NORSOK STANDARD

COMMON REQUIREMENTS

# PIPING DETAILS

L-CR-003
Rev. 1, January 1996

# CONTENTS

# 1 FOREWORD

NORSOK (The competitive standing of the Norwegian offshore sector) is the industry initiative to add value, reduce cost and lead time and remove unnecessary activities in offshore field developments and operations.

The NORSOK standards are developed by the Norwegian petroleum industry as a part of the NORSOK initiative and are jointly issued by OLF (The Norwegian Oil Industry Association) and TBL (The Federation of Norwegian Engineering Industries). NORSOK standards are administered by NTS (Norwegian Technology Standards Institution).

The purpose of this industry standard is to replace the individual oil company specifications for use in existing and future petroleum industry developments, subject to the individual company's review and application.

The NORSOK standards make extensive references to international standards. Where relevant, the contents of this standard will be used to provide input to the international standardization process. Subject to implementation into international standards, this NORSOK standard will be withdrawn.

# 2 SCOPE

The standard defines the installation requirements for piping details.

# 3 NORMATIVE REFERENCES

NORSOK L-CR-001 Piping and valves

# 4 DEFINITIONS AND ABBREVIATIONS

## 4.1 Definitions

| | |
|---|---|
| Normative references | Shall mean normative in the application of NORSOK standards. |
| Informative references | Shall mean informative in the application of NORSOK standards. |
| Shall | Shall is an absolute requirement which shall be followed strictly in order to conform with the standard. |
| Should | Should is a recommendation. Alternative solutions having the same functionality and quality are acceptable. |
| May | May indicates a course of action that is permissible within the limits of the standard (a permission). |
| Can | Can-requirements are conditional and indicates a possibility open to the user of the standard. |

## 4.2 Abbreviations

| | |
|---|---|
| ASME | American National Standards Institute |

# 5 TECHNICAL REQUIREMENTS

## 5.1 General

This document is based upon using components from L-CR-001. However, components not covered in L-CR-001 may be handled as special items.

### 5.2 Options

This standard contains individual piping details. It is the intention that each project shall compile a set of standard sheets from this document applicable for the particular project.

Undesired sheets and options (E.g. 10A or 10B) should be subtracted by the project.

### 5.3 Double block

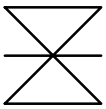
Requirements for double block (& bleed if applicable) shall be in accordance with P-CR-001. The details shown in this document have been based on the assumption of applying double block arrangement for ANSI Class 600 and above.

### 5.4 Modular compact valves

The philosophy for use of modular compact valves will be included when these valves have been included in the next revision of NORSOK standard for Piping and valves, L-CR-001. However, some of the details in this standard show Modular Compact Valves. The extent of use of these valves, is to be decided by project.

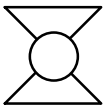
### 5.5 Valve legend

Please note that this standard are not using the NORSOK symbols according to Z-CR-004, CAD legend. The required symbols were not available when this standard was made.

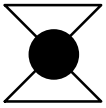


Gate valve, normally open

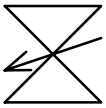
Gate valve, normally closed



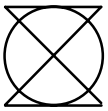
Globe valve, normally open



Globe valve, normally closed

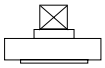


Check valve



Ball valve, normally open

Hex head plug



Threaded reducing flange with temporary hex head plug.
Alternatively, blind flange tapped and bored with hex head plug.

### 5.6 Drilling details

Drilling related piping is not included in this revision.

### 5.7 Hydraulic

Hydraulic related piping is not included in this revision.

### 5.8 Birdscreen

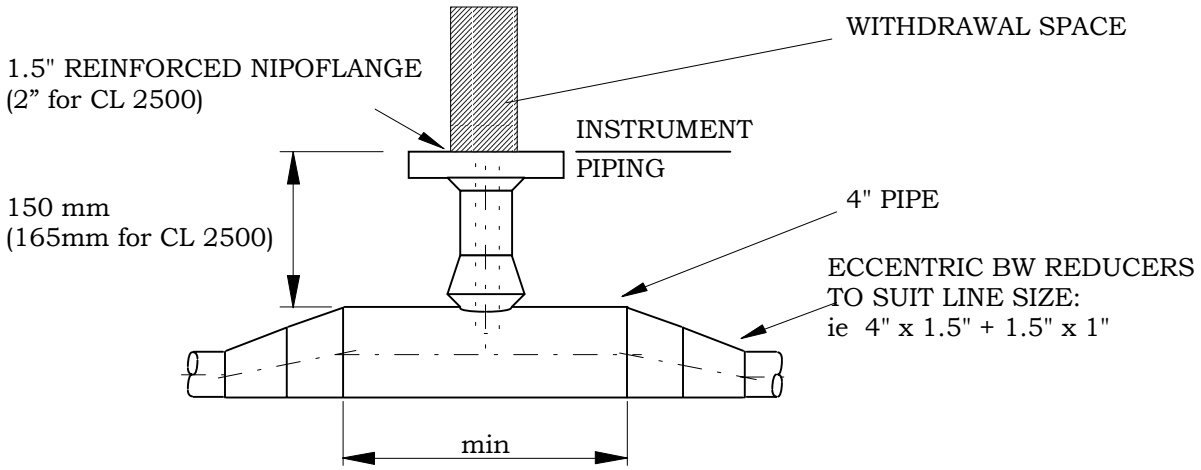
Use standard flanges for optional closure solutions during construction.

For larger sizes, if no pressure testing is required, consider use of other closure solutions for weight reduction.

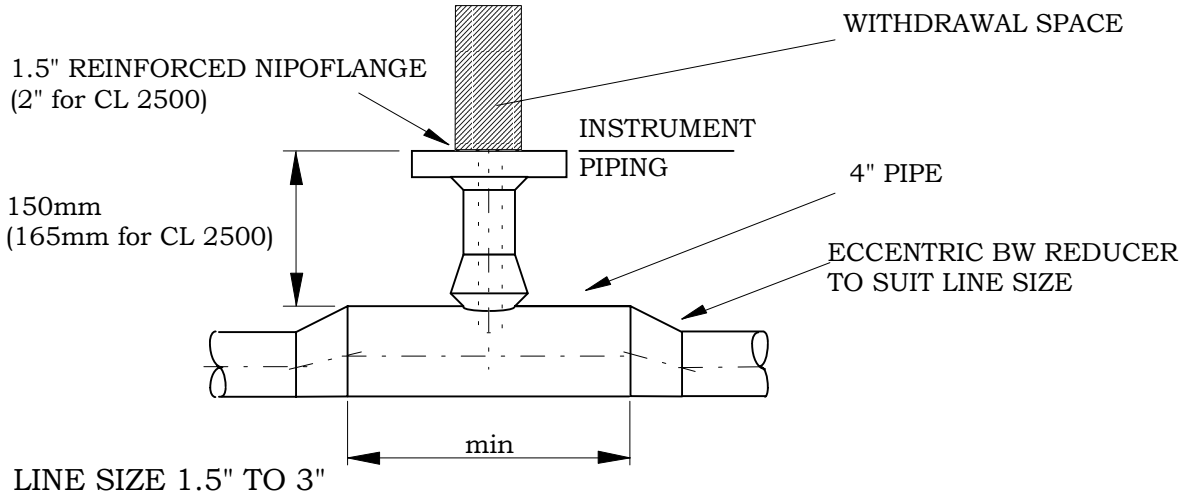
# ANNEX A TYPICAL DRAWINGS (NORMATIVE)

| Title | PD | ANSI CLASS |
|---|---|---|
| THERMOWELL CONNECTIONS | 001 | 150 TO 2500 |
| EXTERNAL THERMOWELL CONNECTION | 004 | 150 TO 2500 |
| INSTRUMENT PRESSURE CONNECTION (WELDED) | 010A | 150 TO 300 |
| INSTRUMENT PRESSURE CONNECTION (FLANGED) | 010B | 150 TO 300 |
| INSTRUMENT PRESSURE CONNECTION (WELDED, DB&B) | 011A | 600 TO 2500 |
| INSTRUMENT PRESSURE CONNECTION (FLANGED, DB&B) | 011B | 600 TO 2500 |
| INSTRUMENT PRESSURE CONNECTION TO VESSEL (WELDED) | 014 | 150 TO 300 |
| INSTRUMENT PRESSURE CONNECTION TO VESSEL (WELDED, DB&B) | 015 | 600 TO 2500 |
| VESSEL TRIM LEVEL GAUGE | 020 | 150 TO 2500 |
| VESSEL TRIM LEVEL TRANSMITTER (FLOAT TYPE) | 022 | 150 TO 2500 |
| VESSEL TRIM LEVEL TRANSMITTER (D.P.) | 023 | 150 TO 2500 |
| VESSEL TRIM LEVEL TRANSMITTER (D.P. INTRUSIVE TYPE) | 024 | 150 TO 2500 |
| STILLING TUBE FOR ATM. TANK LEVEL TRANSM. (TOP ACCESS) | 030 | 150 |
| ATMOSPHERIC TANK LEVEL LOGGING CONNECTING POINT | 031 | 150 |
| ORIFICE FLANGE WITH FLAT AND RAISED FACE | 040 | 150 TO 300 |
| ORIFICE FLANGE WITH RTJ FLANGES | 041 | 600 TO 2500 |
| LOCAL VENT & DRAIN (ALTERNATIVE 1) | 050A | 150 TO 2500 |
| LOCAL VENT & DRAIN (ALTERNATIVE 2) | 050B | 150 TO 2500 |
| HYDROSTATIC PRESSURE TESTING VENT & DRAIN | 055 | 150 TO 2500 |
| BRACING DETAILS | 059 | 150 TO 2500 |
| ANNUBAR CONNECTIONS | 060 | 150 TO 2500 |
| ACCESS FITTING FOR SAND PROBE | 061 | 150 TO 2500 |
| ACCESS FITTING FOR CORROSION MONITORING | 062 | 150 TO 2500 |
| SAMPLE CONNECTION FOR PROCESS GAS/LIQUID SERV. (HAZ. FLUID) | 070 | 150 TO 2500 |
| SAMPLE CONNECTION FOR UTILITY SERVICES (NON-HAZ. FLUID) | 071 | 150 TO 2500 |

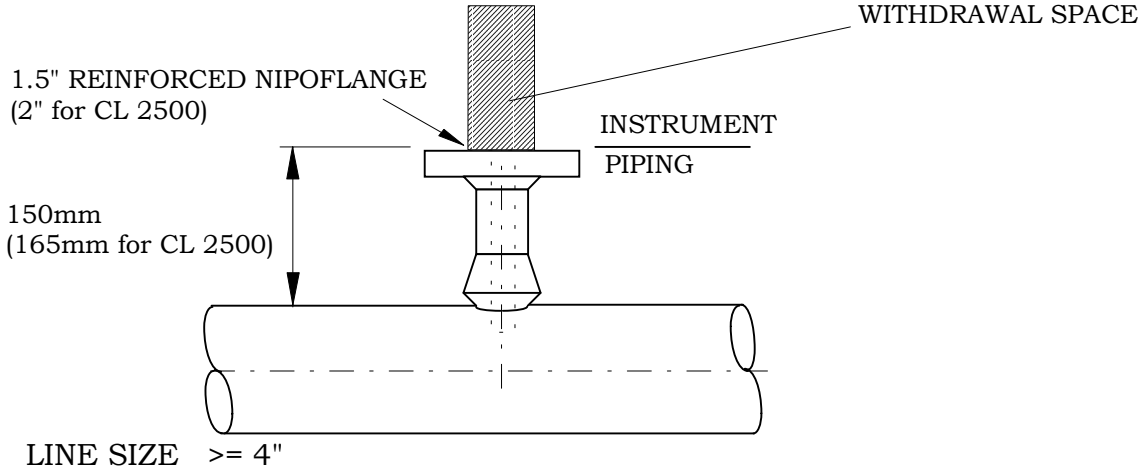
| | | |
|---|---|---|
| TEMPORARY "CONICAL" STRAINER | 080 | 150 TO 2500 |
| TEMPORARY "BATH TUB" STRAINER | 081 | 150 TO 2500 |
| DAVIT FOR BLIND FLANGE | 085 | 150 TO 2500 |
| DRIP RING DETAILS RF FLANGES | 090 | 150 TO 300 |
| DRIP RING DETAILS RTJ FLANGES | 091 | 600 TO 2500 |
| INLINE CONDENSATE DRAIN POINTS FOR STEAM MAINS | 093 | 150 TO 2500 |
| END OF MAIN CONDENSATE DRAIN POINTS FOR STEAM MAINS | 094 | 150 TO 2500 |
| TYPICAL UTILITY STATION CONCEPT | 129 | 150 TO 2500 |




LINE SIZE 1"




LINE SIZE 1.5" TO 3"

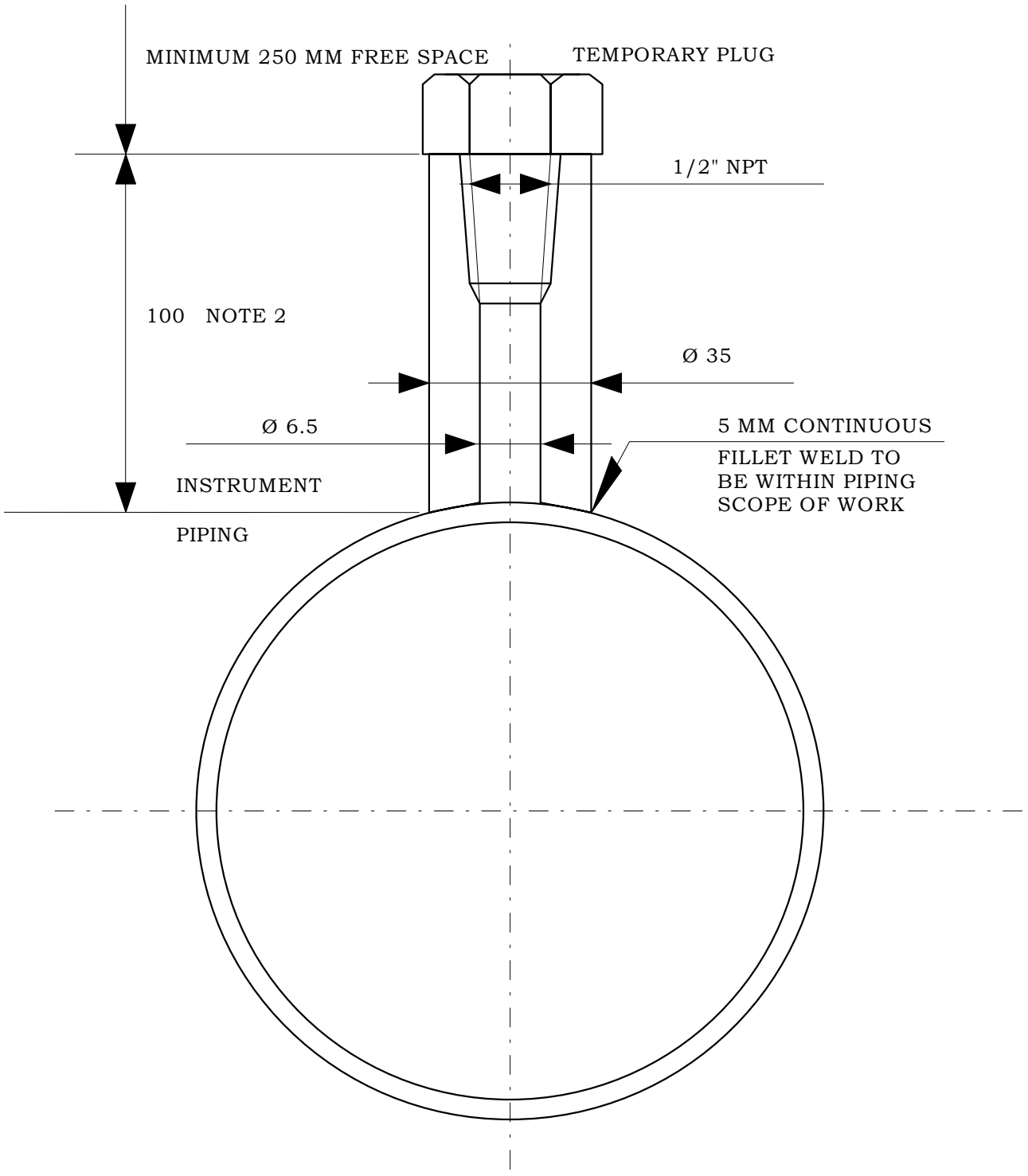



LINE SIZE >= 4"

NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. For installation in vertical lines use concentric buttweld reducers and 45° latroflange if required.
3. The Thermowell must be purchased to fit the inside diameter of the reinforced nipoflange which shall be machined according to the nominal inside diameter of the corresponding piping class.
4. Weldolet, nipple and flange to piping class may be used as an alternative to reinforced nipoflange where this can be documented to be more cost effective.

| | | | |
|---|---|---|---|
| THERMOWELL CONNECTIONS<br>CL 150 TO CL 2500 | **PD-001** | Sht 1 of 1 | Rev. 02 |



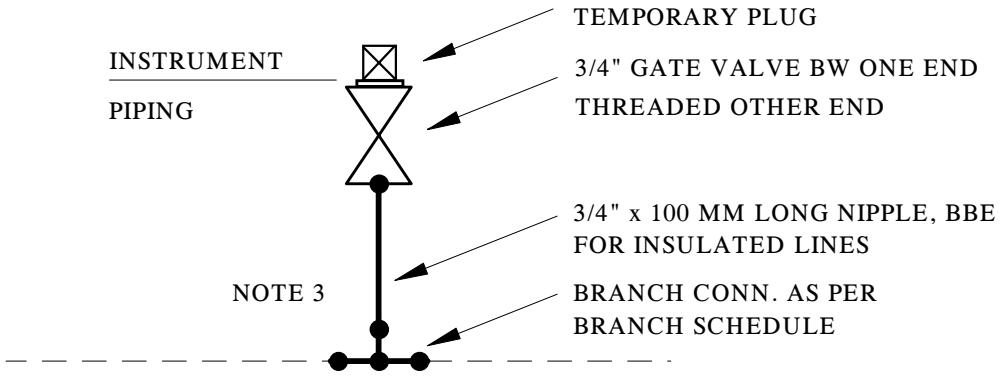

EXTERNAL THERMOWELL NOTE 1

FOR HORISONTAL AND VERTICAL PIPE

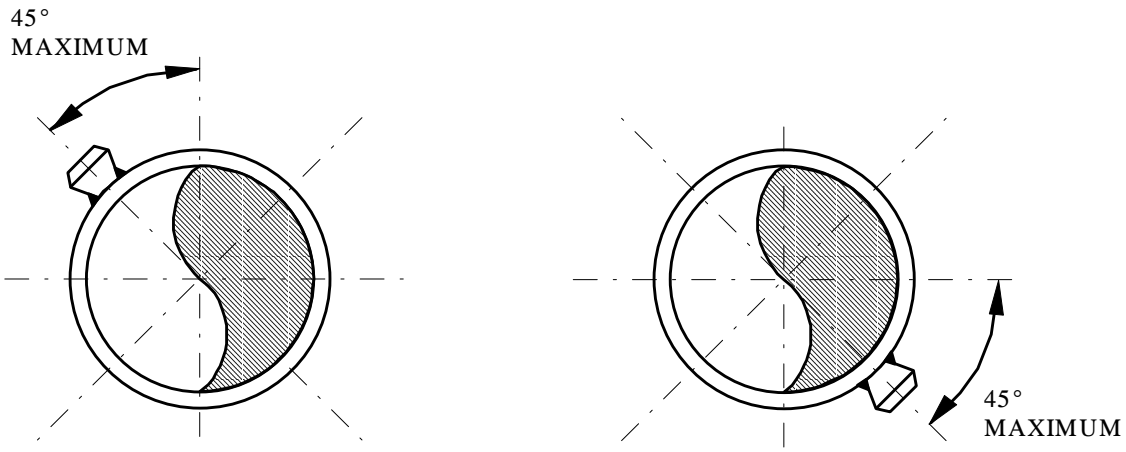
NOTES:

1. Material grade to be compatible with pipe & fittings.
2. Insulation thickness must be considered.

| | | | |
|---|---|---|---|
| EXTERNAL THERMOWELL CONNECTION<br>CL 150 TO CL 2500 | **PD-004** | Sht 1 of 1 | Rev. 02 |




HORIZONTAL LINES
NOTE 4




GAS

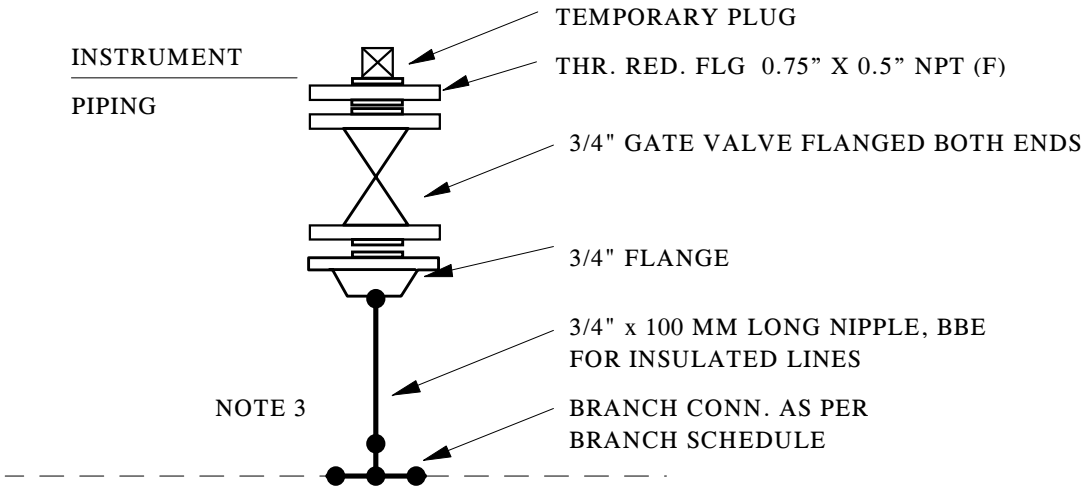
LIQUID

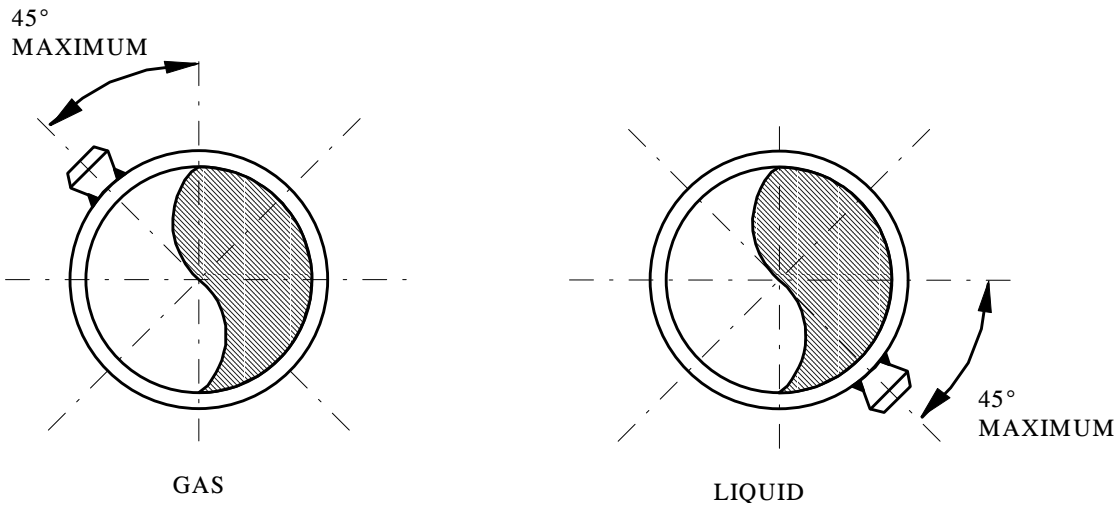
ORIENTATION OF INSTRUMENT CONNECTION ON HEADER

NOTES:

1. Rating and material of all items to be according to the relevant piping class.
2. -
3. For bracing details, see PD-059.
4. For vertical lines add elbow to achieve correct vertical orientation of instrument.

| | | | |
|---|---|---|---|
| INSTRUMENT PRESSURE CONNECTION (WELDED) CL 150 TO CL 300 | **PD-010A** | Sht 1 of 1 | Rev. 02 |



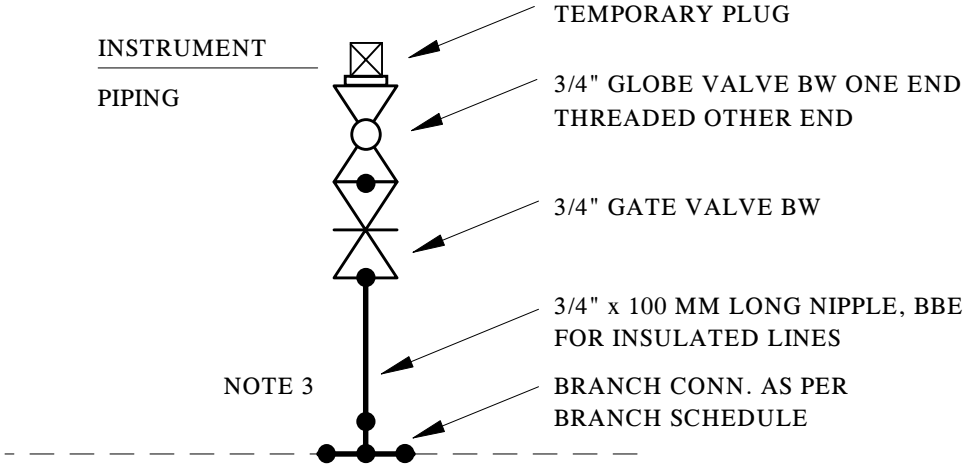




ORIENTATION OF INSTRUMENT CONNECTION ON HEADER

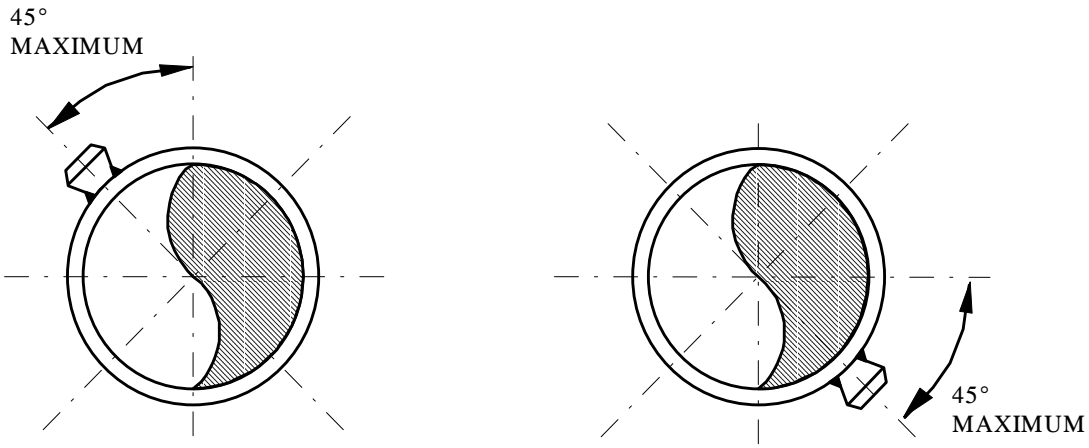
NOTES:

1. Rating and material of all items to be according to the relevant piping class.
2. -
3. For bracing details, see PD-059.
4. For vertical lines add elbow to achieve correct vertical orientation of instrument.

| | | | |
|---|---|---|---|
| INSTRUMENT PRESSURE CONNECTION (FLANGED) CL 150 TO CL 300 | **PD-010B** | Sht 1 of 1 | Rev. 02 |




HORIZONTAL LINES
NOTE 4



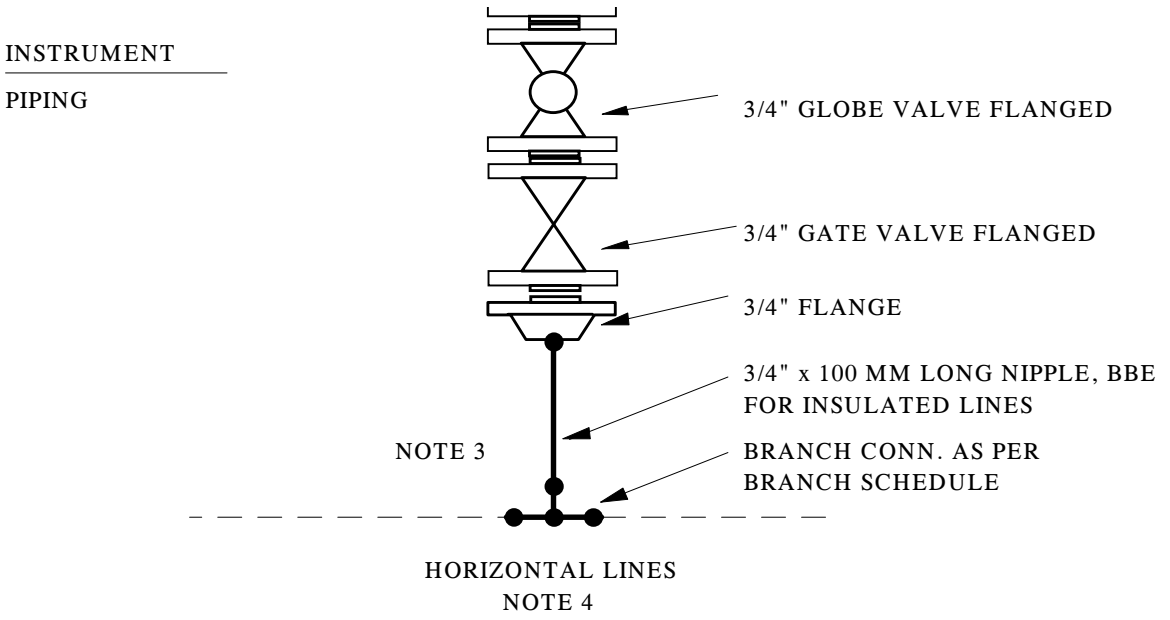

GAS

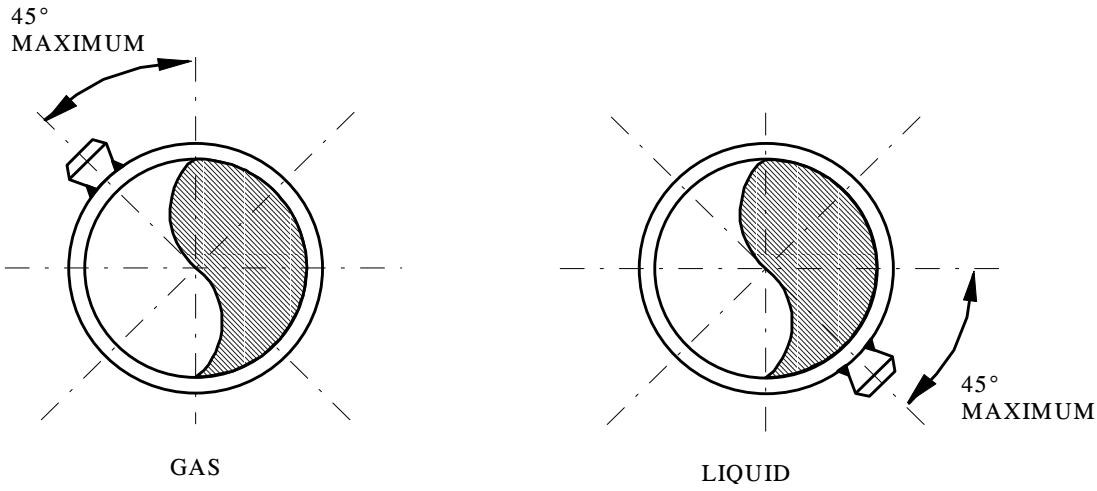
LIQUID

ORIENTATION OF INSTRUMENT CONNECTION ON HEADER

NOTES:
1. Rating and material of all items to be according to the relevant piping class.
2. -
3. For bracing details, see PD-059.
4. For vertical lines add elbow to achieve correct vertical orientation of instrument.

| | | | |
|---|---|---|---|
| INSTRUMENT PRESSURE CONNECTION (WELDED) CL 600 TO CL 2500 | **PD-011A** | Sht 1 of 1 | Rev. 02 |

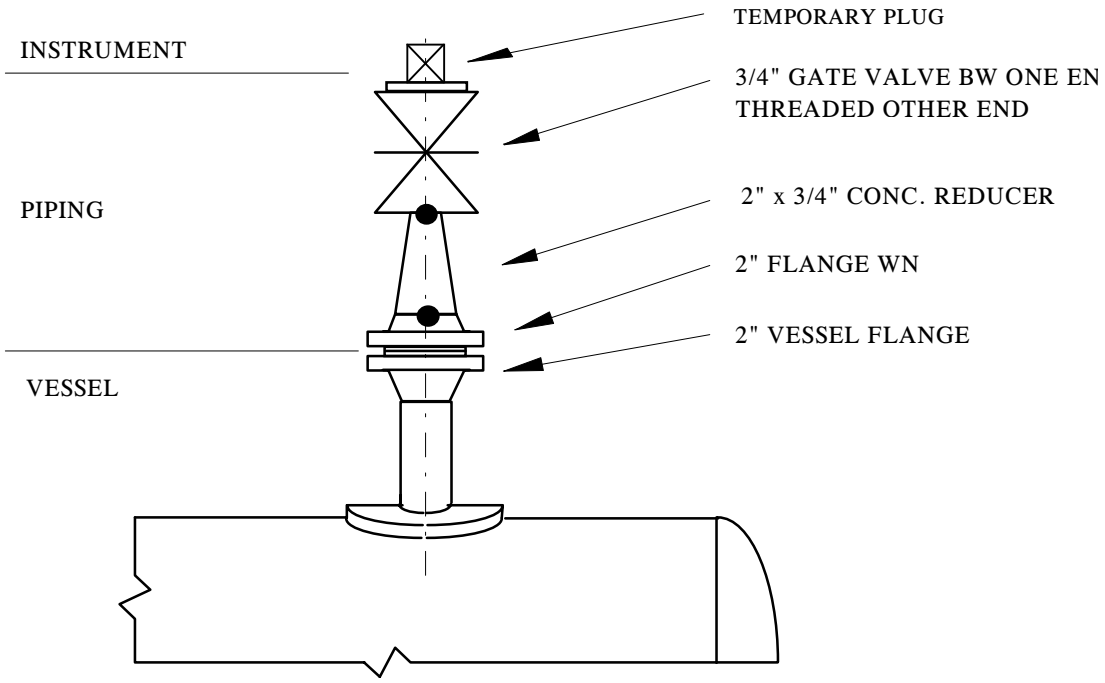



ORIENTATION OF INSTRUMENT CONNECTION ON HEADER

NOTES:
1. Rating and material of all items to be according to the relevant piping class.
2. -
3. For bracing details, see PD-059.
4. For vertical lines add elbow to achieve correct vertical orientation of instrument.

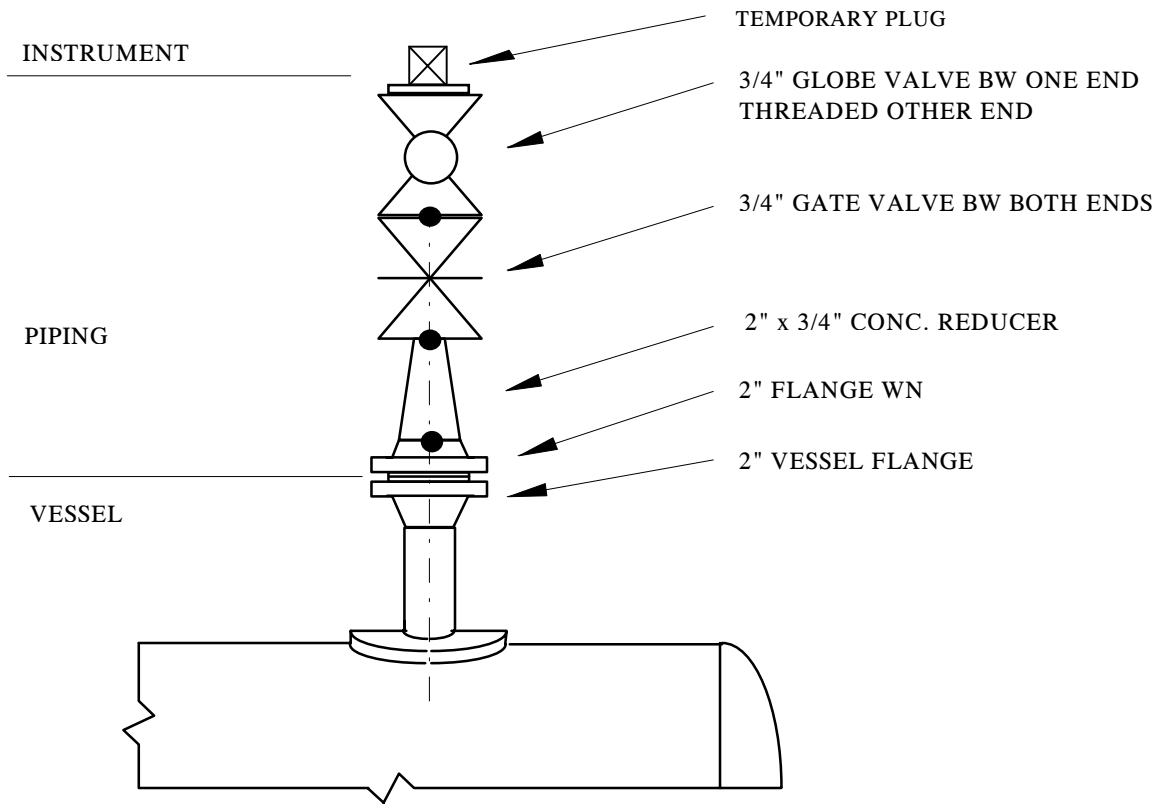
| | | | |
|---|---|---|---|
| INSTRUMENT PRESSURE CONNECTION (FLANGED) CL 600 TO CL 2500 | **PD-011B** | Sht 1 of 1 | Rev. 02 |




NOTES:

1. Rating and material of all items to be according to the relevant piping class.

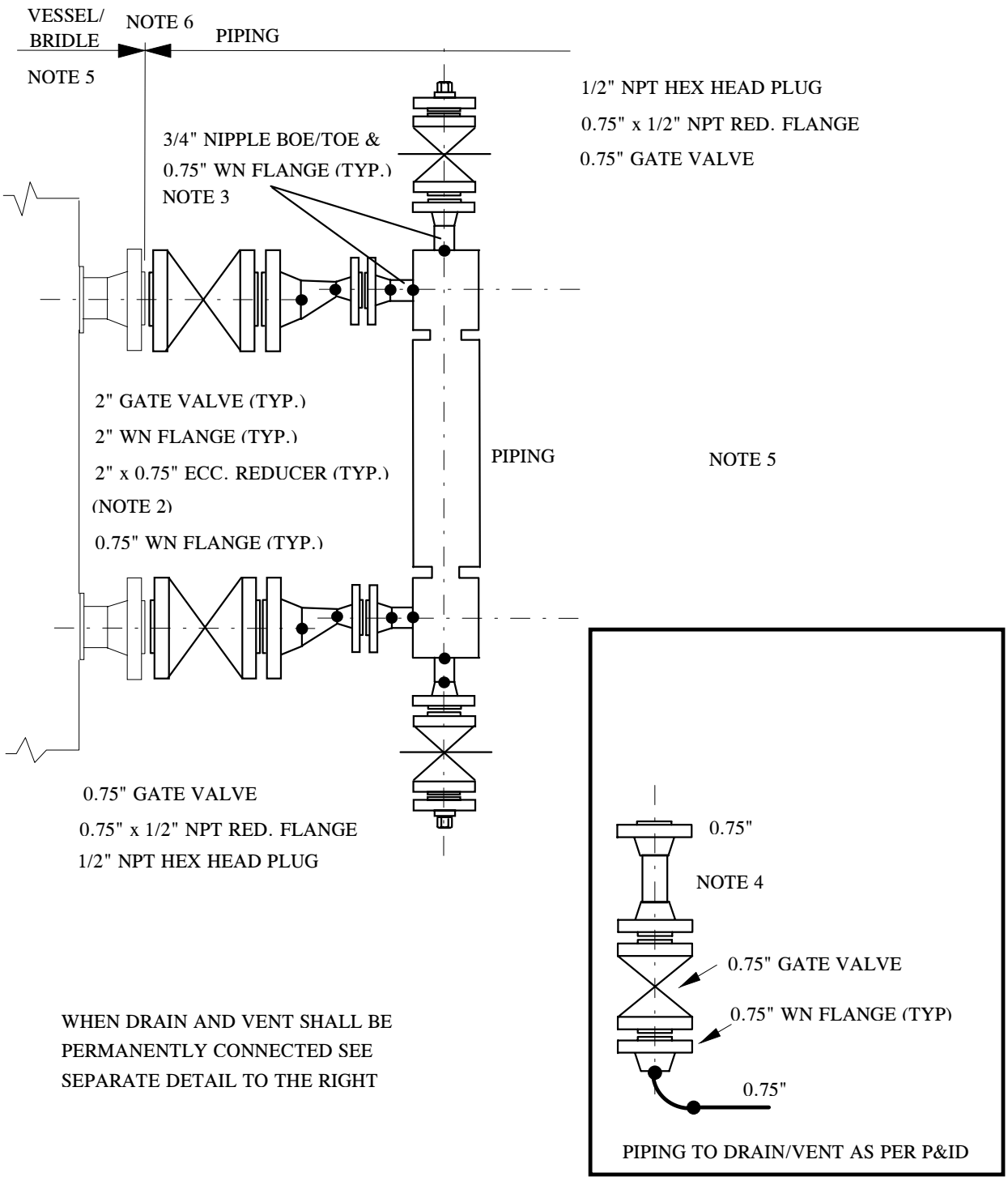
| | | | |
|---|---|---|---|
| INSTRUMENT PRESSURE CONNECTION TO VESSEL (WELDED), CL 150 TO CL 300 | **PD-014** | Sht 1 of 1 | Rev. 02 |




NOTES:

1. Rating and material of all items to be according to the relevant piping class.

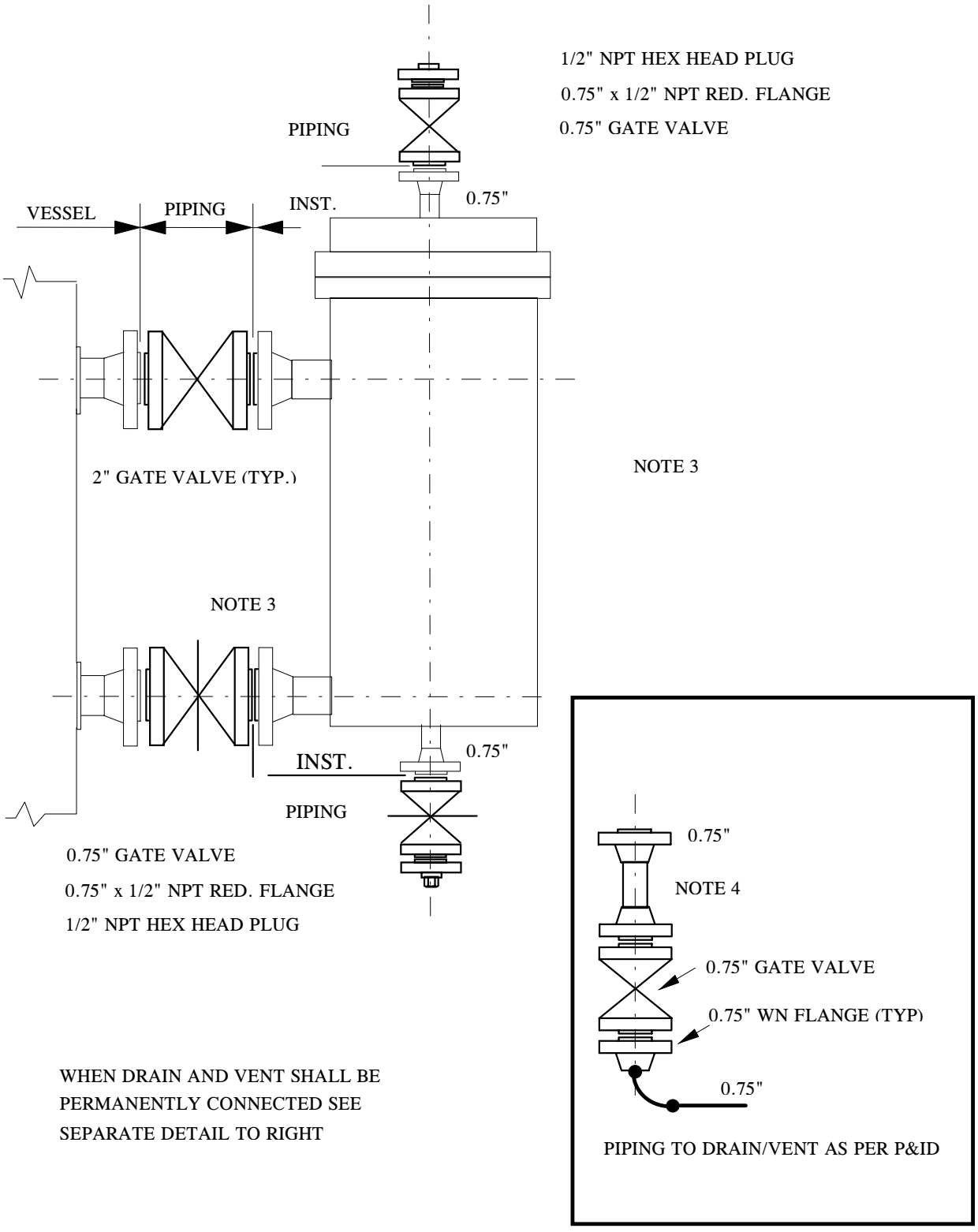
| | | | |
|---|---|---|---|
| INSTRUMENT PRESSURE CONNECTION TO VESSEL (WELDED), CL 600 TO CL 2500 | **PD-015** | Sht 1 of 1 | Rev. 02 |




NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. Use ecc. reducers field welded to allow for alignment.
3. Nipples to be seal welded by level gauge vendor for HC services only.
4. Provide break flanges down stream first isolation valve when piped to drain/flare.
5. Use double block for ANSI class 600 and above.
6. Split between piping and instrument to be decided by project.

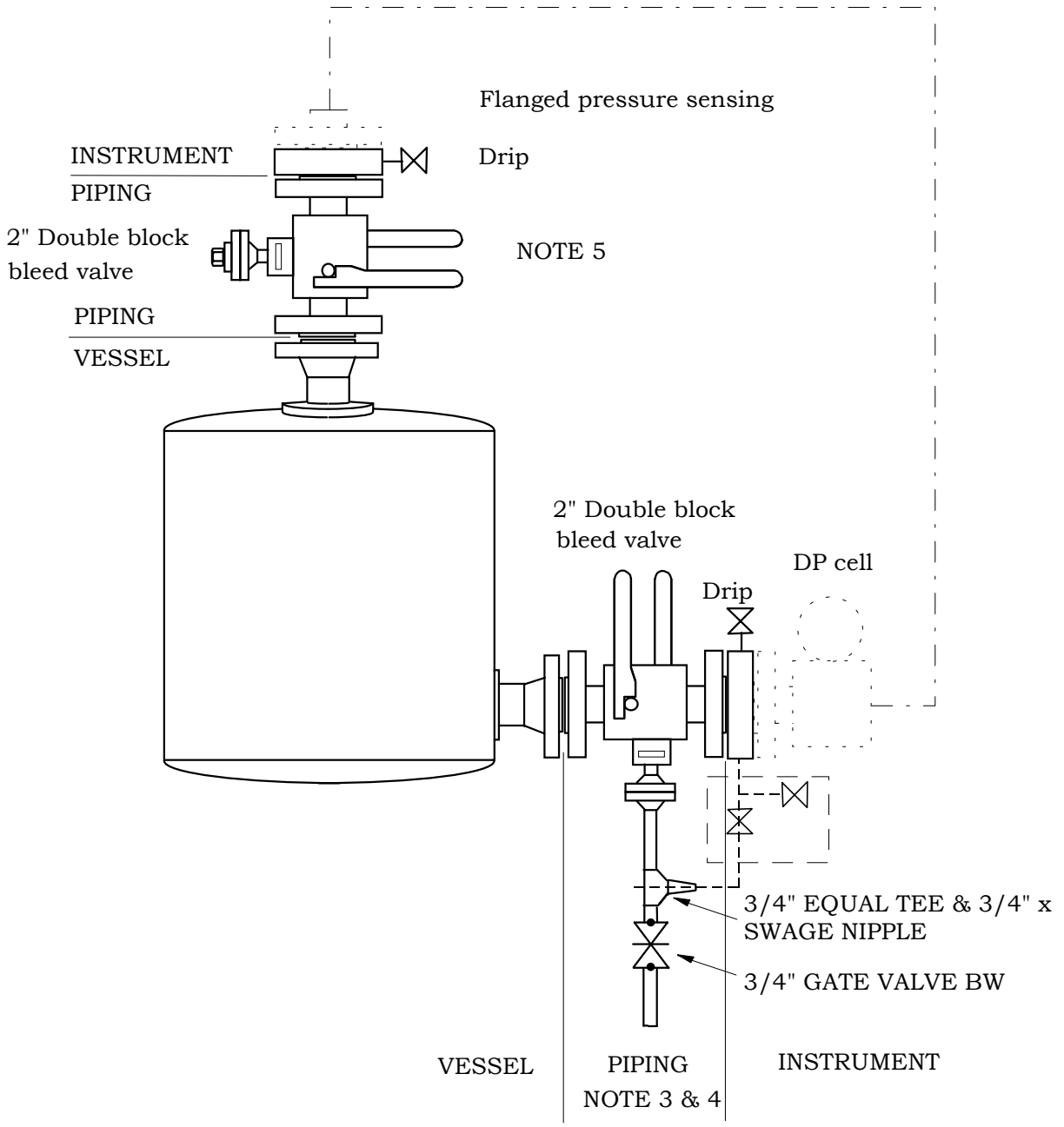
| | | | |
|---|---|---|---|
| VESSEL TRIM LEVEL GAUGE<br>CL 150 TO CL 2500 | **PD-020** | Sht 1 of 1 | Rev. 02 |




NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. Introduce 2" flanges, elbow and pipe to reduce overall standout and provide for adjustment if necessary.
3. Use double block for ANSI class 600 and above.
4. Provide break flanges down stream first isolation valve when piped to drain/flare.

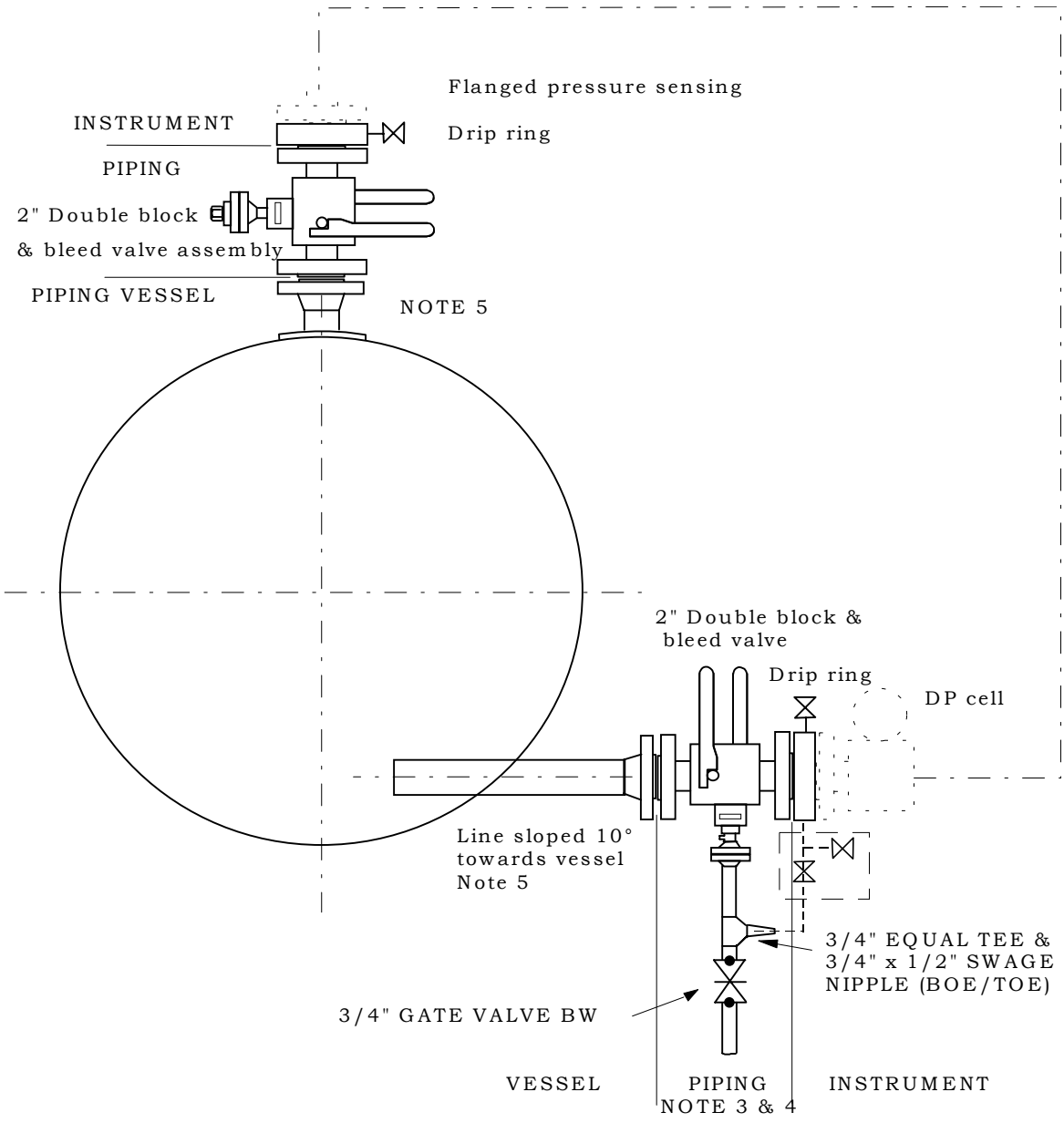
| VESSEL TRIM LEVEL TRANSMITTER (FLOAT TYPE), CL 150 TO CL 2500 | **PD-022** | Sht 1 of 1 | Rev. 02 |
|---|---|---|---|




NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. Introduce 2" flanges, elbow and pipe to reduce overall standout and provide for adjustment if necessary.
3. Check P&ID for any hard pipe requirements to closed drain/flare.
4. Provide break flanges downstream first isolation valve when piped to drain.
5. Location on vessel to be advices by instrument.
6. Support (if required) to be designed by support group.

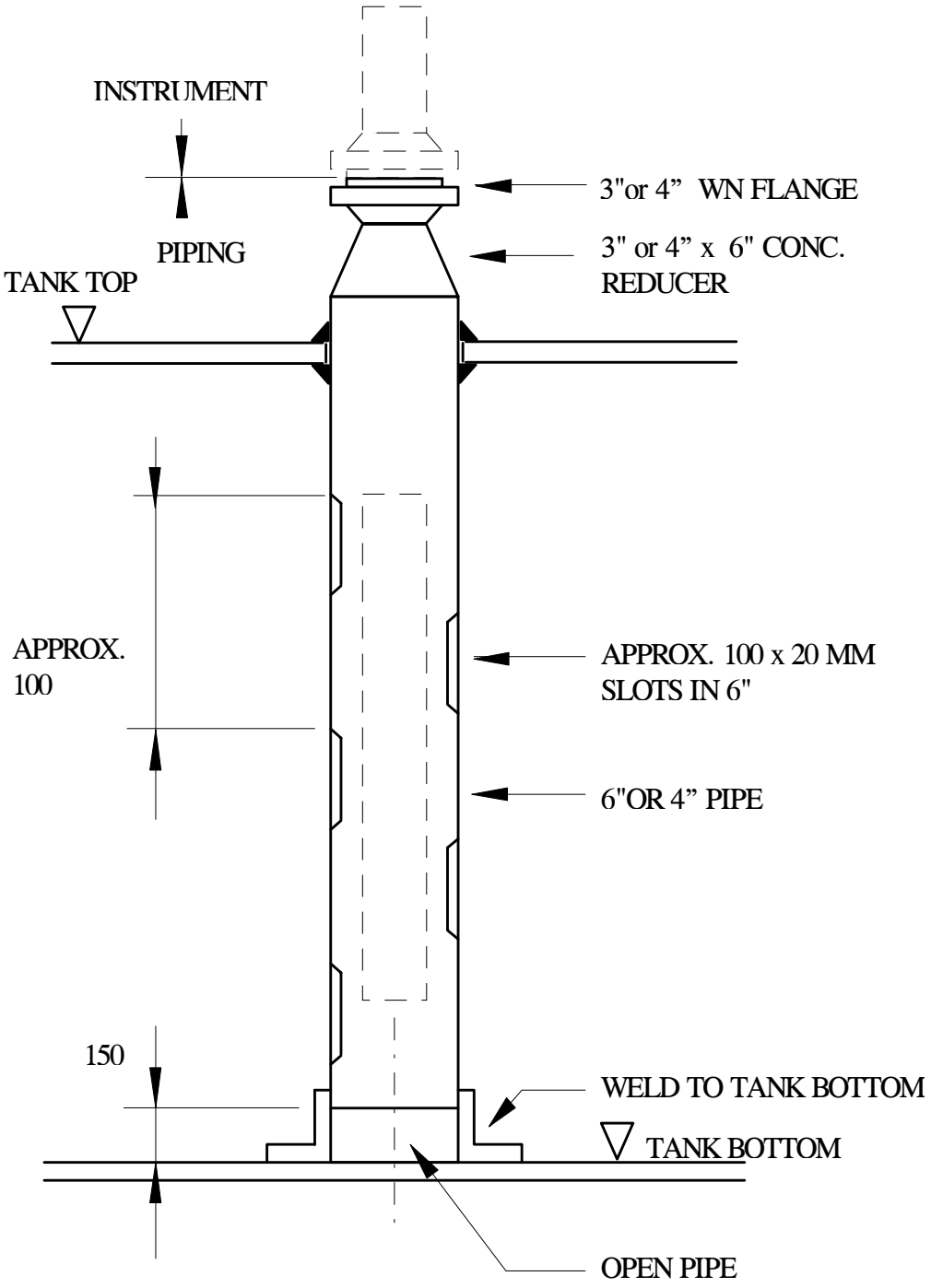
| | | | |
|---|---|---|---|
| VESSEL TRIM LEVEL TRANSMITTER (D.P.), CL 150 TO CL 2500 | **PD-023** | Sht 1 of 1 | Rev. 02 |




NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. Introduce 2" flanges, elbow and pipe to reduce overall standout and provide for adjustment if necessary.
3. Check P&ID for any hard pipe requirements to closed drain/flare.
4. Provide break flanges downstream first isolation valve when piped to drain.
5. Location on vessel to be advices by instrument.
6. Support (if required) to be designed by support group.

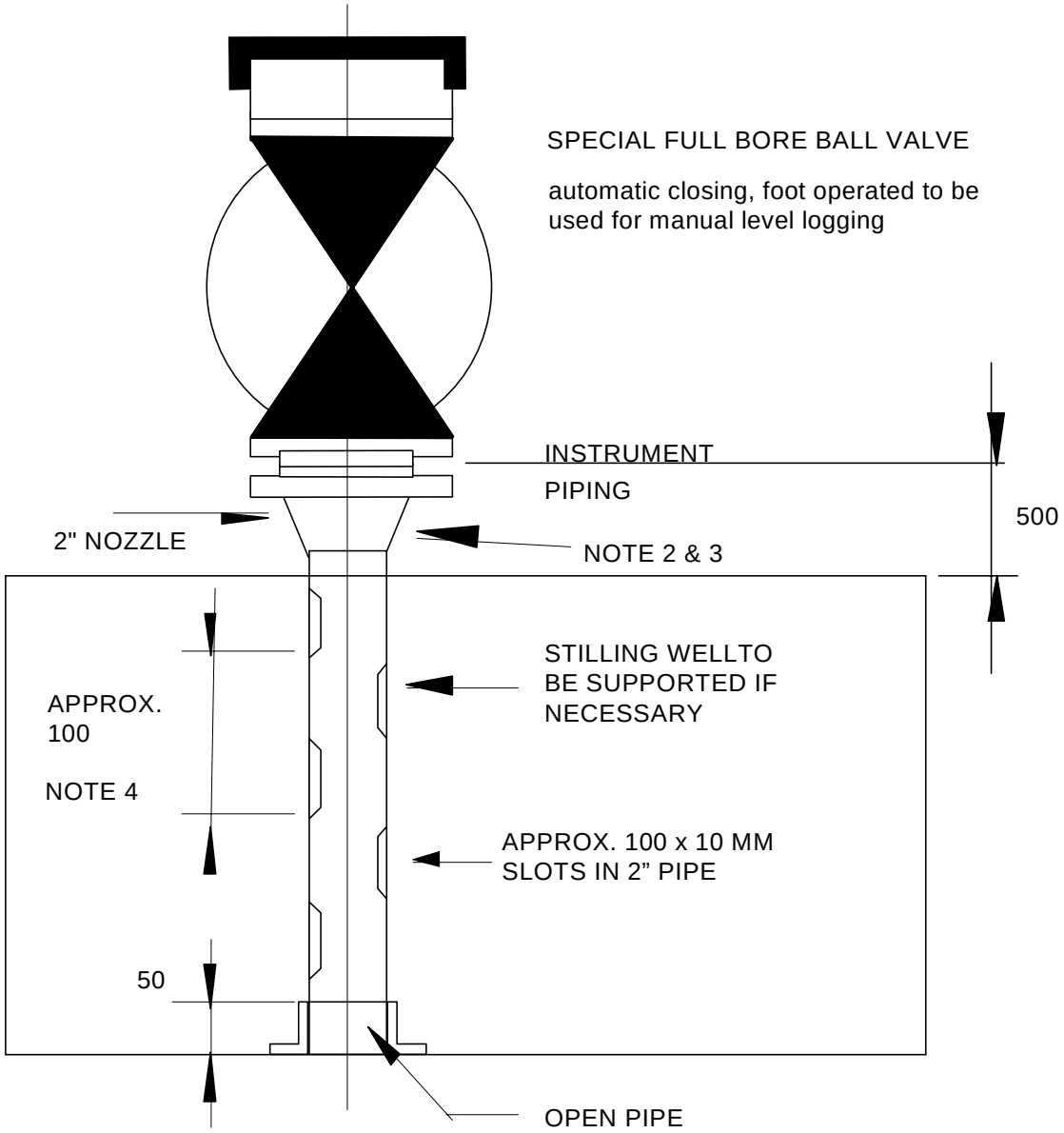
| | | | |
|---|---|---|---|
| VESSEL TRIM LEVEL TRANSMITTER (D.P. INTRUSIVE TYPE), CL 150 TO CL 2500 | **PD-024** | Sht 1 of 1 | Rev. 02 |




NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. Hole in blind flange for sensing unit to be drilled and tapped by instrument.

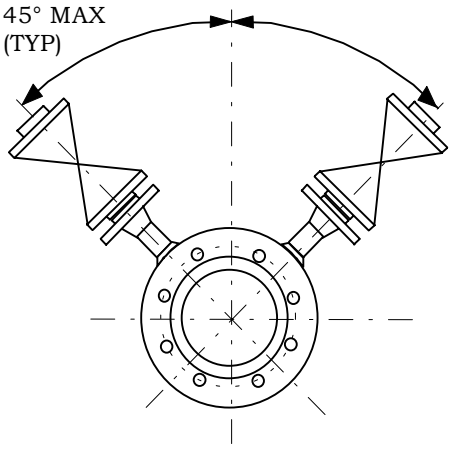
| | | | |
|---|---|---|---|
| STILLING TUBE FOR ATMOSPHERIC TANK LEVEL TRANSMITTER (TOP ACCESS), CL150 | **PD-030** | Sht 1 of 1 | Rev. 02 |




NOTES:

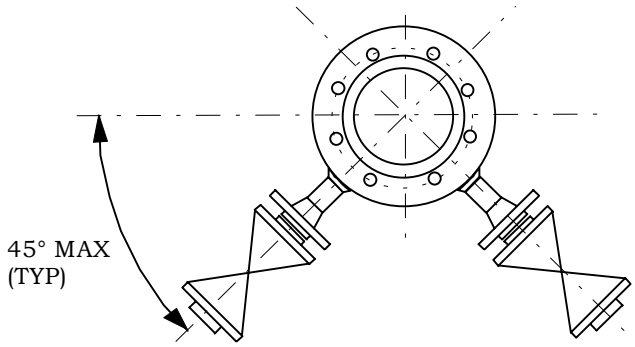
1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. Nozzle to be provided with a stilling well of equal I.D. over the full height of tank.
3. Bolts, nuts & gaskets by piping.
4. Slot to be located as close to tank top as possible.

| | | | |
|---|---|---|---|
| ATMOSPHERIC TANK MANUAL LEVEL LOGGING CONNECTING POINT, CL 150 | **PD-031** | Sht 1 of 1 | Rev. 02 |

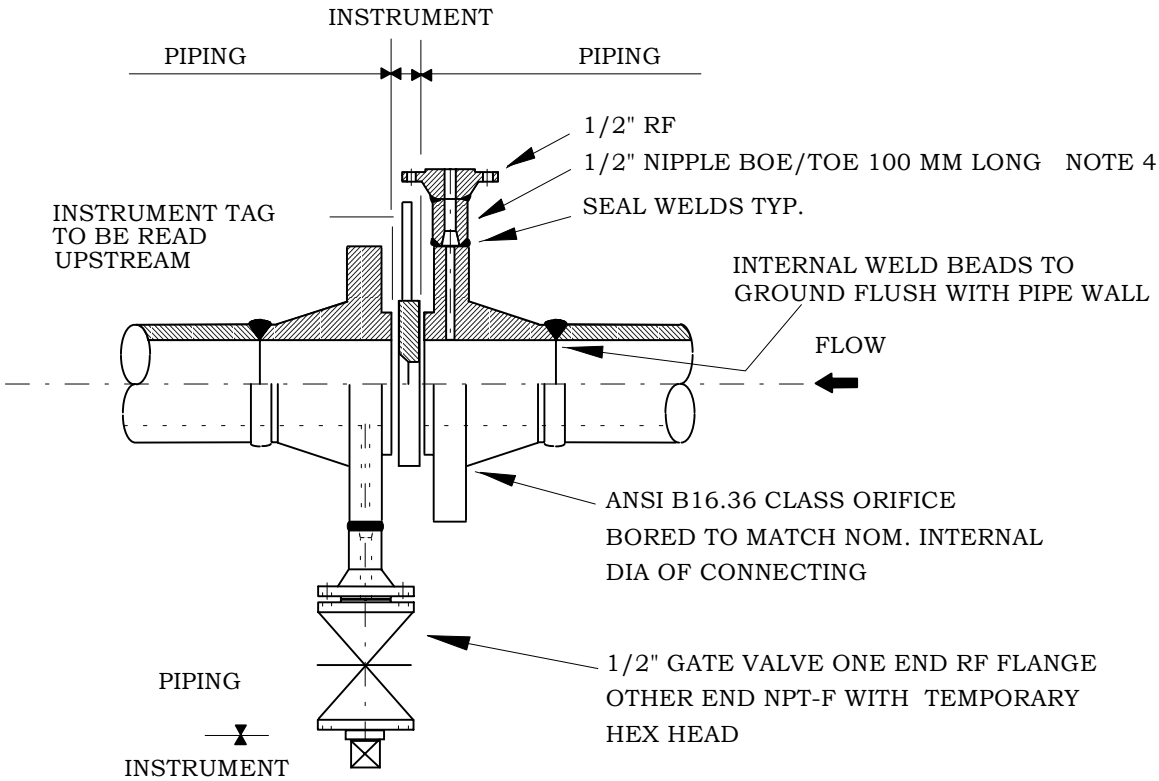



ORIENTATION OF TAPS
GAS AND VAPOUR

NOTE 2



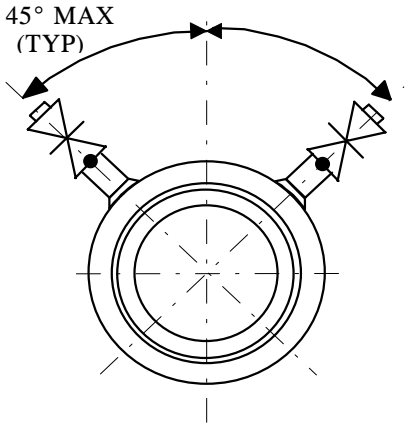

ORIENTATION OF TAPS
LIQUID




NOTES:

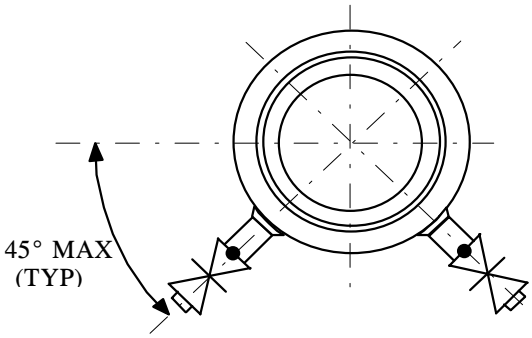
1. Rating and material grade of nipples and valves to be the same as for the flow elements and relevant piping class.
2. If double tapping is required, taps must be offset or extended to avoid clash of tap flanges and valves.
3. For vertical lines add 45° elbow and additional nipple between orifice flange and valve to achieve vertical orientation.
4. Alternatively use nipoflange if feasable.

| | | | |
|---|---|---|---|
| ORIFICE FLANGE WITH FLAT AND RAISED FACE CL 150 TO CL 300 | **PD-040** | Sht 1 of 1 | Rev. 02 |

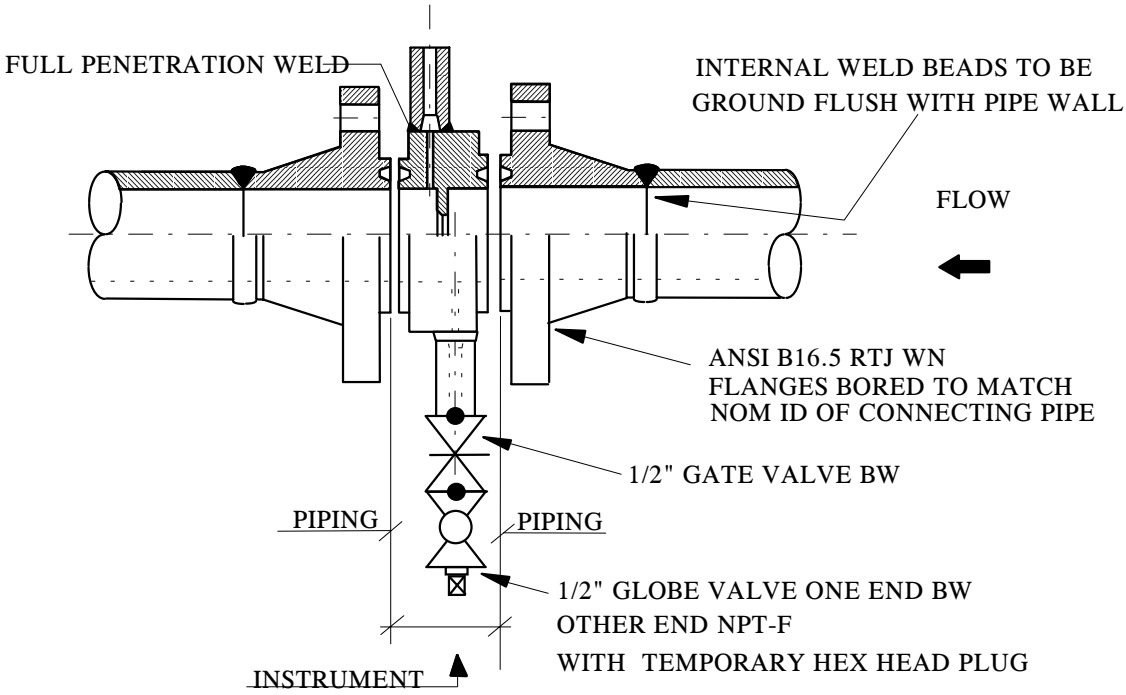



ORIENTATION OF TAPS FOR
GAS AND VAPOUR SERVICE

NOTE 2



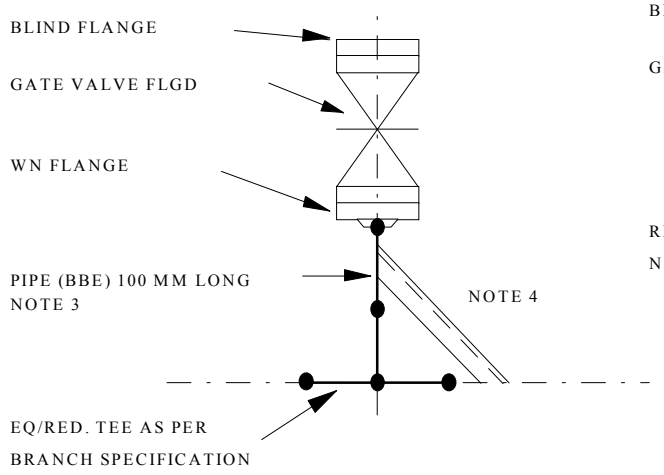

ORIENTATION OF TAPS FOR
LIOUID SERVICE



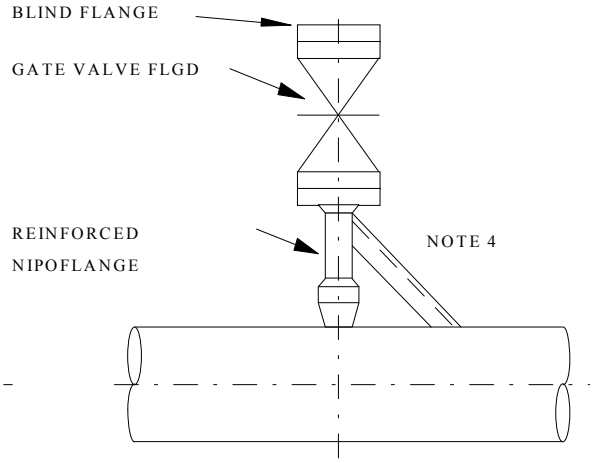

NOTES:

1. Rating and material grade of nipples and valves to be the same as for the flow elements and relevant piping class.
2. If double tapping is required, taps must be offset or extended to avoid clash of tap flanges and valves.
3. For vertical lines add 45° elbow and additional nipple between orifice flange and valve to achieve vertical orientation.

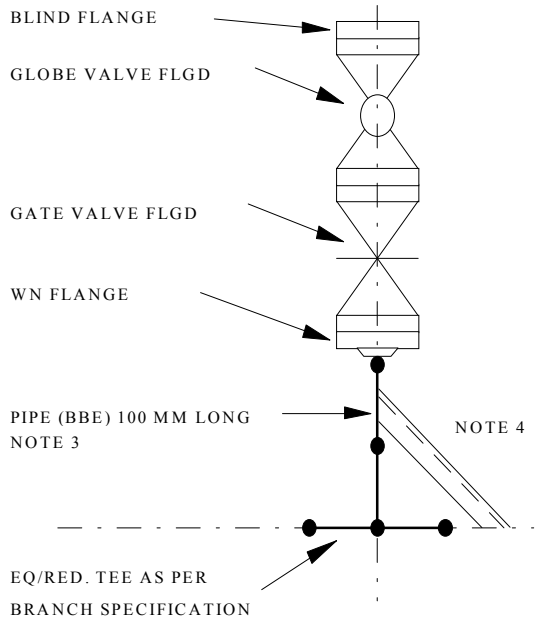
| | | | |
|---|---|---|---|
| ORIFICE FLANGE WITH RTJ FLANGES<br>CL 600 TO CL 2500 | **PD-041** | Sht 1 of 1 | Rev. 02 |



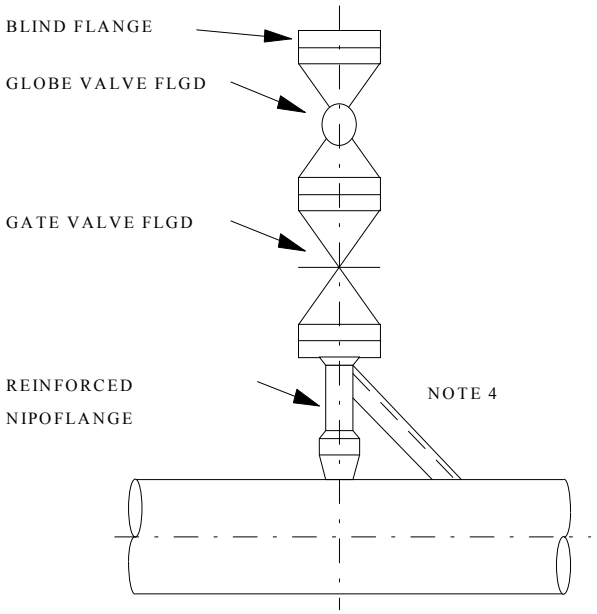

HEADER SIZES 0.5" - 1"




HEADER SIZES 1.5" AND ABOVE




HEADER SIZES 0.5" - 1"



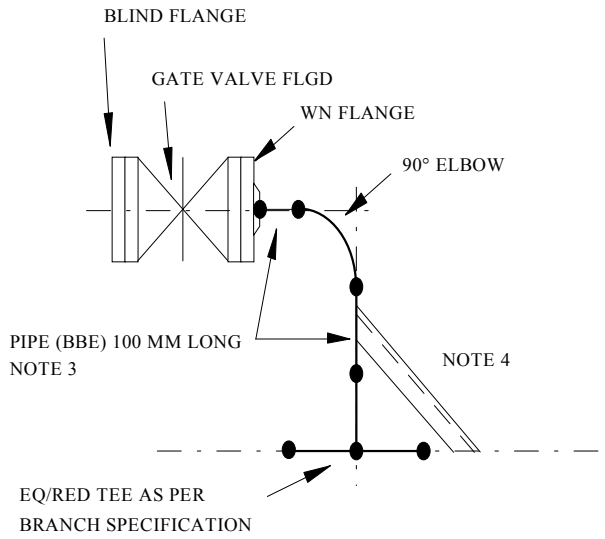

HEADER SIZES 1.5" AND ABOVE

VENTS & DRAINS FOR LINE SIZE 3/4" TO 12" TO BE 3/4" SIZE
VENTS & DRAINS FOR LINE SIZE ABOVE 12" TO BE 1" SIZE

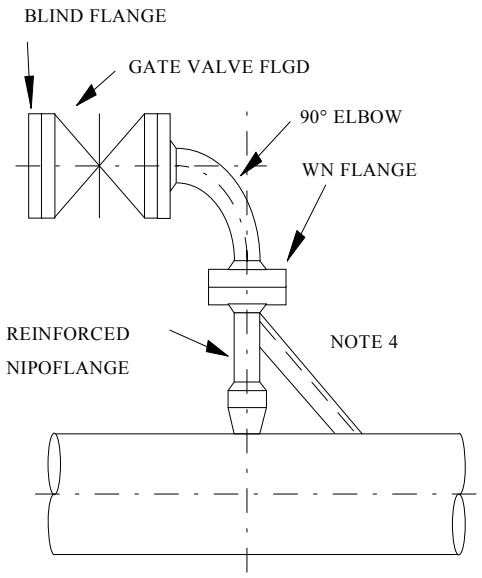
NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. -
3. Cut to suit.
4. For bracing see PD-059.
5. When clearance between face of valve/top of deck or ceiling is less than 200mm, use PD-050B.

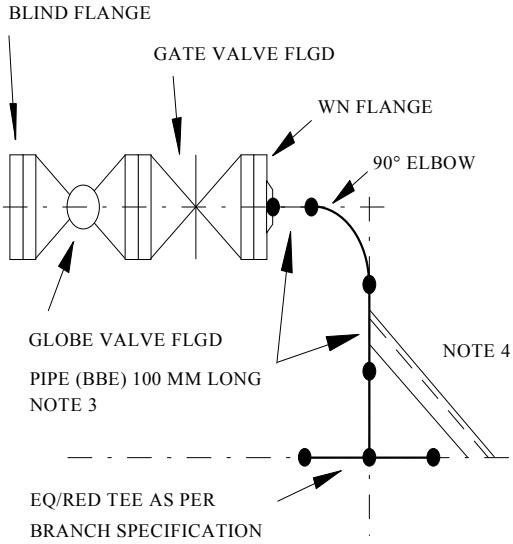
| | | | |
|---|---|---|---|
| LOCAL VENT & DRAIN (ALTERNATIVE 1)<br>CL 150 TO CL 2500 | **PD-050A** | Sht 1 of 1 | Rev. 02 |



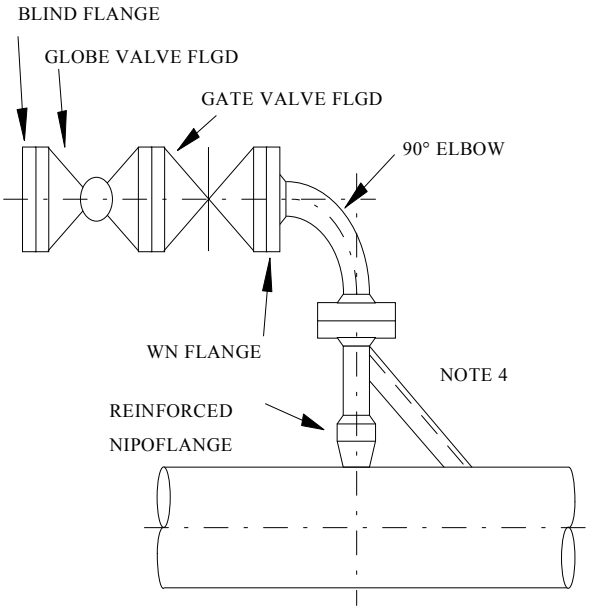

HEADER SIZES 0.5" - 1"




HEADER SIZES 1.5" AND ABOVE




HEADER SIZES 0.5" - 1"



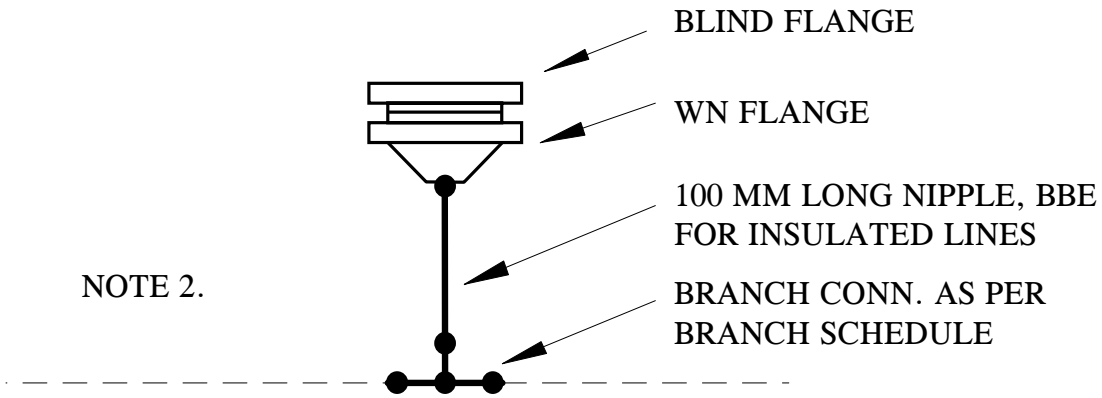

HEADER SIZES 1.5" AND ABOVE

VENTS & DRAINS FOR LINE SIZE 3/4" TO 12" TO BE 3/4" SIZE
VENTS & DRAINS FOR LINE SIZE ABOVE 12" TO BE 1" SIZE

NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. -
3. Cut to suit.
4. For bracing see PD-059.

| | | | |
|---|---|---|---|
| LOCAL VENT & DRAIN (ALTERNATIVE 2)<br>CL 150 TO CL 2500 | **PD-050B** | Sht 1 of 1 | Rev. 02 |

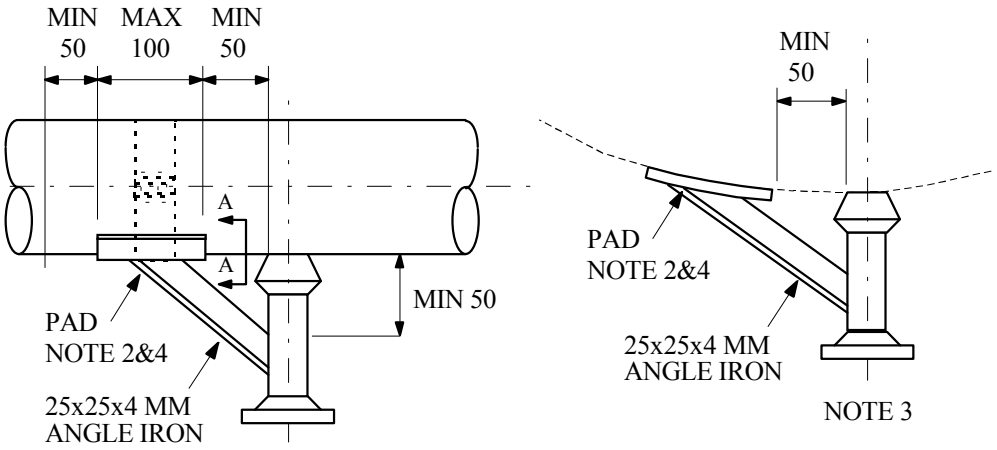



Vents and drains on lines 3/4" to 12" to be 3/4" size.
Vents and drains on lines above 12" to be 1" size.

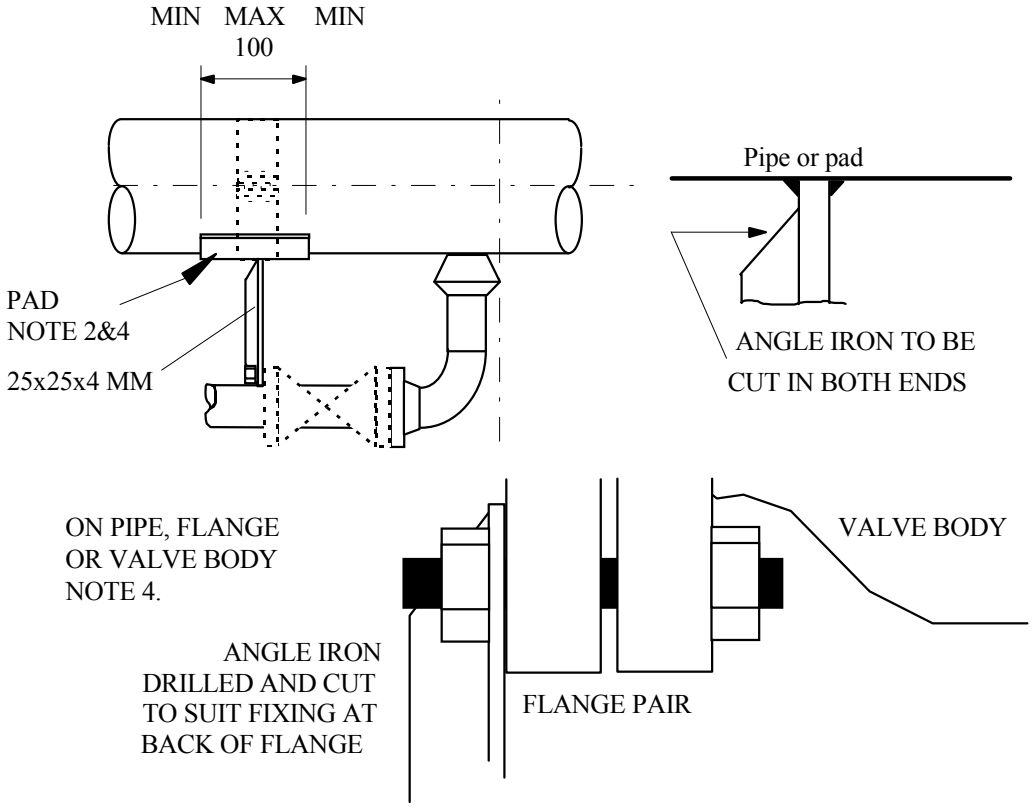
NOTES:

1. Rating and material of all items to be according to the relevant piping class.
2. For bracing details, see PD-059.

| | | | |
|---|---|---|---|
| HYDROSTATIC PRESSURE TESTING<br>VENT & DRAIN, CL 150 TO CL 2500 | **PD-055** | Sht 1 of 1 | Rev. 02 |



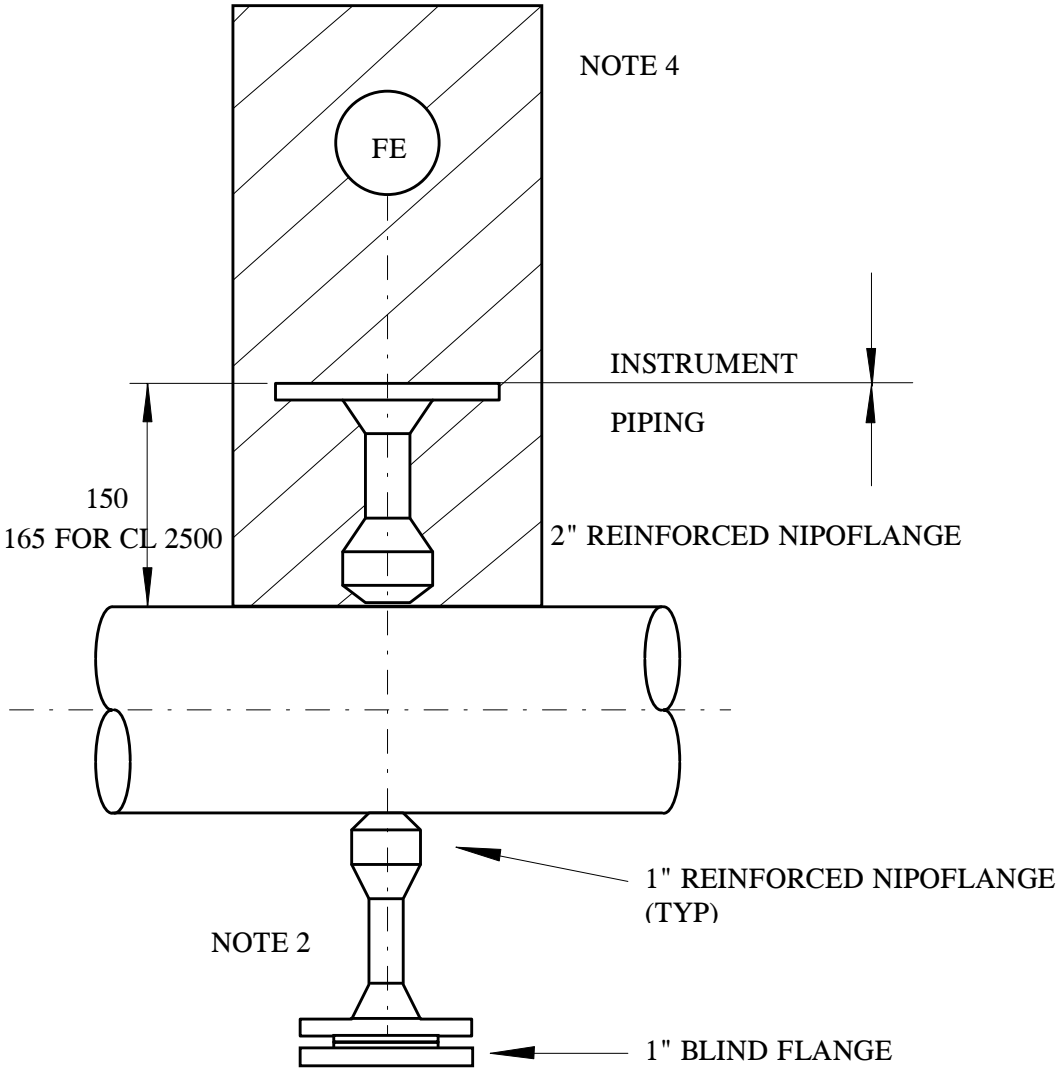

HEADER SIZE 2" AND ABOVE




NOTES:

1. All material grades to be compatible with pipe and fittings.
2. Pad cut to suit shall be used on SCH 10S headers.
3. Headers 12" and above shall have additional bracing in lateral direction.
4. As an alternative to welding, screwed clamps which fully surround the pipe can be used, as well as screwed or clamped solutions directly onto valve body or flange if feasible.
5. Vents and drains <2" shall be supported from main pipe. Where this is not practical or possible, relative movement between main pipe and surrounding steel works need to be considered.

| | | | |
|---|---|---|---|
| BRACING DETAILS<br>CL 150 TO CL 2500 | **PD-059** | Sht 1 of 1 | Rev. 02 |

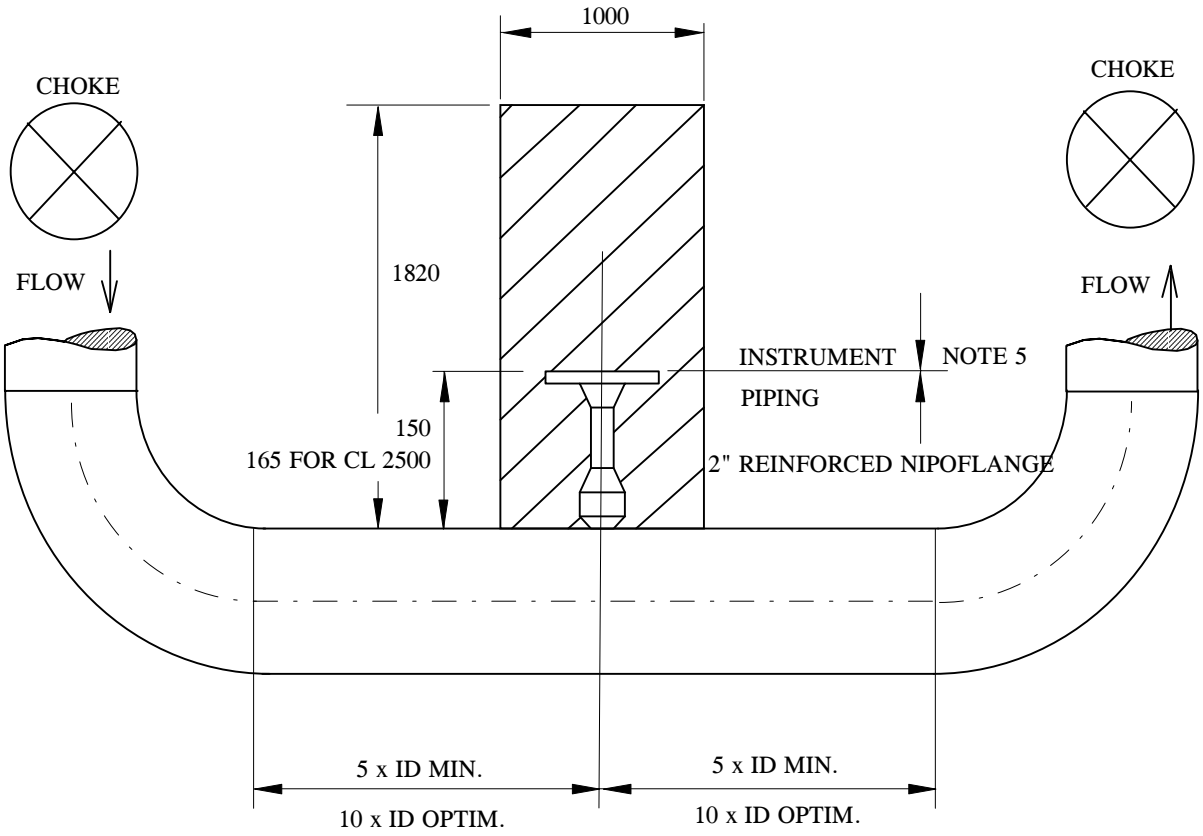


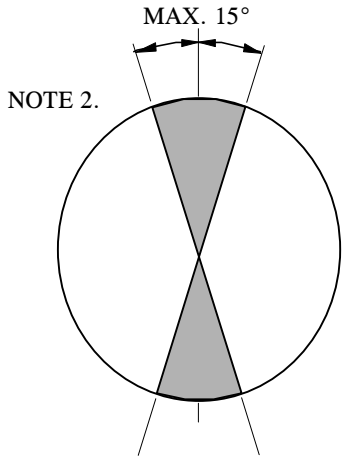

LINE 6" TO 24"

NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. Annubar supporting is only applicable where specified on instr. data sheet.
3. The probe must be purchased to fit the inside diameter of reinforced nipoflange which shall be machined according to the nominal inside diameter of the corresponding piping class.
4. Mounting position to be verified by process.
5. Space requirement to be specified/verified by instrument department for individual case.

| | | | |
|---|---|---|---|
| ANNUBAR CONNECTIONS<br>CL 150 TO CL 2500 | **PD-060** | Sht 1 of 1 | Rev. 02 |

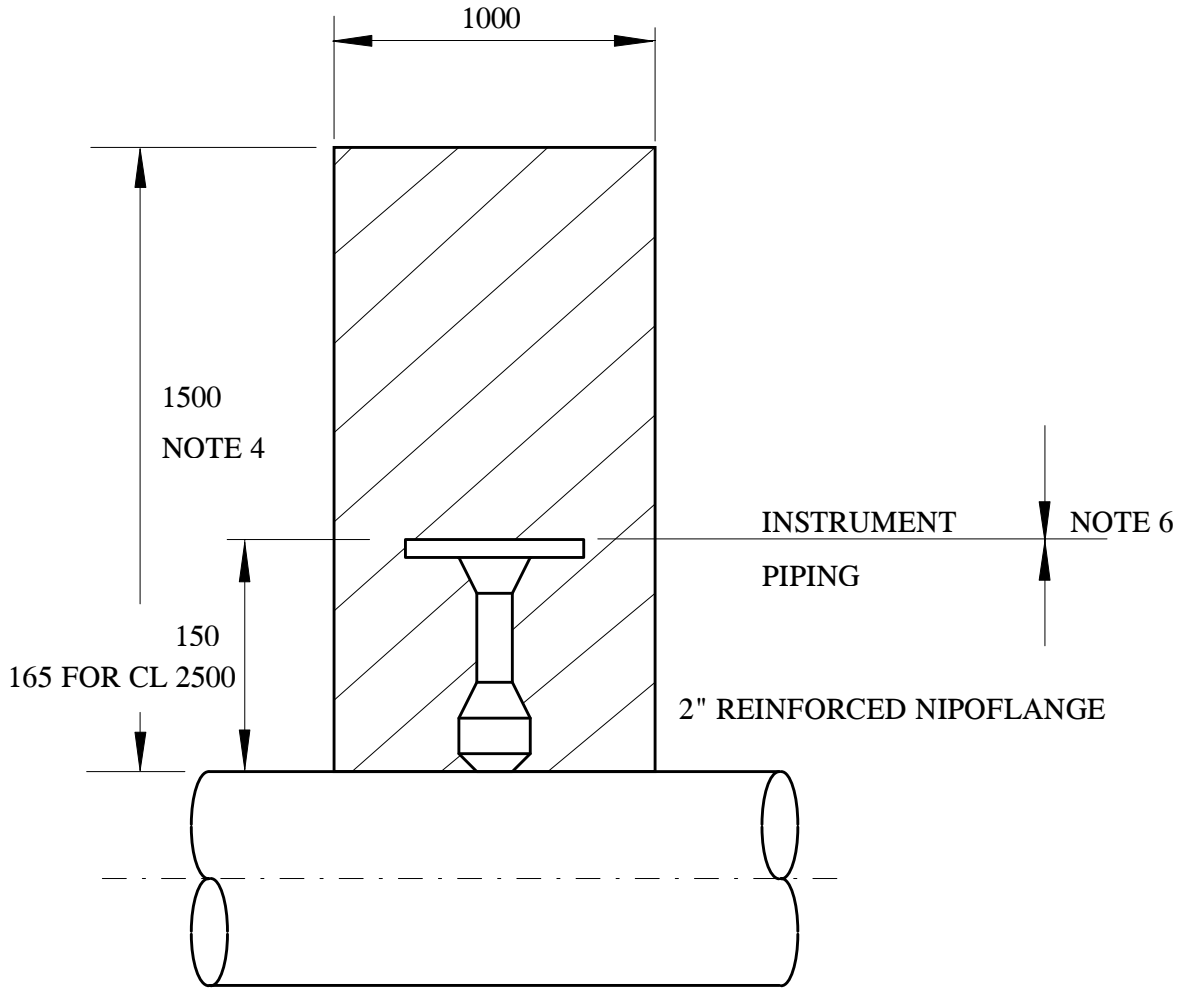



NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. Mounting position: Top mounting prefered.
3. The probe must be purchased to fit the inside diameter of reinforced nipoflange which shall be machined according to the nominal inside diameter of the corresponding piping class.
4. Space requirement, straight pipe requirement and distance from choke valves to be specified/verified by instrument department for individual case.
5. Reinforced nipoflange as an integral part of a complex instrument assembly is acceptable.

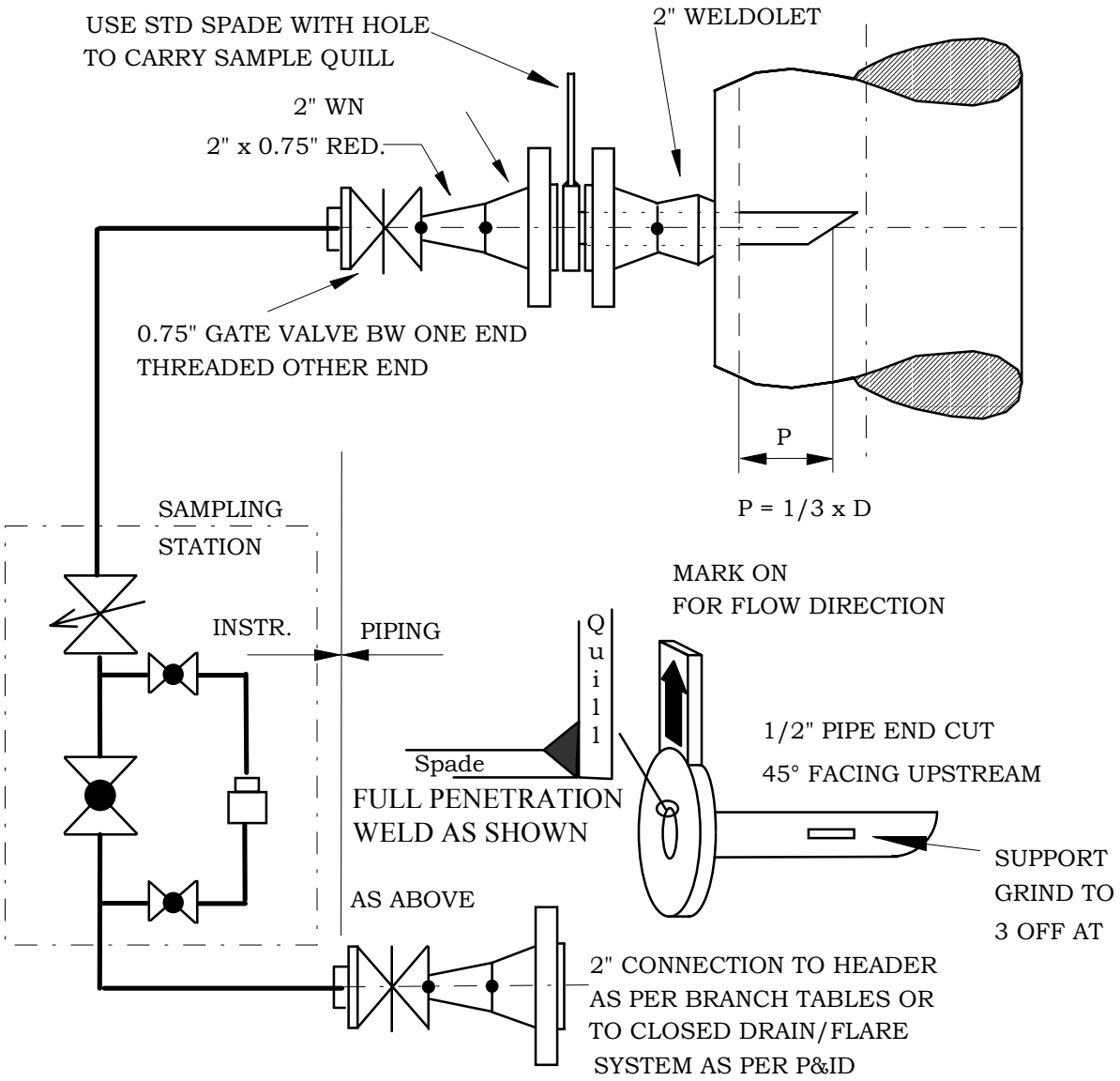
| | | | |
|---|---|---|---|
| ACCESS FITTING FOR SAND PROBE<br>CL 150 TO CL 2500 | **PD-061** | Sht 1 of 1 | Rev. 02 |




NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. The probe must be purchased to fit the inside diameter of reinforced nipoflange which shall be machined according to the nominal inside diameter of the corresponding piping class.
3. Mounting position: Any position, piping to decide.
4. Space requirement and straight pipe requirements to be specified/verified by instrument department for individual case.
5. Transverse space requirements: 500mm each side.
6. Reinforced nipoflange as an integral part of a complex instrument assembly is acceptable.

| | | | |
|---|---|---|---|
| ACCESS FITTING FOR CORROSION MONITORING CL 150 TO CL 2500 | **PD-062** | Sht 1 of 1 | Rev. 02 |

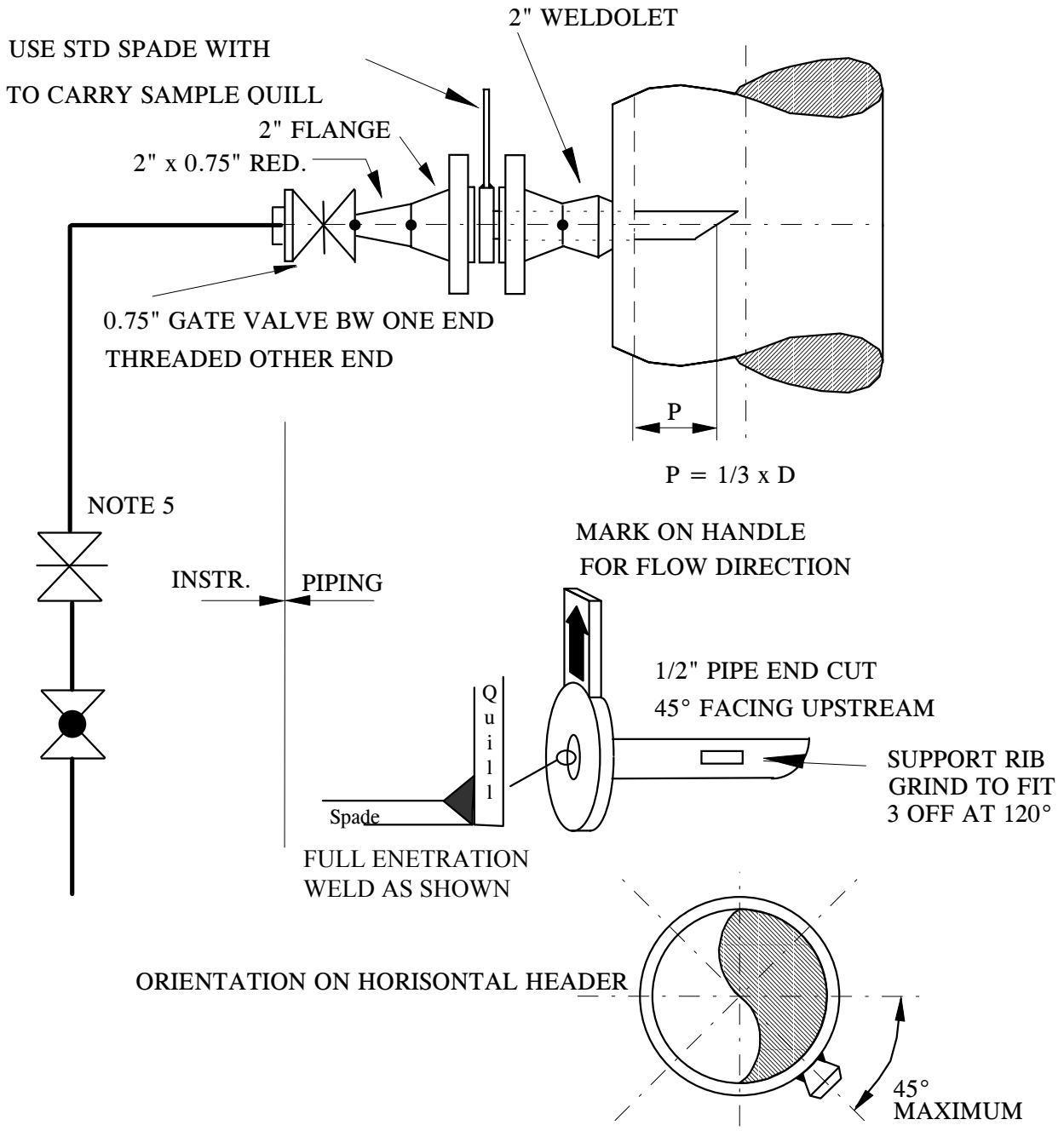



For header sizes 4" and below use 2" connection as per branch table and without quill.

NOTES:

1. Rating and material of all items to be according to the relevant piping class.
2. Preferred location in vertical lines.
3. Instrument and process departments to specify/verify sample probe details, nozzle orientation, special materials, 45° end etc.
4. Support, if needed, by site.
5. Insulation and heat tracing to be introduced upstream sampling station if required.

| | | | |
|---|---|---|---|
| SAMPLE CONNECTION FOR PROCESS GAS/LIQUID SERVICES (HAZARDOUS FLUID), CL 150 TO CL 2500 | **PD-070** | Sht 1 of 1 | Rev. 02 |

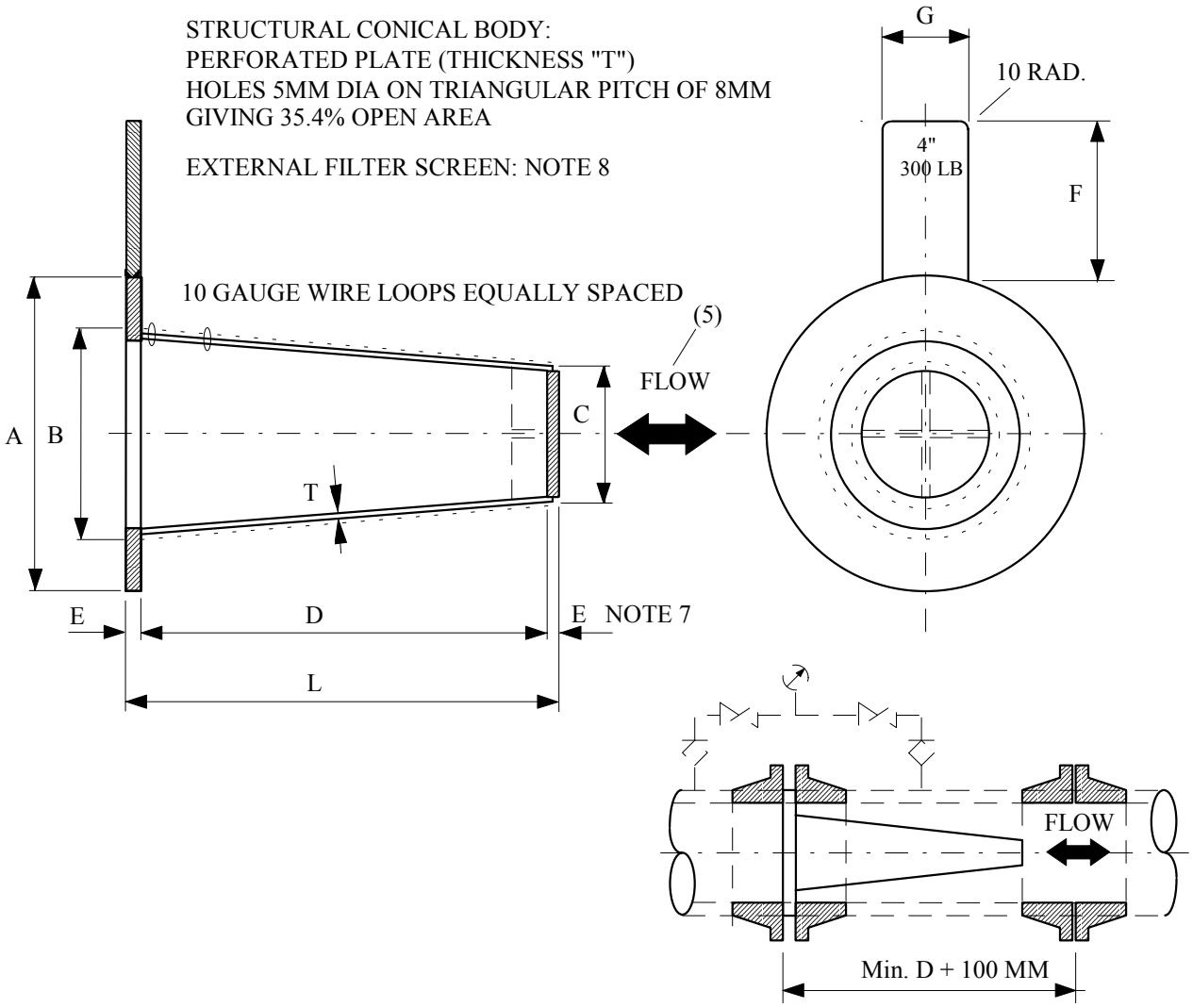



For header sizes 4" and below use 2" connection as per branch table and without quill.

NOTES:

1. Rating and material of all items to be according to the relevant piping class.
2. Preferred location in vertical lines.
3. Instrument and process departments to specify/verify sample probe details, nozzle orientation, special materials, 45° end etc.
4. Support, if needed, by site.
5. Extra gate valve required at low point if no access to header.
6. Sampling line to be heat traced and insulated if required.

| | | | |
|---|---|---|---|
| SAMPLE CONNECTION FOR UTILITY SERVICES (NON-HAZARDOUS FLUID), CL 150 TO CL 2500 | **PD-071** | Sht 1 of 1 | Rev. 02 |



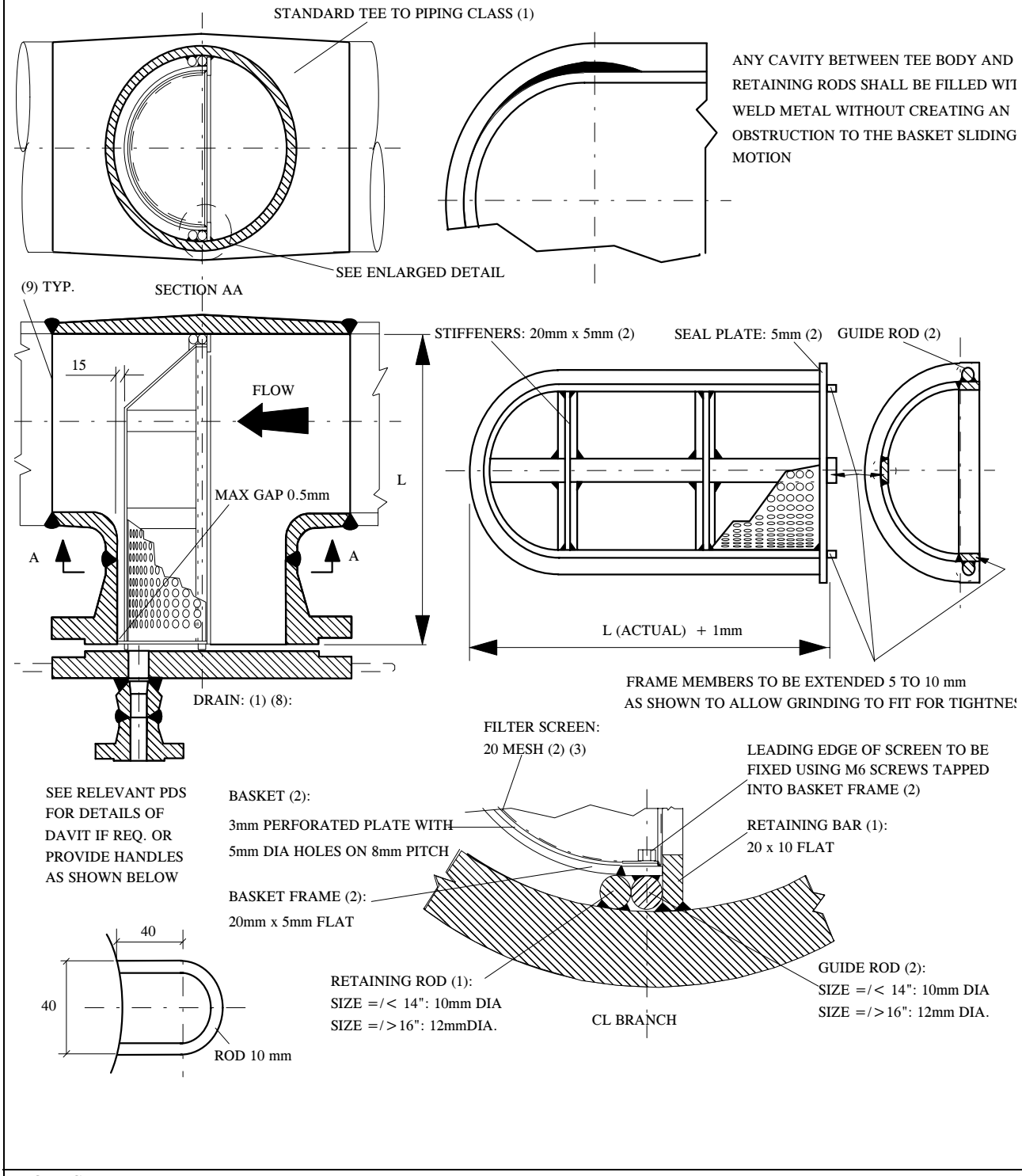

TYPICAL STRAINER INSTALLATION

| Nom Size (in) | A Class 150 | A Class 300 | | B | C | D | F | G | L | T | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 102 | 108 | | 35 | 20 | 125 | 70 | 25 | | | |
| 3 | 132 | 146 | | 68 | 30 | 180 | | | | | |
| 4 | 170 | 178 | | 92 | 40 | 220 | | 30 | | 2 | |
| 6 | 218 | 248 | | 140 | 60 | 320 | 80 | | | | |
| 8 | 276 | 304 | | 186 | 80 | 400 | | 35 | | | |

NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. Dimensions in millimetres.
3. Pipe size and flange class to be clearly die stamped on handle e.g. 6" - class 150.
4. Only the side wall of the cone is perforated.
5. Filter screen to be located on upstream side of cone and shall be securely welded or braced to cone. Filter may be subject to pulsating flow and flow reversal.
6. Surface finish of gasket contact areas to be according to ANSI B16.5.
7. Thickness E according to element data sheet NLB1 of the NORSOK standard Piping and valves (L-CR-001).
8. Filter screen mesh to be based on requirements from relevant connected equipment. (i.e compressor)

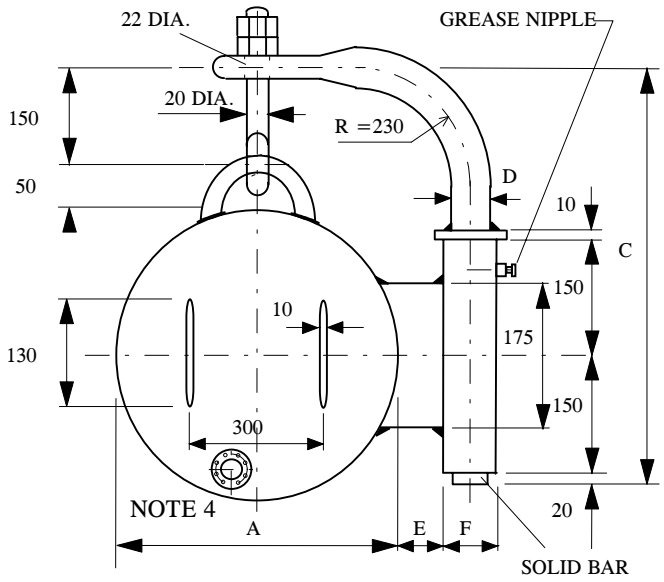
| TEMPORARY "CONICAL" STRAINER CL 150 TO CL 2500 | **PD-080** | Sht 1 of 1 | Rev. 02 |
|---|---|---|---|

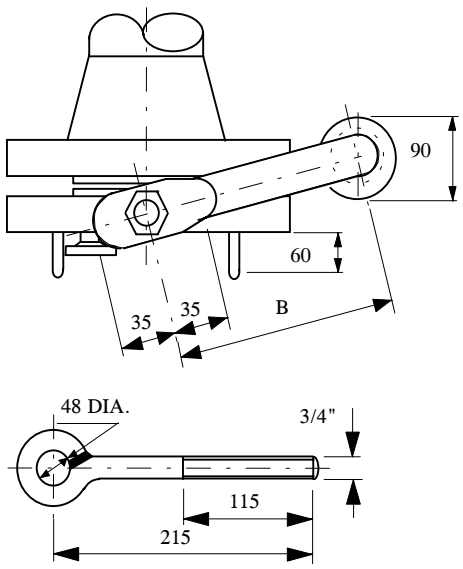



NOTES:

1. Rating and material grade of pipe, fittings and parts shall be in accordance with the relevant piping class.
2. All materials of bathtub to be stainless steel, type 316.
3. Filter screen mesh to be based on requirements from relevant connected equipment (i.e compressor).
4. Dimension L and radius R to be determined by vendor from dims. of BW tee and flanges stated by purchaser.
5. Bolt lengths to account for bolt tensioning.
6. Strainer will be subject to pulsating flow, and must be capable of withstanding reversed flow.
7. Details shown are for piping layout and manufacturers guidance only. Fabricator to supply full dimensional and fabrication detail drawings.
8. Drain/inspection nozzle according to the relevant piping class. Drain to be located at low point if side mounted.
9. Differential pressure measurement to be installed as required by P&ID.

| | | | |
|---|---|---|---|
| TEMPORARY "BATH TUB" STRAINERS 10"-24" NPS CL 150 TO CL 2500 | **PD-081** | Sht 1 of 1 | Rev. 02 |




| SIZE (in) | CLASS 150 LB | | | | | | CLASS 300 LB | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | A | B | C | D | E | F |
| 10 | 406 | 300 | 573 | 42 | 85.0 | 2" SCH 160 | 444 | 322 | 593 | 44 | 76.4 | 2½" SCH 80 |
| 12 | 483 | 340 | 613 | 42 | 81.0 | 2" SCH 160 | 521 | 360 | 630 | 44 | 73.7 | 2½" SCH 80 |
| 14 | 533 | 365 | 638 | 42 | 79.6 | 2" SCH 160 | 584 | 392 | 663 | 44 | 71.9 | 2½" SCH 80 |
| 16 | 597 | 397 | 670 | 42 | 77.9 | 2" SCH 160 | 648 | 425 | 695 | 44 | 70.5 | 2½" SCH 80 |
| 18 | 635 | 415 | 688 | 42 | 77.1 | 2" SCH 160 | 711 | 457 | 728 | 44 | 6.4 | 2½" SCH 80 |
| 20 | 698 | 447 | 720 | 44 | 69.6 | 2½ SCH XXS | 775 | 487 | 758 | 44 | 68.5 | 2½" SCH 80 |
| 24 | 813 | 505 | 778 | 44 | 68.0 | 2½ SCH XXS | 915 | 557 | 828 | 48 | 73.3 | 2" SCH 80 |
| 30 | 984 | 592 | 862 | 48 | 74.6 | 2" SCH 80 | 1092 | 648 | 916 | 72 | 57.6 | 3" SCH 80 |
| 36 | 1168 | 685 | 954 | 58 | 57.2 | 3" SCH XXS | | | | | | |

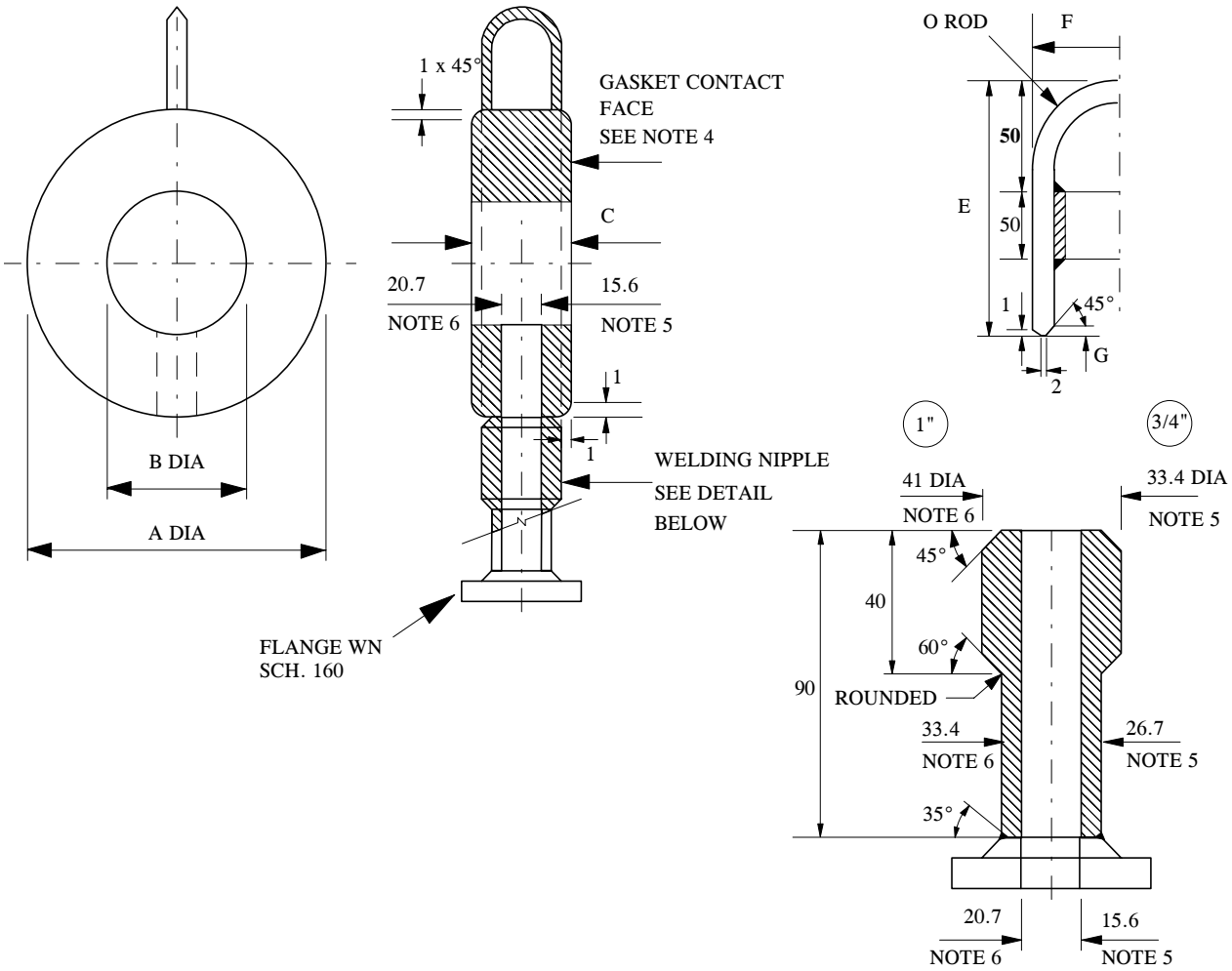
| SIZE (in) | CLASS 600 LB | | | | | | CLASS 900 LB | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | A | B | C | D | E | F |
| 10 | 508 | 360 | 624 | 48 | 80.3 | 2" SCH 80 | 546 | 378 | 643 | 58 | 65.0 | 3" SCH XXS |
| 12 | 559 | 385 | 650 | 48 | 78.9 | 2" SCH 80 | 610 | 412 | 675 | 58 | 63.4 | 3" SCH XXS |
| 14 | 603 | 408 | 673 | 48 | 77.8 | 2" SCH 80 | 641 | 430 | 690 | 58 | 62.7 | 3" SCH XXS |
| 16 | 686 | 448 | 713 | 48 | 76.2 | 2" SCH 80 | 705 | 462 | 723 | 58 | 61.6 | 3" SCH XXS |
| 18 | 743 | 479 | 743 | 48 | 75.3 | 2" SCH 80 | 787 | 505 | 763 | 58 | 60.4 | 3" SCH XXS |
| 20 | 813 | 515 | 778 | 48 | 74.4 | 2" SCH 80 | 857 | 540 | 798 | 58 | 59.6 | 3" SCH XXS |
| 24 | 940 | 580 | 840 | 58 | 58.8 | 3" SCH XXS | 1041 | 640 | 890 | 72 | 58.0 | 3" SCH 80 |

| SIZE (in) | CLASS 1500 LB | | | | | | CLASS 2500 LB | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | A | B | C | D | E | F |
| 10 | 584 | 410 | 663 | 72 | 63.9 | 3" SCH 80 | | | | | | |
| 12 | 673 | 460 | 708 | 72 | 62.1 | 3" SCH 80 | | | | | | |
| 14 | 749 | 500 | 745 | 72 | 60.9 | 3" SCH 80 | | | | | | |
| 16 | 825 | 542 | 783 | 72 | 59.9 | 3" SCH 80 | | | | | | |
| 18 | 914 | 590 | 828 | 72 | 59.0 | 3" SCH 80 | | | | | | |
| 20 | 984 | 628 | 863 | 85 | 52.0 | 3½" SCH 80 | | | | | | |
| 24 | 1168 | 726 | 955 | 90 | 50.8 | 3½" SCH 80 | | | | | | |

NOTES:

1. Flange material grade as per the relevant piping class. Rods and plates welded to flanges shall be of identical material grade as the flanges.
2. All other parts shall be carbon with min. yield strength 220 MPa.
3. Eyebolt and nuts to be hot dip galvanised.
4. Drain/inspection nozzle according to the relevant piping class.
5. Details shown are for fabricators guidance. Other solutions with similar or higher strength and functional properties are acceptable.

| DAVIT FOR BLIND FLANGE<br>CL 150 TO CL 2500 | **PD-085** | Sht 1 of 1 | Rev. 02 |
|---|---|---|---|

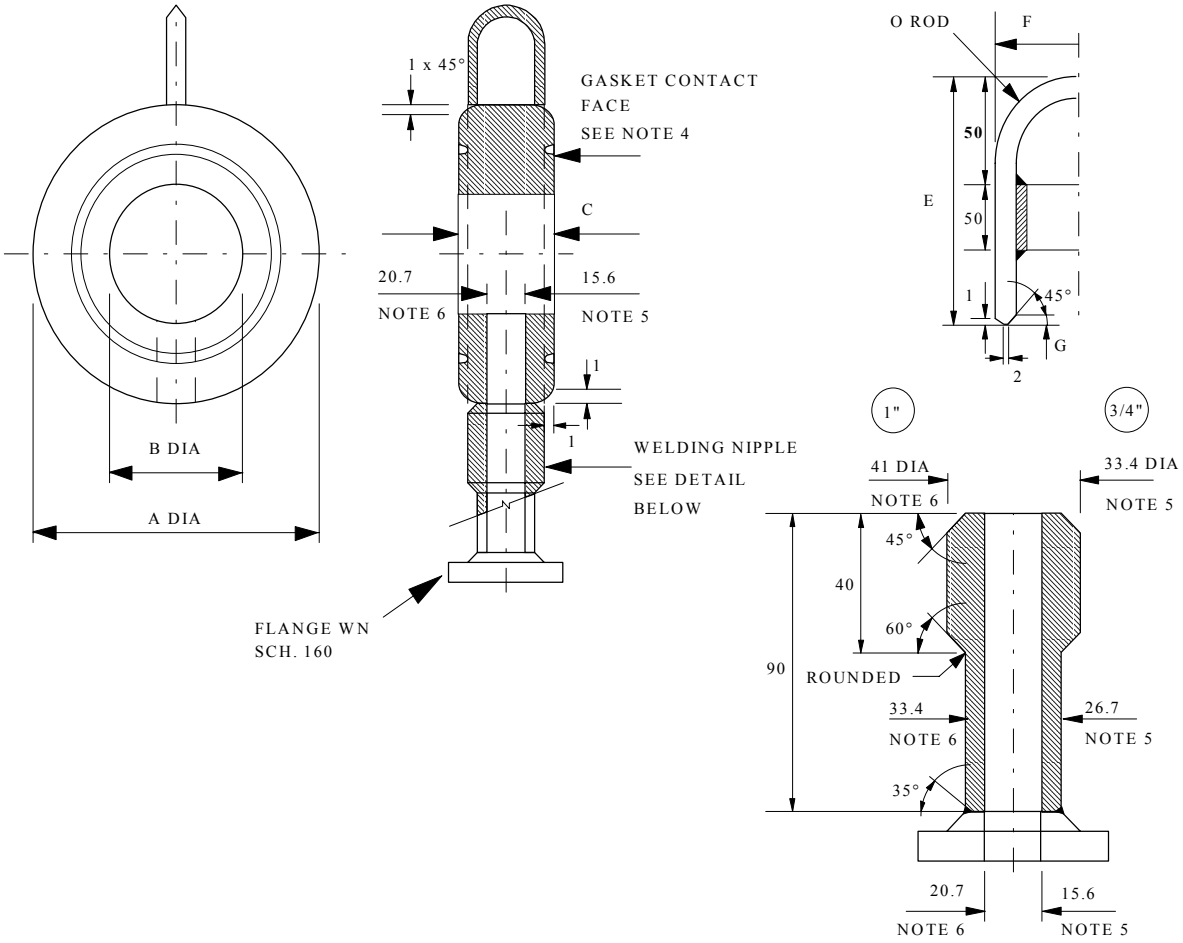



| Nominal pipe size | A | | B | C | E | F | G | O |
|---|---|---|---|---|---|---|---|---|
| | Class 150 | Class 300 | | | | | | |
| 2" | 102 | 108 | 60 | 40 | 180 | 38 | 4 | 6 |
| 3" | 133 | 146 | 89 | 40 | 185 | 38 | 4 | 10 |
| 4" | 171 | 178 | 114 | 40 | 190 | 38 | 4 | 10 |
| 6" | 219 | 247 | 168 | 40 | 200 | 38 | 4 | 10 |
| 8" | 276 | 305 | 219 | 40 | 210 | 38 | 4 | 10 |
| 10" | 337 | 359 | 273 | 40 | 235 | 38 | 4 | 10 |
| 12" | 406 | 419 | 324 | 60 | 248 | 58 | 5 | 16 |
| 14" | 448 | 483 | 356 | 60 | 260 | 58 | 5 | 16 |
| 16" | 511 | 536 | 406 | 60 | 267 | 58 | 5 | 16 |
| 18" | 546 | 594 | 457 | 60 | 279 | 58 | 5 | 16 |
| 20" | 603 | 651 | 508 | 70 | 286 | 68 | 5 | 16 |
| 24" | 714 | 772 | 610 | 70 | 317 | 68 | 5 | 16 |

NOTES:

1. To be used only where space does not allow conventional solution.
2. Material shall be same as for line blinds according to relevant piping class.
3. Lifting handle as shown or equivalent to be provided on all drip rings with size, rating & type of material stamped on lug.
4. Gasket contact surface according to ANSI B16.5.
5. 3/4" connection for pipesize 2" - 12".
6. 1" connection for pipesize 14" - 24".

| DRIP RING DETAILS RF FLANGES CL 150 TO CL 300 | **PD-090** | Sht 1 of 1 | Rev. 02 |
|---|---|---|---|

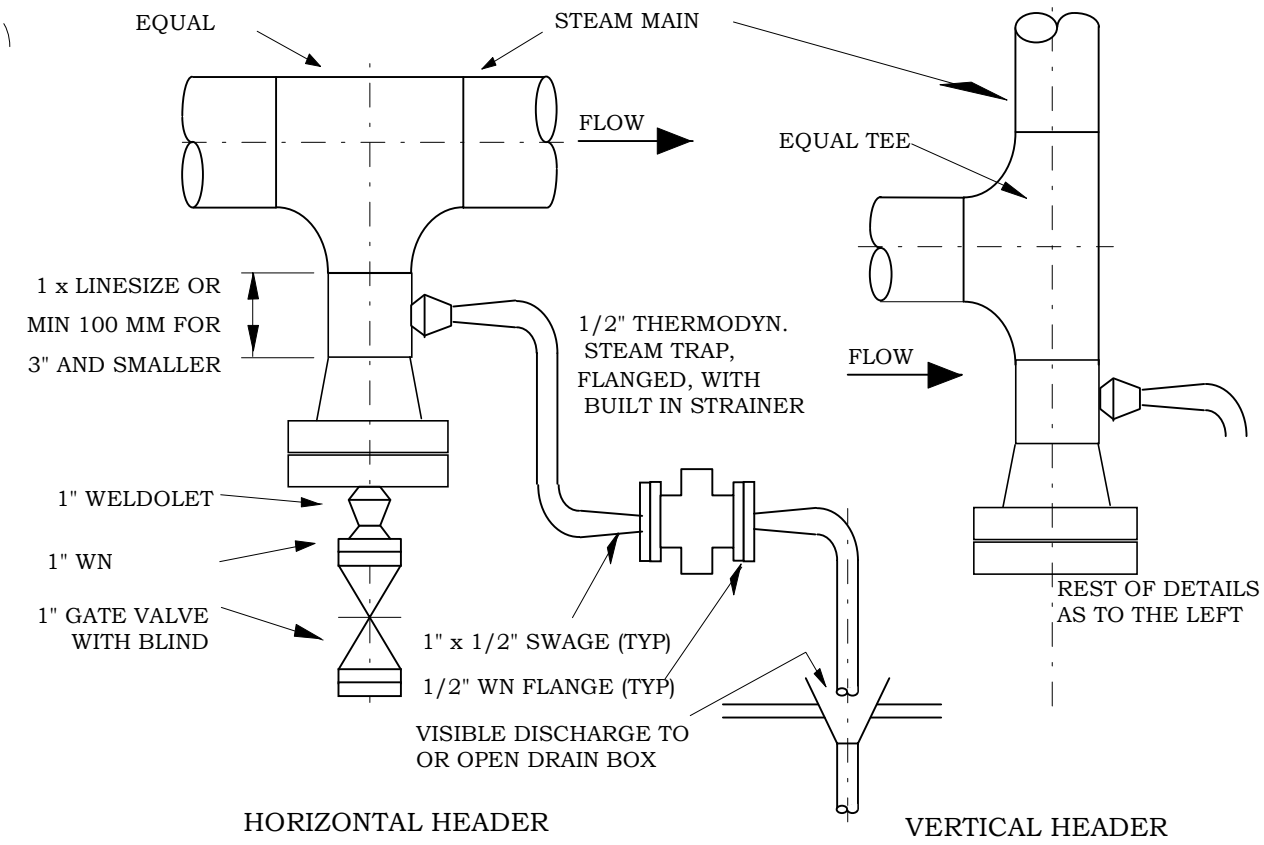



| Nominal pipe size | A | | | B | C | E | F | G | O |
|---|---|---|---|---|---|---|---|---|---|
| | Class 600 | Class 900 | Class 1500 | | | | | | |
| 2" | 108 | 141 | 141 | 60 | 60 | 180 | 58 | 4 | 10 |
| 3" | 146 | 166 | 173 | 89 | 60 | 185 | 58 | 4 | 10 |
| 4" | 192 | 205 | 208 | 114 | 60 | 190 | 58 | 4 | 10 |
| 6" | 265 | 287 | 281 | 168 | 75 | 200 | 72 | 7 | 16 |
| 8" | 319 | 357 | 351 | 219 | 75 | 210 | 72 | 7 | 16 |
| 10" | 399 | 434 | 434 | 273 | 75 | 235 | 72 | 7 | 16 |
| 12" | 456 | 457 | 519 | 324 | 75 | 248 | 72 | 7 | 16 |
| 14" | 491 | 520 | 579 | 356 | 75 | 260 | 72 | 7 | 16 |
| 16" | 564 | 574 | 641 | 406 | 80 | 267 | 78 | 7 | 16 |
| 18" | 612 | 638 | 702 | 457 | 80 | 279 | 78 | 7 | 16 |
| 20" | 682 | 697 | 756 | 508 | 80 | 286 | 78 | 7 | 16 |
| 24" | 790 | 837 | 900 | 610 | 90 | 317 | 88 | 7 | 16 |

NOTES:

1. To be used only where space does not allow conventional solution.
2. Material shall be same as for line blinds according to relevant piping class.
3. Lifting handle as shown or equivalent to be provided on all drip rings with size, rating & type of material stamped on lug.
4. Groove, pitch diameter and surface finish to ANSI B16.5.
5. 3/4" connection for pipesize 2" - 12".
6. 1" connection for pipesize 14" - 24".

| DRIP RING DETAILS RTJ FLANGES CL 600 TO CL 1500 | **PD-091** | Sht 1 of 1 | Rev. 02 |
|---|---|---|---|



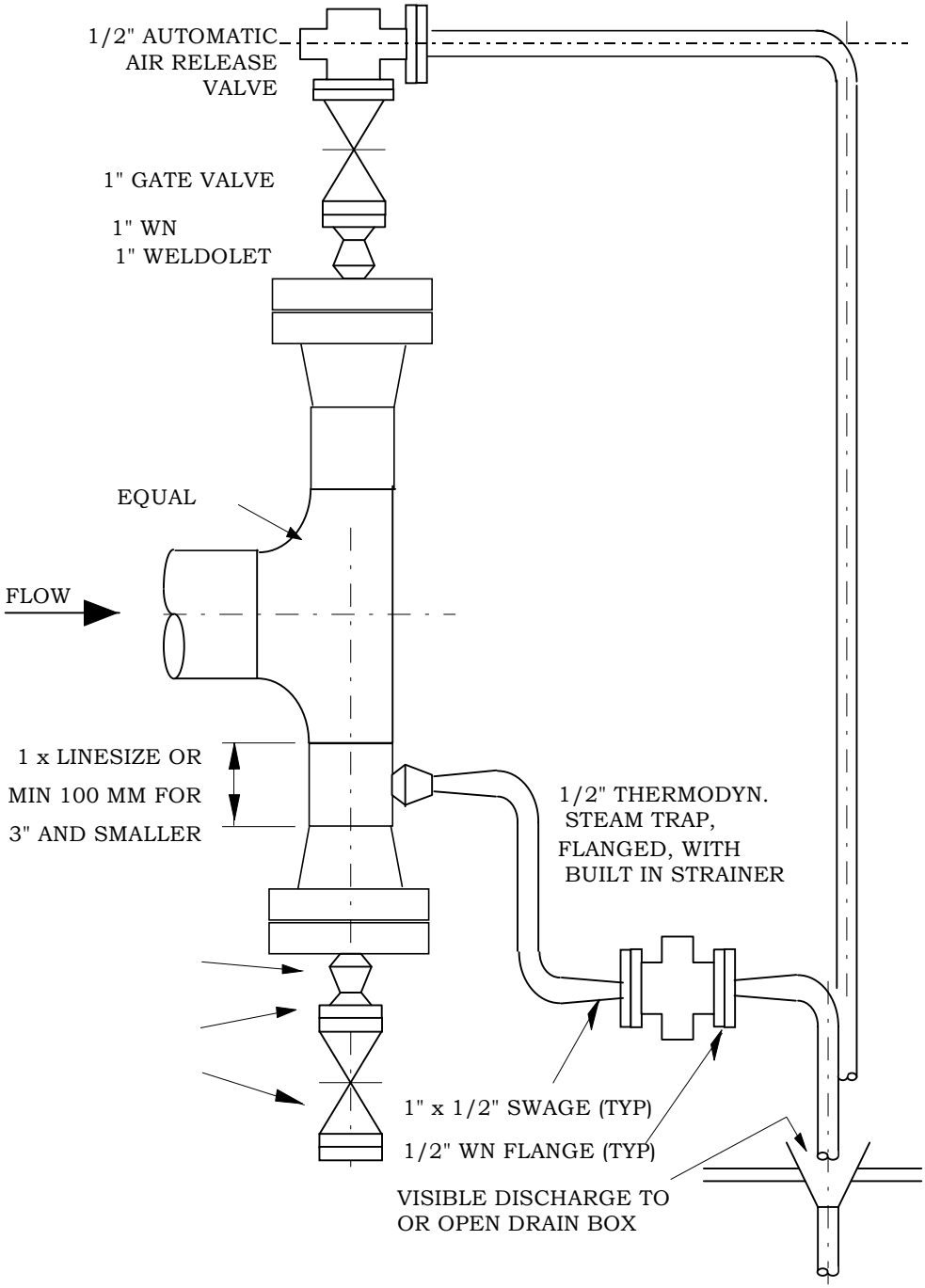

| Nominal pipe size | L (meters) |
|---|---|
| 2" | 70 |
| 3" | 60 |
| 4" | 50 |
| 6" | 50 |

DISTANCE BETWEEN DRAIN POINTS ON HEADERS
L (MAXIMUM SPACING)

NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. The above arrangement to be used in steam mains at intervals as in table and/or at the bottom of vertical up legs of 5 metres or more.

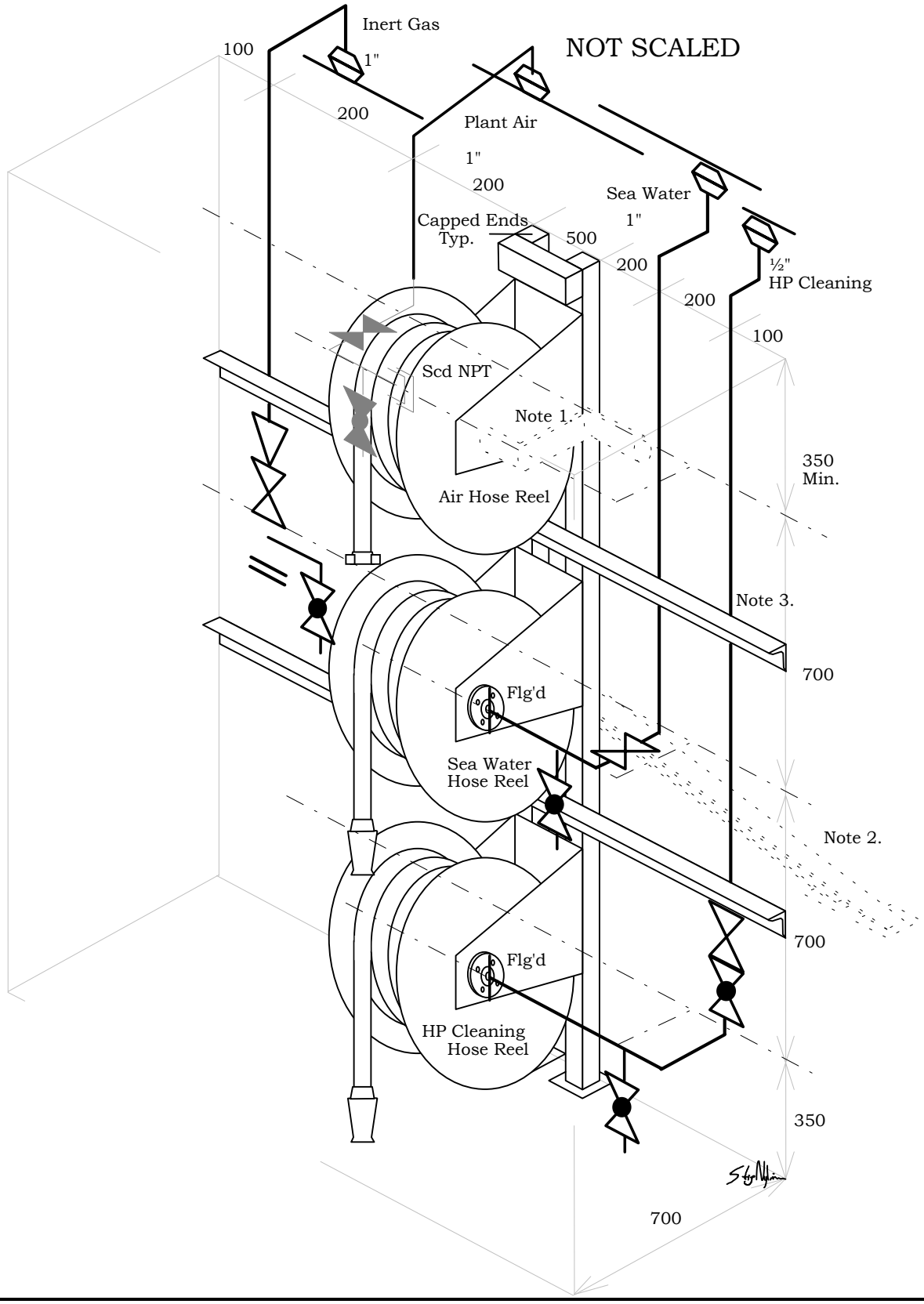
| | | | |
|---|---|---|---|
| INLINE CONDENSATE DRAIN POINTS FOR STEAM MAINS, CL 150 TO CL 2500 | **PD-093** | Sht 1 of 1 | Rev. 02 |




NOTES:

1. Rating and material grade of pipe and fittings shall be in accordance with the relevant piping class.
2. The above arrangement to be used at the end of steam mains for 6", 4" and 3" sizes only.
3. For use of automatic release valve, see P&ID.

| | | | |
|---|---|---|---|
| END OF MAIN - CONDESATE DRAIN POINT FOR STEAM MAINS, CL 150 TO CL 2500 | **PD-094** | Sht 1 of 1 | Rev. 02 |




NOTES:

1. Details of reels, hoses and couplings to be set out in separate document.
2. Main stand to be made from RHS 80x80 as shown with proper bracing to existing steel or floor as req.
3. Use 50x50 angle as required to obtain adequate piping support.
4. Rating and materials of all items to be in accordance with the relevant piping classes on the P&ID's. The required services for each utility station are given on the P&ID's.

| TYPICAL UTILITY STATION CONCEPT | **PD-129** | Sht 1 of 1 | Rev. 02 |
|---|---|---|---|