------|
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| BRANCH1-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| SKEY | | | | | |

Valid SKEY Identifiers

IT**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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INSTRUMENT-TEE

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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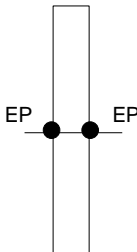
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INSTRUMENT-TEE

Associated Components

ADDITIONAL-ITEM

LAPJOINT-RING (Ring Type)

| | | | | | |
|---|------------|------------|-------------------------------------|---|--------------------------|
| <div>LAPJOINT-RING</div> | | | |  | |
| Ring Type | | | | | |
| Mandatory Attributes | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| SKEY | | | | | |
| Valid SKEY Identifiers | | | | | |
| FLRG | | | | | |
| Material Information Attributes | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | |
| CATEGORY | | ITEM-CODE | | | |
| MATERIAL-IDENTIFIER | | or | ITEM-DESCRIPTION | | |
| | | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | |
| MATERIAL-LIST | | | | | |
| REPEAT-PART-NUMBER | | | | | |
| <div>NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32).</div> | | | | | |

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LAPJOINT-RING (Ring Type)

Connection / Continuation Attributes

END-CONNECTION-[*type*]

END-POSITION-[*type*]

Specification Attributes

INSULATION-SPEC

MISC-SPEC1 *to* MISC-SPEC5

PAINTING SPEC

PIPING SPEC

TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99

CLIENT-DRAWING-IDENTIFIER

COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99

DETAIL-SKETCH-IDENTIFIER

FLANGE-CUT-MINUS

FLANGE-CUT-PLUS

FLANGE-CUT-LOOSE

COMPONENT-IDENTIFIER

INFORMATION-NOTE-IDENTIFIER

INSULATION

LOOSE-FLANGE

MESSAGE-[*type*]

NAME *or* TAG

PIPELINE-DRAWING-SEQUENCE-NUMBER

REVISION

SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10

SPOOL-DRAWING-SEQUENCE-NUMBER

SPOOL-IDENTIFIER

STATUS

TRACING

UNIQUE-COMPONENT-IDENTIFIER

WEIGHT

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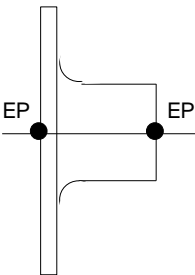
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LAPJOINT-RING (Ring Type)

Associated Components

ADDITIONAL-ITEM

LAPJOINT-STUBEND (Stub End Type)

| | | | | | |
|--|------------|-------------------------------------|------------------|---|--------------------------|
| <div>LAPJOINT-STUBEND</div> | | | |  | |
| | | | | Stub-End Type | |
| Mandatory Attributes | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| SKEY | | | | | |
| <div>NOTE</div> A change of bore is permitted, such that a reducing flange can be specified. | | | | | |
| Valid SKEY Identifiers | | | | | |
| FLSE | | | | | |
| Material Information Attributes | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | |
| CATEGORY | | ITEM-CODE | | | |
| MATERIAL-IDENTIFIER | or | ITEM-DESCRIPTION | | | |
| | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | |
| MATERIAL-LIST | | | | | |
| REPEAT-PART-NUMBER | | | | | |
| <div>NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | | | | |

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LAPJOINT-STUBEND (Stub End Type)

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLANGE-CUT-MINUS
FLANGE-CUT-PLUS
FLANGE-CUT-LOOSE
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
LOOSE-FLANGE
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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LAPJOINT-STUBEND (Stub End Type)

Associated Components

ADDITIONAL-ITEM

MISC-COMPONENT

MISC-COMPONENT

Mandatory Attributes

| | | | | | |
|--------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

NOTE

The CENTRE-POINT attribute is optional but recommended.

Valid SKEY Identifiers

| | | | | | | | | | | | |
|------|------|------|------|------|------|----|----|----|------|----|----|
| CH** | EX** | FT** | FX** | OB** | NC** | PL | RP | SB | SG** | SP | SR |
| TU** | LPIN | | | | | | | | | | |

NOTES

- SKEY LPIN is used only on penetration plates. For more information, see PENETRATION-PLATE (on page 261).
- Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see Materials (on page 32).

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MISC-COMPONENT

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SLIP-PLATE-TAIL-DIRECTION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT
WINDOW-DIRECTION

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MISC-COMPONENT

Associated Components

ADDITIONAL-ITEM

(continued from the previous page)

MISC-COMPONENT-ANGLE

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPINDLE-DIRECTION
SPINDLE-SKEY
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

(continued on the following page)

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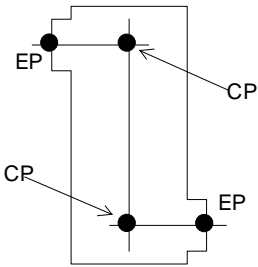
MISC-COMPONENT-ANGLE

Associated Components

ADDITIONAL-ITEM

MISC-COMPONENT-OFFSET

MISC-COMPONENT-OFFSET



Mandatory Attributes

| | | | | | |
|--------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

NOTE The two **CENTRE-POINT** attributes are optional but recommended for primary direction.

Valid SKEY Identifiers

BO**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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MISC-COMPONENT-OFFSET (Non-Primary Direction)

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

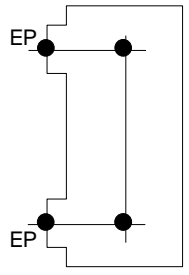
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

MISC-COMPONENT-RETURN

| | | | | | |
|---|-------------------|-------------------|------------------------------|---|---------------------------------|
| <div style="background-color: black; color: white; padding: 5px; text-align: center; font-weight: bold;">MISC-COMPONENT-RETURN</div> | | | |  | |
| Mandatory Attributes | | | | | |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;">NOTE</div> The CENTRE-POINT attribute is optional but recommended. | | | | | |
| Valid SKEY Identifiers | | | | | |
| BR** | | | | | |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;">NOTE</div> Substitute the ** characters with the required end type. | | | | | |
| Material Information Attributes | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | |
| CATEGORY | | ITEM-CODE | | | |
| MATERIAL-IDENTIFIER | | or | ITEM-DESCRIPTION | | |
| | | | ITEM-ATTRIBUTE0 to ITEM-ATTR | | |
| MATERIAL-LIST | | | | | |
| REPEAT-PART-NUMBER | | | | | |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;">NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | | | | |

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MISC-COMPONENT-RETURN

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

MISC-HYGIENIC

| | | | | | | |
|--|------------|-------------------------------------|------------------|------|--------------------------|---------|
| <div>MISC-HYGIENIC</div> | | | | | | |
| Mandatory Attributes | | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | |
| SKEY | | | | | | |
| Valid SKEY Identifiers | | | | | | |
| ADMF | ADMM | BBC | BBE | BM | BP | BTP DVP |
| Material Information Attributes | | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | | |
| CATEGORY | | | ITEM-CODE | | | |
| MATERIAL-IDENTIFIER | or | ITEM-DESCRIPTION | | | | |
| | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | | |
| MATERIAL-LIST | | | | | | |
| REPEAT-PART-NUMBER | | | | | | |
| <div>NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | | | | | |
| Connection / Continuation Attributes | | | | | | |
| END-CONNECTION-[type] | | | | | | |
| END-POSITION-[type] | | | | | | |

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MISC-HYGIENIC

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 to MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 to ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
ATTRIBUTE0 to COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
MESSAGE-[type]
NAME or TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 to SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

(continued from the previous page)

MULTI-PORT-COMPONENT

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
PORT-DIRECTION
PORT-REFERENCE*n*
REVISION
SLIP-PLATE-TAIL-DIRECTION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT
WINDOW-DIRECTION

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MULTI-PORT-COMPONENT


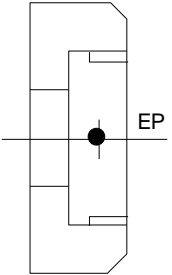
| |
|------------------------------|
| Associated Components |
|------------------------------|

| |
|-----------------|
| ADDITIONAL-ITEM |
|-----------------|

NOZZLE

| | | |
|---|-------------------------|---|
| <div>NOZZLE</div> | |  |
| Mandatory Attributes | | |
| CO-ORDS | <i>E/W co-ord</i> | <i>N/S co-ord</i> |
| CONNECTION-REFERENCE | <i>Elevation co-ord</i> | <i>Size</i> |
| Valid SKEY Identifiers | | |
| Not required for NOZZLE components. | | |
| Material Information Attributes | | |
| Not required for NOZZLE components. | | |
| Connection / Continuation Attributes | | |
| Not required for NOZZLE components. | | |
| Specification Attributes | | |
| Not required for NOZZLE components. | | |
| Supplementary Information Attributes | | |
| ASSEMBLY-ATTRIBUTE0 to ASSEMBLY-ATTRIBUTE99 | | |
| CLIENT-DRAWING-IDENTIFIER | | |
| COMPONENT-ATTRIBUTE0 to COMPONENT-ATTRIBUTE99 | | |
| COMPONENT-IDENTIFIER | | |
| PIPELINE-DRAWING-SEQUENCE-NUMBER | | |
| REVISION | | |
| SPOOL-ATTRIBUTE1 to SPOOL-ATTRIBUTE10 | | |
| SPOOL-DRAWING-SEQUENCE-NUMBER | | |
| Associated Components | | |
| Not required for NOZZLE components. | | |

NUT

| | |
|---|---|
|  |  |
| Mandatory Attributes <div> <div>END-POINT</div> <div>E/W co-ord</div> <div>N/S co-ord</div> <div>Elevation co-ord</div> <div>Size</div> <div>Supplementary Attributes</div> </div> <div>SKEY</div> | |
| Valid SKEY Identifiers BNUT | |
| Material Information Attributes <div> <div>COMPONENT-REMARK-NUMBER</div> <div>CATEGORY</div> <div>MATERIAL-IDENTIFIER</div> <div>MATERIAL-LIST</div> <div>REPEAT-PART-NUMBER</div> </div> <div> <div>ITEM-CODE</div> <div>ITEM-DESCRIPTION</div> <div>ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99</div> </div> <div> <div>or</div> <div>to</div> </div> <div> <div>NOTE</div> <div>Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32).</div> </div> | |
| Connection / Continuation Attributes <div> <div>END-CONNECTION-[type]</div> <div>END-POSITION-[type]</div> </div> | |

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NUT

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

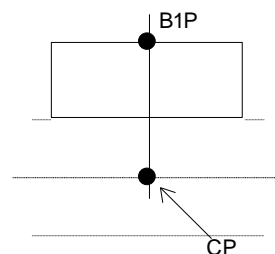
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

OLET



Mandatory Attributes

| | | | | | |
|---------------|------------|------------|------------------|------|------------|
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | (optional) |
| BRANCH1-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | |
| SKEY | | | | | |

Valid SKEY Identifiers

| HCSC | HCSW | LABW | LASC | LASW | NI** | SKSW | SWBW | THSC | WTBW |
|------|------|------|------|------|------|------|------|------|------|
|------|------|------|------|------|------|------|------|------|------|

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

Connection / Continuation Attributes

END-CONNECTION-[type]
END-POSITION-[type]

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OLET

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

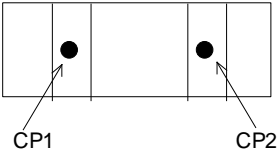
Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM
WELD

PENETRATION-PLATE

| | | | | | |
|--|------------|------------|------------------|------|---|
| <div>PENETRATION-PLATE</div> | | | | |  |
| Mandatory Attributes | | | | | |
| PLATE-DIRECTION | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| PLATE-THICKNESS | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| <div>NOTES</div> <ul style="list-style-type: none">▪ PLATE-DIRECTION and PLATE-THICKNESS attributes are optional but recommended.▪ Up to 20 CENTRE-POINT attributes are allowed. | | | | | |
| Valid SKEY Identifiers | | | | | |
| Not required for the main PENETRATION-PLATE component. | | | | | |
| Material Information Attributes | | | | | |
| MATERIAL-IDENTIFIER or ITEM-CODE ITEM-DESCRIPTION ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | | | |
| <div>NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | | | | |
| Connection / Continuation Attributes | | | | | |
| Not required for the main PENETRATION-PLATE component | | | | | |

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PENETRATION-PLATE

Specification Attributes

INSULATION-SPEC
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

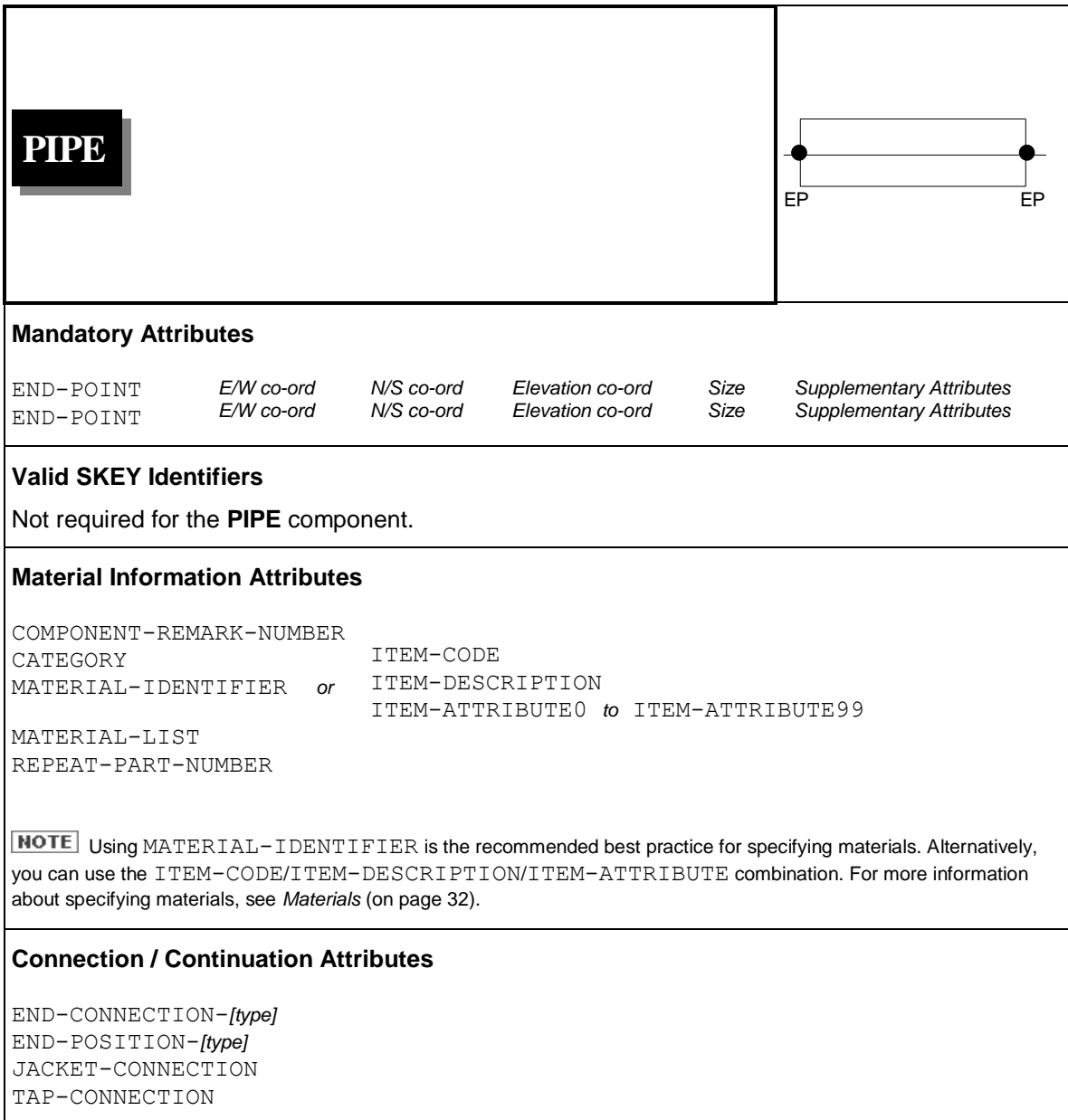
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
MESSAGE-*[type]*
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
UCI
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

PIPE



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PIPE

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

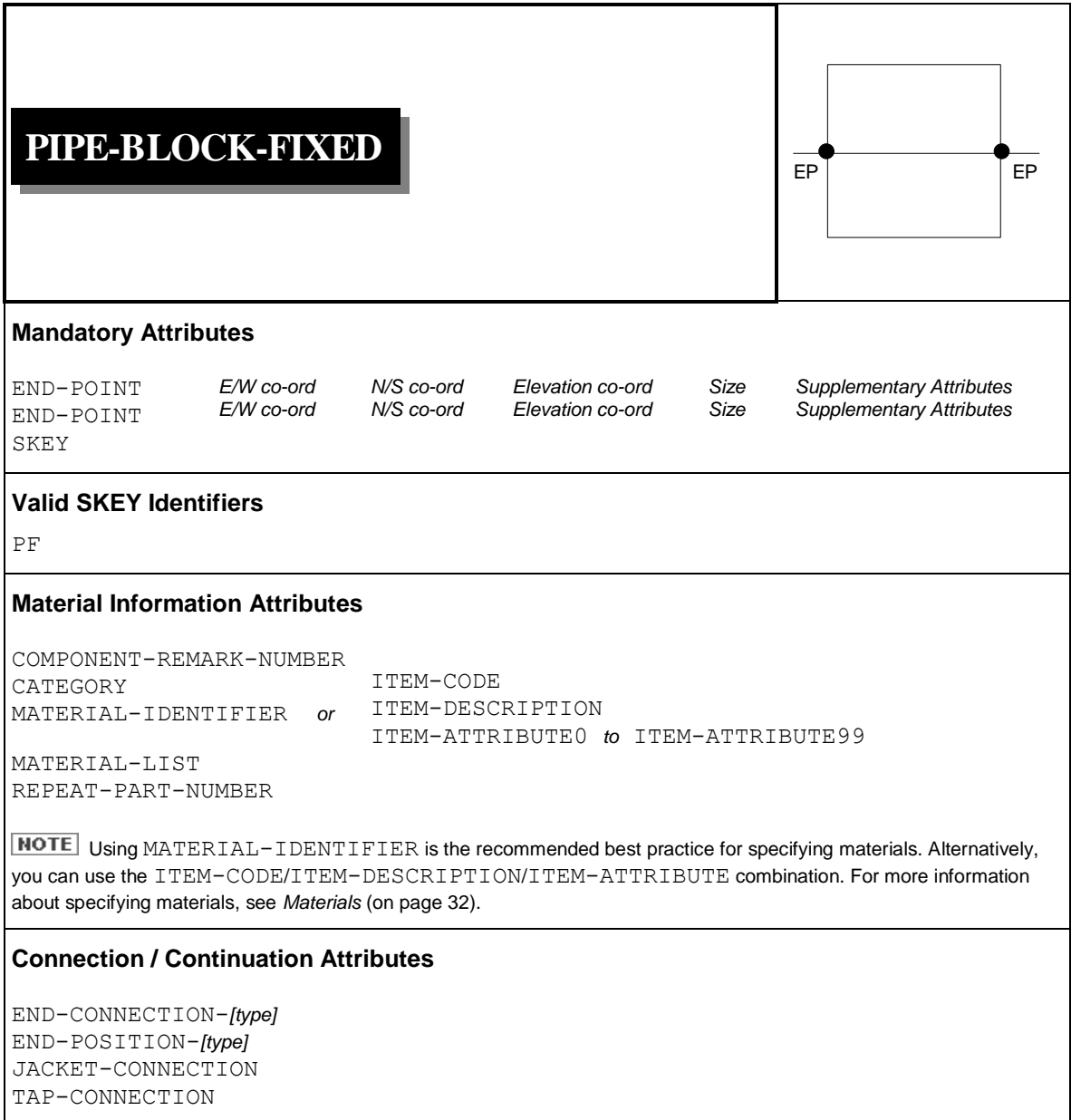
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
CUT-PIECE-ALLOWANCE
CUT-PIECE-LENGTH
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
PIPELINE-DRAWING-SEQUENCE-NUMBER
PLANT-AREA
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WASTE
WEIGHT
WELDING-ALLOWANCE

Associated Components

ADDITIONAL-ITEM

PIPE-BLOCK-FIXED



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PIPE-BLOCK-FIXED

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC


Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

PIPE-BLOCK-VARIABLE

| | |
|---|---|
| <div>PIPE-BLOCK-VARIABLE</div> |  |
| Mandatory Attributes | |
| END-POINT END-POINT SKEY | <div> <i>E/W co-ord</i> <i>N/S co-ord</i> <i>Elevation co-ord</i> <i>Size</i> <i>Supplementary Attributes</i> </div> <div> <i>E/W co-ord</i> <i>N/S co-ord</i> <i>Elevation co-ord</i> <i>Size</i> <i>Supplementary Attributes</i> </div> |
| Valid SKEY Identifiers | |
| PV | |
| Material Information Attributes | |
| COMPONENT-REMARK-NUMBER CATEGORY MATERIAL-IDENTIFIER <i>or</i> MATERIAL-LIST REPEAT-PART-NUMBER | |
| ITEM-CODE ITEM-DESCRIPTION ITEM-ATTRIBUTE0 <i>to</i> ITEM-ATTRIBUTE99 | |
| <div> NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). </div> | |
| Connection / Continuation Attributes | |
| END-CONNECTION-[<i>type</i>] END-POSITION-[<i>type</i>] JACKET-CONNECTION TAP-CONNECTION | |

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PIPE-BLOCK-VARIABLE

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

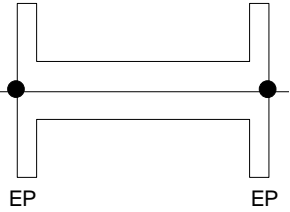
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

PIPE-FIXED

| | | | | | | |
|--|------------|-------------------------------------|------------------|------|--------------------------|---|
| <div>PIPE-FIXED</div> | | | | | |  |
| Mandatory Attributes | | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | |
| SKEY | | | | | | |
| Valid SKEY Identifiers | | | | | | |
| FPFL | FPLC | FPLN | FPMP | FPPL | FPRG | |
| Material Information Attributes | | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | | |
| CATEGORY | | ITEM-CODE | | | | |
| MATERIAL-IDENTIFIER | | or | ITEM-DESCRIPTION | | | |
| | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | | |
| MATERIAL-LIST | | | | | | |
| REPEAT-PART-NUMBER | | | | | | |
| <div>NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | | | | | |
| Connection / Continuation Attributes | | | | | | |
| END-CONNECTION-[type] | | | | | | |
| END-POSITION-[type] | | | | | | |
| JACKET-CONNECTION | | | | | | |
| TAP-CONNECTION | | | | | | |

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PIPE-FIXED

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

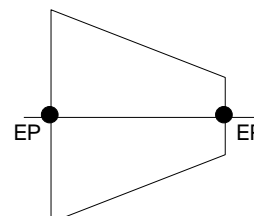
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
PLANT-AREA
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

REDUCER-CONCENTRIC

REDUCER-CONCENTRIC



Mandatory Attributes

| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| SKEY | | | | | |

Valid SKEY Identifiers

| | | | | | | | |
|------|------|------|------|------|------|------|------|
| CPBW | CPFL | CSBW | CSFL | RBSC | RBSW | RC** | RNSC |
| RFPL | | | | | | | |

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | | |
|-------------------------|----|-------------------------------------|
| COMPONENT-REMARK-NUMBER | | |
| CATEGORY | | ITEM-CODE |
| MATERIAL-IDENTIFIER | or | ITEM-DESCRIPTION |
| | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | | |
| REPEAT-PART-NUMBER | | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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REDUCER-CONCENTRIC

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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REDUCER-CONCENTRIC

Associated Components

ADDITIONAL-ITEM

REDUCER-CONCENTRIC-TEED

| | | |
|--|---------------------------------|-------------------------------------|
| <div>REDUCER-CONCENTRIC-TEED</div> | | |
| Mandatory Attributes | | |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> |
| BRANCH1-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> |
| SKEY | | |
| | <i>Elevation co-ord</i> | <i>Elevation co-ord</i> |
| | <i>Size</i> | <i>Size</i> |
| | <i>Supplementary Attributes</i> | <i>Supplementary Attributes</i> |
| Valid SKEY Identifiers | | |
| CTBW | CTFL | CTSC |
| CTSW | CZBW | CZFL |
| CXBW | CXFL | |
| Material Information Attributes | | |
| COMPONENT-REMARK-NUMBER | | |
| CATEGORY | | ITEM-CODE |
| MATERIAL-IDENTIFIER | or | ITEM-DESCRIPTION |
| | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | | |
| REPEAT-PART-NUMBER | | |
| NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | |
| Connection / Continuation Attributes | | |
| END-CONNECTION-[type] | | |
| END-POSITION-[type] | | |

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REDUCER-CONCENTRIC-TEED

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

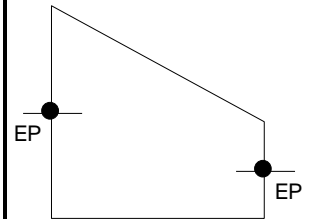
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

REDUCER-ECCENTRIC

REDUCER-ECCENTRIC



Mandatory Attributes

| | | | | | |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| SKEY | | | | | |

Valid SKEY Identifiers

| EPBW | EPFL | ESBW | ESFL | RE** |
|------|------|------|------|------|
|------|------|------|------|------|

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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REDUCER-ECCENTRIC

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
FLAT-DIRECTION
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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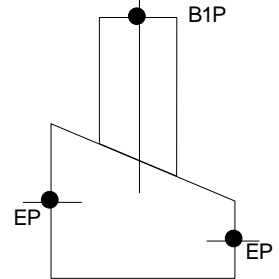
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REDUCER-ECCENTRIC

Associated Components

ADDITIONAL-ITEM

REDUCER-ECCENTRIC-TEED



REDUCER-ECCENTRIC-TEED

Mandatory Attributes

| | | | | | |
|---------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | |
| BRANCH1-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

Valid SKEY Identifiers

| EXBW | EXFL | EZBW | EZFL | OTBW | OTFL | OTSC |
|------|------|------|------|------|------|------|
|------|------|------|------|------|------|------|

Material Information Attributes

| COMPONENT-REMARK-NUMBER | ITEM-CODE |
|-------------------------|-------------------------------------|
| CATEGORY | ITEM-DESCRIPTION |
| MATERIAL-IDENTIFIER | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

Connection / Continuation Attributes

END-CONNECTION-[type]
END-POSITION-[type]

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REDUCER-ECCENTRIC-TEED

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

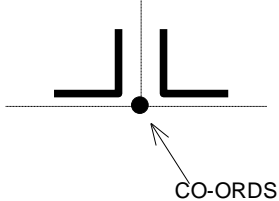
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
FLAT-DIRECTION
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM
WELD

REINFORCEMENT-PAD

| | | |
|--|-------------------|---|
| <div>REINFORCEMENT-PAD</div> | |  |
| Mandatory Attributes | | |
| CO-ORDS | <i>E/W co-ord</i> | <i>N/S co-ord</i> <i>Elevation co-ord</i> |
| Valid SKEY Identifiers | | |
| RPAD | | |
| NOTE The SKEY is optional. If omitted, defaults to RPAD. | | |
| Material Information Attributes | | |
| COMPONENT-REMARK-NUMBER | | |
| CATEGORY | ITEM-CODE | |
| MATERIAL-IDENTIFIER | or | ITEM-DESCRIPTION |
| | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | | |
| REPEAT-PART-NUMBER | | |
| NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | |
| Connection / Continuation Attributes | | |
| Not required for REINFORCEMENT-PAD components. | | |
| Specification Attributes | | |
| Not required for REINFORCEMENT-PAD components. | | |

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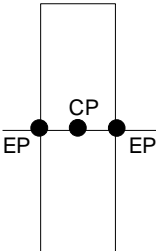
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REINFORCEMENT PAD

| |
|--|
| <p>Supplementary Information Attributes</p> <p>CLIENT-DRAWING-IDENTIFIER DETAIL-SKETCH-IDENTIFIER COMPONENT-IDENTIFIER INFORMATION-NOTE-IDENTIFIER MASTER-COMPONENT-IDENTIFIER MESSAGE-[type] NAME or TAG PIPELINE-DRAWING-SEQUENCE-NUMBER REVISION SPOOL-DRAWING-SEQUENCE-NUMBER STATUS UNIQUE-COMPONENT-IDENTIFIER WEIGHT</p> |
| <p>Associated Components</p> <p>ADDITIONAL-ITEM WELD</p> |

SAFETY-DISC

SAFETY-DISC



Mandatory Attributes

| | | | | | |
|--------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

NOTE

The CENTRE-POINT attribute is optional but recommended.

Valid SKEY Identifiers

RD

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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SAFETY-DISC

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

SUPPORT

| | | |
|--|-------------------------|---|
| <div><div>SUPPORT</div></div> | | CO-ORDS _____ ● _____ |
| Mandatory Attributes | | |
| CO-ORDS SKEY | <i>E/W co-ord</i> | <i>N/S co-ord</i> <i>Elevation co-ord</i> <i>Size</i> <i>Supplementary Attributes</i> |
| Valid SKEY Identifiers | | |
| ANCH DUCK GUID HANG SKID SPRG SLVE bbbb | (Four blank characters) | |
| Material Information Attributes | | |
| COMPONENT-REMARK-NUMBER CATEGORY MATERIAL-IDENTIFIER MATERIAL-LIST REPEAT-PART-NUMBER | or | ITEM-CODE ITEM-DESCRIPTION ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32). | | |
| Connection / Continuation Attributes | | |
| Not required for SUPPORT components. | | |
| Specification Attributes | | |
| Not required for SUPPORT components. | | |

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SUPPORT

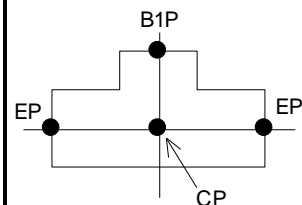
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
SUPPORT-DIRECTION
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM
WELD

TEE



Mandatory Attributes

| | | | | | |
|---------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | |
| BRANCH1-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

Valid SKEY Identifiers

TE** TS**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| COMPONENT-REMARK-NUMBER | ITEM-CODE |
|-------------------------|-------------------------------------|
| CATEGORY | ITEM-DESCRIPTION |
| MATERIAL-IDENTIFIER | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32).

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TEE

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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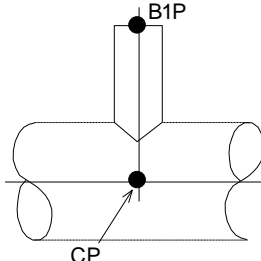
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TEE

Associated Components

ADDITIONAL-ITEM
WELD

TEE-SET-ON

| | | | | | |
|--|------------|------------|------------------|---|------------|
| <div>TEE-SET-ON</div> | | | |  | |
| Mandatory Attributes | | | | | |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | (optional) |
| BRANCH1-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | |
| SKEY | | | | | |
| Valid SKEY Identifiers | | | | | |
| TERF | TESO | TPUL | TYSO | | |
| Material Information Attributes | | | | | |
| COMPONENT-REMARK-NUMBER | | | ITEM-CODE | | |
| CATEGORY | | | ITEM-DESCRIPTION | | |
| MATERIAL-IDENTIFIER | | | or | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | |
| MATERIAL-IDENTIFIER-BRANCH1 | | | or | ITEM-CODE-BRANCH | |
| MATERIAL-LIST | | | | | |
| REPEAT-PART-NUMBER | | | | | |
| <div>NOTE</div> Using MATERIAL-IDENTIFIER and MATERIAL-IDENTIFIER-BRANCH1 is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination along with ITEM-CODE-BRANCH1. For more information about specifying materials, see Materials (on page 32). | | | | | |
| Connection / Continuation Attributes | | | | | |
| END-CONNECTION-[type] | | | | | |
| END-POSITION-[type] | | | | | |

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TEE-SET-ON

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

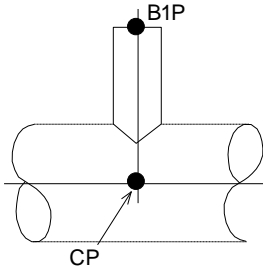
Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NOZZLE-DIRECTION
PIPELINE-DRAWING-SEQUENCE-NUMBER
PLANT-AREA
PORT-DIRECTION
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WASTE
WEIGHT1
WELDING-ALLOWANCE

Associated Components

ADDITIONAL-ITEM
WELD

TEE-STUB

| | | |
|---|-------------------|---|
| <div>TEE-STUB</div> | |  |
| Mandatory Attributes | | |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> |
| BRANCH1-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> |
| SKEY | | |
| Valid SKEY Identifiers | | |
| TERF TESO TPUL TYSO | | |
| Material Information Attributes | | |
| COMPONENT-REMARK-NUMBER | | |
| CATEGORY | | ITEM-CODE |
| MATERIAL-IDENTIFIER | <i>or</i> | ITEM-DESCRIPTION |
| MATERIAL-IDENTIFIER-BRANCH1 | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | | ITEM-CODE-BRANCH1 |
| REPEAT-PART-NUMBER | | |
| NOTE | | |
| Using MATERIAL-IDENTIFIER and MATERIAL-IDENTIFIER-BRANCH1 is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ ITEM-DESCRIPTION/ ITEM-ATTRIBUTE combination along with ITEM-CODE-BRANCH1. For more information about specifying materials, see <i>Materials</i> (on page 32). | | |
| Connection / Continuation Attributes | | |
| END-CONNECTION-[<i>type</i>] | | |
| END-POSITION-[<i>type</i>] | | |

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TEE-STUB

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes


ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NOZZLE-DIRECTION
PIPELINE-DRAWING-SEQUENCE-NUMBER
PLANT-AREA
REPEAT-PART-NUMBER-BRANCH1
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WASTE
WEIGHT
WEIGHT1

Associated Components

ADDITIONAL-ITEM
WELD

TRAP

TRAP



Mandatory Attributes

| | | | | | |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| SKEY | | | | | |

Valid SKEY Identifiers

TI**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32)

(continued from the previous page)

TRAP

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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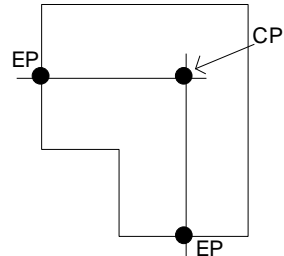
TRAP

Associated Components

ADDITIONAL-ITEM

TRAP-ANGLE

TRAP-ANGLE



Mandatory Attributes

| | | | | | |
|--------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

Valid SKEY Identifiers

TA**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

COMPONENT-REMARK-NUMBER
CATEGORY
MATERIAL-IDENTIFIER *or* ITEM-CODE
ITEM-DESCRIPTION
ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99
MATERIAL-LIST
REPEAT-PART-NUMBER

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32)

(continued on the following page)

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TRAP-ANGLE

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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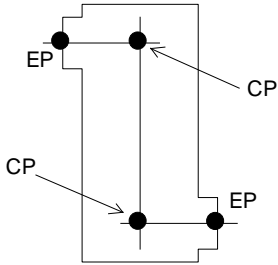
TRAP-ANGLE

Associated Components

ADDITIONAL-ITEM

TRAP-OFFSET

TRAP - OFFSET



Mandatory Attributes

| | | | | | |
|--------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

NOTE The two **CENTRE-POINT** attributes are optional but recommended for primary direction.

Valid SKEY Identifiers

TO**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32)

(continued on the following page)

(continued from the previous page)

TRAP-OFFSET

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

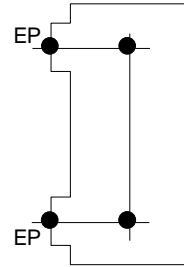
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

TRAP-RETURN

TRAP-RETURN



Mandatory Attributes

| | | | | | |
|--------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

NOTE The **CENTRE-POINT** attribute is optional but recommended.

Valid SKEY Identifiers

TR**

NOTE Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | or ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32)

(continued on the following page)

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TRAP-RETURN

Connection / Continuation Attributes

END-CONNECTION-*[type]*
END-POSITION-*[type]*
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

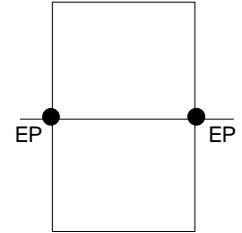
INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CENTRE-POINT
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM



Mandatory Attributes

| | | | | | |
|-----------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| SKEY | | | | | |

Valid SKEY Identifiers

| UNSC | UNSW |
|------|------|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |
| 6 | 6 |
| 7 | 7 |
| 8 | 8 |
| 9 | 9 |
| 10 | 10 |
| 11 | 11 |
| 12 | 12 |
| 13 | 13 |
| 14 | 14 |
| 15 | 15 |
| 16 | 16 |
| 17 | 17 |
| 18 | 18 |
| 19 | 19 |
| 20 | 20 |
| 21 | 21 |
| 22 | 22 |
| 23 | 23 |
| 24 | 24 |
| 25 | 25 |
| 26 | 26 |
| 27 | 27 |
| 28 | 28 |
| 29 | 29 |
| 30 | 30 |
| 31 | 31 |
| 32 | 32 |
| 33 | 33 |
| 34 | 34 |
| 35 | 35 |
| 36 | 36 |
| 37 | 37 |
| 38 | 38 |
| 39 | 39 |
| 40 | 40 |
| 41 | 41 |
| 42 | 42 |
| 43 | 43 |
| 44 | 44 |
| 45 | 45 |
| 46 | 46 |
| 47 | 47 |
| 48 | 48 |
| 49 | 49 |
| 50 | 50 |
| 51 | 51 |
| 52 | 52 |
| 53 | 53 |
| 54 | 54 |
| 55 | 55 |
| 56 | 56 |
| 57 | 57 |
| 58 | 58 |
| 59 | 59 |
| 60 | 60 |
| 61 | 61 |
| 62 | 62 |
| 63 | 63 |
| 64 | 64 |
| 65 | 65 |
| 66 | 66 |
| 67 | 67 |
| 68 | 68 |
| 69 | 69 |
| 70 | 70 |
| 71 | 71 |
| 72 | 72 |
| 73 | 73 |
| 74 | 74 |
| 75 | 75 |
| 76 | 76 |
| 77 | 77 |
| 78 | 78 |
| 79 | 79 |
| 80 | 80 |
| 81 | 81 |
| 82 | 82 |
| 83 | 83 |
| 84 | 84 |
| 85 | 85 |
| 86 | 86 |
| 87 | 87 |
| 88 | 88 |
| 89 | 89 |
| 90 | 90 |
| 91 | 91 |
| 92 | 92 |
| 93 | 93 |
| 94 | 94 |
| 95 | 95 |
| 96 | 96 |
| 97 | 97 |
| 98 | 98 |
| 99 | 99 |
| 100 | 100 |

Material Information Attributes

| | |
|-------------------------|-------------------------------------|
| COMPONENT-REMARK-NUMBER | |
| CATEGORY | ITEM-CODE |
| MATERIAL-IDENTIFIER | ITEM-DESCRIPTION |
| | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32)

Connection / Continuation Attributes

END-CONNECTION-[type]
END-POSITION-[type]

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UNION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

VALVE

| | | | | | | | | | |
|---|------------|-------------------------------------|------------------|------|--------------------------|------|------|------|------|
| <div>VALVE</div> | | | | | | | | | |
| Mandatory Attributes | | | | | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes | | | | |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | | | | | |
| SKEY | | | | | | | | | |
| <div>NOTE</div> The CENTRE-POINT attribute is optional but recommended. | | | | | | | | | |
| Valid SKEY Identifiers | | | | | | | | | |
| CK** | KV** | NV** | VB** | VC** | VD** | VG** | VK** | VN** | VP** |
| VR** | VS** | VT** | VV** | VX** | VY** | VZ** | ZB** | ZG** | |
| <div>NOTE</div> Substitute the ** characters with the required end type. | | | | | | | | | |
| Material Information Attributes | | | | | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | | | | | |
| CATEGORY | | ITEM-CODE | | | | | | | |
| MATERIAL-IDENTIFIER | or | ITEM-DESCRIPTION | | | | | | | |
| | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | | | | | |
| MATERIAL-LIST | | | | | | | | | |
| REPEAT-PART-NUMBER | | | | | | | | | |
| <div>NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32) | | | | | | | | | |

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VALVE

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
FLOW
GEARBOX
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPINDLE-DIRECTION
SPINDLE-SKEY
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

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VALVE

Associated Components

ADDITIONAL-ITEM

(continued from the previous page)

VALVE-3WAY

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 to MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 to ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 to COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
GEARBOX
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME or TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPINDLE-DIRECTION
SPINDLE-KEY
SPOOL-ATTRIBUTE1 to SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

(continued on the following page)

(continued from the previous page)

VALVE-3WAY

Associated Components

ADDITIONAL-ITEM

VALVE-4WAY

VALVE-4 WAY

Mandatory Attributes

| | | | | | |
|--------------|------------|------------|------------------|------|--------------------------|
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| CENTRE-POINT | | | | | |
| SKEY | | | | | |

Valid SKEY Identifiers

4D** 4Z** V4**

NOTE

Substitute the ** characters with the required end type.

Material Information Attributes

COMPONENT-REMARK-NUMBER

CATEGORY

MATERIAL-IDENTIFIER or ITEM-CODE

ITEM-DESCRIPTION

ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99

MATERIAL-LIST

REPEAT-PART-NUMBER

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32)

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VALVE-4WAY

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 to MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 to ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 to COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
GEARBOX
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME or TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPINDLE-DIRECTION
SPINDLE-KEY
SPOOL-ATTRIBUTE1 to SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

(continued on the following page)

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VALVE-4WAY

Associated Components

ADDITIONAL-ITEM

(continued from the previous page)

VALVE-ANGLE

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
FLOW
GEARBOX
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPINDLE-DIRECTION
SPINDLE-KEY
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

(continued on the following page)

(continued from the previous page)

VALVE-ANGLE

Associated Components

ADDITIONAL-ITEM

(continued from the previous page)

VALVE-MULTIWAY (Two Levels)

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 to MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

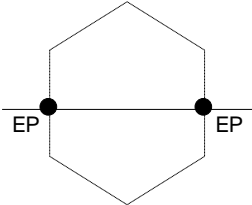
Supplementary Information Attributes

ASSEMBLY-ATTRIBUTE0 to ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 to COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
DIRECTION
GEARBOX
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME or TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPINDLE-DIRECTION
SPINDLE-SKEY
SPOOL-ATTRIBUTE1 to SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

Associated Components

ADDITIONAL-ITEM

WELD

| | | | | | |
|---|------------|-------------------------------------|------------------|---|--------------------------|
| <div>WELD</div> | | | |  | |
| Mandatory Attributes | | | | | |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| END-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | Supplementary Attributes |
| SKEY | | | | | |
| Valid SKEY Identifiers | | | | | |
| WF | WFD | WFT | WM | WMD | WMF |
| WO | WOCF | WOD | WOF | WOFD | WOFT |
| WSSP | WSSR | WST | WSST | WVST | WW |
| | | | | | WWA |
| | | | | | WWCP |
| | | | | | WWD |
| | | | | | WMO |
| | | | | | WMOD |
| | | | | | WMS |
| | | | | | WMSD |
| | | | | | WMT |
| | | | | | WOSR |
| | | | | | WOST |
| | | | | | WOT |
| | | | | | WS |
| | | | | | WSCP |
| | | | | | WSD |
| Material Information Attributes | | | | | |
| COMPONENT-REMARK-NUMBER | | | | | |
| CATEGORY | | ITEM-CODE | | | |
| MATERIAL-IDENTIFIER | | ITEM-DESCRIPTION | | | |
| | | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | | |
| MATERIAL-LIST | | | | | |
| REPEAT-PART-NUMBER | | | | | |
| <div>NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32) | | | | | |
| Connection / Continuation Attributes | | | | | |
| END-CONNECTION-[type] | | | | | |
| END-POSITION-[type] | | | | | |

(continued on the following page)

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WELD

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

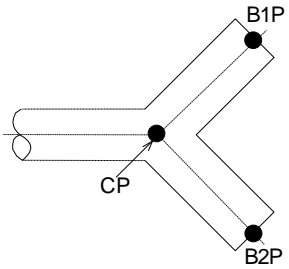
Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
COST-FACTOR
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-*[type]*
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
MASTER-COMPONENT-IDENTIFIER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
STATUS
THICKNESS/RATING
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WELD-TYPE

Associated Components

WELD

Y-PIECE-FABRICATED

| | | | | | |
|--|------------|------------------|-------------------------------------|------|---|
| <div>Y-PIECE-FABRICATED</div> | | | | |  |
| Mandatory Attributes | | | | | |
| CENTRE-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | | |
| BRANCH1-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | |
| BRANCH2-POINT | E/W co-ord | N/S co-ord | Elevation co-ord | Size | |
| SKEY | | | | | |
| Valid SKEY Identifiers | | | | | |
| TYSO | | | | | |
| Material Information Attributes | | | | | |
| COMPONENT-REMARK-NUMBER | | ITEM-CODE | | | |
| CATEGORY | | ITEM-DESCRIPTION | | | |
| MATERIAL-IDENTIFIER | | or | ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 | | |
| MATERIAL-LIST | | | | | |
| REPEAT-PART-NUMBER | | | | | |
| <div><div>NOTE</div> Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see <i>Materials</i> (on page 32)</div> | | | | | |
| Connection / Continuation Attributes | | | | | |
| END-CONNECTION-[type] | | | | | |
| END-POSITION-[type] | | | | | |

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Y-PIECE-FABRICATED

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

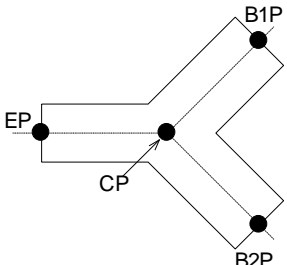
ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
ITEM-CODE-BRANCH1
ITEM-CODE-BRANCH2
MESSAGE-*[type]*
PIPELINE-DRAWING-SEQUENCE-NUMBER
PLANT-AREA
REPEAT-PART-NUMBER-BRANCH1
REPEAT-PART-NUMBER-BRANCH2
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WASTE
WEIGHT
WEIGHT1
WEIGHT2

Associated Components

ADDITIONAL-ITEM
WELD

Y-PIECE-FITTING

Y-PIECE-FITTING



Mandatory Attributes

| | | | | | |
|---------------|-------------------|-------------------|-------------------------|-------------|---------------------------------|
| END-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | <i>Supplementary Attributes</i> |
| CENTRE-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | |
| BRANCH1-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | <i>Size</i> | |
| BRANCH2-POINT | <i>E/W co-ord</i> | <i>N/S co-ord</i> | <i>Elevation co-ord</i> | | |
| SKEY | | | | | |

Valid SKEY Identifiers

TY**

NOTE

Substitute the ** characters with the required end type.

Material Information Attributes

| | |
|-------------------------|--|
| COMPONENT-REMARK-NUMBER | ITEM-CODE |
| CATEGORY | ITEM-DESCRIPTION |
| MATERIAL-IDENTIFIER | or ITEM-ATTRIBUTE0 to ITEM-ATTRIBUTE99 |
| MATERIAL-LIST | |
| REPEAT-PART-NUMBER | |

NOTE

Using MATERIAL-IDENTIFIER is the recommended best practice for specifying materials. Alternatively, you can use the ITEM-CODE/ITEM-DESCRIPTION/ITEM-ATTRIBUTE combination. For more information about specifying materials, see *Materials* (on page 32)

(continued on the following page)

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Y-PIECE-FITTING

Connection / Continuation Attributes

END-CONNECTION-[*type*]
END-POSITION-[*type*]
JACKET-CONNECTION
TAP-CONNECTION

Specification Attributes

INSULATION-SPEC
MISC-SPEC1 *to* MISC-SPEC5
PAINTING SPEC
PIPING SPEC
TRACING-SPEC

Supplementary Information Attributes

ANGLE
ASSEMBLY-ATTRIBUTE0 *to* ASSEMBLY-ATTRIBUTE99
BOP-ELEVATION
CLIENT-DRAWING-IDENTIFIER
COMPONENT-ATTRIBUTE0 *to* COMPONENT-ATTRIBUTE99
DETAIL-SKETCH-IDENTIFIER
COMPONENT-IDENTIFIER
INFORMATION-NOTE-IDENTIFIER
INSULATION
MESSAGE-[*type*]
NAME *or* TAG
PIPELINE-DRAWING-SEQUENCE-NUMBER
REVISION
SPOOL-ATTRIBUTE1 *to* SPOOL-ATTRIBUTE10
SPOOL-DRAWING-SEQUENCE-NUMBER
SPOOL-IDENTIFIER
STATUS
TRACING
UNIQUE-COMPONENT-IDENTIFIER
WEIGHT

(continued on the following page)

(continued from the previous page)

Y-PIECE-FITTING

Associated Components

ADDITIONAL-ITEM
WELD

Component Attributes and Data Requirements

This section includes descriptions of component attributes and their associated input data requirements.

Mandatory Attributes

The following table lists all the mandatory attributes and associated data requirements that are used as the basic information that locates, sizes, and identifies the various piping components that are included in a PCF for a particular pipeline.

NOTES

- Not all components carry all the listed attributes. The actual attributes used depend upon the type of component being described.
- Actual requirements for individual piping components are listed in the Component Information Sheets. For more information, *Component Information Sheets* (on page **Error! Bookmark not defined.**).

| Attribute | Data Requirement |
|--|--|
| BRANCH1-POINT <i>data</i> BRANCH2-POINT <i>data</i> | <p>Identifies branch connection points on various components.</p> <ul style="list-style-type: none">▪ Coordinates must be listed in the following order: East/West, North/South, Elevation. West and South coordinates and all Elevations below zero must be preceded by a minus (-) sign.▪ Nominal Bore (Size) of the component at the point identified by the stated coordinates.▪ Component Branch Connection type b for the point identified by the stated coordinates. <p>Data in this position is only required if the end connection is different to the one identified by the component SKEY.</p> <p>The following is an example of a typical record using MM coordinates and INCH bore with an alternative end connection:</p> <p>BRANCH1-POINT 262210.50 16422.55 6410.00 2 SW</p> |
| BRANCH1-DIRECTION <i>data</i> | <p>Branch leg direction on flanged bend-teed components and all elbow-teed components with integral (built in) type ends.</p> <p>NOTE Valid directions that you can input as data on these attributes are North, South, East, West, Up or Down.</p> |

| Attribute | Data Requirement |
|--------------------------|--|
| CENTRE-POINT <i>data</i> | <p>Coordinate data related to the center or intersection point of a component. Coordinates must be listed in the following order: East/West, North/South, Elevation. West, South, coordinates and all Elevations below zero must be preceded by a minus (-) sign. The following is an example of a typical record using MM coordinates:</p> <p>CENTRE-POINT 262210.50 16492.55 6410.00</p> |
| END-POINT <i>data</i> | <ul style="list-style-type: none"> Coordinate data related to either the start or end of a component. Coordinates must be listed in the following order: East/West, North/South, Elevation. West and South coordinates and all Elevations below zero must be preceded by a minus (-) sign. Nominal Bore (Size) of the component at the point identified by the coordinates. Component end connection type for the point identified by the coordinates. <p>Data in this position is only required if the end connection is different than the one identified by the component SKEY.</p> <p>The following is an example of a typical record using MM coordinates and INCH bore with an alternative end connection:</p> <p>END-POINT 262210.50 16422.55 6410.00 2 SW</p> <p>NOTE The following is a list of valid general end connection types:</p> <ul style="list-style-type: none"> BW - Butt Weld End CP - Compression End FL - Flanged End PL - Plain End SC - Screwed End SW - Socket Weld End LN - Liner/Nut End MP - Male Part End LC - Liner (Clamped) End LR - Reducing Liner / Nut End |
| SKEY <i>data</i> | Valid Isogen SKEY (Shape Key) for the component being processed. |

NOTES

- Attributes can be included in any order following the component identifier.
- All attributes are entered one per line and must start in column position five (5).
- The input data must be separated from the attribute name by at least one blank character.

Material Information Attributes

The following table lists all the attributes and associated data requirements that are used for the input of material-related information for components.

NOTE Not all components carry the listed attributes. The particular attributes used depend upon the type of component being described and in some cases the facilities that are used during the isometric generation.

| Attribute | Data Requirement |
|-------------------------------------|--|
| ADDITIONAL-ITEM | Information related to additional items that are required to be added to the material list (BOM). |
| BOLT-ITEM-DESCRIPTION <i>data</i> | Allows bolts having the same item code to have different material descriptions |
| BOLT-NOT-ON-MATERIAL-LIST | Causes the related bolt to be not listed on the BOM. |
| CATEGORY <i>data</i> | Data is Fabrication , Erection or Offshore . This CATEGORY attribute can be used as an alternative to the FABRICATION-ITEM , ERECTION-ITEM , and OFFSHORE-ITEM attributes. |
| COMPONENT-REMARK-NUMBER <i>data</i> | Used to associate a text remark with a component. The input data required is a Remark ID Number that is to be extracted from a nominated Remarks File at isometric generation time. The Remark information appears on the BOM in two areas: <ul style="list-style-type: none">▪ A cross-reference number against the component.▪ A list of Remarks is output at the bottom of the BOM with a cross-reference number against each Remark. |
| ERECTION-ITEM | No input data is required. This attribute is a simple trigger to indicate that the component is designated as an Erection item. |
| FABRICATION-ITEM | No input data is required. This attribute is a simple trigger to indicate that the component is designated as a Fabrication item. |
| GEOMETRIC-STANDARD | Specifies the industry standard, such as DIN or ANSI. |

| Attribute | Data Requirement |
|---|---|
| ITEM-ATTRIBUTE0 <i>data</i> to ITEM-ATTRIBUTE99 <i>data</i> | Holds up to 100 material information attributes per component in 100 numbered material information attribute slots. |
| NOTE The following conditions apply to item codes: <ul style="list-style-type: none"> ▪ If the ITEM-CODE attribute is not present on a component, then that component is not listed on the material list. ▪ If an ITEM-CODE attribute is present but no data is present, then the component is listed on the material list with a blank item code and description. | |
| ITEM-CODE <i>data</i> | Unique identifier for each component. The item code (material code) is used for component identification on the material list and in any generated material control interface file. |
| ITEM-CODE-BRANCH1 <i>data</i> ITEM-CODE-BRANCH2 <i>data</i> | Unique identification of the pipe required for the branch legs of fabricated type tees and crosses. This data is not required in cases where the branch pipe is the same as the pipe used for the main pipeline. |
| ITEM-CODE-ON-ISO | No input data is required. This attribute is a simple trigger to cause the component item code to be shown local to the component on the isometric in addition to being used on the material list. NOTE Applies only to in-line fittings. |
| ITEM-DESCRIPTION <i>data</i> | Allows components having the same item code to have different material descriptions |
| MATERIAL-LIST <i>data</i> | Input data is Include , Include with ISO or Exclude . The MATERIAL-LIST attribute can be used as an alternative to the ITEM-CODE-ON-ISO and NOT-ON- MATERIAL-LIST attributes. |
| MATERIAL-IDENTIFIER <i>data</i> | Allows the specification of a unique material at the component level in the PCF. This attribute is the recommended best practice for defining the link between a component and its material. For more information, see <i>Material Attributes</i> (on page 70). |
| MATERIAL-IDENTIFIER-BRANCH1 <i>data</i> MATERIAL-IDENTIFIER-BRANCH2 <i>data</i> | Unique material specification of the pipe required for the branch legs of fabricated type tees and crosses. For more information, see <i>Material Attributes</i> (on page 70). |
| MATERIAL-OF-CONSTRUCTION <i>data</i> | Specifies the pipe material type, such as carbon-steel or iron. |

| Attribute | Data Requirement |
|---|---|
| NOT-ON-MATERIAL-LIST | Causes the component not to be listed on the BOM. The NOT-ON-MATERIAL-LIST attribute can be used as an alternative to the MATERIAL-LIST attribute. |
| OFFSHORE-ITEM | No input data is required. This attribute is a simple trigger to indicate that the component is designated as an Offshore item. |
| OUTSIDE-DIAMETER <i>data</i> OUTSIDE-DIAMETER2 <i>data</i> | Specifies the outside diameter of the pipe. |
| RATING <i>data</i> RATING2 <i>data</i> | Specifies the maximum pressure allowed for the pipe. |
| REPEAT-PART-NUMBER <i>data</i> | Input data is the material list part number that was initially allocated. NOTE When using the Isogen Repeatability function which makes use of the data that is input using the REPEAT-PART-NUMBER attribute, the HIGHEST-PART-NUMBER attribute must also be included in the Pipeline Header Information block. |
| REPEAT-PART-NUMBER-BRANCH1 <i>data</i> | Both attributes are only used on tees and crosses that have the SKEY TESO and CRSO, respectively. NOTE When using the Isogen Repeatability function which makes use of the data that is input using the REPEAT-PART-NUMBER attribute, the HIGHEST-PART-NUMBER attribute must also be included in the Pipeline Header Information block. |
| REPEAT-PART-NUMBER-BRANCH2 <i>data</i> | Input data is the material list part number that was initially allocated. NOTE When using the Isogen Repeatability function which makes use of the data that is input using the REPEAT-PART-NUMBER attribute, the HIGHEST-PART-NUMBER attribute must also be included in the Pipeline Header Information block. |
| SCHEDULE <i>data</i> SCHEDULE2 <i>data</i> | Specifies the pipe schedule code. |
| WALL-THICKNESS <i>data</i> WALL-THICKNESS2 <i>data</i> | Specifies the pipe wall thickness. |

NOTES

- Attributes can be included in any order following the component identifier.
- All attributes are entered one per line and must start in column position five (5).

- The input data must be separated from the attribute identifier by at least one blank character.

Connection and Continuation Attributes

All open ends of pipelines (start, end and all branch ends) can be identified on the plotted isometric. The Isogen system provides facilities for identifying a range of continuation and termination situations.

Where a pipeline connects to an equipment item, the full equipment name/connecting nozzle reference can be indicated. Where one pipeline connects to another, the connecting pipeline reference can be indicated together with a number of components belonging to the connecting pipeline. These are indicated in dotted format to show the physical connection. Also in the PCF, jacket and core pipelines can be separately defined so as to allow isometric output of connection information. The end connection messages associated with the jacketed flanges allow a reference to be made to the core pipeline. Additional information to identify the point at which the jacket pipe and flange connect is also provided.

Five other termination types covering open ends, closed ends, vents, drains and simple coordinate locations are provided.

Pipeline continuations in the form of a tap connection (point of secondary connection) from most components are also provided. The table below lists the attributes that cover the various situations. For more information regarding the valid data inputs associated with each attribute, see *End Connection and Position Types* (on page 112).

| Attribute | Data Requirement |
|---------------------|---|
| END-CONNECTION-xxxx | Where xxxx is set to one of the following: <ul style="list-style-type: none">▪ EQUIPMENT, if the pipeline is connected to an equipment item, such as vessel, tank, pump, and so on.▪ PIPELINE, if connected to another pipeline.▪ CORE, if defining a jacket pipeline containing jacket connections on flanges.▪ JACKET, if defining a core pipeline containing jacket connections on flanges. |
| END-POSITION-xxxx | Where xxxx is set to one of the five data types that are used at pipeline terminations. |
| TAP-CONNECTION | Point of secondary connection on most components where a new pipeline can be attached or a branch of the current pipeline can be positioned. |
| CONTINUATION | No data is required. This attribute is a simple trigger to indicate that a component is included for dotted pipeline continuation indication. Components with this attribute set will be un-dimensioned on the plotted isometric and will not be included on the material list. |

| Attribute | Data Requirement |
|--------------------------|--|
| JACKET-POINT <i>data</i> | Identifies the point at which the jacket pipe connects to the flange. Coordinates must be listed in the following order: East/West, North/South, Elevation. West and South coordinates and all Elevations below zero must be preceded by a minus (-) sign. |

NOTES

- **END-CONNECTION**, **END-POSITION** and **TAP-CONNECTION** attributes can be entered in column positions one (1) or five (5), depending on whether they are entered as independent items or in association with a piping component. For more information, see *End Connection and Position Types* (on page 112).
- The **CONTINUATION** and **JACKET-POINT** attributes must be entered in column position five (5).

Specification Attributes

The following table lists the attributes that can be used on individual components to:

1. Indicate specification changes
2. Indicate which components are Insulated and/or traced.

Both types of information are used at the isometric generation stage to graphically indicate the input requirements.

| Attribute | Data Requirement |
|--|--|
| INSULATION-SPEC <i>data</i> PAINTING-SPEC <i>data</i> PIPING-SPEC <i>data</i> TRACING-SPEC <i>data</i> | Use on relevant components to indicate alternative specification. Input data is used to indicate a specification change on the plotted isometric. |
| MISC-SPEC1 <i>data</i> MISC-SPEC2 <i>data</i> MISC-SPEC3 <i>data</i> MISC-SPEC4 <i>data</i> MISC-SPEC5 <i>data</i> | Use on relevant components to indicate alternative user-defined specification. Input data is used to indicate a specification change on the plotted isometric. |
| INSULATION <i>data</i> | Input data is ON or OFF . This INSULATION data attribute can be used as an alternative to the INSULATION-ON attribute. |
| INSULATION-ON | No input data is required. This attribute is a simple trigger to indicate that the component is insulated. |
| TRACING <i>data</i> | Input data is ON or OFF . This TRACING attribute can be used as an alternative to the TRACING-ON attribute. |
| TRACING-ON | No input data is required. This attribute is a simple trigger to indicate that the component is traced. |

A specification change occurs whenever a single component or group of components are assigned to a different specification than the one identified in the Pipeline Header Information block. There is no need to include specification attributes on individual components unless the specification is different than the one stated in the Pipeline Header Information block.

NOTES

- Attributes can be included in any order following the component identifier.
- All attributes are entered one per line and must start in column position five (5).
- The input data must be separated from the attribute identifier by at least one blank character.

Supplementary Information Attributes

The following table lists all the attributes and associated input data requirements that are used for the specialized information related to specific component types. This type of information augments the basic component information and allows the generation of isometrics that contain all the information relevant to the Fabrication and Erection activities.

Not all components carry all of the listed attributes. The particular ones used depend upon the type of component being described, and in some cases the facilities that are used during the isometric generation. The use of any of the attributes listed in the following table is optional.

- **NOTE** The Component Information Sheets identify the attributes that can be used on individual piping components. For more information, see *Component Information Sheets* (on page **Error! Bookmark not defined.**)..

| Attribute | Data Requirements |
|---|--|
| ANGLE <i>data</i> | Angle values in hundredths of degrees. Angle data is required on ELBOW, BEND, OLET, TEE, CROSS, BEND-TEED, and ELBOW-TEED type components plus any MITRE WELD. Inclusion of angle data where the required angle is 90- or 180- degrees is optional as neither of these two values is shown on the isometric. |
| ASSEMBLY-ATTRIBUTE0 <i>data</i> to ASSEMBLY-ATTRIBUTE99 <i>data</i> | An attribute for bolt components only. Holds up to 100 attributes per assembly in 100 numbered attribute slots. |
| BEND-RADIUS <i>data</i> | Use on a pulled bend to indicate the required radius. NOTE You can express BEND-RADIUS in either pipe diameters--2D, 3D, 5D, and so on)--or as a measurement in the same units that are declared at the top of the file in the UNITS-CO-ORDS attribute. |
| BOP-ELEVATION <i>data</i> | Use on tees, crosses, bends and elbows to override the standard elevation output with a bottom of pipe elevation. NOTE Express BOP-ELEVATION data in the same units that are declared at the top of the file in the UNITS-CO-ORDS attribute. |

| Attribute | Data Requirements |
|---|--|
| CO-ORDS <i>data</i> | <p>Coordinate data related to the location of the following:</p> <ul style="list-style-type: none"> • Supports • Reinforcement pads • Instrument dials and instrument balloons • Repeat weld identifiers • Bolts not included in association with gaskets or nozzles, such as on pipelines where gaskets are not used <p>Coordinates must be listed in the following order: East/West, North/South, and Elevation. West and South coordinates and all elevations below zero must be preceded by a minus (-) sign. An example of a typical record using MM coordinates is:</p> <p>CO-ORDS 262210.50 16422.55 6410.00</p> |
| COMPONENT-ATTRIBUTE0 <i>data</i> to COMPONENT-ATTRIBUTE99 <i>data</i> | Holds up to 100 attributes per component in 100 numbered attribute slots. |
| COMPONENT-IDENTIFIER <i>data</i> | Distinguishes the component uniquely within the PCF. The COMPONENT-IDENTIFIER attribute is used in conjunction with the MASTER-COMPONENT-IDENTIFIER attribute to define the relationships between parent and child items. |
| COST-FACTOR <i>data</i> | <p>Specifies an explicitly defined value used by Isogen to calculate weld diameter totals. If this attribute is used on one weld, it should be used on all welds in the pipeline. The COST-FACTOR defined for each weld can be output on the isometric drawing Weld List and the Welding reports.</p> <p>NOTE If there are weld(s) in the pipeline that do not have COST-FACTOR defined, the totals are prefixed by the * character.</p> |
| CUT-PIECE-ALLOWANCE <i>data</i> | Required input data is in the form EP1 EP2 and/or a value (in the same units as those used to define the main pipelines coordinates). EP1 refers to end point 1 and EP2 to end point 2 of the pipe or bend. If both ends need to be adjusted, two separate CUT-PIECE-ALLOWANCE records need to be included for EP1 and EP2. This enables you to over-ride Isogen's normal cut piece length calculation. |

| Attribute | Data Requirements |
|--------------------------------------|--|
| CUT-PIECE-LENGTH <i>data</i> | Required input data is a value for the required cut piece length of the pipe or bend (in the same units as those used to define the main pipelines coordinates). This enables you to override Isogen's normal cut piece length calculation. |
| DETAIL-SKETCH-IDENTIFIER <i>data</i> | Required input data is either the name of a cell, which is the detail sketch, in a MicroStation cell library if using DGN format, or the filename of a file containing the sketch definition if using DXF. Nominated sketches are automatically positioned on the plotted isometric. |
| DIAL-FACE-DIRECTION <i>data</i> | Direction of face on instrument dials and balloons. Primary directions only. Valid input data is NORTH, SOUTH, EAST, WEST, UP or DOWN . |
| DIRECTION <i>data</i> | <p>Compound direction message on certain components. Mainly used for skewed spindles and flat directions on eccentric reducers that are in skewed sections of a pipeline.</p> <p>NOTES</p> <ul style="list-style-type: none"> Input associated with the DIRECTION attribute is a user-specified text string that conveys the required orientation direction when output as a message on the plotted isometric. The DIRECTION attribute is mainly used to indicate spindle directions and eccentric reducer flat directions that are not in primary planes. Inputs of the form UP 45 NORTH or U 45 N are in common use and augment the graphical outputs which can only be shown in primary directions. |
| FLANGE-CUT-MINUS <i>data</i> | Used on any flange where a negative cutting allowance is required, such as flange types with SKEYS of FLRC, FLRE, FLSO, and FOSO. Set the required allowance in units as specified at beginning of the file. Allowance is used when calculating cut pipe length. |
| FLANGE-CUT-PLUS <i>data</i> | Used on any flange where a positive cutting allowance is required, such as flange types with SKEYS of FLFL or FLSJ. Set the required allowance in units as specified at beginning of the file. Allowance is used when calculating cut pipe length. |
| FLAT-DIRECTION <i>data</i> | Direction of flat side of eccentric reducers. Primary directions only. Valid input data is NORTH, SOUTH, EAST, WEST, UP or DOWN . |

| Attribute | Data Requirements |
|---|---|
| FLANGE-LEFT-LOOSE <i>data</i> | Input data is ON or OFF . The FLANGE-LEFT-LOOSE attribute can be used as an alternative to the LOOSE-FLANGE attribute. |
| FLOW <i>data</i> | Single digit indicator to identify fluid/gas flow direction through a component. <ul style="list-style-type: none"> ▪ 1 - Flow from first to second end as determined by the sequence of END-POINT coordinates listed for the component. ▪ 2 - Reverse of 1. |
| GASKET-CLASS <i>data</i> GASKET-RATING <i>data</i> | Use either to give a valid gasket SKEY, which identifies the class/rating of special transition gaskets used on fixed length type lined pipe. |
| GEARBOX <i>data</i> | Use to identify gearbox orientation direction. Input data is a user-generated directional information message of any form. |
| LEVEL1 LEVEL2 | No data is required. Used to indicate the connection level on multi-way valves. |
| LOOSE-FLANGE | No data is required. This attribute is a simple trigger to indicate that a flange is to be left loose for fitting at site. |
| MASTER-COMPONENT-IDENTIFIER <i>data</i> | Associates the item as a child of another component. For example, an item with a MASTER-COMONENT-IDENTIFIER attribute of 1 is associated to the component whose COMPONENT-IDENTIFIER attribute is also 1. |
| NAME <i>data</i> TAG <i>data</i> | Use either attribute to identify a component with a user-defined identifier. |
| NAME-DIVIDER <i>data</i> TAG-DIVIDER <i>data</i> | In the case of a typical two-line instrument name, controls the appearance of the dividing line within the instrument naming enclosure. Valid input data is SINGLE-SOLID , DOUBLE-SOLID , SINGLE-DOTTED or DOUBLE-DOTTED . |
| ORIFICE-TAP-DIRECTION <i>data</i> | Direction of tapping connection on orifice plate. Primary directions only. Valid input data is NORTH , SOUTH , EAST , WEST , UP or DOWN . |
| PLANT-AREA <i>data</i> | Plant Area identification number where data is a single digit number in the range 1 to 9. This is used in conjunction with the WASTE attribute and certain Option Control switches to allow variation on the basic wastage factor when calculating pipe lengths in each AREA of a project. |

| Attribute | Data Requirements |
|------------------------------------|--|
| PORT-POINT n | Used on multi-port components where n is the port point number, such as 1 , 2 , and so on. |
| PORT-REFERENCE n | Used on multi-port components where n is the port reference number, such as 1 , 2 , and so on. |
| REPEAT-WELD-IDENTIFIER <i>data</i> | Used for previously allocated weld identifiers at single weld locations. |
| REPEAT-WELD-IDENTIFIER <i>data</i> | Used for previously allocated weld identifier at multiple weld locations. |

| Attribute | Data Requirements |
|---|--|
| REVISION | Indicates at which pipeline revision the component was introduced. Typically, this value is a 1 or 2 alphanumeric character, but a maximum of 56 alphanumeric characters are allowed. Components that have been added in the latest revision of the pipeline should have the same revision as that defined in the Pipeline Header. For more information, see the example in the Notes section at the end of this topic. |
| SLIP-PLATE-TAIL-DIRECTION <i>data</i> | Direction of tail on slip plate, slip ring or spectacle blind. Primary directions only. Valid input data is NORTH, SOUTH, EAST, WEST, UP or DOWN . |
| SPECIAL-STATUS | No data is required. This attribute is a simple trigger to indicate that a component is part of a special status--such as ON HOLD or EXISTING --section of a pipeline and is to be drawn in dotted format. Components with this attribute are fully dimensioned on the isometric. |
| SPINDLE-DIRECTION <i>data</i> | Direction of spindle (operator) on a valve. If direction for spindle is not set, then no spindle is shown on the isometric. Primary directions only. Valid input data is NORTH, SOUTH, EAST, WEST, UP or DOWN . |
| SPINDLE-KEY <i>data</i> | Standard or User-Defined SKEY for spindle shape, such as 01S, 02SP, and so forth. Allows Isogen's default spindle shape to be overridden. |
| SPOOL-ATTRIBUTE1 <i>data</i> to SPOOL-ATTRIBUTE10 <i>data</i> | Holds up to ten attributes per spool in ten numbered attribute slots. The attributes can be listed against any component in the spool. |
| STATUS <i>data</i> | Input data is STANDARD, DOTTED-DIMENSIONED, DOTTED-UNDIMENSIONED or UNDIMENSIONED . This STATUS data attribute can be used as an alternative to the SPECIAL-STATUS, CONTINUATION and UNDIMENSIONED attributes. NOTE Do not use the STATUS attribute on any component where the CONTINUATION attribute is being used. |
| SUPPORT-DIRECTION <i>data</i> | Direction of user-defined support symbol. If direction for this type of support is not set, then no support shape is shown on the isometric. Primary Directions only. Valid input data is NORTH, SOUTH, EAST, WEST, UP or DOWN . |
| THICKNESS/RATING <i>data</i> | For use on WELD components. |

| Attribute | Data Requirements |
|--|--|
| UNDIMENSIONED | <p>No data is required. This attribute is used on the following component types to suppress the dimension that is usually associated with them -</p> <ul style="list-style-type: none"> ▪ A GAP element ▪ A MESSAGE (Separate entry type only.) ▪ A PIPE-SUPPORT |
| UNIQUE-COMPONENT-IDENTIFIER <i>data</i> | Input data is the unique database identifier that is generated by the host system for each component |
| WASTE <i>data</i> | Basic wastage factor to be applied when the software calculates pipe lengths. Factor is expressed as a percentage--1 for 1%, 1.5 for 1.5%, and so on. If attribute is not used, the default is 0% . Used in conjunction with the PLANT-AREA attribute, if set. |
| WEIGHT <i>data</i> | Weight of component or weight per unit length of tube using the units specified at the beginning of the PCF file. |
| WEIGHT1 <i>data</i> WEIGHT2 <i>data</i> | <ul style="list-style-type: none"> ▪ Used in place of WEIGHT on fabricated tees and crosses having un-equal branch bores, such as tee types TEE-SET-ON or TEE-STUB and cross types CROSS-SET-ON or CROSS-STUB. ▪ WEIGHT1 is for BRANCH1 pipe and WEIGHT2 is for BRANCH2 pipe. Weight data value is for the unit length of pipe using the units specified at the beginning of the PCF file. |
| WELDING-ALLOWANCE <i>data</i> | Input data is EP1 , EP2 or BOTH . This attribute is used on a PIPE component record to denote which ends of the pipe are to have any associated field fit weld (FFW) allowances taken from. |
| WELD-REMARK-NUMBER <i>data</i> | <p>Used to associate a text remark with a particular weld. The input data is a remark ID number that is to be extracted from a nominated Remarks file at isometric generation time. The Remark information appears on the isometric in two areas:</p> <ul style="list-style-type: none"> ▪ A cross-reference number against the weld identifier in the weld box. ▪ In a list of remarks that is output at the bottom of the BOM with a cross-reference number against each remark. |
| WELD-SPEC <i>data</i> | Used on a weld component or in association with the REPEAT-WELD-IDENTIFIER attribute to identify a Welding specification. |

| Attribute | Data Requirements |
|------------------------------|---|
| WELD-TYPE <i>data</i> | Text identifier on a weld, as distinct from the weld SKEY or from implied end type. |
| WINDOW-DIRECTION <i>data</i> | Direction of window on sight glass. Primary directions only. |

NOTES

- Weight data (**WEIGHT**, **WEIGHT1**, and **WEIGHT2** attributes) must conform to one of the following three input formats:
 - Integer number (55 625 1350)
 - Real number (55.5 625.0 1350.0)
 - Tons/Tonnes (22T5 99T9 [Maximum] - values given to nearest 0.1)
- When using the Isogen Repeatability function, which makes use of any data that is input using the **REPEAT-WELD-IDENTIFIER** attributes, the **HIGHEST-WELD-NUMBER** attribute must also be included in the Pipeline Header Information block.
- Attributes can be included in any order following the component identifier.
- All attributes are entered one per line and must start in column position five (5).
- The input data must be separated from the attribute identifier by at least one blank character.
- Components that have been added in the latest revision of the pipeline should have the same revision as that defined in the Pipeline Header, as shown in the following example:

```

PIPELINE-REFERENCE HC-83501
      AREA          PIP-835A
      NOMINAL-CLASS 150
      REVISION      2
PIPE
      END-POINT      2384369.0000  6210048.5400  9743.4600  2.0000
      END-POINT      2384369.0000  6210048.5400  10453.7900  2.0000
      MATERIAL-IDENTIFIER 1
      ANGLE          9000
      CATEGORY       FABRICATION
      REVISION      2

```

See also

Pipeline Header Information (on page 20)

Connection and Continuation Attributes (on page 332)

APPENDIX A

Appendix: Minimum Mandatory Standard for a Piping Component File

Collectively, the preceding sections of the *Piping Component File Reference Guide* outline and explain the specific rules regarding content and syntax that must be followed when you create any piping component file (PCF). Careful adherence to these rules and guidelines results in a PCF that works well with Isogen. For more information about the basic rules for content and syntax, see *Piping Component File Content and Syntax* (on page 15).

The minimum mandatory standard outlined in this Appendix is aimed at enhancing the quality of the PCFs that you create so that they are *Isogen Certified*. The *Isogen Certified* badge ensures that the PCF meets the highest standard of quality.

The tables below list those items and attributes that make up the enhanced requirements, along with an explanation as to why each is considered a minimum mandatory standard. Where possible, a cross-reference to a specific section of this document is also included. Use the cross-reference as a resource for obtaining pertinent details about acceptable attribute values, and, in many cases, examples of the associated syntax required when using the pipeline and component attribute in the PCF.

IMPORTANT In all cases, the minimum mandatory standard outlined in this Appendix is to be used with the general mandatory requirements detailed throughout this reference guide.

General Syntax Requirements

| Property | Minimum Mandatory Standard | Explanation |
|--------------------|----------------------------|--|
| Character Encoding | ANSI/MBCS | ANSI/MBCS are the only character encodings or sets that are currently supported. There is no support for Unicode encoding and only limited support for UTF encoding. |
| Format | Wide | Eliminates the requirement to wrap lines at the legacy limit of 80 characters. The intent is to make PCF creation easier. |
| Tolerance | Less than or equal to 1mm | Keeping coordinate data within 1mm decreases the likelihood for disconnections between components. |

The requirement for most of the items listed **Pipeline Header Information**, **Component Information**, and **Material Information** tables below is to ensure that any attribute value that should be known by the modelling software is explicitly stated rather than allowing Isogen to determine the value on its own. This reduces the potential for Isogen to choose a value that is slightly different, particularly in the case of the **START-CO-ORDS** attribute and the Parent component association, resulting in unexpected or unwanted behavior.

Pipeline Header Information

| Standard Attribute | Explanation | Additional Information |
|----------------------|--|---|
| START-CO-ORDS | <p>Provides for clear sequencing of weld, part, and spool numbering along the pipeline. The coordinate that you define must match a suitable component coordinate in the PCF, such as an open external keypoint. The only basic requirement is that the start coordinates are on an open end, as long as it is not the end of a tapped branch.</p> <p>TIP There is a general recommendation that the start point is on the component with the largest bore, which typically results in a better presentation of the pipeline.</p> | <p>For additional information, see the sections listed below.</p> <ul style="list-style-type: none">▪ <i>Pipeline Header Information</i> (on page 20)▪ <i>Coordinates</i> (on page 33) |

Component Information

NOTES

- All components in the PCF are to be stand-alone with the exception of taps. For more information, see *Tap Connections* (on page 87).
- For specific details about the attributes and data requirements for each supported component, *Component Information Sheets* (on page **Error! Bookmark not defined.**).

| Standard Attribute | Explanation | Additional Information |
|-----------------------------|--|--|
| CATEGORY | Defines a basic piping concept of which the modelling software should be aware. Setting it explicitly avoids the reliance on the Isogen default value. | For additional information about defining the CATEGORY attribute, see <i>Allowable Attributes</i> (on page 35). |
| COMPONENT-IDENTIFIER | Provides a placeholder so that the component can be explicitly selected as a parent component using the MASTER-COMPONENT-IDENTIFIER attribute. | For additional information about defining parent/child relationships, see <i>Associated Components</i> (on page 39). |

| Standard Attribute | Explanation | Additional Information |
|--|---|--|
| MASTER-COMPONENT-IDENTIFIER | <p>Establishes an explicit association to the component that uses the COMPONENT-IDENTIFIER reference, thus clearly defining the parent and child relationship.</p> <p>NOTE This attribute is required only for support, bolt, gasket, reinforcement pad, and weld components. Also, any potential out-of-network component must carry the MASTER-COMPONENT-IDENTIFIER attribute.</p> | For additional information about defining parent and child relationships, see <i>Associated Components</i> (on page 39). |
| MATERIAL-IDENTIFIER | Defines an explicit link between the component and its material as listed in the MATERIALS section reference of the PCF. | <p>For additional information about linking a component to a set of material attributes, see the sections listed below.</p> <ul style="list-style-type: none"> ▪ <i>Materials</i> (on page 32). ▪ <i>Material Attributes</i> (on page 70). |
| UNIQUE-COMPONENT-IDENTIFIER/UCI | Serves as a resource for cross-referencing the PCF component to the model/database component. | For additional information, see <i>Allowable Attributes</i> (on page 35). |

Material Information

| Standard Attribute | Explanation | Additional Information |
|----------------------------|--|--|
| MATERIAL-IDENTIFIER | Required when MATERIAL-IDENTIFIER (described in the Component Information table above) is used in the PCF. | <p>For additional information about defining the MATERIAL-IDENTIFIER attribute, see the sections listed below.</p> <ul style="list-style-type: none"> ▪ <i>Materials</i> (on page 32). ▪ <i>Material Attributes</i> (on page 70). |

Example Minimum Mandatory Standard PCF Configurations

Six basic piping configurations typically encountered when modelling piping systems are listed below. Each configuration includes a cross-reference to an example PCF that follows the minimum mandatory standard guidelines.

- **Configuration 1: Simple** (on page 347)
- **Configuration 2: Flanged** (on page 349)
- **Configuration 3: Branched** (on page 353)
- **Configuration 4: Welded** (on page 358)
- **Configuration 5: Concept-Based** (on page 362)
- **Configuration 6: Bypass** (on page 368)

Configuration 1: Simple

| | | | | | |
|----------------------|--|------------|------------|--------|--|
| ISOGEN-FILES | ISOGEN.FLS | | | | |
| UNITS-BORE | INCH | | | | |
| UNITS-CO-ORDS | MM | | | | |
| UNITS-BOLT-LENGTH | MM | | | | |
| UNITS-BOLT-DIA | MM | | | | |
| UNITS-WEIGHT | KGS | | | | |
| PIPELINE-REFERENCE | CFG1 | | | | |
| PIPING-SPEC | CS150 | | | | |
| START-CO-ORDS | 0.0000 | 0.0000 | 0.0000 | | |
| PIPE | | | | | |
| COMPONENT-IDENTIFIER | 1 | | | | |
| END-POINT | 0.0000 | 0.0000 | 0.0000 | 6.0000 | |
| END-POINT | 0.0000 | -1200.0000 | 0.0000 | 6.0000 | |
| MATERIAL-IDENTIFIER | 1 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 269E585C-87F9-477A-A2E6-E95A023FA472 | | | | |
| ELBOW | | | | | |
| COMPONENT-IDENTIFIER | 3 | | | | |
| END-POINT | 0.0000 | -1200.0000 | 0.0000 | 6.0000 | |
| END-POINT | 0.0000 | -1428.6000 | -228.6000 | 6.0000 | |
| CENTRE-POINT | 0.0000 | -1428.6000 | 0.0000 | | |
| SKEY | ELBW | | | | |
| MATERIAL-IDENTIFIER | 2 | | | | |
| ANGLE | 9000 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 1DD7CDA9-306B-4A58-9D1F-FC992D66FD20 | | | | |
| PIPE | | | | | |
| COMPONENT-IDENTIFIER | 2 | | | | |
| END-POINT | 0.0000 | -1428.6000 | -228.6000 | 6.0000 | |
| END-POINT | 0.0000 | -1428.6000 | -1228.6000 | 6.0000 | |
| MATERIAL-IDENTIFIER | 1 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 926CFEE2-460E-470E-8A45-C526C8C63999 | | | | |
| MATERIALS | | | | | |
| MATERIAL-IDENTIFIER | 1 | | | | |
| ITEM-CODE | PA5BSTD | | | | |
| DESCRIPTION | PIPE, CS API 5L SML, GRD B, STD WT | | | | |
| MATERIAL-IDENTIFIER | 2 | | | | |
| ITEM-CODE | EEL90CFSTD-LBW | | | | |
| DESCRIPTION | ELBOW, 90 DEG, FRG CS A234 WPB, STD WT, LR, BW | | | | |

Configuration 2: Flanged

| | | | | | |
|-----------------------------|--------------------------------------|------------|--------|--------|--|
| ISOGEN-FILES | ISOGEN.FLS | | | | |
| UNITS-BORE | INCH | | | | |
| UNITS-CO-ORDS | MM | | | | |
| UNITS-BOLT-LENGTH | MM | | | | |
| UNITS-BOLT-DIA | MM | | | | |
| UNITS-WEIGHT | KGS | | | | |
| PIPELINE-REFERENCE | CFG2 | | | | |
| PIPING-SPEC | CS150 | | | | |
| START-CO-ORDS | 0.0000 | 0.0000 | 0.0000 | | |
| GASKET | | | | | |
| COMPONENT-IDENTIFIER | 4 | | | | |
| MASTER-COMPONENT-IDENTIFIER | 5 | | | | |
| END-POINT | 0.0000 | -1.5700 | 0.0000 | 6.0000 | |
| END-POINT | 0.0000 | 0.0000 | 0.0000 | 6.0000 | |
| MATERIAL-IDENTIFIER | 1 | | | | |
| CATEGORY | ERECTION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 0B549D76-7C87-440D-A029-4FD6F0BF1549 | | | | |
| FLANGE | | | | | |
| COMPONENT-IDENTIFIER | 5 | | | | |
| END-POINT | 0.0000 | -1.5700 | 0.0000 | 6.0000 | |
| END-POINT | 0.0000 | -90.4700 | 0.0000 | 6.0000 | |
| SKEY | FLWN | | | | |
| MATERIAL-IDENTIFIER | 2 | | | | |
| CATEGORY | FABRICATION | | | | |
| FLANGE-LEFT-LOOSE | OFF | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 1DD6E25E-F9C7-4062-90CE-7EEA434A8A33 | | | | |
| BOLT | | | | | |
| COMPONENT-IDENTIFIER | 15 | | | | |
| MASTER-COMPONENT-IDENTIFIER | 5 | | | | |
| CO-ORDS | 0.0000 | -1.5700 | 0.0000 | | |
| BOLT-DIA | 19.05 | | | | |
| BOLT-LENGTH | 107.95 | | | | |
| BOLT-QUANTITY | 8 | | | | |
| CATEGORY | ERECTION | | | | |
| MATERIAL-IDENTIFIER | 3 | | | | |
| UCI | DAADD68C-BC23-4D3D-9D42-8E3FD3D831C9 | | | | |
| PIPE | | | | | |
| COMPONENT-IDENTIFIER | 1 | | | | |
| END-POINT | 0.0000 | -90.4700 | 0.0000 | 6.0000 | |
| END-POINT | 0.0000 | -1590.4700 | 0.0000 | 6.0000 | |
| MATERIAL-IDENTIFIER | 4 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 93F75F61-F894-4CA4-9D55-02D37821B589 | | | | |

FLANGE

| | | | | |
|----------------------|--------------------------------------|------------|--------|--------|
| COMPONENT-IDENTIFIER | 9 | | | |
| END-POINT | 0.0000 | -1596.8200 | 0.0000 | 6.0000 |
| END-POINT | 0.0000 | -1590.4700 | 0.0000 | 6.0000 |
| SKEY | FLSO | | | |
| MATERIAL-IDENTIFIER | 5 | | | |
| CATEGORY | FABRICATION | | | |
| FLANGE-LEFT-LOOSE | OFF | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | E68D1B29-ED82-40EF-AC24-2044322EDDAA | | | |

BOLT

| | | | | |
|-----------------------------|--------------------------------------|------------|--------|--|
| COMPONENT-IDENTIFIER | 16 | | | |
| MASTER-COMPONENT-IDENTIFIER | 9 | | | |
| CO-ORDS | 0.0000 | -1596.8200 | 0.0000 | |
| BOLT-DIA | 19.05 | | | |
| BOLT-LENGTH | 107.95 | | | |
| BOLT-QUANTITY | 8 | | | |
| CATEGORY | ERECTION | | | |
| MATERIAL-IDENTIFIER | 3 | | | |
| UCI | 83A203AE-9876-47D0-898C-9698A93C3893 | | | |

GASKET

| | | | | |
|-----------------------------|--------------------------------------|------------|--------|--------|
| COMPONENT-IDENTIFIER | 8 | | | |
| MASTER-COMPONENT-IDENTIFIER | 9 | | | |
| END-POINT | 0.0000 | -1596.8200 | 0.0000 | 6.0000 |
| END-POINT | 0.0000 | -1598.3900 | 0.0000 | 6.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 446A6C28-DD98-4BC9-AE0D-5F8B6A74EC78 | | | |

VALVE

| | | | | |
|----------------------|--------------------------------------|------------|--------|--------|
| COMPONENT-IDENTIFIER | 2 | | | |
| END-POINT | 0.0000 | -2004.7900 | 0.0000 | 6.0000 |
| END-POINT | 0.0000 | -1598.3900 | 0.0000 | 6.0000 |
| SKEY | VGFL | | | |
| MATERIAL-IDENTIFIER | 6 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| SPINDLE-DIRECTION | UP | | | |
| UCI | 1BE70ED0-4D7A-414F-BFFE-E6AD4408B8AF | | | |

BOLT

| | | | | |
|-----------------------------|--------------------------------------|------------|--------|--|
| COMPONENT-IDENTIFIER | 14 | | | |
| MASTER-COMPONENT-IDENTIFIER | 7 | | | |
| CO-ORDS | 0.0000 | -2004.7900 | 0.0000 | |
| BOLT-DIA | 19.05 | | | |
| BOLT-LENGTH | 107.95 | | | |
| BOLT-QUANTITY | 8 | | | |
| CATEGORY | ERECTION | | | |
| MATERIAL-IDENTIFIER | 3 | | | |
| UCI | 0D92716C-DDEB-4A18-8945-580DDF3F63DF | | | |

GASKET

COMPONENT-IDENTIFIER 6
 MASTER-COMPONENT-IDENTIFIER 7
 END-POINT 0.0000 -2006.3600 0.0000 6.0000
 END-POINT 0.0000 -2004.7900 0.0000 6.0000
 MATERIAL-IDENTIFIER 1
 CATEGORY ERECTION
 PIPING-SPEC CS150
 UCI E7883C0D-AD17-4DD1-B69E-5427150B6F6E

FLANGE

COMPONENT-IDENTIFIER 7
 END-POINT 0.0000 -2006.3600 0.0000 6.0000
 END-POINT 0.0000 -2012.7100 0.0000 6.0000
 SKEY FL50
 MATERIAL-IDENTIFIER 5
 CATEGORY FABRICATION
 FLANGE-LEFT-LOOSE OFF
 PIPING-SPEC CS150
 UCI 6F5C3BF0-D752-40E8-9CFE-E08E4A57FBAE

PIPE

COMPONENT-IDENTIFIER 3
 END-POINT 0.0000 -2012.7100 0.0000 6.0000
 END-POINT 0.0000 -3212.7100 0.0000 6.0000
 MATERIAL-IDENTIFIER 4
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI 226675FB-4D4E-4650-83A6-BA34F500C89F

FLANGE

COMPONENT-IDENTIFIER 11
 END-POINT 0.0000 -3301.6100 0.0000 6.0000
 END-POINT 0.0000 -3212.7100 0.0000 6.0000
 SKEY FLWN
 MATERIAL-IDENTIFIER 2
 CATEGORY FABRICATION
 FLANGE-LEFT-LOOSE OFF
 PIPING-SPEC CS150
 UCI 7FF26EF9-4DB4-4956-B6E1-251EC5C95EFA

BOLT

COMPONENT-IDENTIFIER 17
 MASTER-COMPONENT-IDENTIFIER 11
 CO-ORDS 0.0000 -3301.6100 0.0000
 BOLT-DIA 19.05
 BOLT-LENGTH 107.95
 BOLT-QUANTITY 8
 CATEGORY ERECTION
 MATERIAL-IDENTIFIER 3
 UCI 7C59D3B2-04C0-4EE1-AD0C-C76BC84687D1

GASKET

COMPONENT-IDENTIFIER 10
MASTER-COMPONENT-IDENTIFIER 11
END-POINT 0.0000 -3301.6100 0.0000 6.0000
END-POINT 0.0000 -3303.1800 0.0000 6.0000
MATERIAL-IDENTIFIER 1
CATEGORY ERECTION
PIPING-SPEC CS150
UCI 5E4F1F46-9E86-40CF-91F7-8475EB77B259

MATERIALS

MATERIAL-IDENTIFIER 1
ITEM-CODE GCA150-RG2
DESCRIPTION GASKET, CAF, 150#, RING, 1/16 IN
MATERIAL-IDENTIFIER 2
ITEM-CODE FCD150-WNRSTD
DESCRIPTION FLANGE, CS ASTM A105, 150#, WN, RF, STD WT
MATERIAL-IDENTIFIER 3
ITEM-CODE BSBS0.75X4.25
DESCRIPTION STUD BOLT, SS 1% CR MO, EACH WITH TWO WASHERS AND HEAVY
HEX NUTS 0.75 X 4.25
MATERIAL-IDENTIFIER 4
ITEM-CODE PA5BSTD
DESCRIPTION PIPE, CS API 5L SML, GRD B, STD WT
MATERIAL-IDENTIFIER 5
ITEM-CODE FCD150-SOR
DESCRIPTION FLANGE, CS ASTM A105, 150#, SO, RF
MATERIAL-IDENTIFIER 6
ITEM-CODE VVGCF150-FLO
DESCRIPTION VALVE, GLOBE, CS ASTM A234, 150#, FL, OS&Y

Configuration 3: Branched

| | | | | | |
|-------------------------|--------------------------------------|-----------|--------|---------|--|
| ISOGEN-FILES | ISOGEN.FLS | | | | |
| UNITS-BORE | INCH | | | | |
| UNITS-CO-ORDS | MM | | | | |
| UNITS-BOLT-LENGTH | MM | | | | |
| UNITS-BOLT-DIA | MM | | | | |
| UNITS-WEIGHT | KGS | | | | |
| PIPELINE-REFERENCE | CFG3 | | | | |
| PIPING-SPEC | CS150 | | | | |
| WELD-PREFIX-FABRICATION | F | | | | |
| START-CO-ORDS | 0.0000 | 0.0000 | 0.0000 | | |
| PIPE | | | | | |
| COMPONENT-IDENTIFIER | 9 | | | | |
| END-POINT | 0.0000 | 0.0000 | 0.0000 | 18.0000 | |
| END-POINT | 1033.8600 | 0.0000 | 0.0000 | 18.0000 | |
| MATERIAL-IDENTIFIER | 1 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 46AF59AE-17F6-436F-8CB5-6D35EB7FDAFF | | | | |
| TEE | | | | | |
| COMPONENT-IDENTIFIER | 52 | | | | |
| END-POINT | 1033.8600 | 0.0000 | 0.0000 | 18.0000 | |
| END-POINT | 1719.6600 | 0.0000 | 0.0000 | 18.0000 | |
| CENTRE-POINT | 1376.7600 | 0.0000 | 0.0000 | | |
| BRANCH1-POINT | 1376.7600 | 342.9000 | 0.0000 | 18.0000 | |
| SKEY | TEBW | | | | |
| MATERIAL-IDENTIFIER | 2 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 7ED29C62-F596-400D-B1FB-1768E430F962 | | | | |
| PIPE | | | | | |
| COMPONENT-IDENTIFIER | 53 | | | | |
| END-POINT | 1719.6600 | 0.0000 | 0.0000 | 18.0000 | |
| END-POINT | 4185.7997 | 0.0000 | 0.0000 | 18.0000 | |
| MATERIAL-IDENTIFIER | 1 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 934FB304-5AA5-4F2A-8F11-BA03132C5F09 | | | | |
| PIPE | | | | | |
| COMPONENT-IDENTIFIER | 51 | | | | |
| END-POINT | 1376.7600 | 342.9000 | 0.0000 | 18.0000 | |
| END-POINT | 1376.7600 | 1842.9000 | 0.0000 | 18.0000 | |
| MATERIAL-IDENTIFIER | 1 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | E45C0339-22A6-4F22-82F4-2FB12AE7303B | | | | |

OLET

| | | | | |
|----------------------|--------------------------------------|--------|----------|--------|
| COMPONENT-IDENTIFIER | 11 | | | |
| CENTRE-POINT | 2935.7997 | 0.0000 | 0.0000 | 3.0000 |
| BRANCH1-POINT | 2935.7997 | 0.0000 | 273.0500 | 3.0000 |
| MATERIAL-IDENTIFIER | 3 | | | |
| SKEY | WTBW | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | BB05DBCB-9821-4E2E-8024-3ED28E30A939 | | | |

WELD

| | | | | |
|-----------------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 38 | | | |
| MASTER-COMPONENT-IDENTIFIER | 11 CP | | | |
| END-POINT | 2935.7997 | 0.0000 | 0.0000 | 3.0000 |
| END-POINT | 2935.7997 | 0.0000 | 0.0000 | 3.0000 |
| SKEY | WW | | | |
| ITEM-DESCRIPTION | WELD - WORKSHOP WELD | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | C15EC39C-2832-48E6-AFF6-A19D72CF2B7A | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|--------|-----------|--------|
| COMPONENT-IDENTIFIER | 10 | | | |
| END-POINT | 2935.7997 | 0.0000 | 273.0500 | 3.0000 |
| END-POINT | 2935.7997 | 0.0000 | 1129.4100 | 3.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | D4C795BA-1301-469E-B821-76B7642F2E9D | | | |

TEE-SET-ON

| | | | | |
|----------------------|--------------------------------------|--------|----------|--------|
| COMPONENT-IDENTIFIER | 25 | | | |
| CENTRE-POINT | 3728.4997 | 0.0000 | 0.0000 | 3.0000 |
| BRANCH1-POINT | 3728.4997 | 0.0000 | -38.1000 | 3.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| SKEY | TESO | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | F112247A-A758-4D0A-9592-F7707E2EB54B | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|--------|-----------|--------|
| COMPONENT-IDENTIFIER | 22 | | | |
| END-POINT | 3728.4997 | 0.0000 | -38.1000 | 3.0000 |
| END-POINT | 3728.4997 | 0.0000 | -727.8600 | 3.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | D4E664F6-89D0-4AB8-A296-B85D731EE4E4 | | | |

FLANGE

| | | | | |
|----------------------|--------------------------------------|--------|-----------|--------|
| COMPONENT-IDENTIFIER | 42 | | | |
| END-POINT | 3728.4997 | 0.0000 | -796.2100 | 3.0000 |
| END-POINT | 3728.4997 | 0.0000 | -727.8600 | 3.0000 |
| SKEY | FLWN | | | |
| MATERIAL-IDENTIFIER | 4 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 1E1665A0-6E06-49C5-9A0C-92B680645947 | | | |

BOLT

COMPONENT-IDENTIFIER 50
 MASTER-COMPONENT-IDENTIFIER 42
 CO-ORDS 3728.4997 0.0000 -796.2100
 BOLT-DIA 15.88
 BOLT-LENGTH 95.25
 BOLT-QUANTITY 4
 CATEGORY ERECTION
 MATERIAL-IDENTIFIER 5
 UCI EE63CE5C-D63C-4A8E-BA11-8D18A5093321

GASKET

COMPONENT-IDENTIFIER 48
 MASTER-COMPONENT-IDENTIFIER 42
 END-POINT 3728.4997 0.0000 -796.2100 3.0000
 END-POINT 3728.4997 0.0000 -797.7800 3.0000
 MATERIAL-IDENTIFIER 6
 CATEGORY ERECTION
 PIPING-SPEC CS150
 UCI C2011C71-B00A-4650-9B76-3D81313FABAD

VALVE

COMPONENT-IDENTIFIER 30
 END-POINT 3728.4997 0.0000 -797.7800 3.0000
 END-POINT 3728.4997 0.0000 -1037.5100 3.0000
 CENTRE-POINT 3728.4997 0.0000 -918.4300
 SKEY VGFL
 MATERIAL-IDENTIFIER 7
 CATEGORY ERECTION
 PIPING-SPEC CS150
 SPINDLE-DIRECTION NORTH
 UCI 2A7EBE8F-1A1C-4994-81FE-FD87BBE8D067
 TAP-CONNECTION
 CO-ORDS 3728.4997 0.0000 -797.7800 1.0000 BW

BOLT

COMPONENT-IDENTIFIER 49
 MASTER-COMPONENT-IDENTIFIER 44
 CO-ORDS 3728.4997 0.0000 -1037.5100
 BOLT-DIA 15.88
 BOLT-LENGTH 95.25
 BOLT-QUANTITY 4
 CATEGORY ERECTION
 MATERIAL-IDENTIFIER 5
 UCI 044A87C9-FB8E-43E5-9252-D6D7213BF474

GASKET

COMPONENT-IDENTIFIER 47
 MASTER-COMPONENT-IDENTIFIER 44
 END-POINT 3728.4997 0.0000 -1037.5100 3.0000
 END-POINT 3728.4997 0.0000 -1039.0800 3.0000
 MATERIAL-IDENTIFIER 6
 CATEGORY ERECTION
 PIPING-SPEC CS150
 UCI 0C0A1DD6-4973-46B8-A819-085255CA4FB4

FLANGE

| | | | | |
|----------------------|--------------------------------------|--------|------------|--------|
| COMPONENT-IDENTIFIER | 44 | | | |
| END-POINT | 3728.4997 | 0.0000 | -1109.0000 | 3.0000 |
| END-POINT | 3728.4997 | 0.0000 | -1039.0800 | 3.0000 |
| SKEY | FLWN | | | |
| MATERIAL-IDENTIFIER | 4 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 3622DDEB-D0F5-4F2A-931E-B045B21A041B | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|--------|------------|--------|
| COMPONENT-IDENTIFIER | 45 | | | |
| END-POINT | 3728.4997 | 0.0000 | -1109.0000 | 3.0000 |
| END-POINT | 3728.4997 | 0.0000 | -1481.1000 | 3.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | D428121E-7BD4-47DC-B1BF-401CC8BB8BA7 | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|-----------|-----------|--------|
| COMPONENT-IDENTIFIER | 57 | | | |
| END-POINT | 3728.4997 | 0.0000 | -797.7800 | 1.0000 |
| END-POINT | 3728.4997 | -150.0000 | -797.7800 | 1.0000 |
| MATERIAL-IDENTIFIER | 8 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 6657112C-3E3A-4505-ADD1-540AFD501B6F | | | |

ELBOW

| | | | | |
|----------------------|--------------------------------------|-----------|-----------|--------|
| COMPONENT-IDENTIFIER | 59 | | | |
| END-POINT | 3728.4997 | -150.0000 | -797.7800 | 1.0000 |
| END-POINT | 3728.4997 | -173.8100 | -821.5900 | 1.0000 |
| CENTRE-POINT | 3728.4997 | -173.8100 | -797.7800 | |
| SKEY | ELSW | | | |
| MATERIAL-IDENTIFIER | 9 | | | |
| ANGLE | 9000 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 9298B4F6-28BB-48FC-A141-2D0CEA9BA335 | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|-----------|-----------|--------|
| COMPONENT-IDENTIFIER | 58 | | | |
| END-POINT | 3728.4997 | -173.8100 | -821.5900 | 1.0000 |
| END-POINT | 3728.4997 | -173.8100 | -871.5900 | 1.0000 |
| MATERIAL-IDENTIFIER | 8 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 758D5396-4401-4D01-95FA-F0B94A82777B | | | |

MATERIALS

MATERIAL-IDENTIFIER 1

| | |
|-------------|------------------------------------|
| ITEM-CODE | PA5BSTD |
| DESCRIPTION | PIPE, CS API 5L SML, GRD B, STD WT |

MATERIAL-IDENTIFIER 2

| | |
|-------------|--------------------------------------|
| ITEM-CODE | T1ECFSTD-BW |
| DESCRIPTION | TEE, EQ, FRG CS A234 WPB, STD WT, BW |

MATERIAL-IDENTIFIER 3

| | |
|-------------|---------------------------------------|
| ITEM-CODE | OWDBWCFSTD |
| DESCRIPTION | WELDOLET, BW, FRG CS A234 WPB, STD WT |

MATERIAL-IDENTIFIER 4

| | |
|-------------|--|
| ITEM-CODE | FCD150-WNRSTD |
| DESCRIPTION | FLANGE, CS ASTM A105, 150#, WN, RF, STD WT |

MATERIAL-IDENTIFIER 5

ITEM-CODE BSBS0.625X3.75

DESCRIPTION STUD BOLT, SS 1% CR MO, EACH WITH TWO WASHERS AND HEAVY
HEX

NUTS 0.625 X 3.75

MATERIAL-IDENTIFIER 6

ITEM-CODE GCA150-RG2

DESCRIPTION GASKET, CAF, 150#, RING, 1/16 IN

MATERIAL-IDENTIFIER 7

ITEM-CODE VVGCF150-FLO

DESCRIPTION VALVE, GLOBE, CS ASTM A234, 150#, FL, OS&Y

MATERIAL-IDENTIFIER 8

ITEM-CODE PA5BXS

DESCRIPTION PIPE, CS API 5L SML, GRD B, X-STG

MATERIAL-IDENTIFIER 9

ITEM-CODE EEL90CF3000SW

DESCRIPTION ELBOW, 90 DEG, FRG CS A234 WPB, 3000#, SW

Configuration 4: Welded

| | | | | | |
|-----------------------------|--------------------------------------|------------|----------|--------|--|
| ISOGEN-FILES | ISOGEN.FLS | | | | |
| UNITS-BORE | INCH | | | | |
| UNITS-CO-ORDS | MM | | | | |
| UNITS-BOLT-LENGTH | MM | | | | |
| UNITS-BOLT-DIA | MM | | | | |
| UNITS-WEIGHT | KGS | | | | |
| PIPELINE-REFERENCE | CFG4 | | | | |
| PIPING-SPEC | CS150 | | | | |
| START-CO-ORDS | 0.0000 | 0.0000 | 0.0000 | | |
| HIGHEST-WELD-NUMBER | 1 6 | | | | |
| HIGHEST-SUPPORT-WELD-NUMBER | 1 0 | | | | |
| PIPE | | | | | |
| COMPONENT-IDENTIFIER | 2 | | | | |
| END-POINT | 0.0000 | 0.0000 | 0.0000 | 2.0000 | |
| END-POINT | 0.0000 | -1500.0000 | 0.0000 | 2.0000 | |
| MATERIAL-IDENTIFIER | 1 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| REPEAT-PART-NUMBER | 1 | | | | |
| UCI | A008540C-9703-4E63-ADB6-E6BAC47474DE | | | | |
| END-POSITION-NULL | | | | | |
| CO-ORDS | 0.0000 | 0.0000 | 0.0000 | | |
| WELD | | | | | |
| COMPONENT-IDENTIFIER | 3 | | | | |
| MASTER-COMPONENT-IDENTIFIER | 4 | | | | |
| END-POINT | 0.0000 | -1500.0000 | 0.0000 | 2.0000 | |
| END-POINT | 0.0000 | -1500.0000 | 0.0000 | 2.0000 | |
| SKEY | WW | | | | |
| MATERIAL-IDENTIFIER | 2 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| REPEAT-WELD-IDENTIFIER | 1 | | | | |
| WELD-TYPE | BW | | | | |
| UCI | C3C2CED9-ABF8-43C0-B89B-2950455EBA0F | | | | |
| ELBOW | | | | | |
| COMPONENT-IDENTIFIER | 4 | | | | |
| END-POINT | 0.0000 | -1500.0000 | 0.0000 | 2.0000 | |
| END-POINT | 0.0000 | -1576.2000 | -76.2000 | 2.0000 | |
| CENTRE-POINT | 0.0000 | -1576.2000 | 0.0000 | | |
| SKEY | ELBW | | | | |
| MATERIAL-IDENTIFIER | 3 | | | | |
| ANGLE | 9000 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| REPEAT-PART-NUMBER | 4 | | | | |
| UCI | B8D43FB0-C0A6-4A76-8BBA-785722253BA7 | | | | |

WELD

COMPONENT-IDENTIFIER 6
 MASTER-COMPONENT-IDENTIFIER 4
 END-POINT 0.0000 -1576.2000 -76.2000 2.0000
 END-POINT 0.0000 -1576.2000 -76.2000 2.0000
 SKEY WW
 MATERIAL-IDENTIFIER 2
 CATEGORY FABRICATION
 MATERIAL-LIST EXCLUDE
 PIPING-SPEC CS150
 REPEAT-WELD-IDENTIFIER 2
 WELD-TYPE BW
 UCI 8D7F601C-7E70-4F76-B881-D6B04F026C74

PIPE

COMPONENT-IDENTIFIER 7
 END-POINT 0.0000 -1576.2000 -76.2000 2.0000
 END-POINT 0.0000 -1576.2000 -1076.2000 2.0000
 MATERIAL-IDENTIFIER 1
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 REPEAT-PART-NUMBER 1
 UCI F2037B8D-2ABF-4107-B1FA-279A952B3AA7

WELD

COMPONENT-IDENTIFIER 8
 MASTER-COMPONENT-IDENTIFIER 9
 END-POINT 0.0000 -1576.2000 -1076.2000 2.0000
 END-POINT 0.0000 -1576.2000 -1076.2000 2.0000
 SKEY WW
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 REPEAT-WELD-IDENTIFIER 3
 WELD-TYPE BW
 UCI FC225B61-D1CF-4180-9CA0-D9F94EEA41C6

REDUCER-CONCENTRIC

COMPONENT-IDENTIFIER 9
 END-POINT 0.0000 -1576.2000 -1076.2000 2.0000
 END-POINT 0.0000 -1576.2000 -1152.4000 1.5000
 SKEY RCBW
 MATERIAL-IDENTIFIER 4
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 REPEAT-PART-NUMBER 3
 UCI 2BD498B6-104E-47AD-8B56-E5B822F86FCC

WELD

COMPONENT-IDENTIFIER 11
 MASTER-COMPONENT-IDENTIFIER 9
 END-POINT 0.0000 -1576.2000 -1152.4000 1.5000
 END-POINT 0.0000 -1576.2000 -1152.4000 1.5000
 SKEY WW
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 REPEAT-WELD-IDENTIFIER 4
 WELD-TYPE BW
 UCI 8E1BBD1F-3B07-4670-B7DC-96AB487CF28D

PIPE

| | | | | |
|----------------------|--------------------------------------|------------|------------|--------|
| COMPONENT-IDENTIFIER | 12 | | | |
| END-POINT | 0.0000 | -1576.2000 | -1152.4000 | 1.5000 |
| END-POINT | 0.0000 | -1576.2000 | -2152.4000 | 1.5000 |
| MATERIAL-IDENTIFIER | 5 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| REPEAT-PART-NUMBER | 2 | | | |
| UCI | 4AE120EC-E62C-497C-98E8-580CF9DC9841 | | | |

WELD

| | | | | |
|-----------------------------|--------------------------------------|------------|------------|--------|
| COMPONENT-IDENTIFIER | 13 | | | |
| MASTER-COMPONENT-IDENTIFIER | 14 | | | |
| END-POINT | 0.0000 | -1576.2000 | -2152.4000 | 1.5000 |
| END-POINT | 0.0000 | -1576.2000 | -2152.4000 | 1.5000 |
| SKEY | WW | | | |
| MATERIAL-IDENTIFIER | 2 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| REPEAT-WELD-IDENTIFIER | 5 | | | |
| WELD-TYPE | SW | | | |
| UCI | 8654A43C-83B2-41B0-941A-5900D9C719A7 | | | |

ELBOW

| | | | | |
|----------------------|--------------------------------------|------------|------------|--------|
| COMPONENT-IDENTIFIER | 14 | | | |
| END-POINT | 0.0000 | -1576.2000 | -2152.4000 | 1.5000 |
| END-POINT | 0.0000 | -1609.5400 | -2185.7400 | 1.5000 |
| CENTRE-POINT | 0.0000 | -1576.2000 | -2185.7400 | |
| SKEY | ELSW | | | |
| MATERIAL-IDENTIFIER | 6 | | | |
| ANGLE | 9000 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| REPEAT-PART-NUMBER | 5 | | | |
| UCI | 73715027-5023-4B7A-9ADF-7D84D9ED93AF | | | |

WELD

| | | | | |
|-----------------------------|--------------------------------------|------------|------------|--------|
| COMPONENT-IDENTIFIER | 16 | | | |
| MASTER-COMPONENT-IDENTIFIER | 14 | | | |
| END-POINT | 0.0000 | -1609.5400 | -2185.7400 | 1.5000 |
| END-POINT | 0.0000 | -1609.5400 | -2185.7400 | 1.5000 |
| SKEY | WW | | | |
| MATERIAL-IDENTIFIER | 2 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| REPEAT-WELD-IDENTIFIER | 6 | | | |
| WELD-TYPE | SW | | | |
| UCI | F35970E0-E595-452E-A54D-7AC8CD30ED5D | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|------------|------------|--------|
| COMPONENT-IDENTIFIER | 17 | | | |
| END-POINT | 0.0000 | -1609.5400 | -2185.7400 | 1.5000 |
| END-POINT | 0.0000 | -3109.5400 | -2185.7400 | 1.5000 |
| MATERIAL-IDENTIFIER | 5 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| REPEAT-PART-NUMBER | 2 | | | |
| UCI | E9C8249C-E53A-4AD6-A3A4-540639EC3C28 | | | |
| END-POSITION-NULL | | | | |
| CO-ORDS | 0.0000 | -3109.5400 | -2185.7400 | |

MATERIALS

| | |
|---------------------|--|
| MATERIAL-IDENTIFIER | 1 |
| ITEM-CODE | PA5BSTD |
| DESCRIPTION | PIPE, CS API 5L SML, GRD B, STD WT |
| MATERIAL-IDENTIFIER | 2 |
| ITEM-CODE | WW |
| DESCRIPTION | WELD - WORKSHOP WELD |
| MATERIAL-IDENTIFIER | 3 |
| ITEM-CODE | EEL90CFSTD-LBW |
| DESCRIPTION | ELBOW, 90 DEG, FRG CS A234 WPB, STD WT, LR, BW |
| MATERIAL-IDENTIFIER | 4 |
| ITEM-CODE | RRCFSXX-BW |
| DESCRIPTION | REDUCER CONC, FRG CS A234 WPB, SCH STD X X-STG, BW |
| MATERIAL-IDENTIFIER | 5 |
| ITEM-CODE | PA5BXS |
| DESCRIPTION | PIPE, CS API 5L SML, GRD B, X-STG |
| MATERIAL-IDENTIFIER | 6 |
| ITEM-CODE | EEL90CF3000SW |
| DESCRIPTION | ELBOW, 90 DEG, FRG CS A234 WPB, 3000#, SW |

Configuration 5: Concept-Based

| | | | | | |
|-----------------------------|--------------------------------------|-----------|------------|--------|--|
| ISOGEN-FILES | ISOGEN.FLS | | | | |
| UNITS-BORE | INCH | | | | |
| UNITS-CO-ORDS | MM | | | | |
| UNITS-BOLT-LENGTH | MM | | | | |
| UNITS-BOLT-DIA | MM | | | | |
| UNITS-WEIGHT | KGS | | | | |
| PIPELINE-REFERENCE | CFG5 | | | | |
| PIPING-SPEC | CS150 | | | | |
| START-CO-ORDS | 0.0000 | 0.0000 | 0.0000 | | |
| GASKET | | | | | |
| COMPONENT-IDENTIFIER | 59 | | | | |
| MASTER-COMPONENT-IDENTIFIER | 60 | | | | |
| END-POINT | 0.0000 | 0.0000 | -1.5700 | 6.0000 | |
| END-POINT | 0.0000 | 0.0000 | 0.0000 | 6.0000 | |
| MATERIAL-IDENTIFIER | 1 | | | | |
| CATEGORY | ERECTION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | D123B8E5-4D1F-4483-B242-1FCCD5D6C7BA | | | | |
| FLANGE | | | | | |
| COMPONENT-IDENTIFIER | 60 | | | | |
| END-POINT | 0.0000 | 0.0000 | -1.5700 | 6.0000 | |
| END-POINT | 0.0000 | 0.0000 | -90.4700 | 6.0000 | |
| SKEY | FLWN | | | | |
| MATERIAL-IDENTIFIER | 2 | | | | |
| CATEGORY | FABRICATION | | | | |
| FLANGE-LEFT-LOOSE | OFF | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 4A8E40B3-5206-4FBF-B62E-5A27277D40BC | | | | |
| PIPE | | | | | |
| COMPONENT-IDENTIFIER | 25 | | | | |
| END-POINT | 0.0000 | 0.0000 | -90.4700 | 6.0000 | |
| END-POINT | 0.0000 | 0.0000 | -1590.4700 | 6.0000 | |
| MATERIAL-IDENTIFIER | 3 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 26A505DB-C67C-4322-B49D-5965828F33CE | | | | |
| ELBOW | | | | | |
| COMPONENT-IDENTIFIER | 27 | | | | |
| END-POINT | 0.0000 | 0.0000 | -1590.4700 | 6.0000 | |
| END-POINT | 0.0000 | -224.6104 | -1819.0352 | 6.0000 | |
| CENTRE-POINT | 0.0000 | 0.0000 | -1815.1146 | | |
| SKEY | ELBW | | | | |
| MATERIAL-IDENTIFIER | 4 | | | | |
| ANGLE | 8900 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 02113485-9600-4488-A00E-93ABC19D2FAF | | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|------------|------------|--------|
| COMPONENT-IDENTIFIER | 42 | | | |
| END-POINT | 0.0000 | -224.6104 | -1819.0352 | 6.0000 |
| END-POINT | 0.0000 | -1424.4300 | -1839.9781 | 6.0000 |
| MATERIAL-IDENTIFIER | 3 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 789ACB33-8FDE-4F0F-BB56-8F35242B073B | | | |

FLANGE

| | | | | |
|----------------------|--------------------------------------|------------|------------|--------|
| COMPONENT-IDENTIFIER | 62 | | | |
| END-POINT | 0.0000 | -1430.7791 | -1840.0889 | 6.0000 |
| END-POINT | 0.0000 | -1424.4300 | -1839.9781 | 6.0000 |
| SKEY | FLSO | | | |
| MATERIAL-IDENTIFIER | 5 | | | |
| CATEGORY | FABRICATION | | | |
| FLANGE-LEFT-LOOSE | OFF | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | FC146B7D-22C7-432C-8F67-5F2A942F969C | | | |

GASKET

| | | | | |
|-----------------------------|--------------------------------------|------------|------------|--------|
| COMPONENT-IDENTIFIER | 61 | | | |
| MASTER-COMPONENT-IDENTIFIER | 62 | | | |
| END-POINT | 0.0000 | -1430.7791 | -1840.0889 | 6.0000 |
| END-POINT | 0.0000 | -1432.3488 | -1840.1163 | 6.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | F5AD4B6E-0B9A-4DA8-A9C5-BDC4CCE3C458 | | | |

BOLT

| | | | | |
|-----------------------------|--------------------------------------|------------|------------|--|
| COMPONENT-IDENTIFIER | 95 | | | |
| MASTER-COMPONENT-IDENTIFIER | 62 | | | |
| CO-ORDS | 0.0000 | -1430.7791 | -1840.0889 | |
| BOLT-DIA | 19.05 | | | |
| BOLT-LENGTH | 107.95 | | | |
| BOLT-QUANTITY | 8 | | | |
| CATEGORY | ERECTION | | | |
| MATERIAL-IDENTIFIER | 7 | | | |
| UCI | BCF376ED-77D5-447B-9A16-04F200FDA6FB | | | |

VALVE

| | | | | |
|----------------------|--------------------------------------|------------|------------|--------|
| COMPONENT-IDENTIFIER | 53 | | | |
| END-POINT | 0.0000 | -1432.3488 | -1840.1163 | 6.0000 |
| END-POINT | 0.0000 | -1838.6869 | -1847.2090 | 6.0000 |
| SKEY | VGFL | | | |
| MATERIAL-IDENTIFIER | 6 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| SPINDLE-DIRECTION | UP | | | |
| UCI | EAA6C7C7-148E-435A-AEEA-D8A680909824 | | | |

BOLT

COMPONENT-IDENTIFIER 96
 MASTER-COMPONENT-IDENTIFIER 64
 CO-ORDS 0.0000 -1840.2567 -1847.2364
 BOLT-DIA 19.05
 BOLT-LENGTH 107.95
 BOLT-QUANTITY 8
 CATEGORY ERECTION
 MATERIAL-IDENTIFIER 7
 UCI 2AA97C67-3D3F-4156-A9C1-5C98A2FF451E

GASKET

COMPONENT-IDENTIFIER 63
 MASTER-COMPONENT-IDENTIFIER 64
 END-POINT 0.0000 -1840.2567 -1847.2364 6.0000
 END-POINT 0.0000 -1838.6869 -1847.2090 6.0000
 MATERIAL-IDENTIFIER 1
 CATEGORY ERECTION
 PIPING-SPEC CS150
 UCI 48327E5D-ED00-4D37-A9CF-2BC90B387719

FLANGE

COMPONENT-IDENTIFIER 64
 END-POINT 0.0000 -1840.2567 -1847.2364 6.0000
 END-POINT 0.0000 -1846.6057 -1847.3472 6.0000
 SKEY FL50
 MATERIAL-IDENTIFIER 5
 CATEGORY FABRICATION
 FLANGE-LEFT-LOOSE OFF
 PIPING-SPEC CS150
 UCI 5CAAC57A-7316-42BB-AD04-FBC5F5ED1687

PIPE

COMPONENT-IDENTIFIER 54
 END-POINT 0.0000 -1846.6057 -1847.3472 6.0000
 END-POINT 0.0000 -2846.4500 -1864.7996 6.0000
 MATERIAL-IDENTIFIER 3
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI 3F554E2B-51D1-4E30-AC3A-4C8A664914EB

ELBOW

COMPONENT-IDENTIFIER 44
 END-POINT 0.0000 -2846.4500 -1864.7996 6.0000
 END-POINT 114.3000 -3272.9886 -1868.7892 6.0000
 CENTRE-POINT 0.0000 -3075.0152 -1868.7892
 SKEY ELBW
 MATERIAL-IDENTIFIER 4
 ANGLE 3002
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI 2F76D383-7209-458F-9EFF-5E70D93F1C2B

PIPE

COMPONENT-IDENTIFIER 43
 END-POINT 114.3000 -3272.9886 -1868.7892 6.0000
 END-POINT 131.5685 -3302.8985 -1868.7892 6.0000
 MATERIAL-IDENTIFIER 3
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI B38F16F5-C8A0-408D-938B-4C85A1A8EF12

ELBOW

COMPONENT-IDENTIFIER 46
 END-POINT 131.5685 -3302.8985 -1868.7892 6.0000
 END-POINT 245.8685 -3500.8719 -2097.3892 6.0000
 CENTRE-POINT 245.8685 -3500.8719 -1868.7892
 SKEY ELBW
 MATERIAL-IDENTIFIER 4
 ANGLE 9000
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI 54C31477-10F6-458D-A7C5-A3BBE6E3456B

PIPE

COMPONENT-IDENTIFIER 45
 END-POINT 245.8685 -3500.8719 -2097.3892 6.0000
 END-POINT 245.8685 -3500.8719 -3297.3900 6.0000
 MATERIAL-IDENTIFIER 3
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI 37AFEEFC-0017-478B-8573-B7686C18A043

ELBOW

COMPONENT-IDENTIFIER 85
 END-POINT 245.8685 -3500.8719 -3297.3900 6.0000
 END-POINT 17.2685 -3500.8719 -3525.9900 6.0000
 CENTRE-POINT 245.8685 -3500.8719 -3525.9900
 SKEY ELBW
 MATERIAL-IDENTIFIER 4
 ANGLE 9000
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI B5301CC2-F371-4205-A068-182ED69FCD34

PIPE

COMPONENT-IDENTIFIER 84
 END-POINT -1076.2485 -3500.8719 -3525.9900 6.0000
 END-POINT 17.2685 -3500.8719 -3525.9900 6.0000
 MATERIAL-IDENTIFIER 3
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI 669E1209-BC6D-45E0-B570-E3B782F6007F

ELBOW

COMPONENT-IDENTIFIER 91
 END-POINT -1076.2485 -3500.8719 -3525.9900 6.0000
 END-POINT -1262.8997 -3432.5528 -3457.6709 6.0000
 CENTRE-POINT -1194.5806 -3500.8719 -3525.9900
 SKEY ELBW
 MATERIAL-IDENTIFIER 4
 ANGLE 5474
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI 13C56F45-EE8B-4F77-92A6-BA9787E65803

PIPE

COMPONENT-IDENTIFIER 90
 END-POINT -1262.8997 -3432.5528 -3457.6709 6.0000
 END-POINT -1626.2616 -3069.1909 -3094.3090 6.0000
 MATERIAL-IDENTIFIER 3
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI 01927E96-2DE0-4811-BC17-73BBE8EA76BC

ELBOW

COMPONENT-IDENTIFIER 93
 END-POINT -1626.2616 -3069.1909 -3094.3090 6.0000
 END-POINT -1812.9127 -3000.8719 -3025.9900 6.0000
 CENTRE-POINT -1694.5806 -3000.8719 -3025.9900
 SKEY ELBW
 MATERIAL-IDENTIFIER 4
 ANGLE 5474
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI BA75969E-7DA2-453F-B098-9DAF8F068DDF

PIPE

COMPONENT-IDENTIFIER 92
 END-POINT -1812.9127 -3000.8719 -3025.9900 6.0000
 END-POINT -2312.9127 -3000.8719 -3025.9900 6.0000
 MATERIAL-IDENTIFIER 3
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI 777D36F1-69FD-46B9-9C76-A48A43D2D4AA

MATERIALS

MATERIAL-IDENTIFIER 1

ITEM-CODE GCA150-RG2
 DESCRIPTION GASKET, CAF, 150#, RING, 1/16 IN

MATERIAL-IDENTIFIER 2

ITEM-CODE FCD150-WNRSTD
 DESCRIPTION FLANGE, CS ASTM A105, 150#, WN, RF, STD WT

MATERIAL-IDENTIFIER 3

ITEM-CODE PA5BSTD
 DESCRIPTION PIPE, CS API 5L SML, GRD B, STD WT

MATERIAL-IDENTIFIER 4

ITEM-CODE EEL90CFSTD-LBW
 DESCRIPTION ELBOW, 90 DEG, FRG CS A234 WPB, STD WT, LR, BW

MATERIAL-IDENTIFIER 5

ITEM-CODE FCD150-SOR
 DESCRIPTION FLANGE, CS ASTM A105, 150#, SO, RF

MATERIAL-IDENTIFIER 6

ITEM-CODE VVGCF150-FLO
 DESCRIPTION VALVE, GLOBE, CS ASTM A234, 150#, FL, OS&Y

MATERIAL-IDENTIFIER 7

ITEM-CODE BSBS0.75X4.25

DESCRIPTION STUD BOLT, SS 1% CR MO, EACH WITH TWO WASHERS AND HEAVY
HEX

NUTS 0.75 X 4.25

Configuration 6: Bypass

| | | | | | |
|-----------------------------|--------------------------------------|--------|--------|--------|--|
| ISOGEN-FILES | ISOGEN.FLS | | | | |
| UNITS-BORE | INCH | | | | |
| UNITS-CO-ORDS | MM | | | | |
| UNITS-BOLT-LENGTH | MM | | | | |
| UNITS-BOLT-DIA | MM | | | | |
| UNITS-WEIGHT | KGS | | | | |
| PIPELINE-REFERENCE | CFG6 | | | | |
| PIPING-SPEC | CS150 | | | | |
| GASKET | | | | | |
| COMPONENT-IDENTIFIER | 21 | | | | |
| MASTER-COMPONENT-IDENTIFIER | 22 | | | | |
| END-POINT | -1.5700 | 0.0000 | 0.0000 | 6.0000 | |
| END-POINT | 0.0000 | 0.0000 | 0.0000 | 6.0000 | |
| MATERIAL-IDENTIFIER | 1 | | | | |
| CATEGORY | ERECTION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 57A5C7A8-3C84-4EF2-AA50-939936F13ADE | | | | |
| FLANGE | | | | | |
| COMPONENT-IDENTIFIER | 22 | | | | |
| END-POINT | -1.5700 | 0.0000 | 0.0000 | 6.0000 | |
| END-POINT | -7.9200 | 0.0000 | 0.0000 | 6.0000 | |
| SKEY | FLSO | | | | |
| MATERIAL-IDENTIFIER | 2 | | | | |
| CATEGORY | FABRICATION | | | | |
| FLANGE-LEFT-LOOSE | OFF | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 0107F716-0627-4531-B34B-49C3EE4D476B | | | | |
| BOLT | | | | | |
| COMPONENT-IDENTIFIER | 37 | | | | |
| MASTER-COMPONENT-IDENTIFIER | 22 | | | | |
| CO-ORDS | -1.5700 | 0.0000 | 0.0000 | | |
| BOLT-DIA | 19.05 | | | | |
| BOLT-LENGTH | 107.95 | | | | |
| BOLT-QUANTITY | 8 | | | | |
| CATEGORY | ERECTION | | | | |
| MATERIAL-IDENTIFIER | 3 | | | | |
| UCI | FB72B9C7-832F-41A6-BA41-7B24177D32E4 | | | | |
| PIPE | | | | | |
| COMPONENT-IDENTIFIER | 1 | | | | |
| END-POINT | -7.9200 | 0.0000 | 0.0000 | 6.0000 | |
| END-POINT | -1357.1200 | 0.0000 | 0.0000 | 6.0000 | |
| MATERIAL-IDENTIFIER | 4 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 825CCF26-BAB8-4741-8AAB-E578DC27DD8B | | | | |

TEE

| | | | | |
|----------------------|--------------------------------------|--------|----------|--------|
| COMPONENT-IDENTIFIER | 13 | | | |
| END-POINT | -1357.1200 | 0.0000 | 0.0000 | 6.0000 |
| END-POINT | -1642.8800 | 0.0000 | 0.0000 | 6.0000 |
| CENTRE-POINT | -1500.0000 | 0.0000 | 0.0000 | |
| BRANCH1-POINT | -1500.0000 | 0.0000 | 142.8800 | 6.0000 |
| SKEY | TEBW | | | |
| MATERIAL-IDENTIFIER | 5 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 76705B16-4A69-4184-AD50-905D1E1A24AD | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 14 | | | |
| END-POINT | -1642.8800 | 0.0000 | 0.0000 | 6.0000 |
| END-POINT | -1957.9000 | 0.0000 | 0.0000 | 6.0000 |
| MATERIAL-IDENTIFIER | 4 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | A67CD5F0-2E5B-4E83-A6D4-A8DAA8CDA0E4 | | | |

FLANGE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 32 | | | |
| END-POINT | -2046.8000 | 0.0000 | 0.0000 | 6.0000 |
| END-POINT | -1957.9000 | 0.0000 | 0.0000 | 6.0000 |
| SKEY | FLWN | | | |
| MATERIAL-IDENTIFIER | 6 | | | |
| CATEGORY | FABRICATION | | | |
| FLANGE-LEFT-LOOSE | OFF | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | C1AE3948-5E90-4D46-8CC9-F6DB78FDEBDC | | | |

BOLT

| | | | | |
|-----------------------------|--------------------------------------|--------|--------|--|
| COMPONENT-IDENTIFIER | 38 | | | |
| MASTER-COMPONENT-IDENTIFIER | 32 | | | |
| CO-ORDS | -2046.8000 | 0.0000 | 0.0000 | |
| BOLT-DIA | 19.05 | | | |
| BOLT-LENGTH | 107.95 | | | |
| BOLT-QUANTITY | 8 | | | |
| CATEGORY | ERECTION | | | |
| MATERIAL-IDENTIFIER | 3 | | | |
| UCI | 78AD3D58-0D1A-4A19-AD83-C461D2FC59AC | | | |

GASKET

| | | | | |
|-----------------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 34 | | | |
| MASTER-COMPONENT-IDENTIFIER | 32 | | | |
| END-POINT | -2048.3700 | 0.0000 | 0.0000 | 6.0000 |
| END-POINT | -2046.8000 | 0.0000 | 0.0000 | 6.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 177D512B-60BE-486B-8351-F363209BCB42 | | | |

INSTRUMENT

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 29 | | | |
| END-POINT | -2048.3700 | 0.0000 | 0.0000 | 6.0000 |
| END-POINT | -2453.2000 | 0.0000 | 0.0000 | 6.0000 |
| CENTRE-POINT | -2250.0000 | 0.0000 | 0.0000 | |
| SKEY | CVFL | | | |
| MATERIAL-IDENTIFIER | 7 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| SPINDLE-DIRECTION | UP | | | |
| UCI | 4B733390-26D1-4FF8-BE00-592C1B52E33A | | | |

BOLT

| | | | | |
|-----------------------------|--------------------------------------|--------|--------|--|
| COMPONENT-IDENTIFIER | 35 | | | |
| MASTER-COMPONENT-IDENTIFIER | 31 | | | |
| CO-ORDS | -2453.2000 | 0.0000 | 0.0000 | |
| BOLT-DIA | 19.05 | | | |
| BOLT-LENGTH | 107.95 | | | |
| BOLT-QUANTITY | 8 | | | |
| CATEGORY | ERECTION | | | |
| MATERIAL-IDENTIFIER | 3 | | | |
| UCI | B59EFD99-8D3C-4749-9ABC-6352D523987B | | | |

GASKET

| | | | | |
|-----------------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 33 | | | |
| MASTER-COMPONENT-IDENTIFIER | 31 | | | |
| END-POINT | -2454.7700 | 0.0000 | 0.0000 | 6.0000 |
| END-POINT | -2453.2000 | 0.0000 | 0.0000 | 6.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 87138D68-F230-4891-9C14-278B3DB9BCA1 | | | |

FLANGE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 31 | | | |
| END-POINT | -2454.7700 | 0.0000 | 0.0000 | 6.0000 |
| END-POINT | -2542.1000 | 0.0000 | 0.0000 | 6.0000 |
| SKEY | FLWN | | | |
| MATERIAL-IDENTIFIER | 6 | | | |
| CATEGORY | FABRICATION | | | |
| FLANGE-LEFT-LOOSE | OFF | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | B8956E37-D29B-401A-B7FD-198F61542811 | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 30 | | | |
| END-POINT | -2542.1000 | 0.0000 | 0.0000 | 6.0000 |
| END-POINT | -2857.1200 | 0.0000 | 0.0000 | 6.0000 |
| MATERIAL-IDENTIFIER | 4 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | E8FA2225-77D9-4CA4-BCD0-DDD982D3C496 | | | |

TEE

| | | | | |
|----------------------|--------------------------------------|--------|----------|--------|
| COMPONENT-IDENTIFIER | 7 | | | |
| END-POINT | -2857.1200 | 0.0000 | 0.0000 | 6.0000 |
| END-POINT | -3142.8800 | 0.0000 | 0.0000 | 6.0000 |
| CENTRE-POINT | -3000.0000 | 0.0000 | 0.0000 | |
| BRANCH1-POINT | -3000.0000 | 0.0000 | 142.8800 | 6.0000 |
| SKEY | TEBW | | | |
| MATERIAL-IDENTIFIER | 5 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | C0086358-4581-42EB-9950-822C7B542195 | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|--------|--------|--------|
| COMPONENT-IDENTIFIER | 8 | | | |
| END-POINT | -3142.8800 | 0.0000 | 0.0000 | 6.0000 |
| END-POINT | -4271.4000 | 0.0000 | 0.0000 | 6.0000 |
| MATERIAL-IDENTIFIER | 4 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 2271D2A9-D128-4AFB-A30D-CDE4F530E087 | | | |

ELBOW

| | | | | |
|----------------------|--------------------------------------|--------|----------|--------|
| COMPONENT-IDENTIFIER | 3 | | | |
| END-POINT | -4271.4000 | 0.0000 | 0.0000 | 6.0000 |
| END-POINT | -4500.0000 | 0.0000 | 228.6000 | 6.0000 |
| CENTRE-POINT | -4500.0000 | 0.0000 | 0.0000 | |
| SKEY | ELBW | | | |
| MATERIAL-IDENTIFIER | 8 | | | |
| ANGLE | 9000 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 4ADC7B31-2B89-455F-BB9C-799A76D944C9 | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|--------|----------|--------|
| COMPONENT-IDENTIFIER | 2 | | | |
| END-POINT | -4500.0000 | 0.0000 | 228.6000 | 6.0000 |
| END-POINT | -4500.0000 | 0.0000 | 571.4000 | 6.0000 |
| MATERIAL-IDENTIFIER | 4 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 4A2081F2-D537-489C-A5D1-C1AD5C80C9D5 | | | |

ELBOW

| | | | | |
|----------------------|--------------------------------------|----------|----------|--------|
| COMPONENT-IDENTIFIER | 5 | | | |
| END-POINT | -4500.0000 | 0.0000 | 571.4000 | 6.0000 |
| END-POINT | -4500.0000 | 228.6000 | 800.0000 | 6.0000 |
| CENTRE-POINT | -4500.0000 | 0.0000 | 800.0000 | |
| SKEY | ELBW | | | |
| MATERIAL-IDENTIFIER | 8 | | | |
| ANGLE | 9000 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 95F21FF9-8195-48C4-8DC7-80540DA5806C | | | |

PIPE

| | | | | | |
|----------------------|--------------------------------------|-----------|----------|--------|--|
| COMPONENT-IDENTIFIER | 4 | | | | |
| END-POINT | -4500.0000 | 228.6000 | 800.0000 | 6.0000 | |
| END-POINT | -4500.0000 | 2492.0800 | 800.0000 | 6.0000 | |
| MATERIAL-IDENTIFIER | 4 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | E2E8499C-CD93-4D0F-98CC-073DA7574627 | | | | |

FLANGE

| | | | | | |
|----------------------|--------------------------------------|-----------|----------|--------|--|
| COMPONENT-IDENTIFIER | 24 | | | | |
| END-POINT | -4500.0000 | 2498.4300 | 800.0000 | 6.0000 | |
| END-POINT | -4500.0000 | 2492.0800 | 800.0000 | 6.0000 | |
| SKEY | FLSO | | | | |
| MATERIAL-IDENTIFIER | 2 | | | | |
| CATEGORY | FABRICATION | | | | |
| FLANGE-LEFT-LOOSE | OFF | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 64301EA3-D51D-41D0-9139-8F69B0B3A412 | | | | |

BOLT

| | | | | | |
|-----------------------------|--------------------------------------|-----------|----------|--|--|
| COMPONENT-IDENTIFIER | 36 | | | | |
| MASTER-COMPONENT-IDENTIFIER | 24 | | | | |
| CO-ORDS | -4500.0000 | 2498.4300 | 800.0000 | | |
| BOLT-DIA | 19.05 | | | | |
| BOLT-LENGTH | 107.95 | | | | |
| BOLT-QUANTITY | 8 | | | | |
| CATEGORY | ERECTION | | | | |
| MATERIAL-IDENTIFIER | 3 | | | | |
| UCI | A8BAAB5E-6A46-439A-9FEA-B82FA956BAD3 | | | | |

GASKET

| | | | | | |
|-----------------------------|--------------------------------------|-----------|----------|--------|--|
| COMPONENT-IDENTIFIER | 23 | | | | |
| MASTER-COMPONENT-IDENTIFIER | 24 | | | | |
| END-POINT | -4500.0000 | 2498.4300 | 800.0000 | 6.0000 | |
| END-POINT | -4500.0000 | 2500.0000 | 800.0000 | 6.0000 | |
| MATERIAL-IDENTIFIER | 1 | | | | |
| CATEGORY | ERECTION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 8DBAE441-E0C9-4717-9265-432BE361749D | | | | |

PIPE

| | | | | | |
|----------------------|--------------------------------------|--------|----------|--------|--|
| COMPONENT-IDENTIFIER | 11 | | | | |
| END-POINT | -1500.0000 | 0.0000 | 771.4000 | 6.0000 | |
| END-POINT | -1500.0000 | 0.0000 | 142.8800 | 6.0000 | |
| MATERIAL-IDENTIFIER | 4 | | | | |
| CATEGORY | FABRICATION | | | | |
| PIPING-SPEC | CS150 | | | | |
| UCI | 9E96CBD4-B483-4913-BD90-C1A73395B9F8 | | | | |

ELBOW

| | | | | |
|----------------------|--------------------------------------|--------|-----------|--------|
| COMPONENT-IDENTIFIER | 12 | | | |
| END-POINT | -1728.6000 | 0.0000 | 1000.0000 | 6.0000 |
| END-POINT | -1500.0000 | 0.0000 | 771.4000 | 6.0000 |
| CENTRE-POINT | -1500.0000 | 0.0000 | 1000.0000 | |
| SKEY | ELBW | | | |
| MATERIAL-IDENTIFIER | 8 | | | |
| ANGLE | 9000 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | B40C2A71-6E5C-4A53-B20A-E3C55E9EC9BA | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|--------|-----------|--------|
| COMPONENT-IDENTIFIER | 16 | | | |
| END-POINT | -1957.9000 | 0.0000 | 1000.0000 | 6.0000 |
| END-POINT | -1728.6000 | 0.0000 | 1000.0000 | 6.0000 |
| MATERIAL-IDENTIFIER | 4 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 2B910FF8-35A6-4E88-857C-743CE9909935 | | | |

FLANGE

| | | | | |
|----------------------|--------------------------------------|--------|-----------|--------|
| COMPONENT-IDENTIFIER | 18 | | | |
| END-POINT | -2046.8000 | 0.0000 | 1000.0000 | 6.0000 |
| END-POINT | -1957.9000 | 0.0000 | 1000.0000 | 6.0000 |
| SKEY | FLWN | | | |
| MATERIAL-IDENTIFIER | 6 | | | |
| CATEGORY | FABRICATION | | | |
| FLANGE-LEFT-LOOSE | OFF | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | F71EA44E-FD91-40DE-9ADD-F8C9F64A5540 | | | |

BOLT

| | | | | |
|-----------------------------|--------------------------------------|--------|-----------|--|
| COMPONENT-IDENTIFIER | 40 | | | |
| MASTER-COMPONENT-IDENTIFIER | 18 | | | |
| CO-ORDS | -2046.8000 | 0.0000 | 1000.0000 | |
| BOLT-DIA | 19.05 | | | |
| BOLT-LENGTH | 107.95 | | | |
| BOLT-QUANTITY | 8 | | | |
| CATEGORY | ERECTION | | | |
| MATERIAL-IDENTIFIER | 3 | | | |
| UCI | 259E8A59-E819-4884-89CE-3DBBA86E26F6 | | | |

GASKET

| | | | | |
|-----------------------------|--------------------------------------|--------|-----------|--------|
| COMPONENT-IDENTIFIER | 20 | | | |
| MASTER-COMPONENT-IDENTIFIER | 18 | | | |
| END-POINT | -2048.3700 | 0.0000 | 1000.0000 | 6.0000 |
| END-POINT | -2046.8000 | 0.0000 | 1000.0000 | 6.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 1B066EB5-1409-4B51-9A0F-DB0DBB7892E0 | | | |

VALVE

| | | | | |
|----------------------|--------------------------------------|--------|-----------|--------|
| COMPONENT-IDENTIFIER | 15 | | | |
| END-POINT | -2451.6300 | 0.0000 | 1000.0000 | 6.0000 |
| END-POINT | -2048.3700 | 0.0000 | 1000.0000 | 6.0000 |
| SKEY | VGFL | | | |
| MATERIAL-IDENTIFIER | 9 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| SPINDLE-DIRECTION | UP | | | |
| UCI | 6A9954B8-8456-429B-AC16-771D9E4B9C12 | | | |

BOLT

| | | | | |
|-----------------------------|--------------------------------------|--------|-----------|--|
| COMPONENT-IDENTIFIER | 39 | | | |
| MASTER-COMPONENT-IDENTIFIER | 17 | | | |
| CO-ORDS | -2451.6300 | 0.0000 | 1000.0000 | |
| BOLT-DIA | 19.05 | | | |
| BOLT-LENGTH | 107.95 | | | |
| BOLT-QUANTITY | 8 | | | |
| CATEGORY | ERECTION | | | |
| MATERIAL-IDENTIFIER | 3 | | | |
| UCI | 46BDD7B3-54E7-4F8E-8260-65817EE9CA8F | | | |

GASKET

| | | | | |
|-----------------------------|--------------------------------------|--------|-----------|--------|
| COMPONENT-IDENTIFIER | 19 | | | |
| MASTER-COMPONENT-IDENTIFIER | 17 | | | |
| END-POINT | -2451.6300 | 0.0000 | 1000.0000 | 6.0000 |
| END-POINT | -2453.2000 | 0.0000 | 1000.0000 | 6.0000 |
| MATERIAL-IDENTIFIER | 1 | | | |
| CATEGORY | ERECTION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 7A16E534-7006-47A2-81BE-71DF3277EC42 | | | |

FLANGE

| | | | | |
|----------------------|--------------------------------------|--------|-----------|--------|
| COMPONENT-IDENTIFIER | 17 | | | |
| END-POINT | -2453.2000 | 0.0000 | 1000.0000 | 6.0000 |
| END-POINT | -2542.1000 | 0.0000 | 1000.0000 | 6.0000 |
| SKEY | FLWN | | | |
| MATERIAL-IDENTIFIER | 6 | | | |
| CATEGORY | FABRICATION | | | |
| FLANGE-LEFT-LOOSE | OFF | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 585A2CAD-C748-4EFA-A489-AF889ED33779 | | | |

PIPE

| | | | | |
|----------------------|--------------------------------------|--------|-----------|--------|
| COMPONENT-IDENTIFIER | 9 | | | |
| END-POINT | -2771.4000 | 0.0000 | 1000.0000 | 6.0000 |
| END-POINT | -2542.1000 | 0.0000 | 1000.0000 | 6.0000 |
| MATERIAL-IDENTIFIER | 4 | | | |
| CATEGORY | FABRICATION | | | |
| PIPING-SPEC | CS150 | | | |
| UCI | 8485C539-6E0C-431A-8FC2-0B03939419C7 | | | |

ELBOW

COMPONENT-IDENTIFIER 10
 END-POINT -3000.0000 0.0000 771.4000 6.0000
 END-POINT -2771.4000 0.0000 1000.0000 6.0000
 CENTRE-POINT -3000.0000 0.0000 1000.0000
 SKEY ELBW
 MATERIAL-IDENTIFIER 8
 ANGLE 9000
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI B2BAE974-BC77-4630-9977-AD87E9431F8C

PIPE

COMPONENT-IDENTIFIER 6
 END-POINT -3000.0000 0.0000 142.8800 6.0000
 END-POINT -3000.0000 0.0000 771.4000 6.0000
 MATERIAL-IDENTIFIER 4
 CATEGORY FABRICATION
 PIPING-SPEC CS150
 UCI C9058DBF-E9A6-4B28-BF47-02C6F2E5A931

MATERIALS

MATERIAL-IDENTIFIER 1

ITEM-CODE GCA150-RG2
 DESCRIPTION GASKET, CAF, 150#, RING, 1/16 IN

MATERIAL-IDENTIFIER 2

ITEM-CODE FCD150-SOR
 DESCRIPTION FLANGE, CS ASTM A105, 150#, SO, RF

MATERIAL-IDENTIFIER 3

ITEM-CODE BSBS0.75X4.25
 DESCRIPTION STUD BOLT, SS 1% CR MO, EACH WITH TWO WASHERS AND HEAVY
 HEX

NUTS 0.75 X 4.25

MATERIAL-IDENTIFIER 4

ITEM-CODE PA5BSTD
 DESCRIPTION PIPE, CS API 5L SML, GRD B, STD WT

MATERIAL-IDENTIFIER 5

ITEM-CODE T1ECFSTD-BW
 DESCRIPTION TEE, EQ, FRG CS A234 WPB, STD WT, BW

MATERIAL-IDENTIFIER 6

ITEM-CODE FCD150-WNRSTD
 DESCRIPTION FLANGE, CS ASTM A105, 150#, WN, RF, STD WT

MATERIAL-IDENTIFIER 7

ITEM-CODE ICGCF150-FL
 DESCRIPTION CV, GLOBE TYPE, CS ASTM A234, 150#, FL

MATERIAL-IDENTIFIER 8

ITEM-CODE EEL90CFSTD-LBW
 DESCRIPTION ELBOW, 90 DEG, FRG CS A234 WPB, STD WT, LR, BW

MATERIAL-IDENTIFIER 9

ITEM-CODE VVGCF150-FLO
 DESCRIPTION VALVE, GLOBE, CS ASTM A234, 150#, FL, OS&Y

APPENDIX B

Appendix: Superseded PCF Syntax

The topics in this appendix discuss older forms of PCF syntax. Although employing these methods no longer fall under recommended best practices, they may still hold some viability for more experienced customers.

Associating Components

Although the recommended best practice for defining parent/child relationships within the PCF is to use the **COMPONENT-IDENTIFIER** and **MASTER-COMPONENT-IDENTIFIER** attributes, some users may be more accustomed to using the older, alternative method for associating items: indenting the child item underneath the parent item. With this method, an item is said to be associated with a component when its data appears in column five (5) of the PCF, within the body of the component data, rather than in column one (1). In the following example, the syntax defines a weld at the branch of the set-on tee:

```
TEE-SET-ON
  CENTRE-POINT    -10228.6000  1228.6000  830.1400
  BRANCH1-POINT   -10171.4500  1228.6000  830.1400  4.0000
  MATERIAL-IDENTIFIER  3
  SKEY  TESO
  CATEGORY  FABRICATION
  PIPING-SPEC  CS150
  UCI  67A43A2B-4C2B-11D4-8133-00C04F218FEE
  WELD
  SKEY  WW
  CATEGORY  FABRICATION
  LOCATION  B1P
```

The following sections provide clear examples of using the indentation method to associate items within the PCF.

Associated Additional Items

The **ADDITIONAL-ITEM** attribute and all related data attributes must be input in column five (5) following the last normal attribute for the component to which the additional item or items are associated. The following example illustrates the typical data input for an additional item associated with a valve:

```
VALVE
  END-POINT  E/W N/S ELEV Size
  END-POINT  E/W N/S ELEV Size
  MATERIAL-IDENTIFIER  data
  SKEY  data
  CATEGORY-ITEM
  SPINDLE-DIRECTION  data
  ADDITIONAL-ITEM
  SIZE  data
  QUANTITY  data
  ITEM-GROUP  data
  CATEGORY-ITEM
```

Associated Components: Bolts

When using indented syntax, bolting information can be associated only with the following types of components:

- GASKET
- NOZZLE

This limitation applies because these are the only components to which bolt information can be associated without any ambiguity arising as to which end of a component the bolts belong. The following basic attributes are used for these bolts:

```
GASKET
  END-POINT  data
  END-POINT  data
  MATERIAL-IDENTIFIER  data
BOLT
  BOLT-DIA  data
  BOLT-LENGTH  data
  MATERIAL-IDENTIFIER-DATA  data
```

Associated Components: Welds

The following examples shows the PCF syntax used when using indentation to associate a weld with various other components. In all instances, the weld and its data appear in column five (5) of the PCF, within the body of the component data.

NOTE When a weld is associated with a component, it must be positioned in the PCF file after all the components attributes.

Support Welds:

The output for the weld is identical to a normal weld, with the exception that no coordinate information is supplied (the weld coordinates are taken from the parent).

```
SUPPORT
  CO-ORDS  0.0000  -1000.0000  0.0000  4.0000
  SKEY  01HG
  MATERIAL-IDENTIFIER  4
  UNIQUE-COMPONENT-IDENTIFIER  5A58CC5D-754A-4469-8C3E-B61705FAF801
  SUPPORT-DIRECTION  UP
  CATEGORY  ERECTION
  STATUS  STANDARD
  WELD
  SKEY  ZSP1
  CATEGORY  ERECTION
```

Set-on Tee, Set-on Cross, Y-Piece Fabricated:

```
TEE-SET-ON
  CENTRE-POINT  -10228.6000  1228.6000  830.1400
  BRANCH1-POINT  -10171.4500  1228.6000  830.1400  4.0000
  MATERIAL-IDENTIFIER  4
  SKEY  TESO
  CATEGORY  FABRICATION
  PIPING-SPEC  CS150
  UCI  67A43A2B-4C2B-11D4-8133-00C04F218FEE
  WELD
  SKEY  WW
  CATEGORY  FABRICATION
  LOCATION  B1P
```

Olet:

OLET

CENTRE-POINT 257000.0000 120034.5400 10000.0000
BRANCH1-POINT 257000.0000 120034.5400 9885.7000 1.0000
SKEY WTBW
MATERIAL-IDENTIFIER 3
UNIQUE-COMPONENT-IDENTIFIER F255A7F8-6106-4497-8253-67A5C366CB3C
CATEGORY FABRICATION
WELD
SKEY WW
CATEGORY FABRICATION

Weld:

WELD

END-POINT -10171.4500 1228.6000 830.1400 4.0000
END-POINT -10171.4500 1228.6000 830.1400 4.0000
SKEY WW
MATERIAL-IDENTIFIER 5
CATEGORY FABRICATION
REPEAT-WELD-IDENTIFIER 6
WELD
SKEY WW
CATEGORY FABRICATION
REPEAT-WELD-IDENTIFIER 7

Clamp:

CLAMP

END-POINT 190000 910700 556200 48 MALE
PIPING-SPEC XALP
MATERIAL-IDENTIFIER 4
SKEY CLVT
CATEGORY ERECTION
WELD
SKEY WW
CATEGORY FABRICATION
REPEAT-WELD-IDENTIFIER 8

Associated Welds on Olets

OLET

```
COMPONENT-IDENTIFIER  O1
CENTRE-POINT    0.0000  -750.0000    0.0000  0.5000
BRANCH1-POINT   0.0000  -750.0000   73.0300  0.5000
MATERIAL-IDENTIFIER  4
SKEY  SKSW
CATEGORY  FABRICATION
PIPING-SPEC  CS150
UCI  0DD07D35-84BC-4708-B893-06F81C186FF1
WELD
SKEY  WW
CATEGORY  FABRICATION
REPEAT-WELD-IDENTIFIER  1
LOCATION  CP
UCI  3985C3FB-7170-42DF-9A80-F6AB9A0CCF6F
WELD
SKEY  WW
CATEGORY  FABRICATION
REPEAT-WELD-IDENTIFIER  2
LOCATION  B1P
UCI  1A2916A1-57EC-4E7A-8E0C-8ECC026AFB8C
```

IMPORTANT

- The PCF may contain a mixture of the two styles (with/without the **COMPONENT-IDENTIFIER** and **MASTER-COMPONENT-IDENTIFIER** attributes), such that the new **COMPONENT-IDENTIFIER** and **MASTER-COMPONENT-IDENTIFIER** attributes are present only on those items required to overcome the ambiguities using indention to define a parent-child relationship. However, indention is explicitly forbidden when using the **COMPONENT-IDENTIFIER** and **MASTER-COMPONENT-IDENTIFIER** attributes, as shown in the following example which the associated weld entry is positioned in column five (5) and is also assigned a **MASTER-COMPONENT-IDENTIFIER** attribute: .

OLET

```
COMPONENT-IDENTIFIER  O1
CENTRE-POINT    0.0000  -750.0000    0.0000  0.5000
BRANCH1-POINT   0.0000  -750.0000   73.0300  0.5000
MATERIAL-IDENTIFIER  4
SKEY  SKSW
CATEGORY  FABRICATION
PIPING-SPEC  CS150
UCI  0DD07D35-84BC-4708-B893-06F81C186FF1
WELD
MASTER-COMPONENT-IDENTIFIER  01
SKEY  WW
CATEGORY  FABRICATION
REPEAT-WELD-IDENTIFIER  1
LOCATION  CP
UCI  3985C3FB-7170-42DF-9A80-F6AB9A0CCF6F
WELD
MASTER-COMPONENT-IDENTIFIER  O1
SKEY  WW
CATEGORY  FABRICATION
REPEAT-WELD-IDENTIFIER  2
```

LOCATION B1P

UCI 1A2916A1-57EC-4E7A-8E0C-8ECC026AFB8C

- For more information about using **COMPONENT-IDENTIFIER** and **MASTER-COMPONENT-IDENTIFIER** attributes, see *Associated Components* (on page 39).

Linking Components with Materials

Before the **MATERIAL-IDENTIFIER** attribute was introduced, the link between the component and its material was defined in the PCF by either a stand-alone **ITEM-CODE** attribute or the combination of **ITEM-CODE**, **ITEM DESCRIPTION** and **ITEM-ATTRIBUTE** attributes. The following sections discuss how these attributes can be used to define materials data, as well as their inherent limitations.

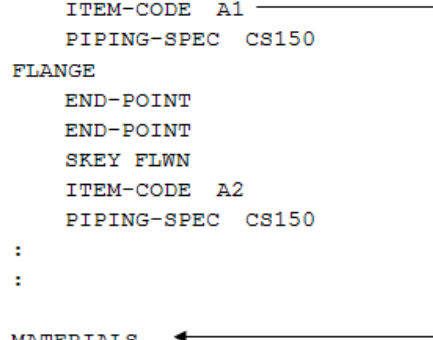
IMPORTANT

- The recommended best practice for linking components and materials data is to use the **MATERIAL-IDENTIFIER** attribute. For more information, see *Material Attributes* (on page 70).
- You *cannot* use the **MATERIAL-IDENTIFIER** attribute in combination with the **ITEM-CODE** / **ITEM-DESCRIPTION** / **ITEM-ATTRIBUTE** attributes to specify materials. Any such inconsistency in methods within the PCF will cause processing to immediately cease.

ITEM-CODE Attribute

This method presumes that every component with the same **ITEM-CODE** property has the same material.

```
VALVE
  END-POINT
  END-POINT
  SKEY VBFL
  ITEM-CODE  A1
  PIPING-SPEC CS150
FLANGE
  END-POINT
  END-POINT
  SKEY FLWN
  ITEM-CODE  A2
  PIPING-SPEC CS150
:
:
MATERIALS
ITEM-CODE  A1
  DESCRIPTION Valve, Ball, 150#, Flanged ends
ITEM-CODE  A2
  DESCRIPTION Flange, Weld Neck, 150#, CS
```



This method works satisfactorily as long as each component has a unique item code. Situations do arise when this practice is not followed, such as when the same component is used both as an olet (branch) and as a coupling. Whereas the item codes for each can be identical, the descriptions, however, are different.

NOTE Isogen always uses the first match it finds in the MATERIALS section to link the component and material.

ITEM-CODE and ITEM-DESCRIPTION Attributes

This method presumes that every component with the same pair of **ITEM-CODE** and **ITEM-DESCRIPTION** properties has the same material.

```

VALVE
  END-POINT
  END-POINT
  SKEY VBFL
  ITEM-CODE A1
  ITEM-DESCRIPTION Valve, Ball, 150#, Flanged ends
  PIPING-SPEC CS150
FLANGE
  END-POINT
  END-POINT
  SKEY FLWN
  ITEM-CODE A1
  ITEM-DESCRIPTION Flange, Weld Neck, 150#, CS
  PIPING-SPEC CS150
:
:
MATERIALS
  ITEM-CODE A1
    DESCRIPTION Valve, Ball, 150#, Flanged ends
    CLASS X
    SCHEDULE Y
  ITEM-CODE A1
    DESCRIPTION Flange, Weld Neck, 150#, CS
    CLASS A
    SCHEDULE B
  
```

All components with the same **ITEM-CODE** and **ITEM-DESCRIPTION** pair share the same material attributes. This behavior is significant in Isogen, as components with the same material and nominal size are accumulated in the Isogen generated MTO (Material Take Off).

| MATERIAL LIST - FABRICATION | | | | |
|-----------------------------|------|----------------|--|--------|
| PT.NO | SIZE | ITEM CODE | DESCRIPTION | QTY |
| 1 | 6 | PA5BSTD | PIPE, CS API 5L SML, GRD B, STD WT | 14.8 M |
| 2 | 4 | PA5BSTD | PIPE, CS API 5L SML, GRD B, STD WT | 10.0 M |
| 3 | 6X4 | TIRCFSTD-BW | TEE, RED, FRG CS A234 WPB, STD WT, BW | 1 |
| 4 | 6 | EEL90CFSTD-LBW | ELBOW, 90 DEG, FRG CS A234 WPB, STD WT, LR, BW | 1 |
| 5 | 4 | EEL90CFSTD-LBW | ELBOW, 90 DEG, FRG CS A234 WPB, STD WT, LR, BW | 2 |
| 6 | 6 | FCD150-WNRSTD | FLANGE, CS ASTM A105, 150#, WN, RF, STD WT | 3 |
| 7 | 4 | FCD150-WNRSTD | FLANGE, CS ASTM A105, 150#, WN, RF, STD WT | 3 |

The following is the MATERIALS section from the PCF that generated the previous MTO.

MATERIALS

```
ITEM-CODE GCA150-RG2
DESCRIPTION GASKET, CAF, 150#, RING, 1/16 IN
ITEM-CODE FCD150-WNRSTD
DESCRIPTION FLANGE, CS ASTM A105, 150#, WN, RF, STD WT
ITEM-CODE PA5BSTD
DESCRIPTION PIPE, CS API 5L SML, GRD B, STD WT
ITEM-CODE EEL90CFSTD-LBW
DESCRIPTION ELBOW, 90 DEG, FRG CS A234 WPB, STD WT, LR, BW
ITEM-CODE VVGCF150-FLO
DESCRIPTION VALVE, GLOBE, CS ASTM A234, 150#, FL, OS&Y
ITEM-CODE T1RCFSTD-BW
DESCRIPTION TEE, RED, FRG CS A234 WPB, STD WT, BW
```

There is one entry in the MATERIALS section for **ITEM-CODE FCD150-WNRSTD** (the second item), but Isogen generates two entries in the MTO. This is because the 4" flanges and 6" flanges are separately accumulated – a total of three 6" flanges and three 4" flanges.

The following is the PCF entry for a flange:

FLANGE

```
END-POINT 450198.4300 782000.0000 158000.0000 6.0000
END-POINT 450109.5300 782000.0000 158000.0000 6.0000
SKEY FLWN
ITEM-CODE FCD150-WNRSTD
ITEM-DESCRIPTION FLANGE, CS ASTM A105, 150#, WN, RF, STD WT
CATEGORY FABRICATION
FLANGE-LEFT-LOOSE OFF
PAINTING-SPEC PNT-1
PIPING-SPEC CS150
UCI 50E0FD39-E259-11D5-BD05-0000397D3C39
```

As shown in the previous PCF entry, both **ITEM-CODE** and **ITEM-DESCRIPTION** properties are defined and match the **ITEM-CODE** and **ITEM-DESCRIPTION** properties in the MATERIALS section of the file:

```
ITEM-CODE FCD150-WNRSTD
DESCRIPTION FLANGE, CS ASTM A105, 150#, WN, RF, STD WT
```

In this case, because no additional material attributes are defined, the MATERIALS section is unnecessary. This can be shown by modifying the **ITEM-DESCRIPTION** of the flange slightly to include the characters **XX** (line 6 in the following PCF entry):

FLANGE

```
END-POINT 450198.4300 782000.0000 158000.0000 6.0000
END-POINT 450109.5300 782000.0000 158000.0000 6.0000
SKEY FLWN
ITEM-CODE FCD150-WNRSTD
ITEM-DESCRIPTION FLANGE, CS ASTM A105, 150#, WN, RF, STD WT XX
CATEGORY FABRICATION
FLANGE-LEFT-LOOSE OFF
PAINTING-SPEC PNT-1
PIPING-SPEC CS150
UCI 50E0FD39-E259-11D5-BD05-0000397D3C39
```

The resulting MTO is shown in the following illustration. The total number of flanges remains the same (6), but there is now one 6" flange with the modified description (**XX**) in addition to the 2x6" flanges with the original description.

| | | | | | |
|---|---|---------------|---|---|---|
| 6 | 6 | FCD150-WNRSTD | FLANGE, CS ASTM A105, 150#, WN, RF, STD WT XX | 1 | 2 |
| 7 | 6 | FCD150-WNRSTD | FLANGE, CS ASTM A105, 150#, WN, RF, STD WT | 2 | |
| 8 | 4 | FCD150-WNRSTD | FLANGE, CS ASTM A105, 150#, WN, RF, STD WT | 3 | |

NOTES

- For set-on, stub-in, tangential and offset tees, the **ITEM-CODE** attribute, as well as the optional **ITEM-DESCRIPTION** attribute, should be those of the branch pipe.
- For pulled tees, the **ITEM-CODE** attribute, as well as the optional **ITEM-DESCRIPTION** attribute, should be those of the main pipe.

Additional Material Attributes

Up to ten user-defined material attributes are supported by the PCF syntax. These attributes can be used to map properties that are available in the host system reference data. These properties can be plotted on the material list and output in Isogen generated reports.

The PCF allows you to enter these user-defined material attributes either with each component or in the MATERIALS section. The latter is strongly recommended. For more information about user-defined material attributes, see *Additional Material Attributes* (on page 72).

Limitations

Certain restrictions are inherent when relying on the **ITEM-CODE** and **ITEM-DESCRIPTION** pair to define the link between a component and its material. For example, any given combination of **ITEM-CODE** and **ITEM-DESCRIPTION** can only bear one combination of material attributes. Too, all components that share the same combination of **ITEM-CODE** and **ITEM-DESCRIPTION** properties are accumulated by Isogen on the material list. As such, it is not possible to separately accumulate two components that have the same **ITEM-CODE** and **ITEM-DESCRIPTION** properties, even if they are from different piping specifications.

Conflicts can also arise if (against recommended best practices) differing combinations of material attributes for a given combination of **ITEM-CODE** and **ITEM-DESCRIPTION** are included at the component level. In these situations, it is impossible to be certain that the intended behavior is being followed.

IMPORTANT You *cannot* use the **MATERIAL-IDENTIFIER** attribute in combination with the **ITEM-CODE** / **ITEM-DESCRIPTION** attributes to specify materials. Any such inconsistency in methods within the PCF will cause processing to immediately cease.

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