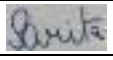
VCS Quality Services Pvt. Ltd.

STANDARD SPECIFICATION
FOR
PRESSURE GAUGE

VCS–SS–IN-5001_02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REVISION RECORD						
Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
00	23.05.2018	Neha Dev	Udit Manichanda	K.Prasanth	Anupam Das	
01	18.01.2020					Format change and document numbering is revised.
		Karan Singh	Vinod Babu	Kedarnath Chakraborty	Anupam Das	
02	11.05.2022					VCS QMS Integration
		Sarita Verma	Kedar Nath Chakraborty	Hashim khan	GV Walimbe	

ABBREVIATION

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BS	British Standards
DIN	Deutsches institute fur Normung
FAT	Factory Acceptance Test
IEC	International Electro-technical Commission
IP	Ingress Protection
IS	Indian Standards
ISA	Instrument Society of America
ISO	International Organization for Standardization
NACE	National Association of Corrosion Engineers
NPT	Nominal Pipe Thread
SAT	Site Acceptance Test
SS	Stainless Steel

CONTENTS

1 SCOPE

This Standard Specification, together with the Data Sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, painting, inspection and testing, documentation, marking, packing and shipping of Pressure Gauge along with its accessories.

2 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
Works/ Shop	The place where the ITEM / UNIT is fabricated and tested and transported to Purchaser.
Datasheet	Technical data provided by the Purchaser / Owner / Company.
Standard Specification	Specifications Developed as Standard by the Company.
Job Specification	Specifications Developed pertaining to particular project / Job in regard.
Material Requisition	Requisition as raised to Supplier for Quotation of the item
Purchase Requisition	Requisition as raised to Supplier for Procurement of the item
Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

3 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

American Society of Mechanical Engineers

ASME B1.20.1	Pipe Threads
ASME B 16.5	Steel Pipe Flanges and Flanged Fitting
ASME B 16.20	Ring Joint Gaskets and Grooves for Steel Pipe Flanges

British Standards

BS 1780	Specifications for Bourdon Tube Pressure and Vacuum Gauges

Deutsches Institute fur Normung

DIN 50049	Document on Material Testing

Indian Standards

IS 3624	Specification for Pressure and Vacuum Gauges
IS 2147	Degree of Protection provided for Enclosures

International Electro technical Commission

IEC 529	Degree of Protection by providing Enclosures
EN 837	Pressure Gauges Part-t: Bourdon Type Pressure Gauges, Dimensions, Metrology, Requirements and Testing

3.2 Order of Precedence

In the event of conflict between Specifications, Data sheets, related standards, codes etc., the order of precedence shall be as follows:

a. Data sheets

b. Job Specifications

c. Standard Specifications

d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4 MATERIALS

Materials selected shall be in accordance with the Data Sheets and Standard Specifications. For corrosion service the material selected shall be in compliance with the requirements of NACE MR-0175 / IS0-15156 latest editions.

5 DESIGN

5.1 Pressure Element, Gauge Movement and Socket

The Pressure Gauges shall be used for local indication.

Pressure Gauge sensing element shall be SS316 and movement of SS304, as a minimum. Pressure Gauge measuring element shall generally be Bourdon / Bellows / Diaphragm type. In case of Bourdon type of Gauges, the size of the Bourdon tube shall not be less than 75% of the nominal diameter of the dial size.

The wetted parts of the Pressure Gauge, the Bourdon tube and socket must be compatible with the process media. If not compatible with the wetted parts of the Gauge, corrosion will occur. Corrosion of Gauge wetted parts will eventually cause gauge failure and possibly safety issues.

The material of construction of all accessories wetted by process shall be as per socket material.

Gauge construction shall ensure no leakage of process fluid from the sensor elements to atmosphere and between the high pressure and low-pressure side (in case of differential Pressure Gauges) under normal condition.

Primary elements shall withstand the specified overpressure for at least 30 minutes without having their elastic characteristics affected.

When any Gauge is used for steam pressures, a siphon filled with water must be installed between the Gauge and the line.

All Pressure Gauges with maximum operating pressure exceeding 60 Kg/cm2 shall be solid front type.

Over range protector and pulsation dampener, whenever used shall be of SS304, as a minimum. Pulsation Dampener shall be used for all pulsating services. It shall be floating pin type, externally mounted and externally adjustable.

5.2 Cases Dials

Unless specified otherwise the gauges shall be weather proof to IP 65 as per IEC 529/IS 2147 as a minimum.

When safety type cases are specified, they shall consist of a solid partition isolating the pressure element from the dial.

Pressure Gauge dial shall be white, non-rusting plastic with black figures. The dial face shall be marked with pressure element material; dial size shall be 150mm. Pointers shall have micrometer adjustment.

Cases shall normally be cast aluminum alloy or black phenol.

In general, dial markings and dial color shall be as per IS 3624. Protect Gauges from frequent pressure pulsations by using liquid-filled.

5.3 Diaphragm Seals

Diaphragm seals, filled type or mechanical type shall be furnished where plugging of the element may occur or where suitable material is not available in highly corrosive services. When chemical seals are required, they shall be of the clean out type with flushing connection. Gauges specified with diaphragm seals shall have their diaphragms integral with the Gauges.

The sealing liquid for diaphragm seal Gauges shall be an inert liquid, compatible with the process fluid temperature.

For Gauges in oxygen and chlorine service, the sealing liquid shall be fluro lube or equivalent compatible with the specified service.

For diaphragm seal Pressure Gauges with flanged ends, the diaphragm shall be rated for the maximum allowable pressure of the associated flange.

5.4 End Connection

Process Pressure Gauges with 150mm dial sizes or larger are most often supplied with a ½ NPTM connection to best support the gauge. Where NPT connections have been specified, the threading shall be to ANSI/ASM 81.20.1.

When flanges are specified, unless otherwise stated, they shall be to ANSI / ASME B 16.5. Process connection shall be bottom entry type.

5.5 Accuracy

For a mechanical Pressure Gauge, accuracy is defined as a percentage of the full scale range. The following are general guidelines:

a. Test Gauges and standards: 0.25% through 0.10% full scale.

b. Critical processes: 0.5% full scale.

c. General industrial processes: 1.0% Less Critical Commercial Uses:2.0%

5.6 Range

Ranges shall be so specified that the Gauge normally operates in the middle third of the scale and shall confirm to IS-3624 standard dials, wherever possible.

Pressure range is approximately twice the normal operating pressure. The maximum operating pressure should not exceed approximately 75% of the full scale range. Pressure Gauges shall have an accuracy of ±0.5% as a minimum. Over range protection of 130% shall be used.

5.7 Name Plate

All Pressure Gauges shall be marked as per Manufacturer's standard and shall have a permanently attached stainless steel plate with the following, as a minimum detail:

d. Tag number as per Data Sheet

e. Manufacturer's name and trade mark

f. Gauge type, model no. Serial no.

g. Range of the Instrument.

h. Maximum working pressure and maximum vacuum rating of the element.

i. Area classification

6 FABRICATION AND PAINTING

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of Pressure Gauge. Vendor shall submit the required Specification, drawings & documents for approval. Also Vendor shall refer the relevant codes and standards for manufacturing herein.

7 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per Job Specification requirements, and as per relevant codes, prior to shipment. The inspection and testing for Pressure Gauge shall be carried out as per approved Inspection and Test Plan. Vendor shall submit the Inspection and Testing for Approval. Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process like hydro test, material test, hazardous area certification test, calibration test and any other before Factory Acceptance Testing (FAT).

7.1 Factory Acceptance Testing (FAT)

Prior to FAT, Vendor shall submit to the Company a detailed FAT procedure, for review and approval, listing all the Pressure Gauges complete with the project approved tags, and highlighting the inspection and testing requirements of all such devices. FAT shall be carried out as per approved Inspection and Test Plan. FAT shall be carried out prior to shipment of the Pressure Gauge.

FAT procedures shall be submitted at least 4 weeks prior to FAT testing taking place. FAT shall be carried out at the manufacturing facilities. The tests shall be witnessed by the Company or their approved representative. FAT procedure will be signed off by the Vendor and Company or their approved representative at the successful completion and conclusion of testing.

The FAT shall be consisting of the following as a minimum:

a. Visual inspection

b. Dimensional check

c. Chemical and mechanical properties as per relevant material standards

d. Calibration

e. Functional test

f. A certificate to detail the results and records obtained during the FAT shall be made available for ratification by the Vendor on the date of test. Following certificates shall be submitted by the Vendor:

g. Mill test certificates relevant to the chemical analysis and mechanical properties of the materials as per the relevant Standards and Specifications.

h. NOT (NDT) reports for radiography, ultrasonic, magnetic particle and liquid penetrate inspection.

i. Test report on operation of Gauges including operating time.

j. Test report on hydrostatic test of Gauges.

k. Test report on Gauge assembly tests.

l. All other test reports and certificates as required by this Specification.

m. The certificates shall be valid only when signed by Purchaser's Inspector. Only those Gauges which have been certified by Purchaser's Inspector shall be dispatched from Manufacturer's works.

7.2 Site Acceptance Testing (SAT)

A SAT shall be carried out on completion of the installation of the equipment at site which shall be witnessed by the company / owner's representative. SAT shall be performed on the Pressure Gauge as per the approved test procedure. A comprehensive test procedure in compliance with the company specification shall be developed and issued to company / owner for review and approval.

The Site Acceptance Test (SAT), in general, shall demonstrate that the Gauge functions correctly and properly in accordance with the specified requirements.

8 MARKING, PACKING AND SHIPMENT

Following FAT completion, Vendor responsible for the Pressure Gauge shall ensure that all equipment and associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Vendor shall provide and submit his standard "Marking, Packing and Shipping Procedures" for review by Company / Owner.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Equipment shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite.

Preparation for shipment and packing will be subject to inspection and rejection by Company's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

9 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include recommended Spare Parts List for start-up, pre-commissioning and two years operation as per the following;

a. Itemized recommended spare parts list for start-up and pre-commissioning.
b. Itemized recommended spare parts list for two years operation.

Vendor shall recommend accessories and special tools required for operation and maintenance of Pressure Gauge, for Company review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

10 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if it is not covered in Job Specification.

10.1 Documentation Required with Technical Bid

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

a. Standard Specification, Data Sheets;

b. Bill of Materials including Vendor list, details of third party items;

c. Catalogues and Manuals;

d. Quality Assurance Plan;

e. A list of accessory items together with Manufacturer's name and part number;

f. Any other documents.

10.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company's approval:

g. Specifications, Data Sheets;

h. Bill of materials including Vendor list, details for third party items;

i. Catalogues, Manuals and relevant drawings and documents;

j. Dimensional drawings;

k. Calibration certificates;

l. Material test certificates;

m. Procedures for FAT;

n. Quality Assurance Plan;

o. Any Other documents.

10.3 Guarantee & Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design .The cost of correction / replacement of any warranty items shall be borne by the Vendor, as per the purchase conditions of the Material / Purchase Requisition.

The Job specifications / Data sheets shall be referred for any specific warranty / guarantee.

VCS Quality Services Pvt. Ltd.

STANDARD SPECIFICATION
FOR
PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER

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		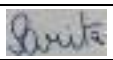			
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		Sarita Verma	Kedar Nath Chakraborty	Hashim khan	GV Walimbe	

ABBREVIATION

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
FAT	Factory acceptance Test
IEC	International Electro technical Commission
IP	Ingress Protection
IS	Indian Standard
ISO	International Organization for Standardization
NACE	National Association of Corrosion Engineers
NPT	Nominal Pipe Thread
SAT	Site acceptance Test
SS	Stainless Steel

CONTENTS

1.0 SCOPE

This Standard Specification, together with the Data Sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, painting, inspection and testing, documentation, marking, packing and shipping of Pressure Transmitter /Differential Pressure Transmitter along with its accessories.

2.0 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
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Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

3.0 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

American Society of Mechanical Engineers

ASME B 16.5	Steel Pipe Flanges and Flanged Fitting
ASME B 16.20	Ring Joint Gaskets and Grooves for Steel Pipe Flanges
ASME B1.20.1	Pipe Threads

American Petroleum Institute (API)

API RP 551	Process Measurements Instrumentation

International Electro technical Commission

IEC-60529	Degree of Protection by providing Enclosures (IP Code)
IEC-60079-15	Electrical Apparatus with type of protection 'n'
IEC-60079-7	Electrical apparatus for explosive gas atmospheres increased safety 'e'
IEC-60605-1	Equipment Reliability Testing.
IEC-60068.2-13	Basic Environmental Testing Procedure for Electrical Components and Electronic Equipment.

Indian Standards

IS 2147	Degree of Protection provided for Enclosures

3.2 Order of Precedence

In the event of conflict between Specifications, Data sheets, related standards, codes etc., the order of precedence shall be as follows:

a. Data sheets

b. Job Specifications

c. Standard Specifications

d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4.0 MATERIALS

Materials requirements for Pressure/ Differential Pressure Transmitter shall be in accordance with the Data sheets and Company's Standard Specifications. For corrosion service the material selected shall be in compliance with the requirements of NACE MR-0175/ISO-15156 latest editions

Transmitter body studs shall be high tensile stainless steel or other corrosion - resistant material for higher stress levels.

5.0 DESIGN

5.1 General

The Pressure / Differential Pressure Transmitters shall be used in all cases where a continuous transmission of a pressure measurement is required in the control room for use in a control loop, or for indication or data acquisition.

Pressure / Differential Pressure Transmitters shall have an electronic state-of-art capacitance or any other type of sensor meeting all functional requirements. Element material for Transmitters shall be SS316 as a minimum.

Diaphragm seal element with capillary shall be used for congealing, corrosive and highly viscous services.

All Transmitters shall have an integral output meter. Remote mounted meters may be provided if required in addition. All Transmitters shall have accuracy of ±0.25% of full scale deflection, unless otherwise specified.

Transmitter shall be capable of working with a minimum load of 600 ohms and at a 24V DC supply.

All electronic modules shall be designed for short circuit protection.

The change in output due to change in ambient temperature should be very minimum.

Electronic Transmitters shall have externally adjustable zero and span. Setting adjustment shall have locking adjustment.

5.2 Process Connection

Process connection for Transmitters shall be ½ NPT or 2" flanged connection as per the Job Specification.

Process connection should be from bottom side.

3 Valve manifold in SS316 shall be used for Pressure Transmitter and 5 Valve manifold in SS316 shall be used for Differential Pressure Transmitter.

5.3 Equipment Protection

Transmitter shall be furnished with all necessary weather and anti-corrosion protection to prevent damage from saline and corrosive process atmosphere.

Over range protection shall be 130 % of range or maximum pressure whichever is higher.

5.4 Enclosure Class

In addition to weatherproof, the Pressure Transmitter enclosure shall be explosion-proof to NEMA-7 and certified by third party statutory bodies like UL/FM/BASEEFA or equal for use in hazardous area.

5.5 Range

Where possible, Pressure Transmitters shall use the same range selection as Pressure Gauges. However, the range of a Transmitter shall always be within the range of the local gauge used to monitor its output.

The normal pressure shall not be read at greater than 75 % of the Transmitter calibrated range for instruments reading steady pressure. For fluctuating service, the normal pressure shall be not more than 60 % of the range:

5.6 Name Plate

All transmitters shall be marked as per Manufacturer's standard and shall have a permanently attached stainless steel plate with the following, as a minimum detail:

a. Tag number as per Data Sheet

b. Manufacturer's name and trade mark

c. Area classification

d. Adjustment range.

e. Element material.

f. Body material.

g. Service

6.0 FABRICATION

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of Pressure/ Differential Pressure Transmitter. Vendor shall submit the required specification, drawings & documents for approval. Also Vendor shall refer the relevant codes and standards for manufacturing herein.

7.0 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per Job Specification requirements, and as per relevant codes, prior to shipment. The inspection and testing for Pressure Transmitter shall be carried out as per approved Inspection and Test Plan. Vendor shall submit the Inspection and Testing for Approval. Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process like hydro test, material test, hazardous area certification test, calibration test and any other before Factory Acceptance Testing (FAT).

7.1 Factory Acceptance Testing (FAT)

Prior to FAT, Vendor shall submit to the Company a detailed FAT procedure, for review and approval, listing all the Pressure/Differential Pressure Transmitter complete with the project approved tags, and highlighting the inspection and testing requirements of all such devices. FAT shall be carried out as per approved Inspection and Test Plan. FAT shall be carried out prior to shipment of the Pressure Transmitter.

FAT procedures shall be submitted at least 4 weeks prior to FAT testing taking place. FAT shall be carried out at the manufacturing facilities. The tests shall be witnessed by the Company or their approved representative. FAT procedure will be signed off by the Vendor and Company or their approved representative at the successful completion and conclusion of testing.

The FAT shall be consisting of the following as a minimum:

a. Visual inspection

b. Dimensional check

c. Chemical and mechanical properties as per relevant material standards

d. Calibration

e. Functional test

A certificate to detail the results and records obtained during the FAT shall be made available for ratification by the Vendor on the date of test.

7.2 Site Acceptance Testing (SAT)

A SAT shall be carried out on completion of the installation of the equipment at site which shall be witnessed by the Company / Owner's representative. SAT shall be performed on the Pressure / Differential Pressure Transmitter as per the approved test procedure. A comprehensive test procedure in compliance with the Company Specification shall be developed and issued to company / owner for review and approval.

The Site Acceptance Test (SAT), in general, shall demonstrate that the Pressure Transmitters functions correctly and properly in accordance with the specified requirements.

8.0 MARKING, PACKING AND SHIPMENT

Following FAT completion, Vendor responsible for the Pressure Transmitter shall ensure that all equipment and associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Vendor shall provide and submit his standard "Marking, Packing and Shipping Procedures" for review by Company / Owner.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Equipment shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite.

Preparation for shipment and packing will be subject to inspection and rejection by Company's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

9.0 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include recommended Spare Parts List for start-up, pre-commissioning and two years operation as per the following;

a. Itemized recommended spare parts list for start-up and pre-commissioning.

b. Itemized recommended spare parts list for two years operation.

Vendor shall recommend accessories and special tools required for operation and maintenance of Pressure / Differential Pressure Transmitter, for Company review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

10.0 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if it is not covered in Job Specification.

10.1 Documentation Required with Technical Bid

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

a. Standard Specification, Data Sheets;

b. Bill of Materials including Vendor list, details of third party items;

c. Catalogues and Manuals;

d. Quality Assurance Plan;

e. Any other documents.

10.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company's approval:

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b. Bill of materials including Vendor list, details for third party items;

c. Catalogues, Manuals and relevant drawings and documents;

d. Dimensional drawings;

e. Calibration certificates;

f. Material test certificates;

g. Procedures for FAT;

h. Quality Assurance Plan;

i. Any Other documents.

10.3 Guarantee / Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design. The cost of correction / replacement of any warranty items shall be borne by the Vendor, as per the purchase conditions of the Material / Purchase Requisition.

The Job specifications / Data sheets shall be referred for any specific warranty / guarantee.

Energising Quality

VCS Quality Services Pvt. Ltd.

STANDARD SPECIFICATION
FOR
TEMPERATURE GAUGES AND THERMOWELLS

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		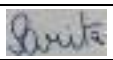			
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1.0 SCOPE

This Standard Specification, together with the Data Sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, painting, inspection and testing, documentation, marking, packing and shipping of Temperature Gauges & Thermowells along with its accessories.

2.0 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
Works/ Shop	The place where the ITEM / UNIT is fabricated and tested and transported to Purchaser.
Datasheet	Technical data provided by the Purchaser / Owner / Company.
Standard Specification	Specifications Developed as Standard by the Company.
Job Specification	Specifications Developed pertaining to particular project / Job in regard.
Material Requisition	Requisition as raised to Supplier for Quotation of the item
Purchase Requisition	Requisition as raised to Supplier for Procurement of the item
Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

3.0 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

ANSI/ASME	ASME B 16.5 Steel Pipe Flanges and Flanged Fitting
	ASME B 16.20 Ring Joint Gaskets and Grooves for Steel Pipe Flanges
	ASME B1.20.1 Pipe Threads
IEC-529	Degree of Protection by Provided by Enclosures
SAMA	Scientific Apparatus Maker's Association
IS-2147`	Degree of Protection provided for Enclosures for Low Voltages Switch gear and control gear.
IS-7358	Specification for Thermocouples

3.2 Order of Precedence

In the event of conflict between Specifications, Data sheets, related standards, codes etc., the order of precedence shall be as follows:

a. Data sheets
b. Job Specifications
c. Standard Specifications
d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4.0 MATERIALS

Materials requirements for Temperature Gauge shall be in accordance with the Data sheets and Company's Standard Specifications. For corrosion service the material selected shall be in compliance with the requirements of NACE MR-0175 / ISO-15156 latest editions

For all Temperature Gauges, the case & bulb / stem material shall be as a minimum SS316 unless otherwise specified in the Data Sheet. Capillary tubing shall be of SS316 as a minimum with stainless steel flexible armoring and PVC covering over armor.

The casing of the Temperature Gauge shall be as a minimum weather proof to IP-65 & suitable for outdoor installation.

5.0 DESIGN

5.1 General

The following design requirements cover the general requirements of Temperature Gauge & Thermowells. But for the exact requirement and applications, the relevant job specification and design basis shall be referred and complied.

5.2 Temperature Gauges

Local Temperature Gauges shall be Liquid / vapor / Gas filled type in general and shall be manufactured as per relevant SAMA Class. Bimetallic gauges can also consider if approved by Purchaser. All local Temperature Gauges shall have 150 mm dial size. The bulb size shall be selected to suit the Thermowell.

In vibrating service filled type Temperature Gauges with capillary extension shall only be used. Temperature Gauges shall have accuracy of ±1% URV (Upper Range Value). Bimetallic type dial thermometers shall be avoided where excessive vibrations are encountered, such as compressors. Only filled type with capillary extension shall be used in such cases.

Temperature Gauges shall be of the separate socket type suitable for well installation. Upon assembly of components, the Temperature Gauge element shall firmly contact the bottom of the well. The well shall fit the gauge stem so that maximum transfer rate results. Thermometer stem adjustable gland with union connection and bushing shall be suitable for ½ NPTF connections.

For filled system type Temperature Gauges, the SAMA (Scientific Apparatus Makers Association) classification shall be decoded as below.

SAMA CLASS	FILLING FLUID
I	Liquid
II	Vapor
III	Gas
IV	Mercury

Unless otherwise specified, the Temperature Gauges shall have an over range protection of at least 30% of the specified range.

All other technical details of the Gauges are defined on the Data Sheet

5.3 Name Plate

Each Temperature Gauge Shall have a SS name plate attached firmly to it at a visible place, furnishing the following information:

a. Tag number as per Data Sheet
b. Manufacturer’s name and trade mark

5.4 Thermowell

Thermowell material shall be as a minimum SS316 unless otherwise specified and shall be machined out of forged bar-stock. Built-up Thermowells can be considered for immersion length greater than 500mm and when special pipe materials are needed for the well. Built-up Thermowells shall be used in low pressure and velocity services like in fired heaters.

Thermowells natural frequency calculations, where specified on the Data Sheet, are required for review. The base of the Thermowells shall be chosen to fit the instrument without air gap for minimizing measuring lag.

Immersion length of Thermowells shall be as follows:

Line Size	Immersion Length
From 4" to 6"	280mm
From 8" Onwards	320mm
Vessels / Columns	400mm

In special applications, not covered above, Vendor shall decide the immersion length based on actual requirements. Immersion length is based on 200 mm length between flange face and inner wall of pipe.

Thermowells shall be capable of withstanding the maximum design temperature and Pressure of the system. Any pipe line less than 4" nominal bore shall be blown to 4" size to install Thermowell.

Unless otherwise specified, the following shall govern:-

a. Threaded end connections shall be to NPT as per ANSI/ASME B 1.20.1. b. Flanged end connections shall be to ANSI/ ASME B 16.5.

b. Where ring type joint flanges have been specified, the groove shall be suitable for octagonal rings as per ANSI/ ASME B 16.20 unless otherwise specified.

c. Flange face finish shall be serrated concentric to paragraphs 6.3.4.1, 6.3.4.2 and 6.3.4.3 of ANSI/ASME 816.5. The face finish as specified in Data Sheets, shall be as follows:-

i. Serrated	250 to 500 AARH
ii. 125 AARH:	125 to 200 AARH
iii. 63 AARH	32 TO 63 AARH

5.5 NAME PLATE DETAILS

The following information shall be punched on the extension of the Thermowell:

a. Tag number as per Purchaser's Data Sheets.

b. Material of the well to the same standards as in Purchaser's Data Sheets.

c. Thermowell immersion length 'U'.

The following information shall be punched on the Thermowell flange at a visible place:-

a. Nominal flange size in inches and rating in pounds.

b. Flange material to the same standards as per Purchaser's Data Sheets.

6.0 FABRICATION

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of Temperature Gauges & Thermowells. Vendor shall submit the required specification, drawings & documents for approval. Also Vendor shall refer the relevant codes and standards for manufacturing herein. Painting of Temperature Gauges & Thermowells is in accordance with Company Painting Specifications.

All equipment's shall be coated with anticorrosive paints for a corrosive, near shore environment. Vendor in compliance with the written procedures recommended by the manufacturer shall prepare his own coating procedures including surface preparation and application of coating and curing. Vendor's painting/coating system shall be submitted along with the bid for Buyer's review and approval.

All material shall be new, clean and free from rust, pits and obvious defects.

7.0 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per Job Specification requirements, and as per relevant codes, prior to shipment. The inspection and testing for Pressure Transmitter shall be carried out as per approved Inspection and Test Plan. Vendor shall submit the Inspection and Testing for Approval. Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process like hydro test, material test, hazardous area certification test, calibration test and any other before Factory Acceptance Testing (FAT).

Unless otherwise specified, Purchaser reserves the right to test and inspect all the items at the Vendor's works. Vendor shall submit following test certificates and test reports for Purchaser's review:-

a. Material test certificate (MIL Certificate) for Thermowells and flanges.

b. Certificate of Radiography / X-ray for welded joints. Dye penetration test certificate shall be provided for joints where Radiography / X-ray is not possible.

c. Certificate for concentricity of bore.

d. Hydrostatic test report as Para 7.1 of this specification.

e. Type test report for enclosure class for Temperature Gauges.

f. Calibration report for Temperature Gauges

g. Dimensional Test Report

7.1 Hydrostatic Test

Each Thermowell made of bar stock or built up type shall be subjected to hydrostatic test for a time period of 20 minutes at the following pressures:-

a. Inside of the well	100 kg/cm2 up to 600# flange rating.
	200 Kg/cm2 above 600# flange rating.
b. Outside of the well	As per flange rating.

During and after the hydrostatic test, the Thermowell shall not show any leaks or rupture.

7.2 Witness Inspection

All Temperature Gauges and Thermowells shall be offered for pre-dispatch inspection for following, as a minimum:-

a. Physical dimensional checks and workmanship.

b. Hydrostatic test on Thermowells at random.

c. Calibration including establishing accuracy and repeatability over the entire range.

d. Review of all certificates and test reports as indicated in Para 7.0 of this Specification.

In the event of not witnessed by Purchaser, the tests shall anyway be completed by the Vendor and documents for same submitted for scrutiny.

7.3 Factory Acceptance Testing (FAT)

Prior to FAT, Vendor shall submit to the Company a detailed FAT procedure, for review and approval, listing all the Temperature Gauges & Thermowells complete with the project approved tags, and highlighting the inspection and testing requirements of all such devices. FAT shall be carried out as per approved Inspection and Test Plan. FAT shall be carried out prior to shipment of the Temperature Gauges & Thermowells.

FAT procedures shall be submitted at least 4 weeks prior to FAT testing taking place. FAT shall be carried out at the manufacturing facilities. The tests shall be witnessed by the Company or their approved representative. FAT procedure will be signed off by the Vendor and Company or their approved representative at the successful completion and conclusion of testing.

The FAT shall be consisting of the following as a minimum:

a. Visual inspection

b. Calibration

c. Functional test

A certificate to detail the results and records obtained during the FAT shall be made available for ratification by the Vendor on the date of test.

7.4 Site Acceptance Testing (SAT)

A SAT shall be carried out on completion of the installation of the equipment at site which shall be witnessed by the Company / Owner's representative. SAT shall be performed on the Temperature Gauges & Thermowells as per the approved test procedure. A comprehensive test procedure in compliance with the Company Specification shall be developed and issued to company / owner for review and approval.

The Site Acceptance Test (SAT), in general, shall demonstrate that the Pressure Transmitters functions correctly and properly in accordance with the specified requirements.

8.0 MARKING, PACKING AND SHIPMENT

Temperature Gauges & Thermowells Vendor shall ensure that all equipment and associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Vendor shall provide and submit his standard "Marking, Packing and Shipping Procedures" for review by Company / Owner.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Equipment shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite.

Preparation for shipment and packing will be subject to inspection and rejection by Company's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

9.0 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include recommended Spare Parts List for start-up, pre-commissioning and two years operation as per the following;

a. Itemized recommended spare parts list for start-up and pre-commissioning.

b. Itemized recommended spare parts list for two years operation.

Vendor shall recommend accessories and special tools required for operation and maintenance of Pressure Switch, for Company review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

10.0 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if it is not covered in Job Specification.

10.1 Documentation Required with Technical Bid

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

a. Standard Specification, Data Sheets;

b. Bill of Materials including Vendor list, details of third party items;

c. Catalogues and Manuals;

d. Quality Assurance Plan;

e. A list of accessory item together with manufacturer's name and part number.

10.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company's approval:

f. Specifications, Data Sheets;

g. Bill of materials including Vendor list, details for third party items;

h. Catalogues, Manuals and relevant drawings and documents;

i. Dimensional drawings;

j. Calibration certificates;

k. Material test certificates;

l. Procedures for FAT;

m. Quality Assurance Plan;

n. Any Other documents.

10.3 Guarantee / Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design. The cost of correction / replacement of any warranty items shall be borne by the Vendor, as per the purchase conditions of the Material / Purchase Requisition.

The Job specifications / Data sheets shall be referred for any specific warranty / guarantee.

Energising Quality

VCS Quality Services Pvt. Ltd.

STANDARD SPECIFICATION
FOR
TEMPERATURE TRANSMITTER

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		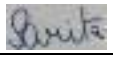			
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00	23.05.2018	Neha Dev	Udit Manichanda	K.Prasanth	Anupam Das	
01	18.01.2020	Karan Singh	Vinod Babu	Kedarnath Chakraborty	Anupam Das	Format change and document numbering is revised.
02	11.05.2022	Sarita Verma	Kedar Nath Chakraborty	Hashim khan	GV Walimbe	VCS QMS Integration

ABBREVIATION

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
IEC	International Electro technical Commission
NACE	National Association of Corrosion Engineers
HART	Highway Addressable Remote Transmission
PROM	Programmable Read only Memory
RTD	Resistance Temperature Detector
HHC	Hand Held Communicator
LCD	Liquid Crystal Display
IP	Ingress Protection

CONTENTS

1.0 SCOPE

This Standard Specification, together with the Data Sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, painting, inspection and testing, documentation, marking, packing and shipping of Temperature Transmitter.

2.0 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
Works/ Shop	The place where the ITEM / UNIT is fabricated and tested and transported to Purchaser.
Datasheet	Technical data provided by the Purchaser / Owner / Company.
Standard Specification	Specifications Developed as Standard by the Company.
Job Specification	Specifications Developed pertaining to particular project / Job in regard.
Material Requisition	Requisition as raised to Supplier for Quotation of the item
Purchase Requisition	Requisition as raised to Supplier for Procurement of the item
Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

3.0 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

ANSI/ASME	ASME B 16.5 Steel Pipe Flanges and Flanged Fitting
	ASME B 16.20 Ring Joint Gaskets and Grooves for Steel Pipe Flanges
	ASME B1.20.1 Pipe Threads
IEC-529	Degree of Protection by Provided by Enclosures
IEC-60529	Degrees of protection provided by Enclosures (IP Code)
IEC-60770	Transmitters for use in Industrial Process control systems
IEC-60751	Industrial Platinum resistance thermometer sensors
BS-5345	Electrical and Instruments in Hazardous Areas.
IS-2147	Degree of protection Provided for Enclosures for Low Voltage Switch gear and control gear
IS-2148	Flameproof Enclosures for Electrical Apparatus
NACE MR-01-75	Material Requirement- Sulfide stress cracking Resistant Material for oil Field Equipment (Latest)

3.2 Order of Precedence

In the event of conflict between Specifications, Data sheets, related standards, codes etc., the order of precedence shall be as follows:

a. Data sheets

b. Job Specifications

c. Standard Specifications

d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4.0 MATERIALS

Materials selected shall be in accordance with the Data Sheets and Standard Specifications. For corrosion service the material selected shall be in compliance with the requirements of NACE MR-0175 / ISO-15156 latest editions.

5.0 DESIGN

5.1 General

The temperature element type shall be as specified in the Data Sheets unless otherwise specified. The Temperature Transmitters should be "SMART' type suitable for analog signal transmission using HART protocol and have a non-volatile memory, unless otherwise specified. A self-diagnostic facility shall be available. The Transmitters shall be certified for use in a hazardous area classified as mentioned in Data Sheet. The Vendor shall supply the extension cable between the temperature element and the Transmitter. All field Transmitters shall have an accuracy of 0.25% of span and shall be provided with output meter / output gauge at the signal output. Burn out protection must be provided with Temperature Transmitters and trip amplifiers. Upscale or down scale protection shall be decided based on its application to ensure fail safe operation.

5.2 Element

If element is RTD, then RTD shall comply with IEC 60751. The RTD shall be three-wire type unless otherwise specified and shall have a resistance value of 100 ohms at 100°C.

5.3 Output

Transmitter output shall be 4-20 mA analog signals complying with HART protocol. The Transmitter power supply shall be normally 24 VDC, arranged for two wire transmission, with minimum power supply voltage of 12.5 VDC.

5.4 Electronics

The Transmitter electronics shall be solid state with appropriate smart circuitry. Printed circuit boards should be of a replaceable modular construction and shall be hermetically sealed or protected by a corrosion resistant coating. It should be supported against vibration in the case of plug-in type circuit boards. Signal wiring terminals and electronics shall be housed in separate compartments so that the electronics remain sealed during electrical connection to the signal cable. The electronics system shall be provided with environmental protection cover.

5.5 Calibration / Configuration

It shall be possible to perform on-line and remote set point configuration / calibration of the transmitter via a hand held communicator (HHC) The HHC shall be of easy to use and shall be suitable for use in the area classification specified in this Specification. The analog output of the transmitter shall not be affected during communication with the HHC. At least one number of hand held configurator shall be supplied as a minimum

5.6 Adjustments

The zero and span of the Transmitters shall be adjusted through a hand held communicator (HHC). A facility for engineering unit selection shall be available from the hand held communicator. The zero and span adjustments shall be non-interactive and continuously adjustable.

5.7 Indication

The Transmitters shall be provided with integral digital output indicator with 4 digits, LCD readout. The output meter scale meter shall cover the range specified in the Data Sheets, with selectable indication either in the specified engineering units or in percentage value.

5.8 Performance

The Transmitter accuracy, including the combined effect of linearity, hysteresis and repeatability shall be equal to or better than as stated in the Data Sheets. With reference to IEC 60770, errors shall be expressed as percentage of calibrated span, unless stated otherwise

5.9 Temperature Compensation

The Transmitter electronics shall include for the temperature compensation. The sensor characterization curve shall be stored in PROM.

5.10 Transmitter Housing

The instrument housing shall be low copper aluminum coated with epoxy paint. The epoxy coating shall be as per the industry standard, and shall be done on dry blast clean surface. The ingress protection for the enclosure shall be IP 65 as a minimum. No aluminum in its un-anodized form shall be used. No copper or its alloys shall be used except in its plated or tinned condition. No plastic shall be used except with a UV filter. The unit shall be supplied in housing suitable for outside (field) mounting in service conditions mentioned in the data sheets. Transmitters shall be installed in a sunshade for protection against direct sunlight.

5.11 CABLE ENTRY / CONNECTION

The electrical signal cable entry shall be M20. Unused cable entries shall be plugged off in compliance with the specified electrical safety rating. Signal wiring terminals shall be of the screw type.

5.12 TAGGING

Transmitters shall be provided with an identification plate, with all data clearly stamped on a corrosion resistant plate permanently attached to each instrument by means of rivets or pins and shall indicate, as a minimum, the following:

a. Name of the Manufacturer or trademark.

b. Instrument tag number.

c. Serial number

d. Year of manufacture
e. Range & calibration (including units of measurement)
f. Type of input
g. Electrical safety (Type of Protection)
h. Output signal.
i. All information on the nameplate shall be die- stamped or deep engraved.

6.0 FABRICATION

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of Temperature Transmitter. Vendor shall submit the required Specification, drawings & documents for approval. Also Vendor shall refer the relevant codes and standards for manufacturing mentioned herein. Painting of Thermocouple & RTD shall be in accordance with Company Painting Specifications.

7.0 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per Job Specification requirements, and as per relevant codes, prior to shipment. The inspection and testing for Temperature Transmitter shall be carried out as per approved Inspection and Test Plan. Vendor shall submit the Inspection and Testing for Approval. Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process like hydro test, material test, hazardous area certification test, calibration test and any other before Factory Acceptance Testing (FAT).

7.1 Factory Acceptance Testing (FAT)

Prior to FAT, Vendor shall submit to the Company a detailed FAT procedure, for review and approval, listing all the Temperature Transmitter complete with the project approved tags, and highlighting the inspection and testing requirements of all such devices. FAT shall be carried out as per approved Inspection and Test Plan. FAT shall be carried out prior to shipment of the Temperature Transmitter.

FAT procedures shall be submitted at least 4 weeks prior to FAT testing taking place. FAT shall be carried out at the manufacturing facilities. The tests shall be witnessed by the Company or their approved representative. FAT procedure will be signed off by the Vendor and Company or their approved representative at the successful completion and conclusion of testing.

The FAT shall be consisting of the following as a minimum:

a. Visual inspection
b. Dimensional check
c. Functional test
d. Any other relevant test

A certificate to detail the results and records obtained during the FAT shall be made available for ratification by the Vendor on the date of test.

7.2 Site Acceptance Testing (SAT)

A SAT shall be carried out on completion of the installation of the equipment at site which shall be witnessed by the company / owner's representative. SAT shall be performed on the Temperature Transmitter as per the approved test procedure. A comprehensive test procedure in compliance with the company specification shall be developed and issued to company / owner for review and approval.

The Site Acceptance Test (SAT), in general, shall demonstrate that the Temperature Transmitter correctly and properly in accordance with the specified requirements.

8.0 MARKING, PACKING AND SHIPMENT

Following FAT completion, Vendor responsible for the Temperature Transmitter shall ensure that all equipment and associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Vendor shall provide and submit his standard "Marking, Packing and Shipping Procedures" for review by Company / Owner.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Equipment shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite.

Preparation for shipment and packing will be subject to inspection and rejection by Company's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

9.0 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include recommended Spare Parts List for start-up, pre-commissioning and two years operation as per the following;

I. Itemized recommended spare parts list for start-up and pre-commissioning.
II. Itemized recommended spare parts list for two years operation.

Vendor shall recommend accessories and special tools required for operation and maintenance of Pressure Switch, for Company review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

10.0 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if it is not covered in Job Specification.

10.1 Documentation Required with Technical Bid

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

a. Standard Specification, Data Sheets;
b. Bill of Materials including Vendor list, details of third party items;
c. Catalogues and Manuals;
d. Quality Assurance Plan;

10.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company's approval:

a. Specifications, Data Sheets;
b. Bill of materials including Vendor list, details for third party items;
c. Catalogues, Manuals and relevant drawings and documents;
d. Dimensional drawings;
e. Calibration certificates;
f. Material test certificates;
g. Procedures for FAT;
h. Quality Assurance Plan;
i. Any Other documents.

10.3 Guarantee / Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design. The cost of correction / replacement of any warranty items shall be borne by the Vendor, as per the purchase conditions of the Material / Purchase Requisition.

The Job specifications / Data sheets shall be referred for any specific warranty / guarantee.

ENERGISING QUALITY

VCS Quality Services Pvt. Ltd.

STANDARD SPECIFICATION
FOR
GAS METER

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		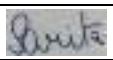			
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00	**23.05.2018**	**ND**	**UM**	**KP**	**AD**
Rev. No	**Date**	**Prepared By**	**Checked By**	**Approved By**	**Authorized By**

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Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
00	23.05.2018	Neha Dev	Udit Manichanda	K.Prasanth	Anupam Das	
01	18.01.2020					Format change and document numbering is revised.
		Karan Singh	Vinod Babu	Kedarnath Chakraborty	Anupam Das	
02	11.05.2022					VCS QMS Integration
		Sarita Verma	Kedar Nath Chakraborty	Hashim khan	GV Walimbe	

ABBREVIATION

AMR	Automatic Meter Reading
ATEX	Atmospheres Explosibles
ANSI	American National Standards Institute
EVC	Electronic Volume Corrector
FAT	Factory acceptance Test
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
MAOP	Maximum Allowable Operating Pressure
MIU	Meter Interface Unit
NACE	National Association of Corrosion Engineers
NPT	Nominal Pipe Thread
NRV	Non Return Valve
OEM	Original Equipment Manufacturer
PNGRB	Petroleum and Natural Gas Regulatory Board
RF	Radio Frequency
RO	Restriction Orifice
SAT	Site Acceptance Test
SS	Stainless Steel
TPIA	Third Party Inspection Agency
WPC	Wireless Planning & Coordination Wing

CONTENTS

1.0 SCOPE

This Standard Specification, together with the data sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, painting, inspection and testing, documentation, marking, packing and shipping of gas meters used in commercial and industrial applications in CGD industry.

2.0 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Agreement	Designates the agreement concluded between the Client and the Contractor, under which the latter undertakes to the former the Goods and/or Services according to the stipulations which are agreed and specified in the form of an order.
Client	Designates the purchaser of the Goods and/or Services, which are the subject of the agreement.
Contractor / Supplier	Designates the individual or legal entity with whom the order has been concluded by the Client. The term "Contractor / Supplier" may be used indifferently for a supplier, a manufacturer, an erection Contractor / Supplier, etc.
Days-Weeks-Months	Specify the number of calendar days, weeks or months and not of working days, weeks or months.
Client's Representative	Designates the individual or legal entity to which the Client has entrusted various tasks in relation with the carrying out of his Project.
Goods and / or Services	Designate, depending on the case, all or part of the drawings or documents, substances, materials, materiel, equipment, structures, plant, tools, machinery, to be studied, designed, manufactured, supplied by the Contractor / Supplier under the agreement, including all the studies, tasks, works and services specified by the order. The Terms Goods or Services may by indifferently used one for the other as required by the context.
Project	Designates the aggregate of Goods and/or Services to be provided by one or more Contractor / Supplier.

3.0 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

EN 1359 + A1 Latest	Gas Meters - Diaphragm Meters
OIML R137	Gas Meters
ATEX	94/9/EC Directive
EN 12480	Gas meters - Rotary Displacement Gas Meters
AGA Report No.7	Measurement of Natural Gas by Turbine Meters
AGA Report No.8	Compressibility factor of Natural Gas and other related Hydrocarbon gases
ISO 27001	Information security standards
BS 4161	Specification for diaphragm meters of 6 cubic meters
IEC 60529	Degree of Protection Provided by Enclosures (IP Code)
ASME B1.20.1	Pipe Threads, General Purpose (Inch)
ASME B16.5	Pipe Flanges and Flanged Fittings
EN12405-1 + A1	Electronic Volume Calculator
IEC 60529	Degree of Protection Provided by Enclosures (IP Code)
IEC 60079	Electrical apparatus for explosive gas atmospheres
PNGRB T4S	PNGRB Technical Standards and Specifications

3.2 Order of Precedence

In the event of conflict between specifications, data sheets, related standards, codes etc., and the order of precedence shall be as follows:

a. Data sheets

b. Job Specifications

c. Standard Specifications

d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4.0 DESIGN CRITERIA

4.1 General

All gas meters shall be designed for continuous operation in the given site conditions with the following design criteria:

- Ease of operation and maintenance;
- Suitability for applicable environmental conditions;
- Suitability for operation in the designated classification of hazardous areas;
- State of art proven technology and instrumentation;
- Safety to operating and maintenance personnel;
- Safety to connected equipment;
- High Redundancy with high reliability (high MTBF and low MTTR) and no single point of failure;
- Minimum cost of ownership.

4.2 Environmental Conditions

The equipment considered and the complete installation shall be suitable for continuous operation under the ambient conditions prevailing at site.

4.3 EMC Compliance

All gas meters and accessories shall be immune to Radio Frequency Interference (RFI) and Electro Magnetic Interference (EMI). The design and installation of all electrical / electronic equipment shall meet the RFI/EMI requirements according to IEC 61000, emission (IEC61000-6-4) and immunity (IEC-61000-6-2) requirements for an industrial environment.

4.4 Hazardous Area Certification

Gas meters shall be certified for use in designated areas when installed in hazardous area classified zones as per IEC 60079.

4.5 Ingress Protection

Gas meters shall have ingress protection to IP 54 or better in accordance with IEC 60529.

5.0 TECHNICAL REQUIREMENTS

Gas meters shall be installed at commercial and industrial applications in order to meter the gas consumed by the Customers. Gas meter type shall be decided based on flow capacity, pressure rating and accuracy requirements. These meters shall be designed to operate on clean and dry natural gas.

This document specifies all types of gas meters used for commercial and industrial applications in CGD industry. However, the exact requirement shall be as defined in Material Requisition and Datasheets.

5.1 Diaphragm Meter

Diaphragm meter shall be suitable for measurement of low gas flows in domestic and light commercial metering applications.

Diaphragm meter shall be designed in accordance to EN 1359:1999 + A1 Amendment 2006 or latest and shall be suitable for outdoor / indoor installations, tamper proof and corrosion resistance for a life period of 10 years.

Diaphragm meters fall into the positive displacement category as they have well defined measurement compartments that alternately fill and empty as the meter reciprocates or rotates. The meter will indicate volumetric flow based on the gear ratio, number of revolutions and fixed volume displaced in each meter revolution.

Diaphragm meter shall have an accuracy class of 1.5 and rangeability of 150:1 or better. Pressure drop across the meter shall be less than 2 mbar at Qmax.

Ingress protection of meter shall be IP 54 or better.

Material of construction of meter shall be steel with suitable coating on inside and outside for corrosion protection of casing. Diaphragm material shall be polyester fabric coated with rubber for an endurance life cycle of 80,000 cum. Meter shall be in accordance with EN 1359.

Diaphragm meter shall have 8 digit mechanical index (As per EN1359 – Units in m^3). Index shall be provided with sealing arrangement to avoid tampering.

Back-run stop is to be provided to prevent the meter from running backwards in case of tampering or back flow condition. Transmission system shall be tamperproof non-magnetic with transmission rate of 0.01 m^3 / rotation for G4 & G6 and 0.10 m^3 / rotation for G10 - G25.

Meter shall be provided with a device in the outlet to prevent reverse flow. Over flow protection device (Restriction Orifice) shall be provided at the downstream of meter. Material of construction of restriction orifice shall be PTFE and shall be suitable for natural gas application.

Vendor shall provide brass adaptor with 1” inlet / outlet connection. Washer shall be of PTFE material of construction and provided along with restriction orifice.

The end connection of the meters shall be protected with plastic caps. In case of flange ends, companion flanges with bolts shall be provided in each end. In case the end connections of the meters proposed by the Vendor is not in line with the end connections mentioned in the data sheets, the Vendor shall supply suitable adaptors to suit the desired end connections. Companion flanges with bolts if supplied shall be enclosed within the meter packing box.

Vendor to provide the type approval certification for meter as per EN 1359 and certification from Weights & Measures Department, India with Model & Make details included. Calibration certificate (original + soft copy) shall be provided to Client. One copy of the certificate shall be provided within the packing box of each meter.

If applicable, diaphragm meter shall be provided with Automatic Meter Reading (AMR) and either integral or external Electronic Volume Corrector (EVC). Refer EVC Datasheet for detailed specifications.

5.2 Thermal Mass Meter

Thermal mass meter shall be suitable for measurement of low gas flows in commercial and light industrial metering applications.

Thermal mass flow meter offers excellent sensitivity at low flow rates, high reliability due to no moving parts, high accuracy, high turndown ratio and easy installation. However, the suitability of thermal mass flow meter with the fluid measured is to be checked prior to usage of this meter.

Thermal mass flow meter shall be designed in accordance to latest version of OIML R137 and shall be suitable for outdoor / indoor installations, tamper proof and corrosion resistance for a life period of 10 years.

Thermal mass flow meter measures gas mass flow directly without need for pressure and temperature correction.

These meters measure the amount of heat transfer between two temperature sensors placed symmetrically in a heated flow sensor. The amount of heat transfer is directly proportional to mass flow rate.

The amount of power in the form of heat to the sensor shall be very low, permitting the use of this technology in natural gas and flammable gas applications.

Thermal mass meter shall have an accuracy class of 1.5 and rangeability of 150:1 or better. Pressure drop across the meter shall be less than 2 mbar at Qmax.

Material of construction of meter shall be steel with suitable coating on inside and outside for corrosion protection of casing. Sensor material of construction shall be in accordance with OIML R137.

Ingress protection of meter shall be IP 54 or better. Meter shall be provided with integral LCD digital display.

Thermal mass flow meters shall be tamper proof and shall provide all diagnostic information to end user.

The end connection of the meters shall be protected with plastic caps. In case of flange ends, companion flanges with bolts shall be provided in each end. In case the end connections of the meters proposed by the Vendor is not in line with the end connections mentioned in the data sheets, the Vendor shall supply suitable adaptors to suit the desired end connections. Companion flanges with bolts if supplied shall be enclosed within the meter packing box.

Vendor to provide the type approval certification for meter as per OIML R137 and certification from Weights & Measures Department, India with Model & Make details included. Calibration certificate (original + soft copy) shall be provided to Client. One copy of the certificate shall be provided within the packing box of each meter.

Thermal mass meter shall be provided with in-built Automatic Meter Reading (AMR) with encrypted communication capability via GSM / GPRS and integral antenna.

An optional optical communication port shall be provided in order to access meter metrological information and diagnostic database.

Meter shall be powered by lithium-ion battery. The life of battery shall be optimum with respect to the performance and communication capability of the meter.

Refer EVC Datasheet for detailed specifications.

5.3 Ultrasonic Meter

Ultrasonic meter shall be suitable for measurement of low gas flows in commercial and light industrial metering applications.

Ultrasonic flow meter offers excellent sensitivity at low flow rates, high reliability due to no moving parts, high accuracy, high turndown ratio and easy installation. However, the suitability of ultrasonic flow meter with the fluid measured is to be checked prior to usage of this meter.

Ultrasonic meter shall be designed in accordance to latest version of OIML R137 and shall be suitable for outdoor / indoor installations, tamper proof and corrosion resistance for a life period of 10 years.

Ultrasonic gas meter shall be based on single path ultrasonic sensors. The meter shall be configurable to provide temperature and fixed factor pressure conversion on the measured gas volume.

Temperature shall be measured by a thermistor located within the gas meter. The measured temperature shall be used to calculate a temperature scaling factor, which is used to obtain a temperature converted volume.

Fixed factor pressure conversion shall be provided in the meter and shall convert the volume record using the pressure scaling factor stored in the meter in to a pressure converted volume.

The measuring element shall comprise of a flow tube fitted between an inlet chamber and outlet chamber. One ultrasonic transducer shall be fitted on the upstream and one on the downstream end of the flow tube.

Material of construction of meter casing shall be either steel or die-cast aluminium with suitable coating on inside and outside for corrosion protection of casing. Sensor material of construction shall be in accordance with OIML R137.

Ingress protection of meter shall be IP 54 or better. Meter shall be provided with integral LCD digital display.

Ultrasonic flow meters shall be tamper proof and shall provide all diagnostic information to end user.

The end connection of the meters shall be protected with plastic caps. In case of flange ends, companion flanges with bolts shall be provided in each end. In case the end connections of the meters proposed by the Vendor is not in line with the end connections mentioned in the data sheets, the Vendor shall supply suitable adaptors to suit the desired end connections. Companion flanges with bolts if supplied shall be enclosed within the meter packing box.

Meter shall be powered by lithium-ion battery. The life of battery shall be optimum with respect to the metrological performance of the meter.

Vendor to provide the type approval certification for meter as per OIML R137 and certification from Weights & Measures Department, India with Model & Make details included. Calibration certificate (original + soft copy) shall be provided to Client. One copy of the certificate shall be provided within the packing box of each meter.

The gas meter shall provide a pulse output interface to external monitoring device such as automatic meter reading unit to transmit gas volume flow rate information.

Ultrasonic meter shall have provision to integrate with Automatic Meter Reading (AMR) and either integral or external Electronic Volume Corrector (EVC), with encrypted communication capability via various communication options.

An optional optical communication port shall be provided in order to access meter metrological information and diagnostic database.

AMR and EVC shall be powered by lithium-ion battery. The life of battery shall be optimum with respect to the performance and communication capability of the AMR.

Refer EVC Datasheet for detailed specifications.

5.4 RPD Meter

The in line Positive Displacement Meters (PD meters) with its associated systems shall be designed for natural gas flow measurement required for both custody transfer and non-custody transfer applications. And it shall be field proven and no prototype shall be offered.

RPD meter shall be designed in accordance to EN 12480 or latest and shall be suitable for outdoor / indoor installations, tamper proof and corrosion resistance for a life period of 10 years.

Positive Displacement flow meters measure the volume or flow rate of a moving fluid or gas by dividing the media into fixed, metered volumes. These devices consist of a chamber that obstructs the media flow and a rotating or reciprocating mechanism that allows the passage of fixed-volume amounts. The number of parcels that pass through the chamber determines the media volume. The rate of revolution or reciprocation determines the flow rate.

There are two basic types of Positive Displacement flow meters. Sensor-only systems or transducers are switch-like devices that provide outputs for processors, controllers, or data acquisition systems. Complete sensor systems provide additional capabilities such as an integral display and/or user interface. For both types of Positive Displacement Flow Meters, performance Specifications include operating pressure, temperature range, maximum material density, connection size, and percent accuracy. Suppliers indicate whether devices are designed to move fluid or gas.

RPD meter shall have an accuracy of +/- 1 % or better and rangeability of 100:1 or better. Ingress protection of meter shall be IP 54 or better.

Material of construction of meter casing shall be either steel or die-cast aluminium with suitable coating on inside and outside for corrosion protection of casing. Meters internal parts material of construction shall be SS 316.

RPD meter shall be tamper proof. Ingress protection of meter shall be IP 54 or better.

There are several metering technologies for Positive Displacement Flow Meters. Gear meters have two rotating gears with synchronized, close-fitting teeth. Oval, spur and helical gears are often used because shaft rotation can be monitored to obtain specific flow rates. Vortex meters measure the frequency with which vortices are shed from a bluff body placed in the flow stream.

Typically, the frequency is proportional to the material velocity. Nutating disc meters use media pressure to rock a disc in a circulating path without causing the disc to rotate about its own axis. A pin that extends from the disc is connected to a counter that monitors the disc's rocking motions. Meters that measure incremental volumes of flow with a piston are also available.

The straight length (if required) of calibrated pipe forming the upstream and downstream parts of the meter tubes shall be cut from one piece of pipe without any intermediate girth weld.

Meters shall be marked with the direction of the flow on the meter and the marking shall be clearly visible.

The meters design shall also ensure protection against damage due to hydraulic shock which may be caused by quick opening / closing of upstream / downstream valves.

Meter shall be provided with non-return valve (NRV) and restriction orifice (RO) in order to prevent reverse rotation and meter over run. Pressure drop across NRV, RO and meter shall be calculated by Vendor. Over flow protection shall be 20% of maximum flow.

Vendor to provide the type approval certification for meter as per OIML R137 and certification from Weights & Measures Department, India with Model & Make details included. Calibration certificate (original + soft copy) shall be provided to Client. One copy of the certificate shall be provided within the packing box of each meter.

RPD meter shall provide a pulse output interface to external monitoring device such as automatic meter reading unit to transmit gas volume flow rate information.

RPD meter shall have provision to integrate with Automatic Meter Reading (AMR) and either integral or external Electronic Volume Corrector (EVC), with encrypted communication capability via various communication options.

An optional optical communication port shall be provided in order to access meter metrological information and diagnostic database.

AMR and EVC shall be powered by lithium-ion battery. The life of battery shall be optimum with respect to the performance and communication capability of the AMR.

Refer EVC Datasheet for detailed specifications.

5.4.1 Non Return Valve and Restriction Orifice

Non return valve (NRV) shall be swing type check valve and shall be provided downstream of RPD meter in order to prevent meter reverse rotation. Check valve shall be suitable for natural gas application.

Check valve size, pressure rating and end connections shall be in accordance with the meter supplied. Valve accessories such as carbon steel companion flanges and spare gaskets shall be provided by Vendor.

Maximum allowable pressure drop across the valve shall be 50 mbar.

Material of construction (MOC) of body, cover and hinge shall be ASTM A216 Gr.WCB or equivalent. MOC of disc, seat and hinge pin shall be Alloy 20.and gasket shall be PTFE.

Restriction orifice (RO) shall be provided between meter and NRV in order to prevent meter over run. Material of construction (MOC) of RO shall be SS 316.

5.5 Turbine Meter

The turbine meter shall be axial flow type gas turbine meter in which the entire gas stream passes through the turbine meter rotor. The turbine metering of natural gas shall be designed manufactured and tested, as per AGA report no. 7.

Transmitter and other electrical accessories of Turbine meter shall be suitable for area classification. Enclosure of intrinsically safe system shall be weather proof as per NEMA 4. Explosion proof enclosure shall also be made weather proof as per NEMA 4 + 7.

Vendor shall furnish the sizing calculations to justify the selection of turbine meters considering the density/compressibility of the given composition of the gas. The sizing shall be done at the minimum operating pressure with compressibility factor of 1.0. The maximum velocity through the Turbine meter shall be less than 20 m/sec.

Material of construction of meter casing shall be either steel or die-cast aluminium with suitable coating on inside and outside for corrosion protection of casing. Meters internal parts material of construction shall be SS 316.

The pulse generator shall be non-contact proximity switches mounted near turbine wheel and reference wheel or non-contact type pulse pick up unit. The unit shall be tropicalized hermetically sealed and shall be either intrinsically safe or explosion proof and shall be weatherproof to NEMA 4.

Turbine meter shall have local index head with mechanical / electronic 8-digit totalizer. Electronic totalizer (when supplied) shall have LCD indication and shall be complete with dry cell batteries for power lasting for one year. The system shall be immune to RF / FM interferences in that area.

Straightening vanes shall be provided to eliminate swirls and cross current setup by the pipe-fittings, valves or regulators preceding the meter inlet piping. Straightening vanes shall be designed according to latest revision of AGA Report No-3. Straightening vanes shall be tube bundle of 316 SS tubes and shall be designed and approved by the meter manufacturer.

Vendor shall furnish pressure drop figures for each turbine meter, flow straightener at normal operating conditions and at maximum flow condition. Turbine meter shall have a continuous monitoring feature for detecting missing blades or bearing problems and to give alarm in such situation.

The meters shall be certified by Weights and Measures department, and shall be calibrated to an accuracy of ±0.5% band. Vendor shall furnish the documentary proof in support of the above along with certified calibration curve.

All meters selected shall be of field proven quality with respect to design, material and application. Field mounted instruments shall be capable of working under high ambient Temperature and environmental condition without any degradation in accuracy and repeatability.

The turbine meter shall be calibrated with /natural gas near operating pressure and shall have following performance: -

- Range-ability: Range-ability of Turbine meter shall be 20: 1 for Meter sizes above G100 and for Turbine meters with size less than or equal to G 100 range-ability shall be 10:1 Repeatability: ±0.1%;
- Accuracy: For flow rates between 5% and 20% (of Meter max) at operating pressure the calibration curve shall be within an envelope of ±1% and for flow rates between 20 % to 100% (of meter max.) at operating pressure the calibration curve (min. 7 points) shall be within an envelope of ± 0.5%;
- Repeatability: The repeatability of meter shall be +/- 0.1 % from Qmin to Qmax.

The turbine meters shall have HF pulses on the meter head and shall be connected to the flow computer. For Turbine meter of size up to 2", one (1) HF pulse and one (1) LF pulse is also acceptable. However, for Turbine meter of size 3" and above, two (2) nos. of HF pulse is required.

The turbine flow meter shall be wet calibrated (at average operating/ skid outlet pressure) as per operating conditions along with its supplied flow conditioner. The supplied bundled tube flow conditioner/ straightener shall be used during flow calibration.

The meter tubes/ meter run of other make/ supply can also be used during calibration. Rotor and all wetted parts shall be of Metallic and no Plastic / Non-metallic parts shall be not be used in internal parts of Turbine meter.

Turbine meter shall have an accuracy of +/- 1 % or better, rangeability of 20:1 or better and repeatability of +/-1% or better for calibrated range. Ingress protection of meter shall be IP 54 or better.

Vendor to provide the type approval certification for meter as per OIML R137 and certification from Weights & Measures Department, India with Model & Make details included. Calibration certificate (original + soft copy) shall be provided to Client. One copy of the certificate shall be provided within the packing box of each meter.

Turbine meter shall provide a pulse output interface to external monitoring device such as automatic meter reading unit to transmit gas volume flow rate information.

Turbine meter shall have provision to integrate with Automatic Meter Reading (AMR) and either integral or external Electronic Volume Corrector (EVC), with encrypted communication capability via various communication options.

An optional optical communication port shall be provided in order to access meter metrological information and diagnostic database.

AMR and EVC shall be powered by lithium-ion battery. The life of battery shall be optimum with respect to the performance and communication capability of the AMR.

Refer EVC Datasheet for detailed specifications.

5.6 Automatic Meter Reading and Electronic Volume Corrector (EVC)

The AMR system of each meter shall be supplied with integral / external EVC, GPRS modem and SIM cards to record gas consumption and diagnostics from the meters. The meter reading data collected through AMR system shall be uploaded to Bidder's cloud server.

Electronic Volume Corrector (EVC) with built-in pressure and temperature sensors shall be used to convert measured gas volume from operating conditions to reference pressure and temperature conditions.

Electronic Volume Corrector (EVC) with integral battery, modem and data logging capability shall be provided with gas meter.

Vendor shall supply the EVC installed on the suitable mounting frame / arrangement as per IGL site requirements. Pressure inputs shall be connected using suitable SS tube fitting and the other end of the tubing will be terminated in a 2-way manifold valve.

Vendor shall provide cables (2.5 meter length) along with cable connectors required between meters and EVC device.

Bidder to ensure compatibility of gas meter, EVC and modem and their performance shall be demonstrated in presence of Client.

Gas meters along with EVC & Modem shall be commissioned in presence of meter supplier service engineer only. Bidder shall ensure his presence at time of commissioning and shall include all cost in their rates. Bidder will ensure presence of their representative for technical assistance during commissioning of skid and no extra cost will be payable to Bidder.

Bidder shall supply software for remote data monitoring through GSM modem. The software shall be installed in IGL office / control room and actual performance of software for remote data monitoring shall be carried out by Bidder. All necessary arrangement required to perform software operation shall be done by Bidder at no extra cost.

This SIM card shall not be in scope of bidder. SIM card to be provided by end user.

For Data Hosting details, refer attached "Data Hosting and Service Agreement". Refer

EVC data sheet for detail requirements of volume correction.

5.7 Materials

All the wetted parts including actuating mechanism shall be suitable for the fluid being handled. Material of construction of meter casing shall be either steel or die-cast aluminium with suitable coating on inside and outside for corrosion protection of casing in line with the applicable governing standards.

In case of diaphragm meters, diaphragm material shall be polyester fabric coated with rubber for an endurance life cycle of 80,000 cum. Other Internal parts shall be non – metallic to prevent from tampering like magnet.

Vendor shall use suitable material parts, provide proper surface finish, hardness and clearances, wherever possibilities of galling exists.

Vendor shall use suitable material parts, provide proper surface finish, hardness and clearances, wherever possibilities of galling exists.

For corrosion service, the material selected shall be in compliance with the requirements of NACE MR-0175 / IS0-15156 latest editions.

5.8 Name plate

Each gas meter shall be marked in legible characters, which are permanently visible in accordance with BS EN 1359 / OIML R137 or latest:

a. Type approval mark and number;

b. Manufacturer's name and Identification Mark;

c. Serial Number, Model Name and Model Number;

d. Flow Rate – Max (Qmax) & Min (Qmin) - (m3/h);

e. Maximum Working Pressure pmax (bar);

f. Flow Direction;

g. Nominal value of the cyclic volume, V (dm3);

h. Number and date of EN Standard;

i. Ambient temperature range (°C);

j. Gas temperature range (°C);

k. Accuracy class of the meter, e.g. Class 1.5;

l. Month & Year of Manufacture.

Type approval number shall be issued by Department of Legal Metrology (W&M) (Government of India). ATEX Marking shall be as per directive 94/9/EC on the electrical / electronic device or module certified.

Owner unique serial number shall be marked on the meter as per the standard procedure followed by Owner, which will be communicated to the successful bidder.

6.0 FABRICATION AND PAINTING

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of diaphragm meter. Vendor shall submit the required Specification, drawings & documents for approval. Also Vendor shall refer the relevant codes and standards for manufacturing herein.

Painting shall be such that there is no rust formation on the Meter when exposed continuously to the corrosive atmosphere. All carbon steel bolting shall be hot dip galvanized or cadmium plated and bi-chromated.

Aluminium components shall be anodized then coated with epoxy paint.

The Supplier's painting standard will be considered as an alternative offer provided it meets or exceeds the preceding requirements.

7.0 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per project specification requirements and as per relevant codes, prior to shipment. The inspection and testing

for diaphragm meters shall be carried out as per approved Inspection and Test Plan (ITP).

Vendor shall submit the Inspection and Testing Plan for proprietary items / special items for approval. Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process hazardous area certification test and calibration test.

For any control, test or examination required under the supervision of TPIA / Owner / Owner's representative later shall be informed in writing one (1) week in advance by vendor about inspection date and place along with production schedule.

The Supplier shall provide calibration certificate and accuracy at MAOP of the diaphragm meter for the following flow rates (As per EN 1359):

Q_{MIN} $0.1Q_{MAX}$ Q_{MAX}

Supplier shall hire Third Party Inspection Agency (to be approved by the Client) to perform inspection work. This agency shall inspect all the equipment/material and issue all inspection certificates/reports as per specifications and codes.

Supplier shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports, accuracy test report for individual meter, as per technical specification and specified code for 100% material, at the time of final inspection of each supply lot of material.

Vendor to provide calibration certificates for review of all the measuring instruments at the time of inspection, i.e., used for checking and testing, along with the Master calibration certificate of the measuring instruments from which the instruments is calibrated.

All meters shall be sealed properly by the Manufacturer after final inspection clearance and before dispatch. Meters found in an unsealed condition shall not be accepted.

If the performance of any of the sample meter is not in compliance with the acceptance norms of the respective standards then that the lot of respective item will be rejected.

Vendor should follow the QAP provided in this tender and inline with 1359:1999+A1 2006.

Even after third party inspection, Owner reserves the right to select a sample of diaphragm meters randomly from each manufacturing batch and have these independently tested. Should the results of these tests fall outside the limits specified in Technical specification, then Owner reserves the rights to reject all production supplied from the batch.

7.1 Visual Inspection

A visual inspection and physical check shall be made for compliance of the material with requirements of the specifications of the original Purchase Order and all subsequent change orders including the relevant attachments and with Manufacturer's catalogue description and certified drawings furnished. Included are:

a. Check for satisfactory workmanship, materials compliance and freedom from surface defects and broken glass;

b. Check for compliance with certified drawings including dimensions;

c. Check for all accessories on Purchase Order;

d. Check for required cable length, if any

e. Check paint for imperfections.

Verify that each component has a tag of corrosion resistant material permanently fastened to the unit and stamped with information

Verify that all terminals for interconnecting wiring between units are accessible for connecting and checking. Terminal blocks should be numbered and where 2 or more are present, should have block identification. Interconnecting cables shall be colour coded or numbered.

All electrical wiring shall be checked for continuity and insulation test.

7.2 Functional Testing

Each gas meter shall be accurately calibrated and tested by the Manufacturer at the normal working conditions specified in the attached data sheet. All test equipment used for testing shall have traceability to national standards.

7.3 Installation, Testing & Commissioning

The Supplier shall assist during erection, testing and commissioning of gas meters at site. The bidders shall indicate separate pricing for this purpose in their offers, if applicable.

7.4 Guarantee / Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Generally the Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design. The cost of correction / replacement of any warranty items shall be borne by the Vendor.

The job specifications / data sheets shall be referred for any specific warranty / guarantee.

8.0 MARKING, PACKING AND SHIPMENT

Vendor responsible for gas meter and its accessories shall ensure that all equipment, associated materials and accessories are designed properly packed, and secured for transit to site without damage.

Supplier / Vendor shall provide a detailed packing list for all the items been supplied. Necessary accessories supplied shall be packed in the main package box for which accessories are been supplied.

The calibration certificates of each item shall be enclosed within the package box. Each package box shall be tagged with the Purchase Order number (unique identification is required).

The package box shall be suitable for inland transport or seaworthy (if imported). Necessary precautions and pre-requisites shall be considered by Supplier for package delivery to the concern Client site / location / workshop.

Vendor shall provide and submit his standard "Marking, Packing and Shipping Procedures" for review by Client.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Equipment shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the job site.

Preparation for shipment and packing will be subject to inspection and rejection by Company's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

9.0 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include with the bid, recommended spare parts list for start-up, pre-commissioning and two year operation as per following:

a. Itemized recommended spare parts list for start-up and pre-commissioning;

b. Itemized recommended spare parts list for two years operation.

In case of RPD meters, spare gaskets for meter, NRV and RO installation shall be provided by Vendor.

In case of RPD meters, lubricating oil (500 ml) along with feeding accessories shall be supplied with each meter. Lubricating oil bottle (200 ml) shall be included in each meter box packing.

Vendor shall submit recommended accessories and special tools required for operation and maintenance of gas meters for Company’s review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

10.0 DOCUMENTATION

The following documentation requirements shall be fulfilled by the Vendor at various stages of bidding and execution of order.

Whenever Client and/or Client’s representative’s review and/or approval is requested on a document to be submitted by the Contractor / Supplier or before an action is implemented by the Contractor / Supplier, such review and/or approval shall always be requested in writing by the Contractor / Supplier to the Client and/or the Client’s representative before any action subject of this review and/or approval is taken.

Documentation provided by Vendor shall be in English language only.

Client and/or Client’s representative approval shall always be given in writing.

10.1 Documentation Required with Technical Bid

During bidding stage, Vendor shall submit in his offer the following documents as a minimum:

a. Specification, Data Sheets along with sizing calculations;

b. Bill of Materials including Vendor List, Details for third party items;

c. Catalogues and manuals;

d. Quality Assurance Plan;

e. Weights & Measures Approval Certificate;

f. Type approval / Compliance / Examination Certificate confirming to the governing standard;

g. Pressure Drop Calculations;

h. Performance Curves;

i. Deviations from technical specification, if any, with proper justification;

j. Supplies against major orders for natural gas application (PTR).

The Vendor shall provide at the time of tendering a complete detailed engineering package in accordance with the Purchaser's data requirement and shall include but not necessarily be limited to the same.

10.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company’s approval:

a. Datasheets of meters and all accessories supplied;

b. Bill of materials including Vendor list, details for third party items;

c. Catalogue and Technical literature of commercial meters in English;

d. Weights & Measures Approval Certificate;

e. Type approval / Compliance / Examination Certificate confirming to the governing standard;

f. Installation, Operation and Maintenance Manual;

g. Sizing Calculations;

h. Assembly drawings with overall dimensions;

i. Detailed sectional drawings showing all parts with reference numbers and material specifications of meters and all accessories supplied;

j. Welding, heat treatment, inspection and testing procedures;

k. Painting Specification;

l. Calibration Certificates;

m. Material Test Certificates;

n. Quality Assurance Plan;

o. Any other documents.

Upon approval and completion of testing, full set of above documentation shall be submitted to Client in 2 sets of hardcopy format and 1 no. of CD in soft copy (PDFs) format.

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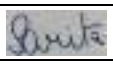
VCS Quality Services Pvt. Ltd.

STANDARD SPECIFICATION
FOR
GAS REGULATORS

VCS-SS-IN-5307_02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01	**18.01.2020**	**KS**	**VB**	**KNC**	**AD**
00	**23.05.2018**	**ND**	**UM**	**KP**	**AD**
Rev. No	**Date**	**Prepared By**	**Checked By**	**Approved By**	**Authorized By**

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REVISION RECORD						
Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
00	23.05.2018	Neha Dev	Udit Manichanda	K.Prasanth	Anupam Das	
01	18.01.2020					Format change and document numbering is revised.
		Karan Singh	Vinod Babu	Kedarnath Chakraborty	Anupam Das	
02	11.05.2022					VCS QMS Integration
		Sarita Verma	Kedar Nath Chakraborty	Hashim khan	GV Walimbe	

ABBREVIATION

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
CV	Valve Coefficient
FAT	Factory acceptance Test
FCI	Fluid Controls Institute
FM	Factory Mutual
ISA	Instrument Society of America
ISO	International Organization for Standardization
NACE	National Association of Corrosion Engineers
NPT	Nominal Pipe Thread
SAT	Site Acceptance Test
SS	Stainless Steel

CONTENTS

1.0 SCOPE

This Standard Specification, together with the data sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, painting, inspection and testing, documentation, marking, packing and shipping of gas regulators along with its accessories used in commercial and industrial applications in CGD industry.

2.0 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
Works/ Shop	The place where the ITEM / UNIT is fabricated and tested and transported to Purchaser.
Datasheet	Technical data provided by the Purchaser / Owner / Company.
Standard Specification	Specifications Developed as Standard by the Company.
Job Specification	Specifications Developed pertaining to particular project / Job in regard.
Material Requisition	Requisition as raised to Supplier for Quotation of the item
Purchase Requisition	Requisition as raised to Supplier for Procurement of the item
Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

3.0 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

American Petroleum Institute (API)

ASME B 16.10	Face to Face and End to end dimensions for valves
ASME B 16.20	Ring joint Gasket, and groves for Steel Pipe Flanges
ASME B16.5	Pipe flange and flange fittings
ASME B1.20.1	Pipe Threads
ASME B 16.34	Valves Flanged, threaded and weld ended
EN 334 / BS EN 13785	Gas pressure regulator for inlet pressure up to 100 Bar
EN 14382	Safety devices for gas pressure regulating stations and installations. Gas safety shut-off devices for inlet pressures up to 100 bar
API 598	Valve Inspection and testing
API 6D	Specification for Pipeline valves
BS 6755	Testing of Valves
FC170-2	Control Valve seat leakage Classification
MSS SP-25	Standard Marking System for Valves, Fittings, Flanges and Unions
DIN-50049	Document on Material Testing
ISA-S-75.03	Face to Face Dimensions for Flanged Globe-Style Valve Bodies.

3.2 Order of Precedence

In the event of conflict between specifications, data sheets, related standards, codes etc., and the order of precedence shall be as follows:

a. Data sheets

b. Job Specifications

c. Standard Specifications

d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4.0 TECHNICAL REQUIREMENTS

Regulator shall be double stage pilot pressure loading. The regulators shall be provided with built-in slam shut off device having over and under pressure shut-off. If required, actual flow rates provided for regulators can be converted into SCMH based on downstream pressure for selection of regulators.

These regulators have fail-open and fail-close configuration. Direct acting regulator is fail-to-open type as per requirements and as defined in EN334 standard. However, when equipped with integrated slam shut-off valves, it is treated as fail-to close due to presence of SSV.

Direct acting pressure regulator with spring control & diaphragm with in-built pressure balance regulating unit to ensure a constant outlet pressure. Pressure sensing shall be internal, external sensing is not acceptable. Regulators shall have Integral Filter. If external filter is supplied, then filter should not cause a pressure loss of more than 5% of line pressure.

Materials selection of the valve shall be in accordance with the Data Sheets and Company's Standard specifications. For corrosive service, the material selected shall be in compliance with the requirements of NACE MR-0175 / IS0-15156 latest editions.

Casing and body shall be of cast Aluminum alloy or WCB (or as per EN 334), all the wetted parts including actuating mechanism shall be suitable for the fluid being handled.

Diaphragm material shall be synthetic rubber and water proof / corrosion resistant for outdoor installation. Pressure parts of the valve shall be suitable for shut-off pressure. Regulators for downstream regulation shall be provided with integral relief valve.

Supplier shall indicate the set range for OPSO, UPSO and relief pressures. The regulators shall be factory-set to the pressures indicated in the respective data sheets.

Vendor shall use suitable material parts, provide proper surface finish, hardness and clearances, wherever possibilities of galling exists.

The regulator body rating shall be equal to or better than the flange rating specified in the data sheets.

Flow direction shall be stamped or cast on the body.

Unless otherwise mentioned, end connection details shall be as below:

a. Threaded end connections shall be NPT as per ANSI/ASME B 1.20.1;

b. Flanged end connections shall be as per ANSI / ASME B16.5;

c. Flanged face finish as specified in the Data Sheets shall have cone serrations as follows:

Serrated	250 to 500 AARH
125 AARH	125 to 200 AARH
63AARH	32 to 63 AARH

Face to face dimensions of flanged valves shall be in accordance with ISA S75.03.The allowable error in dimensions shall be ±2mm.

The term "trim' covers those parts of body assembly (excluding the body, bonnet and bottom flange) which are exposed to and in contact with the line medium consisting of but not limited to the seat ring, plug stem, plug, plug guide, guide bushing and cage.

Single seated valves shall have heavy top guiding. Double seated valves shall have top and bottom or cage guiding and shall be of the pressure balanced type. Guide bushing shall be of a sufficiently hard material to resist side thrust on the plug.

Vendor shall furnish the sizing calculations for minimum, normal and maximum flow. Cv selected shall also be indicated. Droop for regulator shall not be more than 5 % over set point. Noise level shall be limited to 85 dB.

The regulators are meant for installation at various Client’s premises, where space availability is the main constraint. The model shall be selected in such a way that it is compact and robust to suit the site conditions. Client has right to reject any model, proposed by the bidder, considering the size and shape of the regulator offered by them.

Refer the attached datasheet of regulator for further details.

4.1 Name Plate

All Regulators shall be marked as per Manufacturer's standard and shall have a permanently attached stainless steel plate with the following, as a minimum detail:

a. Certification;

b. Manufacturer's Name and Identification Mark;

c. Serial Number, Model Name and Model Number;

d. Body and port sizes in inches;

e. Stem travel in millimeters;

f. Regulation upstream / downstream;

g. Set Pressure;

h. Nominal end connection size in inches and rating in Ibs;

i. Flow Direction;

j. Area Classification;

k. Standard for body / trim materials;

l. Accuracy Class;

m. Month & Year of Manufacture.

Owner unique serial number shall be marked on the regulator as per the standard procedure followed by Owner, which will be communicated to the successful bidder.

5.0 FABRICATION AND PAINTING

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of regulators. Vendor shall submit relevant specification, drawings & documents for approval. Also Vendor shall refer the relevant codes and standards for manufacturing herein.

Vendor shall submit painting specification for Client's approval, prior to start of regulator manufacturing. Painting scheme shall be suitable to environmental conditions prevailing at the place of installation of regulator.

6.0 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per project specification requirements and as per relevant codes, prior to shipment. The inspection and testing for regulators shall be carried out as per approved Inspection and Test Plan.

Vendor shall submit the Inspection and Testing Plan for proprietary items / special items for Client approval, before commencing production. Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process such as hydro test, material test, hazardous area certification test and calibration test.

For any control, test or examination required under the supervision of TPIA / Owner / Owner's representative later shall be informed in writing one (1) week in advance by vendor about inspection date and place along with production schedule.

Supplier shall hire Third Party Inspection Agency (to be approved by the Client) to perform inspection work. This agency shall inspect all the equipment/material and issue all inspection certificates / reports as per specifications and codes.

Supplier shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports, accuracy test report for individual meter, as per technical specification and specified code for 100% material, at the time of final inspection of each supply lot of material.

Vendor to provide calibration certificates for review of all the measuring instruments at the time of inspection, i.e., used for checking and testing, along with the Master calibration certificate of the measuring instruments from which the instruments is calibrated.

All regulators shall be sealed properly by the Manufacturer after final inspection clearance and before dispatch. Regulators found in an unsealed condition shall not be accepted.

If the performance of any of the sample regulator is not in compliance with the acceptance norms of the respective standards then that the lot of respective item will be rejected.

Leak testing shall be carried out by pressurising the body with air at 1.5 MAOP of the regulator, immersed in water for observance of leakage. The Supplier shall carryout calibration for 100% quantity.

The regulators shall be tested as per EN334 and relevant international standards.

Even after third party inspection, Client reserves the right to select a sample randomly from each manufacturing batch and have these independently tested. Should the results of these tests fall outside the limits specified in Client Technical specification, then Client reserves the right to reject all production supplied from the batch.

6.1 Visual Inspection

A visual inspection and physical check shall be made for compliance of the material with requirements of the specifications of the original Purchase Order and all subsequent change orders including the relevant attachments and with Manufacturer's catalogue description and certified drawings furnished. Included are:

a. Check for satisfactory workmanship, materials compliance and freedom from surface defects and broken glass;

b. Check for compliance with certified drawings including dimensions;

c. Check for all accessories on Purchase Order;

d. Check paint for imperfections.

Verify that each component has a tag of corrosion resistant material permanently fastened to the unit and stamped with information

6.2 Functional Testing

Each regulator shall be accurately calibrated and tested by the Manufacturer at the normal working conditions specified in the attached data sheet. All test equipment used for testing shall have traceability to national standards.

6.3 Installation, Testing & Commissioning

The Supplier shall assist during erection, testing and commissioning of regulator at site. The bidders shall indicate separate pricing for this purpose in their offers, if applicable.

6.4 Guarantee / Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Generally the Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design. The cost of correction / replacement of any warranty items shall be borne by the Vendor.

The job specifications / data sheets shall be referred for any specific warranty / guarantee.

7.0 MARKING, PACKING AND SHIPMENT

Vendor responsible for regulator and its accessories shall ensure that all equipment, associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Supplier / Vendor shall provide a detailed packing list for all the items been supplied. Necessary accessories supplied shall be packed in the main package box for which accessories are been supplied.

The calibration certificates of each item shall be enclosed within the package box. Each package box shall be tagged with the Purchase Order number (unique identification is required).

The package box shall be suitable for INLAND transport or seaworthy (if imported). Necessary precautions and pre-requisites shall be considered by supplier for package delivery to the concern client site / location / workshop.

Vendor shall provide and submit his standard "Marking, Packing and Shipping Procedures" for review by Client.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Equipment shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the job site.

Preparation for shipment and packing will be subject to inspection and rejection by Company's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

8.0 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include with the bid, recommended spare parts list for start-up, pre-commissioning and two years operation as per the following:

a. Itemized recommended spare parts list for start-up and pre-commissioning.

b. Itemized recommended spare parts list for two years operation.

Vendor shall submit recommend accessories and special tools required for operation and maintenance of regulators for Company review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

9.0 DOCUMENTATION

The following documentation requirements shall be fulfilled by the Vendor at various stages of bidding and execution of order.

Whenever Client and/or Client's representative's review and/or approval is requested on a document to be submitted by the Contractor / Supplier or before an action is implemented by the Contractor / Supplier, such review and/or approval shall always be requested in writing by the Contractor / Supplier to the Client and/or the Client's representative before any action subject of this review and/or approval is taken.

Client and/or Client's representative approval shall always be given in writing.

9.1 Documentation Required with Technical Bid

During bidding stage, Vendor shall submit in his offer the following documents as a minimum:

a. Specification, Data Sheets along with sizing calculations;

b. Bill of Materials including Vendor List, Details for third party items;

c. Catalogues and manuals;

d. Quality Assurance Plan;

e. Weights & Measures Approval Certificate;

f. Type approval / Compliance / Examination Certificate confirming to the governing standard;

g. Pressure Drop Calculations;

h. Performance Curves;

i. Deviations from technical specification, if any, with proper justification;

j. Supplies against major orders for natural gas application (PTR).

The Vendor shall provide at the time of tendering a complete detailed engineering package in accordance with the Purchaser's data requirement and shall include but not necessarily be limited to the same.

9.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company's approval:

a. Datasheets of regulators and all accessories supplied;

b. Bill of materials including Vendor list, details for third party items;

c. Catalogue and Technical literature of regulators in English;

d. Weights & Measures Approval Certificate;

e. Type approval / Compliance / Examination Certificate confirming to the governing standard;

f. Installation, Operation and Maintenance Manual;

g. Sizing Calculations;

h. Assembly drawings with overall dimensions;

i. Detailed sectional drawings showing all parts with reference numbers and material specifications of regulators and all accessories supplied;

j. Welding, heat treatment, inspection and testing procedures;

k. Painting Specification;

l. Calibration Certificates;

m. Material Test Certificates;

n. Quality Assurance Plan;

o. Any other documents.

Upon approval and completion of testing, full set of above documentation shall be submitted to Client in 2 sets of hardcopy format and 1 no. of CD in soft copy (PDFs) format.

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VCS Quality Services Pvt. Ltd.

STANDARD SPECIFICATION
FOR
RESTRICTION ORIFICE PLATES

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		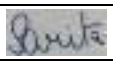			
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Rev. No	**Date**	**Prepared By**	**Checked By**	**Approved By**	**Authorized By**

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REVISION RECORD

Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	23.05.2018	Neha Dev	Udit Manichanda	K.Prasanth	Anupam Das	
01	18.01.2020					Format change and document numbering is revised.
		Debayan Ghoshal	Vinod Babu	Kedarnath Chakraborty	Anupam Das	
02	11.05.2022					VCS QMS Integration
		Sarita Verma	Kedar Nath Chakraborty	Hashim khan	GV Walimbe	

ABBREVIATION

AARH	Arithmetic Average Roughness Height
AGA	American Gas Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BS	British Standard
FM	Factory Mutual
GPA	Gas Processors Association
ISA	Instrument Society of America
IS	Indian Standards
ISO	International Organization for Standardization
NACE	National Association of Corrosion Engineers
NPT	Nominal Pipe Thread
RTJ	Ring Type Joint
SS	Stainless Steel

CONTENTS

1.0 SCOPE

This Standard Specification, together with the data sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, inspection and testing, documentation, marking, packing and shipping of Restriction Orifice Plates

2.0 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
Works/ Shop	The place where the ITEM / UNIT is fabricated and tested and transported to Purchaser.
Datasheet	Technical data provided by the Purchaser / Owner / Company.
Standard Specification	Specifications Developed as Standard by the Company.
Job Specification	Specifications Developed pertaining to particular project / Job in regard.
Material Requisition	Requisition as raised to Supplier for Quotation of the item
Purchase Requisition	Requisition as raised to Supplier for Procurement of the item
Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

3.0 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

B 1.20.1	Pipe Threads
B 16.5	Steel Pipe Flanges and Flanged Fittings
B 16.20	Ring joint Gaskets and Grooves for Steel Pipe Flanges
AGA Report No 3 / API-2530 / GPA 8185	Manual of Petroleum Measurement Standards, Chapter 14 – Natural Gas Fluid Measurement. Orifice Metering of Natural Gas.
AGA Report no 7	Measurement of Gas by Turbine flow meter
BS-1042	Measurement of Fluid Flow in closed conduits
ISO-5167	Measurement of fluid flow by means of orifice plates, nozzles and venturi tubes inserted in circular cross-section conduits running full
ISO 5168	Measurement of fluid flow-estimation of uncertainty of a flow-rate measurement
NACE MR-01-75	Sulphide Stress Cracking Resistant Metallic Materials for Oil Field Equipment

3.2 Order of Precedence

In the event of conflict between Specifications, Data sheets, related standards, codes etc., the order of precedence shall be as follows:

a. Data sheets

b. Job Specifications

c. Standard Specifications

d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4.0 MATERIALS

Materials selected shall be in accordance with the Data Sheets and standard specifications. For corrosion service the material selected shall be in compliance with the requirements of NACE MR-0175 / ISO-15156 latest editions.

The material used for the flow element shall be SS-316 as minimum unless and otherwise specified in the Job Specifications / Data Sheets.

5.0 DESIGN

5.1 General

Restriction Orifice Plates are devices which are used to create a certain pressure drop or to limit the flow rate. For high pressure drops consideration should be given to hard facing of the plate, or the selection of a material which can be hardened throughout.

Unless or otherwise mentioned in project specifications / datasheets, Restriction Orifice Plates shall be concentric, square edged type. For very high pressure drop across the plate, Vendor shall consider multistage Restriction orifice design, either of concentric or eccentric type. The multi stages shall be calculated by considering the required downstream pressure, DP across and Beta ratio.

Vendor shall be responsible for the supply of all the necessary accessories like carrier ring, gaskets, nuts, bolts, etc. to make a complete assembly. Where weld-in type Restriction Orifice plates have been specified, the welding and preparation shall be as per ANSI / ASME B 36.10, unless otherwise specified in project specifications. Where the Restriction Orifice plate is mounted between ring-type joint flanges, Vendor shall supply the plate with a plate carrying holder. Each Restriction Orifice Plate shall have an integral handle which shall, upon assembly with flanges, extend to a distance of 50mm.

The internal and external diameter of the pipe, the orifice bore diameter of the pipe, the Orifice bore diameter (whenever bore diameter calculations fall under the Purchaser's scope of work) etc. The Restriction Orifice diameter resulting from sizing, the required dimension shall be calculated dimension rounded off to the nearest 0.1 mm.

The need of bleed hole shall only be specified for Restriction Orifice plates in horizontal piping of 2" or larger. Vendor shall confirm the "Stress and deflection" calculation for the Restriction Orifice plates and confirm the plate thickness. The calculations shall be submitted along with the bids for approval and after placement of order.

Noise calculation shall be furnished for all the Restriction Orifice Plates and the plate design shall be such that the noise level shall be kept below 85 dBA for normal continuous applications. The calculations shall be submitted along with the bids for approval and after placement of order. When Noise limit is exceeded, Vendor shall provide multi-hole or multi-plate design.

For intermittent operations such as blow down applications where the noise exceeds 85 dBA, the higher noise levels may be permitted depending on the duration and exposure or as specified in the Project Specifications / Data sheets.

The project specifications, datasheets shall be referred for exact value & requirements, Vendor shall size the Restriction Orifice plate as ISO 5167 (latest Edition) or R.W.Miller "sizing of Restriction Orifice Plates for flow measurement "and submit the calculation sheet for approval.

5.2 Name Plate Details

a. Tag Number as provided in the Data Sheet.

b. Manufacturer's name or trade Mark.

c. type, model no., serial no.

d. Material of construction.

e. Nominal pipe size in inches rating in pounds.

6.0 FABRICATION AND PAINTING

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of Restriction Orifice Plates. Vendor shall submit the required specification, drawings & documents for approval. Also vendor shall refer the relevant codes and standards for manufacturing herein. Painting of Restriction Orifice plates shall be in accordance with Company Painting Specifications or as per Project Specifications for Restriction Orifice plates.

Restriction Orifice Plate surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint suitable for marine/industrial environment as indicated in the data sheet.

7.0 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per Job Specification requirements, and as per relevant codes, prior to shipment. The inspection and testing for Restriction Orifice Plates shall be carried out as per approved Inspection and Test Plan. Vendor shall submit the Inspection and Testing for Approval. Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process like hydro test, material test, hazardous area certification test, calibration test and any other before Factory Acceptance Testing (FAT).

7.1 Factory Acceptance Testing (FAT)

Prior to FAT, Vendor shall submit to the Company a detailed FAT procedure, for review and approval, listing all the numbers of Orifice plates and accessories complete with the project approved tags, and highlighting the inspection and testing requirements of all such devices. FAT shall be carried out as per approved Inspection and Test Plan. FAT shall be carried out prior to shipment of the restriction orifice plates and its accessories.

FAT procedures shall be submitted at least 4 weeks prior to FAT testing taking place. FAT shall be carried out at the manufacturing facilities. The tests shall be witnessed by the Company or their approved representative. FAT procedure will be signed off by the Vendor and Company or their approved representative at the successful completion and conclusion of testing.

The FAT shall be consisting of the following as a minimum.

a. Visual Inspection

b. Hydrostatic Test at 1.5 times the maximum operating pressure

c. Radiography Test

d. Material and chemical analysis tests Hydrostatic test

A certificate to detail the results and records obtained during the FAT shall be made available for ratification by the Vendor on the date of test.

Unless otherwise specified, purchaser reserves the right to test and inspect all the items at the vendor's works.

Vendor shall submit following test certificates and test reports for Purchaser's review:-

a. Material test certificate (MIL Certificate) with detailed chemical analysis from the foundry for Restriction Orifice plates and flanges.

b. Certificate of Radiography / X-ray for any welded joints and any casting of 600# and above. Dye penetration test certificate shall be provided for joints where Radiography / X-ray is not possible.

c. Dimensional test report.

d. All other test reports & certificates required for NACE compliance.

If specified in the Purchase Order the orifice assemblies shall be inspected by the Purchaser's designated inspector before despatch unless otherwise specified. Inspection by the Purchaser's inspector shall be restricted to the following:

i. Visual examination and dimensional check of the process connection.

ii. Verification of testing as mentioned under factory testing.

iii. Verification of material certificates.

iv. Verification of NACE compliance if applicable.

7.2 Site Acceptance Testing (SAT)

A SAT shall be carried out on completion of the installation of the equipment at site which shall be witnessed by the Company / Owner's representative. SAT shall be performed on the Restriction Orifice Plates and its accessories, as per the approved test procedure. A comprehensive test procedure in compliance with the Company specification shall be developed and issued to Company / Owner for review and approval.

The Site Acceptance Test (SAT), in general, shall demonstrate that the Restriction Orifice Plates and its accessories are functioning correctly and properly in accordance with the specified requirements.

8.0 MARKING, PACKING AND SHIPMENT

Following FAT completion, Vendor responsible for Restriction Orifice Plates and its accessories shall ensure that all equipment and associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Vendor shall provide and submit his standard 'Marking, Packing and Shipping Procedures' for review by Company / Owner.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Equipment shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite.

Preparation for shipment and packing will be subject to inspection and rejection by Company's / Contractor's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

All threaded and flanged openings shall be suitably protected to prevent entry of foreign material.

Restriction Orifice plates shall be packed inside polythene bags with suitable protective packing outside. Each plate shall be packed separately if necessary in carton boxes suitable for Air/Sea shipment.

9.0 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include with the bid recommended spare parts list for start-up, pre-commissioning and two year operation as per following:

I. Itemized recommended spare parts list for start-up and pre-commissioning.
II. Itemized recommended spare parts list for two years operation.

The Vendor shall submit recommended accessories and special tools required for operation and maintenance of flow elements for review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

10.0 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if it is not covered in Job Specification.

10.1 Documentation Required with Technical Bid

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

a. Specification, Data Sheets.

b. Bill of Materials including Vendor List, Details for third party items.

c. Catalogues and manuals.

d. Quality Assurance Plan.

e. Any other documents.

10.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company's approval:

a. Specifications, Data Sheets;

b. Bill of materials including Vendor list, details for third party items

c. Catalogues, Manuals and relevant drawings and documents

d. Dimensional drawings

e. Material test certificates

f. Procedures for FAT

g. Quality Assurance Plan

h. NACE Compliance Certificate

i. Radiography and Hydrostatic test certificates

j. Sizing calculation for Restriction Orifice plates

10.3 Guarantee / Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Generally the Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design. The cost of correction / replacement of any warranty items shall be borne by the Vendor.

The Job specifications / Data sheets shall be referred for any specific warranty / guarantee.

VCS Quality Services Pvt. Ltd.

STANDARD SPECIFICATION
FOR
PRESSURE SAFETY RELIEF VALVE

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		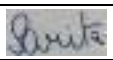			
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00	**23.05.2018**	**ND**	**UM**	**KP**	**AD**
Rev. No	**Date**	**Prepared By**	**Checked By**	**Approved By**	**Authorized By**

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REVISION RECORD						
Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
00	23.05.2018	Neha Dev	Udit Manichanda	K.Prasanth	Anupam Das	
01	18.01.2020					Format change and document numbering is revised.
		Debayan Ghoshal	Vinod Babu	Kedarnath Chakraborty	Anupam Das	
02	11.05.2022					VCS QMS Integration
		Sarita Verma	Kedar Nath Chakraborty	Hashim khan	GV Walimbe	

ABBREVIATION

AARH	Arithmetic Average Roughness Height
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
FAT	Factory Acceptance Test
IBR	Factory Acceptance Test
ISO	International Organization for Standardization
MOP	Maximum Operating Pressure
NACE	National Association of Corrosion Engineers
NPS	Nominal Pipe Size
NPT	Nominal Pipe Thread
PSV	Pressure Safety Relief Valve
SAT	Site Acceptance Test
Sec	Section

CONTENTS

1 SCOPE

This Standard Specification, together with the Data Sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, painting, inspection and testing, documentation, marking, packing and shipping of Pressure Safety Relief Valves along with its accessories.

2 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
Works/ Shop	The place where the ITEM / UNIT is fabricated and tested and transported to Purchaser.
Datasheet	Technical data provided by the Purchaser / Owner / Company.
Standard Specification	Specifications Developed as Standard by the Company.
Job Specification	Specifications Developed pertaining to particular project / Job in regard.
Material Requisition	Requisition as raised to Supplier for Quotation of the item
Purchase Requisition	Requisition as raised to Supplier for Procurement of the item
Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

3 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

American National Standard Institute (ANSI) / American Society of Mechanical Engineers (ASME)

B1.20.1	Pipe Threads
B 16.5	Steel Pipe Flanges and Flanged Fitting
B 16.20	Ring Joint Gaskets and Grooves for Steel Pipe Flanges
B 16.34	Valves- Flanged, Threaded and Welding End

American Society of Mechanical Engineers (ASME)

Sec-VIII	Boiler and Pressure Vessel Code Section VIII 'Pressure Vessels'
Sec-I	Boiler and Pressure Vessel Code Section-I 'Power Boilers'

American Petroleum Institute (API)

API-520	Sizing, selection and installation of pressure relieving devices in refineries
	Part I Sizing & Selection
	Part II Installation
API-521	Guide for Pressure Relieving and Depressurizing systems
API-526	Flanged Steel Pressure Relief Valves
API-527	Seat Tightness of Pressure Relief Valves
EN10204	Inspection Documents for Metallic Products
IBR	Indian Boiler Regulations

3.2 Order of Precedence

In the event of conflict between Specifications, Data sheets, related standards, codes etc., the order of precedence shall be as follows:

a. Data sheets

b. Job Specifications

c. Standard Specifications

d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4 MATERIALS

Materials selected shall be in accordance with the Data Sheets and Standard Specifications. For corrosion service the material selected shall be in compliance with the requirements of NACE MR-0175 / IS0-15156 latest editions.

5 DESIGN

5.1 Valve Design

5.1.1 The definitions of various terminologies used in Purchaser's Data Sheets are as per clause 1.2 of API RP 520 PART 1.

The design of pressure relief valves in steam service under IBR design code shall be governed by regulation 294 and regulation 295 of IBR. However where design code is specifically indicated as ASME SECTION-I, the valve design shall meet the pressure safety relief valve requirements specified in ASME SECTION-I.

Adequate support of relief valves shall be provided, since they are subjected to high reaction forces when they are relieving.

The Valve body, end connections shall be of the same material as the piping material Specification. The body and internal material shall meet the design temperature. Material selection should be in accordance with API STANDARD 526.

Pressure loss between the equipment / vessel nozzles and the inlet of the Valve shall not exceed 3% of the Valve set pressure.

5.2 Type and Selection of Safety Relief Valve

Safety Valves shall be primarily used for Compressible fluids and Safety Relief Valves shall be used for incompressible fluids.

Unless otherwise specified, the Safety Relief Valves shall be non-balanced closed bonnet direct spring-loaded type, i.e. conventional. For special applications pilot operated Safety / Relief Valves or air-assisted Relief Valves may be employed. Safety Valve sizing shall be as per API 520 and the allowable accumulation shall be as per ASME CODE. The Valve sizes, inlet/outlet connections, orifice area shall be sized as per API 526. The range of standard sizes used and the set pressure limits shall be sized in accordance with standard API 526.

The orifice designations, materials, area, end connection sizes and rating shall be as per API RP 526 for flanged steel Safety Relief Valves. Seat tightness requirements and testing shall be as per API RP 527.

Set pressure and accumulation pressure shall be as per the applicable pressure vessel design code:

ASME section VIII	Pressure Vessels
ASME section I	Power boilers / Steam generators

Generally the Thermal Relief Valve shall be modified or semi-nozzle type. Thermal Relief Valves shall have an orifice area of 0.11 Sq. in. and minimum size shall be 101 unless otherwise specified.

Where a number of Relief Valves are provided in parallel, the set pressures may be staggered to avoid valve chatter.

The criteria for the selection of a Relief Valve shall be as given below:

5.2.1 Conventional Safety Relief Valve

The Blow down shall not exceed 3% of the valve set pressure as per standard ASME SECTION I and shall not exceed 7% of the valve set pressure as per standard ASME SECTION VIII.

a. Non-balanced spring-loaded relief valves

A conventional Pressure Safety Relief Valve shall be a self-actuated spring loaded Pressure Safety Relief Valve which shall be designed to open at a pre-determined pressure and protect a vessel or system from excess pressure by removing or relieving fluid from that vessel or system.

i. A conventional Safety/Relief Valve shall be used in the following cases:
ii. Back pressure (super-imposed and built-up) is constant.
iii. Superimposed back pressure is less than 5% and built-up back pressure is less than 10% of the set pressure with overpressure at 10%.
iv. Superimposed back pressure is less than 10% and built-up back pressure is less than 20% of the set pressure with accumulation at 21%.

For cases where a constant back pressure is exerted, the spring of the Safety Relief Valve should be selected and set for the difference between the set pressure (being the maximum allowable working pressure) and the constant back pressure. Spring-loaded Relief Valves connected to a closed discharge system shall always have a closed Bonnet.

Blow down ring shall be provided to adjust the blow down line within 2.5% to 7% of the Valve set pressure.

b. Non-balanced spring-loaded relief valves

A balanced Pressure Safety Relief Valve shall be a spring loaded Pressure Safety /Relief Valve which incorporates a bellows or other means of balancing the Valve disc to minimize the effects of back pressure on the performance characteristics of the Valve.

A balanced type of Safety/Relief Valve shall be provided when the variable back pressure (gauge) is higher than allowed for a conventional Valve.

The maximum superimposed and built-up back pressure (gauge) shall not exceed 65 % (Preferably 50%) of the set pressure (gauge) for relief of vapors or flashing liquids.

Safety/Relief Valves of the balanced type shall have a vented bonnet which shall be vented to atmosphere in such a manner as to prevent the ingress of rain and dirt. Hazards to personnel should be avoided. However, any flow from the vent should be visible.

Whenever the balanced bellow spring type Valve is used, there is always a potential risk of bellow rupture or damage. In such applications, the Valve with supplementary piston shall be provided. The outlet Valve line size shall be large enough to accommodate the internal drain or in case of the balanced bellow spring type Valve, the vent shall be directly routed to the flare atmosphere.

5.2.2 Pilot – Operated Relief Valve

Pilot Design shall be inherently fail safe. Self-actuated Pilot operated Valves shall be of pop / modulating action and it shall be supplied with main Valve and pilot Valve completely piped and tubed along with other accessories specified such as back-flow preventer. Pilot-operated Safety Relief Valves may be used in a clean gas or liquid service where proper operation of the pilot Valve is always assured, provided that, where required, permission has been obtained from local authorities. The pilot Valve shall be of the non-flowing type. With this type, the flow through the pilot lines and pilot valve ceases immediately when the main valve opens, thus minimizing the likelihood of foreign matter being drawn into the small bore sections of the Valve.

Situations in which pilot-operated Safety Relief Valves are particularly suitable are:

a. Where the pressure loss between the protected equipment and the inlet flange of the Relief Valve exceeds 3 % of the set Pressure of the Relief Valve;

b. Where high back-pressures (50 % to 70 % of set pressure) are possible;

c. If the margin between the maximum operating pressure (MOP) of the protected system and the Relief Valve set pressure is less than 10 % of the relief valve set pressure.

The O-ring and diaphragm material of pilot shall be suitable for the pressure and temperature conditions specified in the data sheet.

All Pressure Safety Relief Valves in oxygen and chlorine service shall be thoroughly degreased using reagents like trichloro-ethylene or carbon tetrachloride. End connections shall be blinded / plugged after this degreasing process to avoid images of oil particles.

Normally pilot operated Valves are provided with soft seals which give a better valve tightness.

5.2.3 Rupture Disc

Generally Rupture discs shall be used where:

a. Relief loads caused by unexpected sources cannot be handled fast enough by Safety Relief Valves.

b. On the inlet side of a Relief Valve to protect the valve if the process fluid is extremely corrosive, or polymerizes, or to ensure against valve leakage of hazardous and toxic fluids.

When the rupture disc is used in association with the Safety Relief valve to protect the valve internals, the line pressure of rupture disc/valve void shall be monitored using Pressure gauge.

Unless otherwise specified, the bursting tolerance of the disc shall be as follows:

a. For bursting pressure of 1 bar gauge and above, tolerance shall be ±5% of the specified bursting pressure or less.

b. For bursting pressures below 1 bar gauge Vendor's stated bursting tolerance is acceptable.

Where Vacuum services are encountered, Vendor shall provide vacuum supports. Retainer ring shall also be provided to hold the vacuum support and the rupture disc in place.

5.3 Valve Sizing

5.3.1 Sizing shall be carried out using the formulae mentioned in the following standards whenever the sizing code mentioned in the Purchaser's Data Sheets refers to these;

Sizing Code	Standard
API	API RP 520 Part I API RP 521
ASME	Boiler and Pressure vessel code Section VIII 'Pressure Vessels'. Boilers and Pressure vessel code Section-I. - 'Power Boilers'
IBR	Indian Boiler Regulations, paragraph - 293

5.3.2 Discharge Co-efficient

Following discharge coefficient values shall be used for sizing of Pressure Relief Valves;

a. For all Valves in gas, vapor or steam service with design code as ASME Sec VIII or ASME Section I discharge co-efficient of 0.975 as per API 520 shall be used.

b. For all Valves in steam service covered under IBR design code, discharge coefficient shall either be selected as per Regulation 293 or as tested and certified by IBR as per Appendix 'L' of IBR.

c. For Valves in liquid service, the discharge coefficient of 0.62 shall be used as per API 520. However Vendor may use the ASME certified valve coefficients when Pressure Safety Relief Valve with liquid trim design are offered.

d. For the selected orifice letter designation and inlet and outlet size of the Pressure Safety Relief Valve, relieving area of the valve offered by Vendor shall meet those in API-526.

e. The discharge capacity of the selected Pressure Safety Relief Valves shall be calculated based on certified ASME capacity curves or by using ASME certified discharge coefficient and actual orifice area. Higher valve size shall be selected in case pressure safety relief valve discharge capacity so computed, is less than the required flow rate.

f. For Pressure Safety Relief Valve covered under ASME SEC-I design code, the Valve design shall conform to ASME SECTION I requirements with selected area higher of the area calculated as per ASME SECTION I requirements and that calculated as per regulation 293 of IBR.

5.4 Valve Construction

5.4.1 Body

a. The Valve body material shall be in accordance with the piping material Specification and rating with a minimum of ANSI 150 Ibs. Minimum inlet connections for flanged valves are 1-inch.

b. Flanges shall be integrally cast type, slip-on or weld-on flanges shall not be allowed, except as approved by the Company.

c. Unless otherwise mentioned, end connection details shall be as below:

i. Threaded end connections shall be to NPT as per ANSI/ASME B 1.20.1.

ii. Flanged end connections shall be as per ANSI/ASME B 16.5.

d. Flanged face finish shall be as per clauses 6.4.4.1, 6.4.4.2 and 6.4.4.3 of ANSI/ASME B 16.5.The face finish as specified in the Data Sheets, shall be as follows;

125 AARH	125 to 200 AARH
63 AARH	32 to 63 AARH

e. For flanged Valves, inlet and outlet sizes and ratings and centre to flange face dimensions shall be in accordance with API-526. Dimensional tolerance shall be as mentioned therein.

f. Body drain with a plug shall be provided as a standard feature on every pressure relief valve.

g. For the pilot operated Pressure Relief Valves, where Vendor's standard model provides only semi nozzle design (i.e. the body is part of the inlet flow path), body material shall be of the same material as that of nozzle specified in Purchaser’s Data Sheets, as a minimum.

5.4.2 Trim

a. The term 'trim' covers all the parts of the valves exposed to and in contact with the process fluid except for the body and bonnet assembly i.e. nozzle, disc, disc holder, stem etc.

b. Wherever stelliting of disc and nozzle has been specified, it stands for stelliting of the seat joint and the entire disc contour, unless otherwise mentioned.

c. For high temperature application, the materials for the internals shall be selected to avoid galling.

d. Pressure Relief Valves with design as per ASME Section I shall have two adjustable rings to adjust Valve over-pressure and blow down.

e. Resilient seat, seals or O-rings wherever used shall be suitable for pressure and temperature conditions specified.

f. Gaskets wherever used shall be metallic type. Gaskets with asbestos filler or with asbestos bearing material shall not be used.

5.4.3 Nozzle Disc

a. The Valves shall be full Nozzle - full lift type. The nozzle shall be of forged construction. A full nozzle shall be used for conventional and balance bellows type, for Valve size 1" and larger. Semi-nozzle are acceptable for pilot operated PSV, in accordance with API RP-520.

b. Valves shall be of the full nozzle type of design with the exception as per clause 5.3.4 and Valves in Thermal Relief application.

c. Modified nozzle shall be provided for Thermal Relief Valve services for Valve sizes not greater than 3/4"x 1" unless otherwise specified.

d. The disc is a piston type held against process pressure by a spring, Disc, nozzle, guide and ring are Vendor's standard stainless steel as a minimum except where the line classification dictates a better material.

5.4.4 Bonnet & Spring

a. Lifting lever shall be provided whenever the fluid to be relieved is steam and air or water above 65°C.

b. Bonnet shall be of the closed type for all process applications in general. Open type bonnet shall be used only for steam and non-hazardous/non-toxic fluids. For all steam applications under design code IBR or ASME Section-I with open bonnet design, weather protection cover shall be provided.

c. Carbon steel springs shall be made corrosion resistant through plating/coating as per Manufacturer's standard design or as specified in the Purchaser's Data Sheets.

d. Spring material is carbon steel up to 230°C and tungsten steel for higher temperatures. The spring is adjustable for popping pressures within Code allowances above and below initial set pressure.

e. The spring shall be designed for specified set pressure and suitable for a minimum range of adjustment within +/-10% of set pressure specified for set pressure range below 17 bar and within +/-5% of set pressure above 17 bar.

f. The allowable tolerance in set pressures are as below:

i. ±0.14 kg/cm2g for set pressure upto and including 5 kg/cm2g.

ii. ±3% for set pressure above 5 kg/cm2g.

g. The springs of safety relief valves shall be protected with a suitable coating to prevent the occurrence of general corrosion and / or sulfide stress corrosion cracking.

5.4.5 Cap

All Valves shall be provided with a cap over the adjusting bolt. Cap shall be of either bolted type or screwed type as specified in the Purchaser's Data Sheets with the cap material being the same as for the body. The cap and bonnet will be provided with lugs for wire seal after setting the Valve. Bolted cap will also be provided as per the requirements.

5.5 Name Plate

All Pressure Gauges shall be marked as per Manufacturer's standard and shall have a permanently attached stainless steel plate with the following, as a minimum detail:

a. Tag number as per Data Sheet;

b. Manufacturer's serial number and / or model number;

c. Manufacturer's name / trade mark;

d. Nominal Flange size in inches and rating in pounds for both inlet and outlet;

e. Orifice letter designation;

f. Valve set pressure;

g. Cold Bench test set pressure.

6 FABRICATION AND PAINTING

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of Pressure Safety Relief Valve. Vendor shall submit the required Specification, drawings & documents for approval. Also Vendor shall refer the relevant codes and standards for manufacturing herein. Painting of Pressure Safety Relief Valve shall be in accordance with Company painting Specifications.

7 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per Job Specification requirements, and as per relevant codes, prior to shipment. The inspection and testing for Pressure Safety Relief Valve shall be carried out as per approved Inspection and Test Plan. Vendor shall submit the Inspection and Testing for Approval. Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process like hydro test, material test, hazardous area certification test, calibration test and any other before Factory Acceptance Testing (FAT).

7.1 Factory Acceptance Testing (FAT)

Prior to FAT, Vendor shall submit to the Company a detailed FAT procedure, for review and approval, listing all the Pressure Safety Relief Valve complete with the project approved tags, and highlighting the inspection and testing requirements of all such devices. FAT shall be carried out as per approved Inspection and Test Plan. FAT shall be carried out prior to shipment of the Pressure Relief Valve.

FAT procedures shall be submitted at least 4 weeks prior to FAT testing taking place. FAT shall be carried out at the manufacturing facilities. The tests shall be witnessed by the Company or their approved representative. FAT procedure will be signed off by the Vendor and Company or their approved representative at the successful completion and conclusion of testing.

The FAT shall be consisting of the following as a minimum:

a. Visual inspection

b. Dimensional check

c. Calibration

d. Cold bench set pressure test

e. Functional test

f. Non-Destructive examination of individual components of PRV.

g. Hydrostatic pressure Test

h. Seat tightness Test

i. Hardness test as per NACE MR01-75 (If Applicable)

j. Any other tests

A certificate to detail the results and records obtained during the FAT shall be made available for ratification by the Vendor on the date of test.

7.2 Site Acceptance Testing (SAT)

A SAT shall be carried out on completion of the installation of the equipment at site which shall be witnessed by the company / owner's representative. SAT shall be performed on the Pressure Safety Relief Valve as per the approved test procedure. A comprehensive test procedure in compliance with the company specification shall be developed and issued to company / owner for review and approval.

The Site Acceptance Test (SAT), in general, shall demonstrate that the Pressure Safety Relief Valve functions correctly and properly in accordance with the specified requirements.

8 MARKING, PACKING AND SHIPMENT

Following FAT completion, Vendor responsible for the Pressure Safety Relief Valve shall ensure that all equipment and associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Vendor shall provide and submit his standard "Marking, Packing and Shipping Procedures" for review by Company / Owner.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Equipment shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite.

Preparation for shipment and packing will be subject to inspection and rejection by Company's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

9 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include recommended Spare Parts List for start-up, pre-commissioning and two years operation as per the following;

a. Itemized recommended spare parts list for start-up and pre-commissioning.
b. Itemized recommended spare parts list for two years operation.

Vendor shall recommend accessories and special tools required for operation and maintenance of Pressure Safety Relief Valve, for Company review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

10 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if it is not covered in Job Specification.

10.1 Documentation Required with Technical Bid

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

a. Standard Specification, Data Sheets;

b. Sizing calculations;

c. Bill of Materials including Vendor list, details of third party items;

d. Catalogues and Manuals;

e. Quality Assurance Plan;

f. Any other documents.

10.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company’s approval:

a. Specifications, Data Sheets;

b. Sizing calculations;

c. Bill of materials including Vendor list, details for third party items;

d. Catalogues, Manuals and relevant drawings and documents;

e. Dimensional drawings;

f. Detailed sectional drawings showing all parts with reference numbers;

g. Calibration certificates;

h. Material test certificates;

i. Installation procedures for PSV and its accessories

j. Procedures for FAT;

k. Quality Assurance Plan;

l. Any Other documents.

10.3 Guarantee & Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design .The cost of correction / replacement of any warranty items shall be borne by the Vendor, as per the purchase conditions of the Material / Purchase Requisition.

The Job specifications / Data sheets shall be referred for any specific warranty / guarantee.

Energising Quality

VCS Quality Services Pvt. Ltd.

STANDARD SPECIFICATION
FOR
INSTRUMENTATION CABLES

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		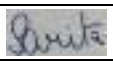			
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00	**23.05.2018**	**ND**	**UM**	**KP**	**AD**
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00	23.05.2018	Neha Dev	Udit Manichanda	K.Prasanth	Anupam Das	
01	18.01.2020					Format change and document numbering is revised.
		Rakesh Bhardwaj	Vinod Babu	Kedarnath Chakraborty	Anupam Das	
02	11.05.2022					VCS QMS Integration
		Sarita Verma	Kedar Nath Chakraborty	Hashim khan	GV Walimbe	

ABBREVIATION

ASTM	American Society of Testing and Materials
AWG	American Wire Gauge
BS	British Standards
DC	Direct Current
DIN	Deutsches Institute for numbering
EPR	Ethylene Propylene Rubber
F&G	Fire and Gas
IEC	International Electro-technical Commission
IS	Indian Standards
PVC	Polyvinyl Chloride

CONTENTS

1 SCOPE

This Standard Specification, together with the Data Sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, painting, inspection and testing, documentation, marking, packing and shipping of Cables along with its spares and accessories.

2 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
Works/ Shop	The place where the ITEM / UNIT is fabricated and tested and transported to Purchaser.
Datasheet	Technical data provided by the Purchaser / Owner / Company.
Standard Specification	Specifications Developed as Standard by the Company.
Job Specification	Specifications Developed pertaining to particular project / Job in regard.
Material Requisition	Requisition as raised to Supplier for Quotation of the item
Purchase Requisition	Requisition as raised to Supplier for Procurement of the item
Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

3 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

IEC-332-3 Part 3	Tests on bunched wires and cables
IEC 584-3 Part	Extension and compensating cables – Tolerances identification system
IEC-60332 Part 3	Tests on electric and optical fibre cables under fire conditions - Test for vertical flame spread of vertically mounted bunched wires or cables
IEC-60331	Fire-Resisting Characteristics of Electric Cables
ASTM D 2863	Test method for measuring the minimum oxygen concentration to support candle like combustion of plastics (Oxygen index)
BS-5308 Part 1	Specification for Polyethylene insulated cables
BS-5308 Part 2	Specification for PVC insulated cables
DIN-50049	Document on Material Testing
IS-1554 Part 1	PVC insulated (heavy duty) electric cables-working voltage up to and including 110 V
IS-2633	Method for testing uniformity of coating on zinc coated articles
IS-3975	Mild steel wires, formed wires and tapes for armouring cables
IS-5831	PVC insulation and sheath of electric cables
IS-8784	Thermocouple compensating cables

3.2 Order of Precedence

In the event of conflict between Specifications, Data sheets, related standards, codes etc., the order of precedence shall be as follows:

a. Data sheets

b. Job Specifications

c. Standard Specifications

d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4 MATERIALS

Materials selected shall be in accordance with the Data Sheets and Company's Standard Specifications. Type and material of extension Cable shall be as per IS-5831 and IEC 584-3 where applicable.

Cable cores shall be of annealed electrolytic tinned copper conductor with PVC jackets conform to IS-5831. Insulation shall be Mica-glass / EPR or silicon rubber for F&G. signal/control Cables. Armouring shall be of galvanized steel wire / strip armour conforming to IS-1554. Screening / shielding shall be of black Aluminium backed Mylar / Polyester foil.

5 DESIGN

The following design requirement covers the general requirements of Instrument Cables and accessories etc., but for the exact requirements and applications, the relevant, specific job Specifications and design basis shall be referred and complied.

5.1 Signal and Control Cables

5.1.1 Type – I (Single Pair / Triad Shielded Cable)

Each core shall be 1.5 mm2, made of 7 stranded annealed electrolytic copper conductor. Each strand shall be 0.53 mm dia.

Primary insulation shall be 85°C polyvinyl chloride (PVC) as per IS-5831 Type-C. Thickness shall be 0.5 mm minimum.

A pair or triad shall have twisted cores and number of twists shall be not less than 10 per meter. Colour of core insulation shall be black-blue in pair and black-blue-brown in a triad.

Individual pair and triad shall be shielded. Shield shall be Aluminium backed by Mylar / polyester tape with the metallic side down helically applied with either side 25 % overlap or 100% coverage. Minimum shield thickness shall be 0.05 mm. Drain wire shall be 0.5 mm2 multistrand bare tinned annealed copper conductor. The drain wire shall be in continuous contact with Aluminium side of the shield.

Inner and outer jacket shall be made of extruded flame retardant 90°C PVC to IS 5831 - Type ST2. Oxygen index of PVC shall be over 30 %. Temperature Index shall be over 250°C. The thickness of the jacket shall be as per IS-1554 Part-1.

Inner jacket colour shall be black. Outer jacket colour shall be black, except for cables to be used in intrinsically safe systems it shall be light blue. A rip cord shall be provided for inner jacket.

Armour over inner jacket shall be of galvanized steel wire / flat as per IS-1554 Part-1.

Tolerance in overall diameter of cable shall be within ±2 mm over offered value.

5.1.2 Type – II (Multipair / Multitriad Cable with Individual Pair Shield and Overall Shield)

a. Generally the Cable shall be same as single pair shielded Cable except conductor sizes shall be 0.5 mm2 made of 7 strands of annealed electrolytic copper conductor. Each strand shall be of 0.3 mm dia.

b. Overall shield shall be of Aluminium backed up by Mylar / polyester tape helically applied with the metallic side down with either side 25% overlap or 100% coverage. Minimum shield thickness shall be 0.075 mm. Drain wire shall be similar to individual pair drain wire and shall be of the overall shield.

c. Overall twist of all pair / triads shall be as per Vendor's standard.

d. A pair of communication wire shall be provided for multipair / multitriad cables. Each wire shall be 0.5 mm2 of plain annealed single or multistrand copper conductor with 0.4 mm thick 85°C PVC insulation. Insulation shall be green and red colour coded.

e. Pair identification shall be with numbers at interval of not more than 250 mm as per vendor's standards.

5.1.3 Type – III (Multipair / Multitraid Cable with Only Overall Shield)

a. These Cables shall be same as type-II cables except that the individual pair / triad shall not have shielding.

5.1.4 Type - IV (Multipair / Multitriad Cable with Individual Pair Shield and Overall Shield)

a. The Cable shall be same as Type II except conductor size shall be 1.5 mm2 made of 7 stranded annealed electrolytic copper conductor. Each strand shall be of 0.53 mm dia.

5.1.5 Type – V (Multipair / Multitriad Cable with Overall Shield only)

a. The Cable shall be same as type IV except that the individual pair / triad shall not have the shielding.

5.2 Fire and Gas Cables shall be fire resistant and shall meet all the Specifications mentioned above and:

a. Insulation shall be Mica-Glass / EPR or silicon rubber.

b. The inner sheath shall be applied with a low smoke fire resisting compound.

c. Suitable filler material (if necessary) shall be filled.

d. Outer sheath shall be made up of low smoke, heat and oil resistant and flame retardant material.

e. Circuit integrity of the Cable shall be maintained for a minimum period of 3 hours as per IEC-60331.

f. The outer jacket colour shall be orange.

5.3 Thermocouple Extension Cables

Type and material of extension cable shall be as per IS-5831 and IEC-584-3 where applicable.

5.3.1 Type – I (Single Pair Shielded Cable)

a. Each core shall be made of 16 AWG solid conductors.

b. Primary insulation shall be 85°C polyvinyl chloride (PVC) as per IS 5831 Type C. Thickness shall be 0.5 mm minimum. Colour coding shall be as per IS-8784 Table-5.

c. The cores of the pair shall be twisted and number of twists shall be not less than 10 per meter. The pair shall be shielded. Shield shall be Aluminium backed by Mylar / polyester tape bonded together helically applied with the metallic side down with either side 25% overlap and 100% coverage. Minimum shield thickness shall be 0.05 mm. Drain wire shall be 0.5 mm2 multistrand bare tinned annealed copper conductor. The drain wire shall be continuous contact with Aluminium side of the shield.

d. Inner and outer jacket shall be made of extruded flame retardant 90°C PVC to IS 5831- Type ST2. Oxygen index of PVC shall be over 30 %. Temperature index shall

be over 250°C. The thickness of the jacket shall be as per IS-1554 part-1. Inner jacket and outer jacket colour shall be as per IS-8784. A rip cord shall be provided for inner jacket.

e. Armour over inner jacket shall be of galvanized steel wire/flat as per IS-1554 Part-I.

f. Tolerance in overall diameter of cable shall be within ±2 mm over offered value.

5.3.2 Type – II (Multipair Cable with Individual Shield and Overall Shield)

a. The Cable shall be same as single pair shielded cable except for following;

i. Each core shall be 20 AWG solid conductor.

ii. In addition to individual pair shield overall shield shall be provided. Overall shield shall be of Aluminium backed up by Mylar / polyester tape helically applied with metallic side down either side 25% overlap or 100% coverage. Minimum shield thickness shall be 0.075 mm. Drain wire shall be similar to individual pair drain wire and shall be in continuous contact with the aluminium side of the overall shield.

iii. Overall twist of all pair shall be as per Vendor's standard.

iv. A pair of communication wire shall be provided for multipair cables. Each wire shall be 0.5 mm2 of plain annealed single or multistrand copper conductor with 0.4 mm thick 85°C PVC insulation. Insulation shall be green and red colour coded.

v. Pair identification shall be with numbers at interval of not more than 250 mm as per Vendor's standard.

5.3.3 Type – III (Multipair Cable with Individual Pair Shield and Overall Shield)

a. The Cable shall be same as type II except conductor size shall be 16 AWG.

5.4 Electrical Characterstics

5.4.1 Cable parameters L/R ratio, capacitance shall conform to intrinsic safety requirements for IS cables. Limitations for cable parameter shall be as follows:

a. Maximum DC resistance of the conductor of the completed cable shall not exceed 12.3 Ω/km at 20°C for cables with 1.5 mm2 conductors and 39.7 Ω/km at 20°C for cables with 0.5 mm2 conductors.

b. Mutual capacitance between any core and screen shall not exceed 250 pF/m at 1 KHz. Capacitance between any cores or screen shall not exceed 400 pF/m at 1 KHz.

c. L/R ratio of adjacent core shall not exceed 40 µH/Ω for cables with 1.5 mm2 conductors and 25 µH/Ω for cables with 0.5 mm2 conductors.

d. Electrostatic noise rejection ratio shall be minimum 76 dBA.

e. Drain wire resistance including screen shall not exceed 30 Ω/km.

f. Core inductance shall not exceed 4 mH/Km.

g. Values shall be derived under the fault condition in the cable which produces the worst case parameters for intrinsic safe cables.

All Cables shall have insulation voltage rating of 600 / 1100 V.

5.5 Name Plate

All Instrument Cable shall be marked as per Manufacturer's standard and shall have a permanently attached stainless steel plate with the following, as a minimum detail:

a. Tag number as per Data Sheet;

b. Manufacturer's name;

c. Details of the Cable;

d. Length of the Cable in meters contained in the drum;

e. Gross weight;

f. Direction of rotation of drum for unwinding by means of an arrow;

g. Purchase Order number.

6 FABRICATION AND PAINTING

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of Cables. Vendor shall submit the required Specification, drawings & documents for approval. Also Vendor shall refer the relevant codes and standards for manufacturing herein.

7 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per Job Specification requirements, and as per relevant codes, prior to shipment. The inspection and testing for Instrument Cables shall be carried out as per approved Inspection and Test Plan. Vendor shall submit the Inspection and Testing for Approval. Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process like hydro test, material test, hazardous area certification test, and any other before Factory Acceptance Testing (FAT).

7.1 Factory Acceptance Testing (FAT)

Prior to FAT, Vendor shall submit to the Company a detailed FAT procedure, for review and approval, listing all the Instrument Cables, complete with the project approved tags, and highlighting the inspection and testing requirements of all such devices. FAT shall be carried out as per approved Inspection and Test Plan. FAT shall be carried out prior to shipment of the Instrument Cables.

FAT procedures shall be submitted at least 4 weeks prior to FAT testing taking place. FAT shall be carried out at the manufacturing facilities. The tests shall be witnessed by the Company or their approved representative. FAT procedure will be signed off by the Vendor and Company or their approved representative at the successful completion and conclusion of testing.

The FAT shall be consisting of the following as a minimum:

7.1.1 Standard Type Test certificate shall be furnished for Cables similar to those being offered,

a. Cable shall be flame retardant to IEC-60332 part-III category A.

b. Cables required for F&G applications shall be as per IEC-60331.

7.1.2 Standard Routing Test (to be carried out by the manufacturer during various stages of manufacturing, test certificates shall be furnished)

a. Insulation resistance, voltage test and spark test as per 8S-5308 part-ll and sheath test as per IS-5831;

b. Armor test as per IS-3975;

c. Cable capacitance, L/R ratio and inductance test;

d. Conductor resistance test in Ohms/km;

e. Thermo emf tests for thermocouple extension cables.

7.1.3 Standard Acceptance Test shall be carried out in the presence of Purchaser or his authorized representatives,

a. Continuity test;

b. Voltage test as per 8S-5308 part-II;

c. L/R ratio and capacitance values test;

d. Oxygen index test as per ASTM D 2863 latest edition;

e. Conductor resistance and drain wire resistance;

f. Dimensional check for overall diameter and under armor lover armor diameter;

g. Fire resistant test / certificate review (when specified);

h. Tests for uniformity of galvanization of armor as per IS-2633;

i. Check for drum length and overall length tolerances.

7.2 Site Acceptance Testing (SAT)

A SAT shall be carried out on completion of the installation of the Cables at site which shall be witnessed by the company / owner's representative. SAT shall be performed as per the approved test procedure. A comprehensive test procedure in compliance with the company specification shall be developed and issued to company / owner for review and approval.

The Site Acceptance Test (SAT), in general, shall demonstrate that the Cables functions correctly and properly in accordance with the specified requirements. SAT mainly consists of the following inspections:

a. Continuity test

b. Conductor resistance and drain wire resistance

c. Drum length and overall length tolerances

d. Any other test, if required.

8 MARKING, PACKING AND SHIPMENT

Following FAT completion, Vendor ensure that all Cables, associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Vendor shall provide and submit his standard "Marking, Packing and Shipping Procedures" for review by Company / Owner.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite.

Cables shall be dispatched in wooden drums, securely battened with take-off end fully protected against damage

The ends of the Cable shall be sealed with suitable PVC / Rubber caps to prevent ingress of moisture.

Preparation for shipment and packing will be subject to inspection and rejection by Company's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

9 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include recommended Spare Parts List for start-up, pre-commissioning and two years operation as per the following;

a. Itemized recommended spare parts list for start-up and pre-commissioning.
b. Itemized recommended spare parts list for two years operation.

Vendor shall recommend accessories and special tools required for operation and maintenance of Instrument Cables for Company review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

10 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if it is not covered in Job Specification.

10.1 Documentation Required with Technical Bid

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

a. Standard Specification, Data Sheets;

b. Bill of Materials including Vendor list, details of third party items;

c. Catalogues and Manuals;

d. Quality Assurance Plan;

e. Any other documents.

10.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company's approval:

a. Specifications, Data Sheets;

b. Bill of materials including Vendor list, details for third party items;

c. Catalogues, Manuals and relevant drawings and documents;

d. Dimensional drawings;

e. Material test certificates;

f. Procedures for FAT;

g. Quality Assurance Plan;

h. List for spare parts for start-up and for 2 years of operation.

10.3 Guarantee & Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design .The cost of correction / replacement of any warranty items shall be borne by the Vendor, as per the purchase conditions of the Material / Purchase Requisition.

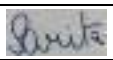
The Job specifications / Data sheets shall be referred for any specific warranty / guarantee.

Energising Quality

VCS Quality Services Pvt. Ltd.

STANDARD SPECIFICATION
FOR
JUNCTION BOXES AND
CABLE GLANDS

VCS-SS-IN-5802_02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00	23.05.2018	Neha Dev	Udit Manichanda	K.Prasanth	Anupam Das	
01	18.01.2020					Format change and document numbering is revised.
		Rakesh Bhardwaj	Vinod Babu	Kedarnath Chakraborty	Anupam Das	
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		Sarita Verma	Kedar Nath Chakraborty	Hashim khan	GV Walimbe	

ABBREVIATION

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
FAT	Factory Acceptance Test
IEC	International Electro-technical Commission
IP	Ingress Protection
IS	Indian Standards
ISO	International Organization for Standardization
NACE	National Association of Corrosion Engineers
SAT	Site Acceptance Test

CONTENTS

1 SCOPE

This Standard Specification, together with the Data Sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, painting, inspection and testing, documentation, marking, packing and shipping of Junction Boxes and Cable Glands along with its accessories which include the following types:

a. Electrical junction boxes

b. Pneumatic junction boxes

c. Cable glands.

2 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
Works/ Shop	The place where the ITEM / UNIT is fabricated and tested and transported to Purchaser.
Datasheet	Technical data provided by the Purchaser / Owner / Company.
Standard Specification	Specifications Developed as Standard by the Company.
Job Specification	Specifications Developed pertaining to particular project / Job in regard.
Material Requisition	Requisition as raised to Supplier for Quotation of the item
Purchase Requisition	Requisition as raised to Supplier for Procurement of the item
Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

3 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

ASME B1.20.1	Pipe Threads
DIN 50049	Document on Material Testing
IS 5	Colours for ready mixed paints and enamels.
IS 2147	Degree of Protection provided for Enclosures
IS 2148	Flame proof Enclosure of Electrical Apparatus.
IEC 529	Degree of Protection by providing Enclosures
IEC 79	Electrical Apparatus for Explosive Gas Atmosphere
EN 837	Pressure Gauges Part-t: Bourdon Type Pressure Gauges, Dimensions, Metrology, Requirements and Testing

3.2 Order of Precedence

In the event of conflict between Specifications, Data sheets, related standards, codes etc., the order of precedence shall be as follows:

a. Data sheets

b. Job Specifications

c. Standard Specifications

d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4 MATERIALS

Materials selected of the Junction Boxes and Cable Glands shall be in accordance with the Data Sheets and Standard Specifications. For corrosion service the material selected shall be in compliance with the requirements of NACE MR-0175 / IS0-15156 latest editions.

5 DESIGN

5.1 Junction Boxes

Junction Boxes shall be either of the following type as specified in Data Sheets.

a. Weather proof Junction Boxes.

b. Weather proof and flameproof Junction Boxes.

The enclosure shall be as per IS-2147 and IP-65 for weather proof Junction Boxes and for flameproof it shall be as per IS-2148 suitable for the area classification specified.

Number of entries and locations shall be as per Data Sheets and all the cable entries shall be bottom entries.

Junction Boxes shall be provided with telephone sockets and plugs for connection of hand powered telephone set.

5.1.1 Electrical Junction Boxes

Material shall be die-cast aluminium of minimum 5 mm thick (LM-6 alloy)

Flame proof Junction Boxes shall have detachable cover which is fixed to the box by means of cadmium plated triangular head /hexagonal head screws.

Weatherproof Junction Boxes shall have doors which shall be hinged type and these shall be fixed by plated countersunk screws.

Flameproof Junction Boxes shall have a warning engraved/integrally cast on the cover as given below;

"Isolate power supply elsewhere before opening."

Terminals shall be spring loaded, vibration proof, clip- on type, mounted on nickel plated steel rails complete with end cover and clamps for each row.

All terminals shall be suitable for accepting minimum 2.5 sq. mm copper conductor, in general. However, for power supply distribution boxes, terminal detail shall be as per job specification/data sheets.

The Junction Box shall be sized for termination of all cores and screens including spares without the need for more than 1 core per terminal. In addition a minimum of 10 % spare terminals shall be provided, unless specified otherwise in Data Sheet.

The Junction Boxes shall have sufficient space to ensure ease of termination. Sizing shall be done with due consideration for accessibility and maintenance in accordance with the following guidelines;

a. 50 to 60 mm between terminals and sides of box parallel to terminal strip for upto 50 terminals and additional 25 mm for each additional 25 terminals.

b. 100 to 120 mm between terminals for up to 50 terminals and additional 25 mm for each additional 25 terminals.

c. Bottom/top of terminal shall not be less than 100mm from bottom/top of the Junction Box.

Terminals shall be marked as per various types indicated in Data Sheets.

Shall be provided with external earthing lugs.

5.1.2 Pneumatic Junction Boxes

Pneumatic Junction Boxes shall be made of 3 mm thick hot rolled steel. They shall have necessary neoprene gasket between door and body. Door shall be flush with the box and shall be hinged type and provided with wing nuts.

Single tube entries shall be suitable for 6 mm 0.0 copper tube with bulk head fittings. Multi tube bundle entry shall be suitable for the data furnished in Data Sheets.

5.2 Cable Glands, Plugs and Reducers / Adaptors

Cable Glands shall be supplied by Vendor whenever specified.

Cable Glands shall be double compression type for use with armoured cables.

The Cable Glands shall be of nickel plated brass material unless specified otherwise in Data Sheet.

The Cable Glands shall be weather proof. Whenever specified they shall also be flameproof and certificate from statutory body shall be furnished.

Cable Glands shall be supplied to suit the Cable dimensions indicated along with tolerance indicated in Data Sheets. Various components like rubber ring, metallic ring, metallic cone and the outer/inner nuts etc. shall be capable of adjusting to the above tolerances of Cable dimensions.

Each Cable Gland shall be supplied as a kit complete with locknut, shroud, and earth tag and sealing washer with proper identification of Gland size. Shrouds provided for additional protection to the Cable Gland termination. Earth tag shall be of nickel plated brass material.

Reducers/Adaptors shall be supplied as per details indicated in Data Sheets. They shall be nickel plated brass. These shall be weather proof in general. These shall also be flame proof wherever specified and certificate from statutory body for flame proofness shall be furnished.

Stopper plugs to seal spare cable entries in the Instrument Junction Boxes shall be provided wherever specified in Data Sheet. They shall be of nickel plated brass for metallic Junction Boxes and glass fibre reinforced polyamide for non-metallic junction boxes.

Plugs shall be certified flameproof when used with Flameproof Junction Boxes.

All Cable Glands and accessories such as reducers, adaptors, stopper plugs shall be stamped with type and size of Cable Glands, type and size of entry thread and the relevant approval details.

5.3 Name Plate

All Junction Boxes shall be marked as per Manufacturer's standard and shall have a permanently attached stainless steel plate with the following, as a minimum detail:

a. Tag number as per Purchaser's Data Sheets.

b. Type of enclosure such as terminal capacity, size, IP rating, serial no etc.

c. Name of Manufacturer.

d. Type of explosion protection (as applicable)

e. Name of certifying agency and certificate number

The Tag no shall be generally white character on red background for fire & gas, white character on blue background for intrinsically safe circuits and black character on white background for all other applications.

6 FABRICATION AND PAINTING

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of Junction Boxes and Cable Glands .Vendor shall submit the required Specification, drawings & documents for approval. Also Vendor shall refer the relevant codes and standards for manufacturing herein. Painting of Junction Box shall be in accordance with Standard Painting Specifications.

Surface shall be prepared for painting. It shall be smooth and devoid of rust and scale

Two coats of lead - free base primer and two final coats of lead free epoxy based paint shall be applied both for interior and exterior surfaces.

The colour shall be as specified in Data Sheets.

7 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per Job Specification requirements, and as per relevant codes, prior to shipment. The inspection and testing for Junction Box and Cable Glands shall be carried out as per approved Inspection and Test Plan. Vendor shall submit the Inspection and Testing for Approval. Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process like Certificate from statutory body for suitability to install in specified area classification, dimensional test report, material test, calibration test and any other before Factory Acceptance Testing (FAT).

7.1 Factory Acceptance Testing (FAT)

Prior to FAT, Vendor shall submit to the Company a detailed FAT procedure, for review and approval, listing all the Junction Box and Cable Glands complete with the project approved tags, and highlighting the inspection and testing requirements of all such devices. FAT shall be carried out as per approved Inspection and Test Plan. FAT shall be carried out prior to shipment of the Junction Box and Cable Glands.

FAT procedures shall be submitted at least 4 weeks prior to FAT testing taking place. FAT shall be carried out at the manufacturing facilities. The tests shall be witnessed by the Company or their approved representative. FAT procedure will be signed off by the Vendor and Company or their approved representative at the successful completion and conclusion of testing.

The FAT shall be consisting of the following as a minimum:

a. Visual inspection

b. Calibration

c. Functional test

A certificate to detail the results and records obtained during the FAT shall be made available for ratification by the Vendor on the date of test.

7.2 Site Acceptance Testing (SAT)

A SAT shall be carried out on completion of the installation of the equipment at site which shall be witnessed by the company / owner's representative. SAT shall be performed on the Junction Box and Cable Glands as per the approved test procedure. A comprehensive test procedure in compliance with the company specification shall be developed and issued to company / owner for review and approval.

The Site Acceptance Test (SAT), in general, shall demonstrate that the Junction Box and Cable Glands functions correctly and properly in accordance with the specified requirements.

8 MARKING, PACKING AND SHIPMENT

Following FAT completion, Vendor responsible for the Junction Box and Cable Glands shall ensure that all equipment and associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Vendor shall provide and submit his standard "Marking, Packing and Shipping Procedures" for review by Company / Owner.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Equipment shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite.

Each packing shall have its weight clearly marked on it and shall be identified with the contents, purchase order no and item number.

All entries shall be installed with plastic plugs to prevent unwanted material and insects entering the instrument junction boxes.

Preparation for shipment and packing will be subject to inspection and rejection by Company's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

9 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include recommended Spare Parts List for start-up, pre-commissioning and two years operation as per the following;

a. Itemized recommended spare parts list for start-up and pre-commissioning.
b. Itemized recommended spare parts list for two years operation.

Vendor shall recommend accessories and special tools required for operation and maintenance of Junction Box and Cable Glands, for Company review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

10 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if it is not covered in Job Specification.

10.1 Documentation Required with Technical Bid

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

a. Standard Specification, Data Sheets;

b. Bill of Materials including Vendor list, details of third party items;

c. Catalogues and Manuals;

d. Quality Assurance Plan;

10.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company's approval:

a. Specifications, Data Sheets;

b. Bill of materials including Vendor list, details for third party items;

c. Catalogues, Manuals and relevant drawings and documents;

d. Dimensional drawings;

e. Calibration certificates;

f. Material test certificates;

g. Procedures for FAT;

h. Quality Assurance Plan;

10.3 Guarantee & Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design .The cost of correction / replacement of any warranty items shall be borne by the Vendor, as per the purchase conditions of the Material / Purchase Requisition.

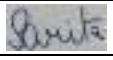
The Job specifications / Data sheets shall be referred for any specific warranty / guarantee.

Energising Quality

VCS Quality Services Pvt. Ltd.

STANDARD SPECIFICATION
FOR
INSTRUMENT TUBE FITTINGS

VCS-SS-IN-5803_02

					
02	**11.05.2022**	**SV**	**KNC**	**HK**	**GVW**
01	**18.01.2020**	**RB**	**VB**	**KNC**	**AD**
00	**23.05.2018**	**ND**	**UM**	**KP**	**AD**
Rev. No	**Date**	**Prepared By**	**Checked By**	**Approved By**	**Authorized By**

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CONTROLLED COPY	**:**	**If in soft and signed**

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00	23.05.2018	Neha Dev	Udit Manichanda	K.Prasanth	Anupam Das	
01	18.01.2020					Format change and document numbering is revised.
		Rakesh Bhardwaj	Vinod Babu	Kedarnath Chakraborty	Anupam Das	
02	11.05.2022					VCS QMS Integration
		Sarita Verma	Kedar Nath Chakraborty	Hashim khan	GV Walimbe	

ABBREVIATION

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
BS	British Standards
FAT	Factory Acceptance Test
IS	Indian Standards
ISA	Instrument Society of America
ISO	International Organization for Standardization
NACE	National Association of Corrosion Engineers
NPT	Nominal Pipe Thread
SAT	Site Acceptance Test
SS	Stainless Steel

CONTENTS

1 SCOPE

This Standard Specification, together with the Data Sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, painting, inspection and testing, documentation, marking, packing and shipping of instrument tube fittings which includes the following types :-

a. SS compression fittings (for SS tube)

b. Brass compression fittings (for copper tube)

2 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
Works/ Shop	The place where the ITEM / UNIT is fabricated and tested and transported to Purchaser.
Datasheet	Technical data provided by the Purchaser / Owner / Company.
Standard Specification	Specifications Developed as Standard by the Company.
Job Specification	Specifications Developed pertaining to particular project / Job in regard.
Material Requisition	Requisition as raised to Supplier for Quotation of the item
Purchase Requisition	Requisition as raised to Supplier for Procurement of the item
Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

3 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

American Society of Mechanical Engineers

ASME B1.20.1	Pipe Threads
ASME B 16.5	Steel Pipe Flanges and Flanged Fitting
ASME B 16.20	Ring Joint Gaskets and Grooves for Steel Pipe Flanges
ASMEB16.11	Forged Steel Fittings -Socket Welding and Threaded

British Standards

BS-4368	Carbon and Stainless Steel Compression Couplings for Tubes -Part-IV

Instrument society of America

ISA RP 42.1	Nomenclature for Instrument tubing fittings

Indian Standards

IS-319	Specification for free cutting Brass Bars, Rods and Sections

3.2 Order of Precedence

In the event of conflict between Specifications, Data sheets, related standards, codes etc., the order of precedence shall be as follows:

a. Data sheets

b. Job Specifications

c. Standard Specifications

d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

4 MATERIALS

Materials selected shall be in accordance with the Data Sheets and Standard Specifications. For corrosion service the material selected shall be in compliance with the requirements of NACE MR-0175 / IS0-15156 latest editions.

5 DESIGN

5.1 SS Tube Fittings

Nomenclature of all Tube Fittings shall be as per ISA RP 42.1.

Fittings shall be of flare less compression type and four - piece (for double compression type) construction consisting of two ferrules, nut and body suitable for use on SS tubes conforming to ASTM A 269 TP 316 with hardness in the range of RB 70 to 79.

All the parts shall be of SS 316.

Hardness of the ferrules shall be in the range of RB 85-90 so as to ensure a hardness difference of the order of 5 to 10 between Tube and Fittings, for better sealing.

Nuts and ferrules of a particular size shall be interchangeable for each type.

Spanner hold shall be metric.

Threaded ends of Fittings shall be NPT as per ANSI B 1.20.1.

Vendor shall ensure that the ferrules and nuts supplied for fittings shall be suitable for the sample Tube which shall be supplied during manufacture.

Specific techniques like Silver plating shall be used over threading in order to avoid jamming and galling.

5.2 Copper Tube Fittings

Nomenclature of all Tube Fittings shall be as per ISA RP 42.1.

Fittings shall be of flare less compression type and of three- piece construction consisting of ferrule, nut and body suitable for use on copper tubes conforming to ASTM B 68/B 68M hardness not exceeding RB 50.

All parts shall be manufactured from Brass as per IS 319 bar stock and nickel plated.

For better grip, Vendor shall maintain hardness difference between tube and ferrule and indicate the same along with the offer.

Nuts and ferrules of a particular size shall be interchangeable for each type.

Threaded ends of Fittings shall be NPT as per ANSI B 1.20.1.

Spanner hold shall be metric.

Vendor shall ensure that the ferrules and nuts supplied for fittings shall be suitable for sample tube which shall be supplied during manufacture.

5.3 Name Plate

No separate nameplates are required on the Fittings. However, a Manufacturer's name / trademark should be punched on a visible place on the body of each Fittings for easy identification.

6 FABRICATION AND PAINTING

Vendor shall obtain approval in writing from the Purchaser before start of fabrication of Instrument Tube Fittings. Vendor shall submit the required Specification, drawings & documents for approval. Also Vendor shall refer the relevant codes and standards for manufacturing herein.

7 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per Job Specification requirements, and as per relevant codes, prior to shipment. The inspection and testing for Instrument Tube Fittings shall be carried out as per approved Inspection and Test Plan.

Type test for the products shall be according to 8S-4368 Part IV which shall necessarily include the following:-

a. Hydrostatic proof pressure test

b. Minimum hydrostatic burst pressure test

c. Disassembly and reassembly test

d. Minimum static gas pressure (vacuum) test

e. Maximum static gas pressure test

f. Hydrostatic impulse and vibration test.

The type test results shall be made available for scrutiny during inspection.

Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process like hydro test, material test, hazardous area certification test, calibration test and any other before Factory Acceptance Testing

(FAT).

7.1 Factory Acceptance Testing (FAT)

Prior to FAT, Vendor shall submit to the Company a detailed FAT procedure, for review and approval, listing all the Instrument Tube Fittings complete with the project approved tags, and highlighting the inspection and testing requirements of all such devices. FAT shall be carried out as per approved Inspection and Test Plan. FAT shall be carried out prior to shipment of the Instrument Tube Fittings.

FAT procedures shall be submitted at least 4 weeks prior to FAT testing taking place. FAT shall be carried out at the manufacturing facilities. The tests shall be witnessed by the Company or their approved representative. FAT procedure will be signed off by the Vendor and Company or their approved representative at the successful completion and conclusion of testing.
The FAT shall be consisting of the following as a minimum:

a. Hydrostatic Test: SS Tube Fittings shall be subjected to hydrostatic test at the following pressures.

   For 6 mm Fittings, at 80 kg/cm2.
   For 1/2" Fittings, at 153 kg/cm2 or 400 kg/cm2 at 38°C, as specified in the Data Sheets. The ratings are based on usage in piping classes with flange ratings up to 600#, 900# and 1500# respectively.
   Brass compression Fittings shall be subjected to hydrostatic test at the following pressure:
   For 1/4" Fittings, at 10 kg/cm2, 3/8 " at 80 kg/cm2, at 38° C.
   During and after the hydrostatic test, the tubes shall not show any leaks or rupture.

b. Pneumatic Pressure Test: The Fittings shall be tested at 7 kg/cm2 of dry air. During and after the test, tubes shall not show any leaks or rupture.

c. Disassembly and Reassembly Test.

d. Hardness verification. Test for hardness shall be done on parent material for the ferrules.

e. Dimensional test report

A certificate to detail the results and records obtained during the FAT shall be made available for ratification by the Vendor on the date of test.

7.2 Site Acceptance Testing (SAT)

A SAT shall be carried out on completion of the installation of the equipment at site which shall be witnessed by the company / owner's representative. SAT shall be performed on the Instrument Tube Fittings as per the approved test procedure. A comprehensive test procedure in compliance with the company specification shall be developed and issued to company / owner for review and approval.

The Site Acceptance Test (SAT), in general, shall demonstrate that the Instrument Tube Fittings functions correctly and properly in accordance with the specified requirements.

8 MARKING, PACKING AND SHIPMENT

Following FAT completion, Vendor responsible for the Instrument Tube Fittings shall ensure that all equipment and associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Vendor shall provide and submit his standard "Marking, Packing and Shipping Procedures" for review by Company / Owner.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Equipment shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite.

Preparation for shipment and packing will be subject to inspection and rejection by Company's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

9 SPARES AND ACCESSORIES

The following spare philosophy shall be followed in case it is not covered in Job Specification.

The Vendor shall include recommended Spare Parts List for start-up, pre-commissioning and two years operation as per the following;

a. Itemized recommended spare parts list for start-up and pre-commissioning.
b. Itemized recommended spare parts list for two years operation.

Vendor shall recommend accessories and special tools required for operation and maintenance of Instrument Tube Fittings, for Company review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

10 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if it is not covered in Job Specification.

10.1 Documentation Required with Technical Bid

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

a. Standard Specification, Data Sheets;

b. Bill of Materials including Vendor list, details of third party items;

c. Catalogues and Manuals;

d. Quality Assurance Plan;

e. Any other documents.

10.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company's approval:

a. Specifications, Data Sheets;

b. Bill of materials including Vendor list, details for third party items;

c. Material test certificates;

d. Procedures for FAT;

e. Quality Assurance Plan;

10.3 Guarantee & Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design .The cost of correction / replacement of any warranty items shall be borne by the Vendor.

ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION
FOR
CARTRIDGE FILTER

VPC-SS-ME-3010

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
01	01.11.2019	SS	RNR	RNR	SK
00	20.05.2018	SS	RNR	RNR	SK

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CONTROLLED COPY	:	If in soft and signed

REVISION RECORD						
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00	20.05.2018	SS	RNR	RNR	SK	Issued for use as standard
		Satish Singh	RN Rai	RN Rai	Suresh kumar	
01	01.11.2019	SS	RNR	RNR	SK	Format change and document is generally revised.
		Satish Singh	RN Rai	RN Rai	Suresh kumar	

ABBREVIATIONS:

ASME	The American Society of Mechanical Engineers

Contents

1.0 SCOPE

This specification covers the general requirements for sizing, design, fabrication, workmanship, erection, inspection, testing and supply of Cartridge Filter.

2.0 REFERENCE DOCUMENTS

2.1 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

OWNER / COMPANY	:	OWNER of the particular Project (Project Specific).
CONSULTANT	:	The party which is doing engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall Project management.
BIDDER/SUPPLIER/VENDOR	:	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor

2.2 ORDER OF PRECEDENCE

In the event of conflict between this Specifications, Data Sheets, related standards, codes etc., the order of precedence shall be as follows:

1. Local regulation and statuary requirement
2. Data Sheets.
3. Specifications
4. National / International Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

2.3 CODES AND STANDARDS

Following principal codes and standards (Latest Edition) and in accordance with the relevant Institute of Gas Engineers (IGE) codes shall be followed for design, manufacture, testing etc. of the equipments.

ASME Boiler and Pressure Vessel Code

Section-II, Part-A,C&D	:	Specification of Materials
Section-V	:	Non Destructive Examination
Section-VIII, Division-I	:	Rules for Construction of Pressure Vessels (Latest Edition)
Section-IX	:	Qualification Standard for Welding and Brazing Procedures

American National Standard Code

ANSI/ASME B16.5	:	Pipe Flanges and Flanged fittings
ANSI/ASME B31.3	:	Process Piping
ANSI/ASME B31.8	:	Gas Transmission and Distribution Systems
ANSI/ASME B16.9	:	Factory-made Wrought Butt Welding Fittings
ANSI/ASME B16.20	:	Metallic gaskets for pipe flanges
ANSI/ASME B1.20.1	:	Pipe threads general purpose (inch)
ANSI/ASME B16.34	:	Valves flanged, threaded & welding ends
ANSI/ASME B16.1	:	Forged Steel Fittings Socket Welded & Threaded
ANSI/ASME B16.47	:	Large Diameter Steel Flanges
ANSI/ASME B36.10	:	Welding & Seamless Wrought Steel Pipe
ANSI/ASME B16.21	:	Design of Non-Metallic Gasket

American Petroleum Institute

API RP 520	:	Part -1 & 2, Design and installation of pressure relieving system in refineries
API RP 521	:	Guide for Pressure relief and Depressing Systems.
API RP 550	:	Manual on installation of refinery instrument and control system.
API 6 D	:	Specification for pipeline valves, end closures and swivels.
API 527	:	Commercial Seat Tightness of safety relief valves with Metal-to-Metal seats.

Seismic Load

IS-1893 Part-1	:	Criteria for Earthquake Resistant – Design of Structure

Wind Load

IS-875 Part-3	:	Code of Practice for Design Loads (other than Earthquake) for Buildings & Structures
SS-MC-008	:	Standard specification for Pressure Vessel

2.4 REGULATIONS

National laws and regulations together with any local by-laws for the country or state wherever the vessels are to be used must be complied with by the fabricator.

3.0 TECHNICAL REQUIREMENTS

3.1 The equipment shall be of the type as mentioned in Data Sheets and shall meet the duty requirements and performance parameters as mentioned therein.

3.2 Vendor shall submit calculations for sizing of the equipment together with all supporting documents/catalogues/monographs etc. with his bid. The type, model and number of cartridges shall be selected based on allowable pressure drop and filter element supplier's recommendation. The total internal cross sectional area of mounted cartridges shall not be

less than inlet nozzle area for inlet size up to 150 NB. The calculation for the selected number of cartridges shall be furnished, along with the Bid.

3.3 Suitable baffle plates shall be provided in the vessels for proper fluid flow distribution. Vessel diameter shall be minimum twice the diameter of inlet nozzle. All internal metal components including nuts and bolts shall be of stainless steel as a minimum irrespective of material of construction of the filter vessel body.

3.4 Corrosion allowance of minimum 3mm shall be considered for all carbon steel parts of the filter unit.

3.5 Vessel of diameters 300 NB and below shall be made from seamless pipe only. Nozzle 300 NB and above can be fabricated with killed steel plate with 100% radiography of long. seam.

3.6 All nozzles / pipe on the vessel shall be of seamless construction. All nozzles less than or equal to 50 NB size shall be provided with 2 Nos. 6mm thick stiffeners at 90° to each other. All nozzles above 80 NB size, shall be provided with reinforcement pads unless specified otherwise.

3.7 All flanges shall be weld neck type only irrespective of the nozzle size. All flanges shall be raised face type, with serrated finish unless specified otherwise.

3.8 Dimensions of flanges including shell flanges, blind head cover flanges, nozzle flanges and blind flanges shall be as per ASME B 16.5. Large flanges shall be as per ASME B 16.47.

3.9 Filter shall be provided Quick opening closure or flange with top cover as specified in data sheet for replacement of filter element. The top cover shall be a forged blind flange. Suitable number of dowel pins shall be provided for proper location of the top cover. The top cover weighing more than 15 Kg shall be provided with lifting davit. The standard stud bolt and nut arrangement shall be provided for top cover.

3.10 Pressure parts joined by butt welds shall be with full penetration welds. Where both sides welding is not accessible, root run by tungsten inert gas process or backing strip, shall be used to ensure full penetration. Backing strip if used shall be removed after welding.

3.11 Vessels shall be post weld heat treated, whenever it is required due to service requirement or due to code requirements. Vessels shall be post weld heat treated as a complete unit and no welding shall be permitted after the post weld heat treatment is completed.

3.12 For vessels in stainless steel construction, lower allowable stress values shall be considered as per ASME Code for their design.

3.13 Filter vessel shall be provided with lifting and earthing lugs, Fire proofing and insulation supports shall be provided if indicated in Data Sheet.

3.14 Filter elements must withstand a pressure of 1.0 kg/cm² (g) without breaking or failure.

3.15 Particle size and Filtering efficiency shall be as per Data Sheet.

3.16 Core of filter element shall be of SS material.

3.17 All quick opening closures opening shall have perfect sealing arrangement to prevent leakage.

3.18 All exposed carbon steel parts to be painted shall be thoroughly cleaned from inside and outside. All scales, rust, dirt and other foreign materials shall be removed by wire brushing and sand blasting as applicable before painting the unit. Minimum acceptable standard of blast cleaning shall be Sa 2 ½ as per Swedish standard SIS 0055900.

3.19 Non-ferrous materials, austenitic stainless steel, plastic or plastic coated materials, insulated surfaces of equipment and pre-painted items shall not be painted.

3.20 Stainless steel surfaces both inside and outside shall be pickled and passivated.

3.21 Machined and bearing surfaces shall be protected with thick coat of grease.

3.22 Depending on the environment, Primer and finish coats shall be applied as per painting speciation SS-PI-008.

3.23 The colour of finish coat shall be intimated to Vendor after placement of Order.

4.0 INSPECTION AND TESTING

4.1 Equipment shall be subjected to stage-wise expediting, inspection and testing at Vendor's works by Purchaser / His authorized inspection agency. Vendor shall submit Quality Assurance (QA) procedures before commencement of fabrication. Approved QA procedures shall form the basis for equipment inspection.

4.2 Testing at Vendor's works shall include the following:

a. Non destructive test such as radiography and dye penetration tests.
b. Hydrostatic test at 130% of design pressure for the vessel unless otherwise specified.
c. Any other tests as specified in Data Sheets / codes / standards.

4.3 Any or all the tests, at Purchaser's option, shall be witnessed by Purchaser / His authorized inspection agency. However, such inspection shall be regarded as check-up and in no way absolve the Vendor of his responsibility.

5.0 PACKING & SHIPMENT

5.1 All packaging shall be done in such a manner as to reduce the volume. The equipment shall be dismantled into major components suitable for shipment and shall be properly packed to provide adequate protection during shipment. All assemblies shall be properly match marked for Site erection.

5.2 Attachments, spare parts of the equipment and small items shall be packed separately in wooden-cases. Each item shall be appropriately tagged with identification of main equipment and reference number of the respective assembly drawing.

5.3 Detailed packing list in water-proof envelope shall be inserted in the package together with equipment.

5.4 Each equipment shall have an identification plate giving salient equipment data, make, year of manufacture, equipment number, name of manufacturer etc.

6.0 SPARE PARTS

6.1 Vendor shall submit his recommended list of spare parts with recommended quantities and itemized prices for first two years of operation of the equipment. Proper coding and referencing of spare parts shall be done so that later identification with appropriate equipment will be facilitated.

6.2 Recommended spares and their quantities should take into account related factors of equipment reliability, effect of equipment downtime upon production or safety, cost of parts and availability of Vendor's service facilities around proposed location of equipment.

6.3 Vendor shall also submit a list of recommended commissioning spares if any along with quantities.

7.0 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if not covered in Job Specification.

7.1 DOCUMENTATION REQUIRED WITH TECHNICAL BID

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

a. Specification & duly filled in Data Sheets enclosed with MR Specifications.
b. GA Drawings with foundation details and MOC of major components.
c. Catalogues.
d. Compliance statement to the MR Specification.
e. Pressure drop curve with the flow rates – Mono graphs of filter elements.

7.2 DOCUMENTATION REQUIRED FOR APPROVAL AFTER ORDER

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings and documents for the COMPANY's approval:

a. Specifications & duly filled in Data Sheets.
b. GA Drawings of the equipment with material of construction of major components and details at the Vendor's Battery Limits.
c. Catalogues and Manuals.
d. Design calculations.
e. Material Test Certificates.
f. Quality Assurance Plan.

VCS QUALITY SERVICES PVT.LTD.

STANDARD SPECIFICATION
FOR
PIPELINE BALL VALVES

VCS-SS-PP-2004

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
04	29.04.2022	RP	MC	HK	GW
03	07.01.2022	SR	MC	HK	HK

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00	23.06.2017					Issued as Standard
		AS	SM	AD	SK	
01	22.05.2019					Revised based on API 6D 24TH Edition.
		BS	MC	AD	SK	
02	28.01.2020					Documents Formatting, numbering updated from SS-PL-004 to VPC-SS-PP-2004, vent drain Diagram updated, other Detail updated as marked
		MB	MC	AD	SK	
03	07.01.2022					Revised as Marked
		SR	MC	HK	HK	
04	29.04.2022					VCS QMS Integration
		RP	MC	HK	GW	

ABBREVIATIONS:

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
API	American Petroleum Institute
BHN	Brinell Hardness Number
DN	Nominal Size
HAZ	Heat Affected Zone
LC	Lock Close (valve locked in full close position)
LO	Lock Open (valve locked in full open position)
MSS-SP	Manufacturers Standardization Society - Standard Practice
NDT	Non Destructive Testing
NPS	Nominal Pipe Size
RTJ	Ring Type Joint
SSPC	Steel Structures Painting Council
MPI	Magnetic Particle Inspection
DP	Dye Penetrant

CONTENTS

1 SCOPE

This specification covers the minimum requirements for design, manufacture, testing and supply of carbon steel ball valves of size DN 50 mm (2") and above and ASME pressure rating Class 150# thru 900# for use in onshore pipeline systems handling non-sour hydrocarbons in liquid or gaseous phase including Liquefied Petroleum Gas (LPG).

2 REFERENCE DOCUMENTS

All valves shall be manufactured and supplied in accordance with the American Petroleum Institute (API) Specification 6D, latest edition (edition in force at the time of issue of enquiry), Specification for Pipeline and Piping Valves, with additions and modifications as indicated in the following sections of this specification.

Reference has also been made in this specification to the latest edition (edition in force at the time of issue of enquiry) of the following Codes, Standards and Specifications.

2.1 American Society of Mechanical Engineers (ASME)

B31.3	:	Process Piping.
B31.4	:	Pipeline Transportation System for Liquid and Slurries.
B 31.8	:	Gas Transmission and Distribution Piping Systems.
B16.5	:	Pipe Flanges and Flanged Fittings.
B16.10	:	Face to Face and End to End Dimensions of Valves.
B 16.25	:	Butt Welding Ends.
B 16.34	:	Valves-Flanged, Threaded and Welding Ends.
B 16.47	:	Large Diameter Steel Flanges.
Section VIII	:	Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels.
Section IX	:	Welding and Brazing Qualifications.

2.2 American Petroleum Institute (API)

1104	:	Specification for Welding of Pipelines and Related Facilities.

2.3 American Society for Testing and Materials (ASTM)

A370	:	Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
B 733	:	Auto catalytic (Electro less) Nickel - Phosphorus Coatings on Metal.

2.4 Manufacturers Standardization Society (MSS)

SP-6	:	Standard Finishes for contact faces of Pipe Flanges and Connecting – End Flanges of Valves and Fittings.
SP-44	:	Steel Pipeline Flanges.

2.5 Steel Structures Painting Council (SSPC)

SSPC-VIS-I	:	Steel Structures Painting Council Visual Standard-Guide and Reference Photographs for Steel Surfaces prepared by Dry Abrasive Blast Cleaning.

2.6 In case of conflict between the requirements of this specification, API 6D and the Codes, Standards and Specifications referred above, the requirements of this specification shall govern.

3 MATERIALS

3.1 The material of major components of the ball valves shall be as indicated in Valve Data Sheet. Remaining components shall be as per Manufacturer's standard (suitable for the service indicated in the data Sheet) and shall be subjected to approval by Company. In addition, the material shall also meet the requirement specified hereinafter.

All process-wetted parts, metallic and non-metallic, sealant and lubricants shall be suitable for the service specified by the Company. Manufacturer shall confirm that all wetted parts are suitable for treated water/ seawater environment, which may be used during field testing.

Non-metallic parts of the valves (including O-rings, soft seals etc.) intended for hydrocarbon gas service shall be resistant to explosive decompression.

3.2 Carbon steel used for the manufacture of valves shall be fully killed.

3.3 The carbon equivalent (CE_{IIW}) of valve end connections which are subject to further field welding by Company shall not exceed 0.43 on check analysis for each heat of steel used, as calculated by the following formula:

$$CE_{IIW} = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

3.4 Charpy V-Notch Test Requirements

Charpy V-notch test on each heat of base material shall be conducted for all pressure containing parts such as Body, End Flanges, Stem and Welding Ends as well as Bolting materials for pressure containing parts.

Test procedure for Charpy V-Notch Test shall conform to ASTM A370.

For Carbon Steel, alloy steel & Stainless Steel (except Austenitic Grades) Materials, The impact test temperature shall be 0 °C or minimum design temperature indicated in valve

data sheet / MR, whichever is lower. The average absorbed energy value of three full sized specimens shall be 27 J (for materials with Specified Minimum Tensile Strength ≤100,000 psi)/ 34 J (for materials with Specified Minimum Tensile Strength >100,000 psi). The minimum impact energy value of any one specimen of the three specimens analysed as above, shall not be less than 22 J (for materials with Specified Minimum Tensile Strength ≤100,000 psi)/ 26 J (for materials with Specified Minimum Tensile Strength >100,000 psi).
For Low Temperature Carbon Steel Materials, the impact test temperature shall be as per requirement of Material Standard or minimum design temperature indicated in valve data sheet/MR, whichever is lower. The average absorbed energy value of three full sized specimens shall be 27 J (for materials with Specified Minimum Tensile Strength ≤100,000 psi)/ 34 J (for materials with Specified Minimum Tensile Strength >100,000 psi). The minimum impact energy value of any one specimen of the three specimens analysed as above, shall not be less than 22 J (for materials with Specified Minimum Tensile Strength ≤100,000 psi)/ 26 J (for materials with Specified Minimum Tensile Strength >100,000 psi).

Where the material specification requires impact values to be higher than specified in the above paragraphs, the higher values shall apply.

For duplex & super duplex stainless steel the Charpy V-Notch test values and test temperature shall be as per API 6D.

3.5 Hardness Test Requirements

For valves specified to be used for Gas service or LPG service, Hardness test shall be carried out as per ASTM A370 for each method of manufacture and each heat of steel used in the manufacture of valves. A full thickness cross section shall be taken for this purpose and the maximum hardness of the materials of valve components shall not exceed 248 HV_{10}.

3.6 Electroless Nickel Plating Requirements

For all such valves where Carbon Steel/Low temperature carbon steel is used as ball material, the ball shall have 75 micrometers (0.003 inches) thick Electro less Nickel Plating (ENP) as per ASTM B 733 with following classification:

- SC2, Type II, Class 2.

The hardness of plating shall be minimum 50 RC.

4 DESIGN AND CONSTRUCTION REQUIREMENTS

4.1 General

Valve design shall meet the requirements of API Specification 6D and shall be suitable for the service conditions indicated in the Valve Data Sheet. The ASME Boiler & Pressure Vessel Code, Section VIII, Div 1 shall be used to design the valve body. Allowable stress requirements shall comply the provisions of above code. Also, corrosion allowance indicated in Valve Data Sheet shall be considered in valve design; however, the minimum wall thickness shall not be less than the minimum requirement of ASME B16.34. The

manufacturer shall have valid license to use API monogram on valves manufactured as per API 6D.

4.2 Valve Installation

Valves shall be suitable for either buried or above ground installation as indicated in Valve Data Sheet/ Material requisition.

4.3 Valve Body

4.3.1 For above ground valve, valve body design shall be either fully welded or bolted type. For buried valves, valve body design shall be fully welded type only. Valve body joints with threads are not permitted.

4.3.2 Ball mounting shall be trunnion or pivot type only. Valve design shall minimize the possibility of debris ingress into the trunnion as far as practicable

4.4 Ball

Ball shall be of single piece, solid type construction.

4.5 Valve Bore Configuration

Valves shall be Full bore (FB) or Reduced bore (RB) as indicated in the Valve Data Sheet.

Full Opening Valve

Full bore valves shall be suitable for the passage of all types of pipeline pigs including instrumented intelligent pigs and regular cleaning, batching and scraper pigs on regular basis without causing damage to either the valve component or the pig. The full bore, valve shall provide an unobstructed profile for pigging operations in either direction. Full bore valves shall be designed to minimize accumulation of debris in the seat ring region to ensure that valve movement is not impeded. The bore of full bore butt-welded & flanged valves shall be in line with Connecting pipe as stated in valve data sheet or Valve MR, however in any case it shall not be less than the minimum required shown in Client Ball Valve specification & API 6D.

Reduced Opening Valve

The bore size of reduced bore valve shall correspond to that of a full-bore valve of smaller nominal diameter as indicated in Table- 4.5 below. For sizes of a particular rating not covered in API 6D, the bore size of the reduced bore valve shall be as per manufacturer`s Standard.

TABLE – 4.5

Nominal Valve Size	Nominal Valve Size for Reduced Bore	Nominal Valve Size	Nominal Valve Size for Reduced Bore
DN mm (NPS inches)	DN mm (NPS inches)	DNmm (NPSinches)	DNmm (NPS inches)
50 (2)	40 (1.5)	600 (24)	500 (20)

80 (3)	50 (2)	650 (26)	550 (22)
100 (4)	80 (3)	700 (28)	600 (24)
150 (6)	100 (4)	750 (30)	600 (24)
200 (8)	150 (6)	800 (32)	650 (26)
250 (10)	200 (8)	850 (34)	700 (28)
300 (12)	250 (10)	900 (36)	750 (30)
350 (14)	250(10)	950 (38)	800 (32)
400 (16)	300 (12)	1000 (40)	850 (34)
450 (18)	350 (14)	1050 (42)	900 (36)
500 (20)	400 (16)	1200 (48)	1050 (42)
550 (22)	450 (18)		

4.6 Seat Design

The valves shall either be a soft seated valve or metal seated valve or with primary metal-to metal contact and secondary soft seats or seat design shall be as indicated in valve data sheet.

For soft seated valves, Metal seat rings may be provided with soft insert. The same shall be positively locked in position in Metal seat rings.

For valves with primary metal to metal contact and secondary soft seats, O-rings or other seals if used for drip tight sealing shall be encased in a suitable groove in such a manner that it cannot be removed from seat ring and there is no extrusion during opening or closing operation of valve at maximum differential pressure corresponding to valve class rating. The seat rings shall be so designed as to ensure sealing at low as well as high differential pressures.

4.7 Valves shall be designed to withstand a sustained internal vacuum of at least 1 (one) mille-bar in both open and closed positions.

4.8 Double Block & Bleed Design

Valves shall have double block and bleed feature to facilitate complete flush, drain and venting of the valve body cavity. Cavity relief pressure shall be as per API 6D.

4.9 Sealant Injection

Full bore valves of nominal valve size DN 200 mm (8") & above and Reduced Bore valves of nominal valve size DN 250 mm (10") & above, shall have provision for secondary sealant injection under full line pressure for seat and stem seals. All sealant injection connections shall be provided with block valve and an internal non-return valve. Valve design shall have a provision to replace the sealant injection fitting under full line pressure. Location and arrangement of sealant points shall be as per Fig 4.9.

4.10 Vent & Drain

Valves shall be provided with vent and drain connections. Location and arrangement of

vents and drains shall be as per Fig. 4.9. Body vent and drain shall be provided with valves (Ball or Plug type). Number and size shall be as per Fig. 4.9.

Valve design shall ensure repair of stem seals/ packing under full line pressure.

4.11 Support Foot

Full bore valves of nominal valve size DN 200 mm (8") & above and Reduced bore valves of nominal valve size DN 250 mm (10") & above, shall be equipped with support foot and lifting lugs unless specified otherwise. Tapped holes and eyebolts shall not be used for lifting lugs. Height of support foot shall be kept minimum. The location and size of support foot/ lifting lugs shall ensure unrestrictive operation of vent/ drain valves. The design of support foot shall be such that it shall take minimum double the weight of the valve assembly.

4.12 Valve design shall be such as to avoid bimetallic corrosion between carbon steel and high alloy steel components. Suitable insulation shall be provided as required.

4.13 The valve body cavity over-pressure shall be prevented by self-relieving seat rings/ assemblies. Valve Cavity relief pressure when added to the valve pressure rating shall not exceed 133% of the pressure rating of the valve at its maximum specified design temperature.

4.14 Valve Ends

Valve ends shall be either flanged/ or butt welded or one end flanged and one end butt welded as indicated in the Valve Data Sheet. Flanges of the flanged end cast/ forged body valves shall be integrally cast/ forged with the body of the valve. Face to face/ end to end dimensions shall conform to API 6D. Face-to-face and end-to-end dimensions for valve sizes not specified in API 6D shall be in accordance with ASME B 16.10. Face-to-face and end-to-end dimensions not shown in API 6D or in ASME B 16.10 shall be as per Manufacturer Standard and shall be subject to approval by Company.

Flanged ends, if specified, shall have flanges as per ASME B16.5 for valve sizes up to DN 600 mm (24") excluding DN 550 mm (22"), as per MSS-SP-44/ ASME B 16.47 Series A for valve sizes DN 550 mm (22") and for DN 650 mm (26 inches) and above. Flange face shall be either raised face or ring joint type (RTJ) as indicated in Valve Data Sheet. Flange face finish shall be serrated or smooth as indicated in Valve Data Sheet. In case of RTJ flanges, the groove hardness shall be minimum 140 BHN.

Butt weld end preparation shall be as per ASME B 16.25. The thickness of the pipe to which the valve has to be welded shall be as indicated in the Valve Data Sheet. In case difference exists between thickness of welding ends of valve and connecting pipe, the welding ends of valve shall have bevel preparation as per ASME B31.4 or ASME B31.8 as applicable.

In case of all Butt welded end valves (including soft seated valves or valves with primary metal to metal and secondary soft seats), actual yield strength of valve body shall not be less than 2/3rd of the specified minimum yield strength (SMYS) of the connecting pipe material.

For soft seated valves with Butt welded end, valves shall be provided with pup pieces on

either side of length 200 mm each for size up-to 8" & 250 mm for size 10" and above, with material as specified in valve data sheet. Length of pup piece shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment. Pup piece thickness shall be calculated for the class rating. Vendor shall provide for each type (considering size, grade and thickness of the pup pieces used for all offered valves) of pup piece, test rings (500 mm long) from pup piece material for field weld procedure qualification. Valves shall be tested along-with pup piece.

4.15 Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. The manufacturer shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.

4.16 POSITION INDICATORS

Valve shall be provided with ball position indicator and stops of rugged construction at the fully open and fully closed positions. For actuated valves, additionally mechanical means of position indicator shall be provided.

4.17 STEM EXTENSIONS

When stem extension requirement is indicated in Valve Data Sheet, the valves shall have the following provisions.

a. Valves provided with stem extension shall have water proof outer casing. Length of stem extension shall be as indicated in Valve Data Sheet. The length indicated corresponds to the distance between centerline of the valve opening and the top of mounting flange for valve operating device (gear operator/ power actuator as applicable).
b. In case of below Ground LTCS valves, Stem extension material shall be equivalent to stem material.
c. Vent and drain connections and sealant injection lines shall be terminated adjacent to the valve operator by means of suitable piping anchored to the valve body. The pipe used shall be API 5L Gr. B/ ASTM A 106 Gr. B, with Sch 160 for carbon steel valves and ASTM A 333 Gr 6, with Sch 160 for Low temperature carbon steel valves or the material shall be as specified in valve data sheet. The material of fittings for Carbon Steel valve shall be ASTM A105/ ASTM A234 Gr. WPB and material for the fittings for low temperature carbon steel valves shall be ASTM A 350 Gr LF2 Cl 1 or the material shall be as specified in valve data sheet. The fittings and valve end shall be Socket welded ANSI class 6000# as per ASME B 16.11 (For piping class up to 600#) and BW end (For Piping Class 900#).
d. Stem extension and stem housing design shall be such that the complete assembly will form a rigid unit giving positive drive under all conditions with no-possibility of free movement between valve body, stem extension or its operator.
e. Outer casing of stem extension shall have 3/8” or 1/2" NPT plugs at the top and bottom, for draining and filling with oil to prevent internal corrosion.
f. The Stem Extension shall be self-relieving.

4.18 OPERATING DEVICES

a. Valves shall have a power actuator or manual operator as indicated in the Valve Data Sheet. In case of manual operator, valve sizes, DN ≤ 100 mm (4") shall be wrench operated and valve sizes, DN ≥ 150 mm (6") shall be gear operated. The length of wrench shall not be longer than twice the face to face or end to end dimension of the valve. Each wrench operated valve shall be supplied with wrench. Valve design shall be such that damage due to malfunctioning of the operator or its controls will only occur in the operator gear train or power cylinder and that damaged parts can be replaced without the valve cover being removed.

b. The power actuator shall be in accordance with the Company Specification issued for the purpose and as indicated in the Valve and Actuator Data Sheet. Operating time shall be as indicated in Valve Data Sheet. Valve operating time shall correspond to full close to full open/ full open to full close under maximum differential pressure corresponding to the valve rating. For actuated valves, the actuator's rated torque output shall be 1.25 times the break torque required to operate the ball valve under the maximum differential pressure corresponding to the Valve Class Rating.

c. For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N. However, failing to meet above requirement, vendor shall offer gear operated valves. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24” and 450 for valve size above 24”.

d. Direction of operation of hand wheel or wrench shall be in clock-wise direction while closing the valve. Hand wheels shall not have protruding spokes.

e. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease.

4.19 The tolerance on internal diameter and out of roundness at the ends for welded ends valves shall be as per connected pipe specification as indicated in the Valve Data Sheet.

4.20 LOCKING DEVICES

When indicated in Material Requisition/Data sheet/ Tender, valves shall have locking devices to lock the valve either in full open (LO) or full close (LC) positions. Locking devices shall be permanently attached to the valve operator and shall not interfere with operation of the valve.

4.21 WELDING

All welds shall be made by welders and welding procedures qualified in accordance with the provisions of ASME Section IX. The procedure qualification shall also include impact test and hardness test when required as per Clause 3.4 to 3.5 of this specification and shall meet the requirements as specified therein.

4.22 REPAIR WELDING

Repair by welding is not permitted for fabricated and forged body valves. However, repair

by welding as per ASME B16.34 is permitted for cast body valves. Such repairs shall be carried out at casting supplier's care only. Repair shall be carried out before any heat treatment of casting is done. Repair welding procedure qualification shall also include impact test and hardness test when required as per Clause 3.4 to 3.5 of this specification and shall meet the requirements as specified therein. Heat treatment and radiography shall be repeated after the weld repair.

4.23 No Casting is permitted for stem and stem extended material of all valve. Valve stem shall be capable of withstanding the maximum operating torque required to operate the valve against the maximum differential pressure corresponding to applicable class rating. The combined stress shall not exceed the maximum allowable stresses specified in ASME section VIII, Division 1. For power actuated valves, the valve stem shall be designed for maximum output torque of the selected power actuator (including gear box, if any) at valve stem.

4.24 Wherever specified for the part of valve in valve data sheet, minimum thickness of stelliting shall be 1.6mm

4.25 All Soft seated valves shall be fire safe design and qualified as per API 6FA/ API 607/ ISO 10497.

4.26 Soft-seated valves shall have antistatic device.

5 INSPECTION & TESTS

5.1 The Manufacturer shall perform all inspection and tests as per the requirements of this specification and the relevant codes, prior to shipment, at his works. Such inspection and tests shall be, but not limited to, the following:

5.2 All valves shall be visually inspected. The internal and external surfaces of the valves shall be free from any strikes, gouges and other detrimental defects. The surfaces shall be thoroughly cleaned and free from dirt, rust and scales.

5.3 Dimensional check on all valves shall be carried out as per the Company approved drawings.

5.4 Chemical composition and mechanical properties shall be checked as per this specification and relevant material standards, for each heat of steel used.

5.5 Non-destructive examination of individual valve material and component consisting of but not limited to castings, forgings, plates and assembly welds shall be carried out by the Manufacturer.

a. Body castings of all valves shall be radio graphically examined as per ASME B16.34. Procedure and acceptance criteria shall be as per ASME B 16.34. The extent of the radiography shall be as under:

Pressure Class Rating	Valve Size	Extent of Radiography
ANSI 150 # Class	≤ DN 600 mm (24")	Nil
	≥ DN 650 mm (26")	100%

ANSI 300 # Class	≤ DN 400 mm (16") ≥ DN 450 mm (18")	Nil 100%
ANSI 600 # Class and above	All sizes	100%

Radiography shall be performed after the final heat treatment also.

All castings shall be wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance shall, comply with ASME B 16.34.

b. All valves, with body fabricated from plates or made by, forgings, shall be ultrasonically examined in accordance with the procedure and acceptance standard as per ASME B16.34.

   All forgings shall be Wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance shall comply with ASME B16.34.

c. Bodies and bonnets made by welded assembly of segments of castings, forgings, plates or combinations thereof shall be examined, as applicable, by methods of 5.5 (a) for cast components or 5.5 (b) for forged components and plates.

5.6 Full inspection by radiography shall be carried out on all welds of pressure containing parts. Acceptance criteria shall be as per ASME B 31.4 or ASME B31.8 as applicable and API 1104.

5.7 Welds, which in Company's opinion cannot be inspected, by radiographic methods, shall be checked by ultrasonic or magnetic particle methods and acceptance criteria shall be as per ASME Sec. VIII , Division 1, Appendix 12 and, Appendix 6 respectively.

5.8 All finished wrought weld ends subject to welding in field shall be 100% ultrasonically tested for lamination type defects for a distance of 50 mm from the end. Laminations shall not be acceptable.

a. Weld ends of all cast valves subject to welding in field shall be 100% radio graphically examined and acceptance criteria shall be as per ASME B16.34.

b. After final machining, all bevel surfaces shall be inspected by dye penetrant or wet magnetic particle methods. All defects longer than 6.35 mm are rejected, as are the defects between 6.35 mm and 1.59 mm that are separated by a distance less than 50 times their greatest length. Rejectable defects must be removed. Weld repair of bevel surface is not permitted.

5.9 All valves shall be tested in compliance with the requirements of API 6D. During pressure testing, valves shall not have sealant lines and other cavities filled with sealant, grease or other foreign material: The drain, vent and sealant lines shall be either included in the hydrostatic shell test or tested independently. Test pressure shall be held for at least 30 minutes for both Shell & seat Test. No leakage is permissible during hydrostatic testing. The body cavity self-relieving feature meeting the requirements of clause 4.13 of this specification shall also be checked.

5.10 A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried

out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.

5.11 Valves shall be subjected to Operational Torque Test as per API 6D (Annex I, Para I.6) under hydraulic pressure equal to maximum differential pressure corresponding to the applicable ANSI class rating of valve. It shall be established that the force required to operate the valve does not exceed the requirements stated in section 4.18 (C) of this specification.

5.12 Power actuated valves shall be tested after assembly of the valve and actuator, at the valve Manufacturer's works. At least five Open-Close-Open cycles without internal pressure and five Open-Close-Open cycles with maximum differential pressure corresponding to the valve rating shall be performed on the valve actuator assembly. The time for Full Open to Full Close shall be recorded during testing. If required, the actuator shall be adjusted to ensure that the opening and closing time is within the limits stated in Valve Data Sheet.

Hand operator provided on the actuator shall also be checked after above testing, for satisfactory manual over-ride performance.

These tests shall be conducted on minimum one valve out of a lot of five (5) valves of the same size, rating and the actuator model/ type. In case, the tests do not meet the requirements, retesting/ rejection of the lot shall be decided by the Company's Inspector.

5.13 Subsequent to successful testing as specified in clause 5.11 and 5.12 above, one (1) valve out of the total ordered quantity shall be randomly selected by the Company Representative for cyclic testing as mentioned below:

a. The valve shall be subjected to at least 100 Open-Close-Open cycles with maximum differential pressure corresponding to the valve rating.
b. Subsequent to the above, the valve shall be subjected to hydrostatic test and supplementary air seat test in accordance with clause 5.9 and 5.10.

In case this valve fails to pass these tests, the valve shall be rejected and two more valves shall be selected randomly and subjected to testing as indicated above. If both valves pass these tests, all valves manufactured for the order (except the valve that failed) shall be deemed acceptable. If either of the two valves fails to pass these tests, all valves shall be rejected or each valve shall be tested at the option of manufacturer.

Previously carried out test of similar nature shall be considered acceptable if the same has been carried out by Manufacturer in last two years. Valves of two sizes below and two sizes above the size of valve previously tested, and rating similar or one rating lower of valve tested previously, shall be qualified.

5.14 Checks shall be carried out to demonstrate that the dissimilar metals used in the valves are successfully insulated as per the requirement of clause 4.12 of this specification.

5.15 Anti-Static testing for soft seated valves in accordance with L.5 of API 6D.

5.16 Company reserves the right to perform stage wise inspection and witness tests as indicated in clause 5.1 above at Manufacturer's works prior to shipment. Manufacturer shall give reasonable access and facilities required for inspection to the Company's

Inspector. Company reserves the right to require additional testing at any time to confirm or further investigate a suspected fault. The cost incurred shall be to Manufacturer's account.

In no case shall any action of Company or his inspector shall relieve the Manufacturer of his responsibility for material, design, quality or operation of valves.

Inspection and tests performed/ witnessed by the Company's Inspector shall in no way relieve the Manufacturer's obligation to perform the required inspection and tests.

6 TEST CERTIFICATES

Manufacturer shall submit the following certificates in accordance with EN 10204 3.2.

a. Mill test certificates relevant to the chemical analysis and mechanical properties of the materials used for the valve construction as per the relevant standards.
b. Report on heat treatment carried out.
c. Test certificates of hydrostatic and pneumatic tests complete with records of timing and pressure of each test.
d. Test reports of radiograph and ultrasonic inspection, MPI and DP Inspection
e. Test report on operation of valves conforming to clause 5.11, 5.12 and 5.13 of this specification.
f. All other test reports and certificates as required by API 6D and this specification.

The certificates shall be considered valid only when signed by Company's Inspector. Only those valves which have been certified by Company's Inspector shall be dispatched from Manufacturer's works.

7 PAINTING

Valve surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint. Surface preparation shall be carried out by shot blasting to SA-2 ½ / SSPC-SP10. For Coastal area, painting shall be suitable for industrial marine environment. For the valves to be installed underground, when indicated in Valve Data Sheet, the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating.

8 MARKING & SHIPMENT

8.1 All valves shall be marked as per API 6D. The units of marking shall be metric except nominal diameter, which shall be in inches.

8.2 Valve ends shall be suitably protected to avoid any damage during transit. All threaded and machined surfaces subject to corrosion shall be well protected by a coat of grease or other suitable material. All valves shall be provided with suitable protectors for flange faces, securely attached to the valves. Bevel ends shall be protected with metallic or high impact plastic bevel protectors.

8.3 All sealant lines and other cavities of the valve shall be filled with sealant before shipment.

8.4 Packaging and shipping instructions shall be as per API 6D.

8.5 The serial number of each valve indicated on its name plate shall appear on all required documentation in accordance with EN 10204 3.2.

8.6 Name Plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25

8.7 All valves shall be transported with ball in fully opened condition

8.8 On packages, following shall be marked legibly with suitable marking ink:

a. Order Number
b. Manufacturer's Name
c. Valve size and rating
d. Tag Number
e. Serial Number

9 SPARES & ACCESSORIES

9.1 Manufacturer shall furnish list of recommended spares and accessories for valves required during start-up and commissioning and supply of such spares shall be included in the price quoted by Manufacturer.

9.2 Manufacturer shall furnish list of recommended spares and accessories required for two years of normal operation and maintenance of valves and price for such spares shall be quoted separately.

10 DOCUMENTATION

Documentation to be submitted by Manufacturer to Company is summarized below. Number of Copies (Hard copies / soft copies etc.) shall be as indicated in CONTRACT document.

10.1 At the time of bidding, Manufacturer shall submit the following documents:

a. Reference list of similar ball valves manufactured and supplied in last seven years indicating all relevant details including project, year, client, location, size, rating, service etc.

b. Torque curves for the power actuated valves along with the break torque, running torque for the valve stem and maximum allowable stem torque.

c. Copy of valid API 6D Certificate.

d. Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.

e. Details of support foot including dimensions and distance from valve centreline to bottom of support foot.

f. List of recommended spares required during start-up and commissioning & 2 years of normal operation and maintenance.

10.2 After placement of order, the Manufacturer shall submit the following drawings, documents and specifications for Company's approval*:*

a. General arrangement & detailed sectional drawings showing all parts with reference numbers and material specifications, overall dimensions and features. Number of turns of hand wheel required for operating the valve from full open to full close position for Gear Operated valves, painting/ coating scheme, Complete dimensional details of support foot (where applicable), shall be indicated in the GA.

Manufacture of valves shall commence only after approval of the above documents. Once the approval has been given by Company, any changes in design, material and method of manufacture shall be notified to Company whose approval in writing of all changes shall be obtained before the valve is manufactured.

10.3 Within 30 days from the approval date, Manufacturer shall submit to Company the approved drawings, documents and specifications as listed in clause 10.2 above.

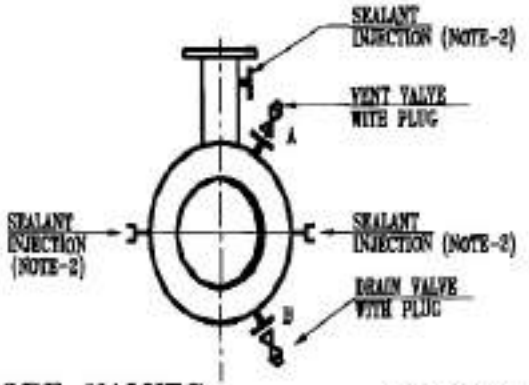
10.4 Prior to shipment, Manufacturer shall submit to Company following:

a. Test certificates as per clause 6.0 of this specification.

b. Manual for installation, erection, maintenance and operation instructions including a list of recommended spares for the valves.

10.5 All documents shall be in English language only.

ABOVE GROUND INSTALLATION



FULL BORE VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)
50 TO 150	-	15
200 TO 600	15	25
650 & ABOVE	15	40

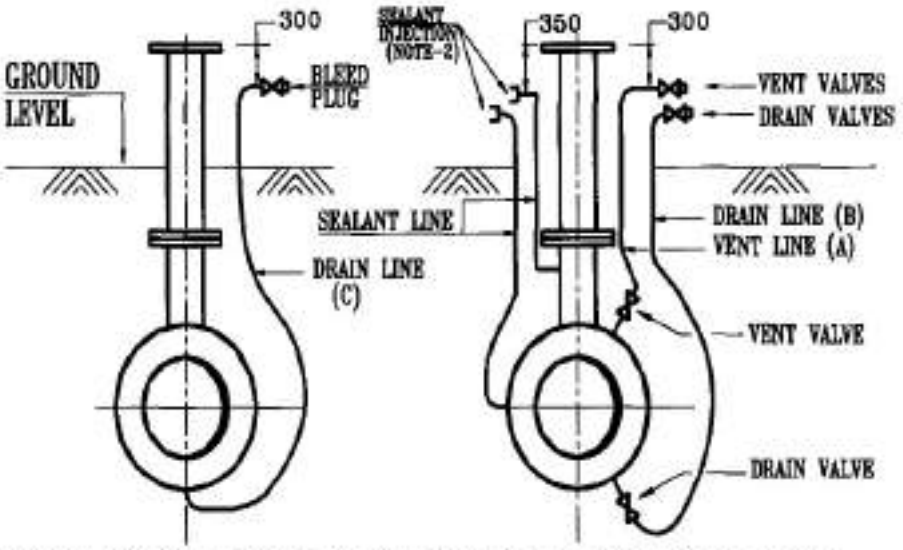
REDUCED BORE VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)
50 TO 200	-	15
250 TO 750	15	25
ABOVE 750	15	40

NOTES:-

1 ALL VALVES (BALL OR PLUG) AND PLUGS FOR A AND B SHALL BE APPROVED BY THE PURCHASER.
2 SEALANT POINTS SHALL BE PROVIDED FOR FULL BORE VALVES OF NOMINAL VALVE SIZE 200 mm (8") & ABOVE AND REDUCED BORE VALVES OF NOMINAL VALVE SIZE, DN 250 mm (10") AND ABOVE ONLY. SEALANT LINES SHALL HAVE PROVISION TO REPLACE THE SEALANT INJECTION FITTING UNDER FULL LINE PRESSURE. SEALANT LINES SHALL HAVE BLOCK VALVE & INTERNAL NON RETURN VALVE.
3 ALL VENT/DRAIN CONNECTION SHALL BE WELDED WITH THE BODY.

UNDERGROUND INSTALLATION



FULL BORE (FB) VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)	C, DN(mm)
50 TO 150	-	-	15
200 TO 300	25	25	-
350 TO 600	25	25	-
650 & ABOVE	40	40	-

REDUCED BORE (RB) VALVES

VALVE SIZE, DN(mm)	A, DN(mm)	B, DN(mm)	C, DN(mm)
50 TO 200	-	-	15
250 TO 400	25	25	-
450 TO 750	25	25	-
800 & ABOVE	40	40	-

NOTES:-

1 ALL VALVES (BALL OR PLUG) AND PLUGS FOR A AND B SHALL BE APPROVED BY THE PURCHASER.

2 SEALANT POINTS SHALL BE PROVIDED FOR FULL BORE VALVES OF NOMINAL VALVE SIZE 200 mm (8") & ABOVE AND REDUCED BORE VALVES OF NOMINAL VALVE SIZE, DN 250 mm (10") AND ABOVE ONLY. SEALANT LINES SHALL HAVE PROVISION TO REPLACE THE SEALANT INJECTION FITTING UNDER FULL LINE PRESSURE. SEALANT LINES SHALL HAVE BLOCK VALVE & INTERNAL NON RETURN VALVE.

3 ALL VENT/DRAIN CONNECTION IN BURIED SECTION SHALL BE OF WELDED CONSTRUCTION. ALL PIPING INCLUDING VALVE ENDS IN BURIED PORTIONS OF VENT & DRAIN SHALL BE WELDED TYPE.

FIGURE-4.9

ENERGISING QUALITY

VCS QUALITY SERVICES PVT.LTD.

STANDARD SPECIFICATION
FOR
ASSORTED VALVES

VCS – SS – PP - 2504

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
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ABBREVIATIONS:

AARH	:	Arithmetic Average Roughness Height
ANSI	:	American National Standards Institute
API	:	American Petroleum Institute
ASME	:	American Society of Mechanical Engineers
ASTM	:	American Society for Testing & Materials
BGO	:	Bevel Gear Operator
BHN	:	Brinnel Hardness Number
BIS	:	Bureau of Indian Standards
BS	:	British Standard
BVIS	:	Bureau Veritas Industrial Services
BW	:	Butt Weld
CAT	:	Category
CS	:	Carbon Steel
DFT	:	Dry Film Thickness
DNV	:	Det Norske Veritas
DP	:	Dye-Penetrant
IBR	:	Indian Boiler Regulations
IGC	:	Inter Granular Corrosion
IS	:	Indian Standard
LT	:	Low Temperature
LTCS	:	Low Temperature Carbon Steel
MOV	:	Motor Operated Valve
MP	:	Magnetic Particle
MR	:	Material Requisition
NDT	:	Non Destructive Testing
PM	:	Positive Material Identification
PO	:	Purchase Order
PR	:	Purchase Requisition
RFQ	:	Request for Quotation
SCRD	:	Screwed
SS	:	Stainless Steel
SW	:	Socket Weld

CONTENTS

1. GENERAL

1.1 Vendor shall supply valves in accordance with the valve specification sheets along with auxiliaries, if any, such as gear operator, bypasses, drains, locking arrangements etc. wherever specified in the specification sheets, subject notes and other enclosures to the material requisition (MR).

1.2 Vendor shall quote in strict accordance with the valve data/ specification sheets, subject technical notes and all other enclosures to the MR. For all valves, no deviations whatsoever shall be accepted.

1.3 All codes and standards for manufacture, testing, inspection etc. shall be of latest editions as on issue date of Material Requisition.

2. DOCUMENTATION

2.1 For all valves, vendor shall submit the following documents with the offer:

2.1.1 Manufacturers complete descriptive and illustrative catalogue/ literature.

2.1.2 Detailed dimensioned cross section drawing with parts/ material lists, weight etc.

2.1.3 Drawings for valves with accessories like gear operator, hydraulic/ pneumatic operator, motor, extension bonnet, extended stems with stands, bypass etc. giving major salient dimensions.

2.1.4 One copy of the valve specification sheets signed as "Accepted" by the manufacturer. Deviations, if any shall be marked as applicable on the valve specification sheet.

2.1.5 If the valve is regretted or has no deviation, the manufacturer shall write clearly on valve specification sheets as "Regret" or "No Deviation".

2.1.6 On failure to submit documents as specified in clauses 2.2.1 to 2.2.6 above, the offer is likely to be rejected.

2.2 The following documents shall be submitted in soft and hard copy after placement of the order.

2.2.1 For all valves to manufacturers' standard specified in MR/valve specification sheet, detailed dimensioned cross section drawing with parts, materials, weight, etc. shall be submitted for records/information/ review.

2.2.2 Test report shall be supplied for all mandatory tests as per the applicable code. Test reports shall also be furnished for any supplementary tests as specified in clauses 3.15.

2.2.3 Material test certificates (physical properties, chemical composition & heat treatment report) of the pressure containing parts shall be furnished for the valves supplied. Material test certificates for the other parts shall also be furnished for verification during inspection.

2.3 Catalogues/Drawings (6 sets) shall be submitted in hard copies (6 sets) and soft copies (2 CDs/DVDs) along with delivery for Purchaser’s record for all categories/ types of valves.

3. DESIGN AND CONSTRUCTION

3.1 Valve shall be designed, manufactured, tested, inspected and marked as per the manufacturing standards, design codes and standards indicated in the respective valve specification sheets. Any conflict between the requisition, enclosures, specification

sheets and referred standards/ codes shall be brought to the notice of the purchaser for clarifications and resolution, before proceeding with the manufacture. The purchaser's decision shall be final and binding to the vendor. The drawings submitted for review shall not include any deviations except as communicated in writing in Deviation permits. The Drawings shall be reviewed only for design and construction features.

3.2 All flanged valves shall have flanges integral (except forged valves) with the valve body. Flange face finish shall be normally specified in the valve specification sheet as 125 AARH etc. The interpretation for range of face finish shall be as follows:

Stock Finish	:	1000 p. in AARH max.
125 AARH	:	Serrations with 125 to 250 p in AARH
63 AARH	:	32 to 63 p. in AARH

3.3 For all weld end valves with bevel end as per ASME B 16.25, the contour of bevel shall be as follows:

Material	**Wall Thickness**	**Weld Contour**
Carbon Steel (Except Low Temp. Carbon Steel)	Upto 22 mm	Figure 2 Type A
	> 22 mm	Figure 3 Type A
Alloy Steel,Stainless Steel &Low Temp. Carbon Steel	Upto 10 mm	Figure 4
	> 10 mm & Upto 25 mm	Figure 5 Type A
	> 25 mm	Figure 6 Type A

Valve ends shall match thickness of the connecting pipe. Sloping of inside contour of valves shall be done wherever necessary to achieve this.

3.4 For flanged valves with ring joint flanges the hardness shall be as follows:

Flange Material	**Min. Hardness of Groove (BHN)**
Carbon Steel	140
1% Cr to 5% Cr, 9% Cr	150
Type 304, 316, 321, 347	160
Type 304L, 316L	140

3.5 Following requirements for check valves shall be met over and above the valve specification sheet requirements:

3.5.1 Unless specified otherwise in the data sheet all check valves 3" & above (except in 900#, 1500# & 2500# rating) shall have a drain boss at location "G" (Refer Fig.No.1 of ASME B16.34) where pocket is formed in valve body. A tapped drain hole with plug shall be provided as per ASME B 16.34. Threads shall be as per ASME B 1.20.1 (Taper) NPT.

3.5.2 For heavy check valves, provisions shall be available for lifting by way of lugs, eye bolts and other such standard devices.

3.6 If an overlay weld-deposit is used for the body seat ring seating surface, the corrosion resistance of the seat ring base material shall be at least equal to the corrosion resistance of the material of the shell.

3.7 Following valve bypass requirements shall be met:

3.7.1 By-pass requirement for Gate valves shall be as follows unless otherwise mentioned.

ASME 150 Class	On sizes 26" and above
ASME 300 Class	On sizes 16" and above
ASME 600 Class	On sizes 6" and above
ASME 900 Class	On sizes 4" and above
ASME 1500 Class	On sizes 4" and above
ASME 2500 Class	On sizes 3" and above

3.7.2 The by-pass piping arrangement shall be such that clearance between main valve body and bypass assembly shall be the minimum possible for layout reasons. Vendor shall follow the sketch enclosed in this Specification No. SS-PI-012_A1.

3.7.3 By-pass valve shall be a globe valve. The sizes shall be as under:

On main valve <= 4"	:	1/2"
On main valve 6" to 8"	:	3/4"
On main valve 10" & above	:	1"

By-pass piping shall be of same metallurgy as main valve. The by-pass piping, fittings and valve tag numbers shall be as specified in Piping Material Specification (PMS).

3.8 Vendor shall supply the by-pass valve duly tested and fitted to the main valve. Valves with by-pass shall have the direction of flow marked on the main valve. By-pass attachment to the main valve body shall not be screwed. All fillet welds for by-pass installation shall be 100% examined by DP/MP test and Butt-weld joints shall be 100% examined by radiography.

3.9 Valve body / bonnet shall be forged / cast as specified. Forgings are acceptable in place of casting but not vice-versa.

3.10 Stem shall be forged or machined from forged / rolled bar. No casting is permitted. However, integral stem of cast material is acceptable for Plug valves.

3.11 Stelliting/ hardfacing by deposition shall be minimum 1.6 mm.

3.12 Renewable seat rings shall be seal welded for valves of size 3" and above to prevent loosening in service.

3.13 For Low Temperature & Cryogenic valve requirements, refer Specification. No. SS-PI-012_A2 unless otherwise specified.

3.14 For all austenitic stainless steel valves Inter Granular Corrosion (IGC) test shall be conducted as per the following:

3.14.1 ASTM A262 Practice 'B' with acceptance criteria of '60 mils/year (max.)' for all

materials forged, rolled, wrought and casting.

Or

ASTM A262 Practice `E' with acceptance criteria of 'No cracks as observed from 20X magnification' for all materials other than castings. Microscopic structure to be observed from 250X magnification' in addition.

3.14.2 When specifically asked for in MR for high temperature application of some grades of austenitic stainless steel (eg. SS309, 310, 316, 316H etc) ASTM A262 Practice 'C' with acceptance criteria of ' 15 mils/year (max.)' shall be conducted.

3.14.3 For the IGC test as described in Clauses 3.15.1 & 3.15.2, two sets of samples shall be drawn from each solution annealing lot. One set shall correspond to the highest Carbon content and the other to the highest pressure rating. When testing is conducted as per practice `E', of the microscopic structure shall be submitted for record.

3.15 All types of 321 or 347 stainless steel valves shall be in a stabilized heat treated condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking temperature and holding time for stabilizing heat treatment shall be 900°C and 4 hours respectively.

3.16 Spiral wound bonnet gaskets are to be provided with inner/ outer ring except when encapsulated gaskets type body-bonnet joints are employed. Outer ring may be avoided case of non-circular spiral wound gasket used in 150# valve provided the outermost layer of spiral touches the bolts ascertaining the centering.

3.17 All Stainless Steel Castings shall be solution heat treated.

3.18 Only normalized and tempered material shall be used in the following specifications:

Castings	:	A217 Gr.WC1, A217 Gr.WC4, A217 Gr.WC5, A217 Gr.WC6, A217 Gr.WC9, A217 Gr.C5, A217 Gr.C12
Forgings	:	A182 Gr.F11 C1.2, A182 Gr.F12 C1.2

3.19 Ball / Plug / Butterfly Valves

3.19.1 As a prequalification, fire safe test as per API 607/ API 6FA/ BS EN ISO 10497 (Supersedes BS 6755 Part II) shall be carried out on soft seated ball, plug & butterfly valves and also on lubricated plug valves The test shall be witnessed and certified by a approved third party inspection agency unless otherwise specified. The vendor has to submit test certificate for the particular design of the valve offered, if fire safe design is required as per the Valve Material Specification sheet.

3.19.2 Each valve shall be supplied with a lever / wrench except for gear operated / motor operated valves.

3.19.3 Soft-seated ball, plug & butterfly valves shall be supplied with antistatic devices.

3.19.4 BW / SW end ball valves shall have pipe nipple/ pup piece welded to each end of the valve. As specified in valve datasheets nipples/ pup piece are to be welded prior to assembling Teflon seats / seals. Specifications of the nipples shall be as indicated in the MR.

3.19.5 The face-to-face dimensions of all ball valves shall be same as those of gate valves of the corresponding ANSI class (except 10" onwards in Class 150 where the face-to-face dimensions shall be as per API 6D long patterns).

3.19.6 The ball of ball valve shall not protrude outside the end flanges of valve.

3.19.7 All Ball valves shall be of floating ball/ trunnion mounted type as per following:

150#	8" & below 10" & above	Floating ball Trunnion mounted
300#	4" & below 6" & above	Floating ball Trunnion mounted
600# & above	1.5" & below 2" & above	Floating ball Trunnion mounted

3.19.8 Unless otherwise specified in the data sheets/ MR, bore of all reduced bore ball valves shall be limited to one size lower than the nominal bore.

3.20 The MOVs are to be installed in an open area and the actuators shall be suitable for all weather conditions. The testing of complete assemblies of MOVs along with the actuators shall be done by the supplier at his works.

3.21 Ends of flanged valves of 22" size shall match corresponding flanges to MSS-SP44 unless otherwise specified.

3.22 Yoke material shall be same as bonnet material where maximum temperature specified is more than 427°C.

4. OPERATION

4.1 Gear operation shall be provided as under:

Valve Type	**Class**	**Size Requiring Gear-Operator**
Gate Valve, Globe Valve & Diaphragm Valve	150 Class	12" and larger
	300 Class	12" and larger
	600 Class	10" and larger
	900 Class	6" and larger
	1500 Class	3" and larger
	2500 Class	3" and larger
Ball Valve / Plug Valve (Other than pressure balance plug valves)	150 Class	6" and larger
	300 Class	6" and larger
	600 Class	4" and larger
	900 Class	3" and larger
	1500 Class	3" and larger
Butterfly Valve	150, 300 Class	6" and larger

For sizes lower than these ranges, hand wheel / lever / wrench shall be provided. For pressure balance plug valves manufacturer's recommendation shall be acceptable provided the requirements specified in clause 4.6 are met.

4.2 Gear operator shall be provided, with position indicators for open / close positions and with limit stops. (Limit stops are not applicable for gate and globe valves).

4.3 Where gear operator is not called for as per Clause 4.1 but vendor recommends a gear operator, the same shall be highlighted.

4.4 Gear operator shall be so designed as to operate effectively with the differential pressure across the closed valve equal to the cold non-shock pressure rating.

4.5 Ball, plug and butterfly valves, shall have "Open" position indicators with limit stops.

4.6 Hand wheel diameter shall not exceed 750mm and lever length shall not exceed 500mm on either side. Effort to operate shall not exceed 35 Kg at hand wheel periphery. However, failing to meet the above requirements, vendor shall offer gear operated valve and quote as per clause 4.3.

5. INSPECTION AND TESTING

5.1 Every valve shall be subjected to all the mandatory tests and checks called in the respective codes/ data sheet by any third party as approved by the purchaser. For IBR valves refer clause 7.0.

5.2 Every valve, its components and auxiliaries must be subjected to all the mandatory tests and checks called for in the respective codes, data sheets etc. by the manufacturer.

5.3 Though the extent of inspection shall be as under, exact extent withhold points shall be decided by company/ company representative and recorded in the form of inspection plan. In case of third party inspection, the inspection plan shall be approved by the purchaser.

Forged Valves:

1. Visual and dimensional inspection.
2. Review of material test certificates.
3. Any mandatory or supplementary test.
4. Hydrostatic test on 10% valves selected on random basis.
5. Strip check is required for 1% of total ordered quantity of Gate & Globe valves (min. 1 No.) for each Valve sheet no., however, strip check is not required for CS/ Brass/ Bronze material valves with 13% Cr/ Brass/ Bronze trims.

Cast Steel Valves:

1. Visual and dimensional inspection.
2. Review of material test certificates.
3. Review of radiographs/radiographic reports or any other NDT tests wherever applicable as per data sheet.
4. Any mandatory or supplementary test.
5. Hydrostatic test 100% for body, 10% other test.
6. Strip check is required for 1% of total ordered quantity of Gate & Globe valves (min. 1 No.) for each Valve sheet no., however, strip check is not required for CS/ Brass/ Bronze material valves with 13% Cr/ Brass/ Bronze trims.

Samples for strip check shall be selected at random and shall generally be in the highest size in the lot.

5.4 In case of motor operated or actuator operated valves, functional/ operational checks as per the requirements of the specifications shall be made on each valve.

6. RADIOGRAPHY OF CAST VALVES

6.1 Valve castings shall undergo radiographic examination as specified below.

Material	Rating	Size Range	Radiography
All	150#	24" and below	NIL**
		26" and above*	100%
	300#	16" and below	NIL**
		18" and above	100%
	600# & above	All sizes	100%

* No radiography is required for valves of size 26" and above in cooling water service.

**For sizes 24" & below in 150# and 16" & below in 300#, radiography percentage if specifically mentioned in individual valve material spec sheet shall govern.

Radiography specified as random 10% or 20% etc. in the respective valve data sheet implies 10% or 20% etc. of number of valves ordered against each item number with a minimum of one valve against each item.

6.2 Radiography procedure, areas of casting to be radiographed shall be as per ASME B 16.34 and acceptance criteria shall be as per ASME B 16.34 Annexure-B. However for areas of casting to be radiographed for types of valves not covered in ASME B 16.34, vendor shall radiograph castings in line with ASME B 16.34.

6.3 For random radiography wherever specified in individual data sheets, the sampling shall be per size of the quantity ordered for each foundry.

6.4 Radiography wherever specified in the data sheets or as per clause 6.1 shall be done by X-ray / Gamma-ray to get the required sensitivity.

7. IBR CERTIFICATION

7.1 For valves described "IBR", valves shall be in accordance with the latest IBR (Indian Boiler Regulation) including the requirements specified in the specification.

7.2 For SW / BW end carbon steel valves under IBR, the chemical composition shall conform to the following:

Carbon (Max) : **0.25%**

Others (S, P, Mn) : **As per IBR**

7.3 Valves coming under the purview of "IBR"(Indian Boiler Regulations) shall each be individually accompanied by IBR certificate original in Form III-C duly approved by IBR authority / local authority empowered by the Central Boiler Board of India. Photocopy

of original certificate duly attested by the local boiler inspector where the supplier is located is the minimum requirement for acceptance.

7.4 All "IBR" valves shall be painted red in body-bonnet / body-cover joint.

8. MARKING

8.1 Valve markings, symbols, abbreviations etc. shall be in accordance with MSS-SP-25 or the standard referred in specification sheet as applicable. Vendor's name, valve rating, material designation, nominal size, direction of flow (if any) etc. shall be integral on the body.

8.2 Each valve shall have a corrosion resistant tag giving size, valve tag / code no., securely attached to the valve body.

8.3 Paint or ink for marking shall not contain any harmful metal or metal salts such as zinc, lead or copper which cause corrosive attack on heating.

8.4 Carbon Steel / Alloy Steel valves shall be painted with one coat of inorganic zinc silicate (minimum DFT 65 to 75 microns).

9. DESPATCH

9.1 Valve shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.

9.2 Valves shall be protected from rust, corrosion and any mechanical damage during transportation, shipment and storage.

9.3 Rust preventive on machined surfaces to be welded shall be easily removable with a petroleum solvent or shall not be harmful to welding.

9.4 Each end of valve shall be protected with the following materials:

Flange Face	:	Wood or Plastic Cover
Bevelled End	:	Wood or Plastic Cover
SW & SCRD. End	:	Plastic Cap

9.5 End protectors of wood / plastic to be used on flange faces shall be attached by at least three bolts and shall not be smaller than the outside diameter of the flange. However, plastic caps for SW & SCRD end valves shall be press fit type.

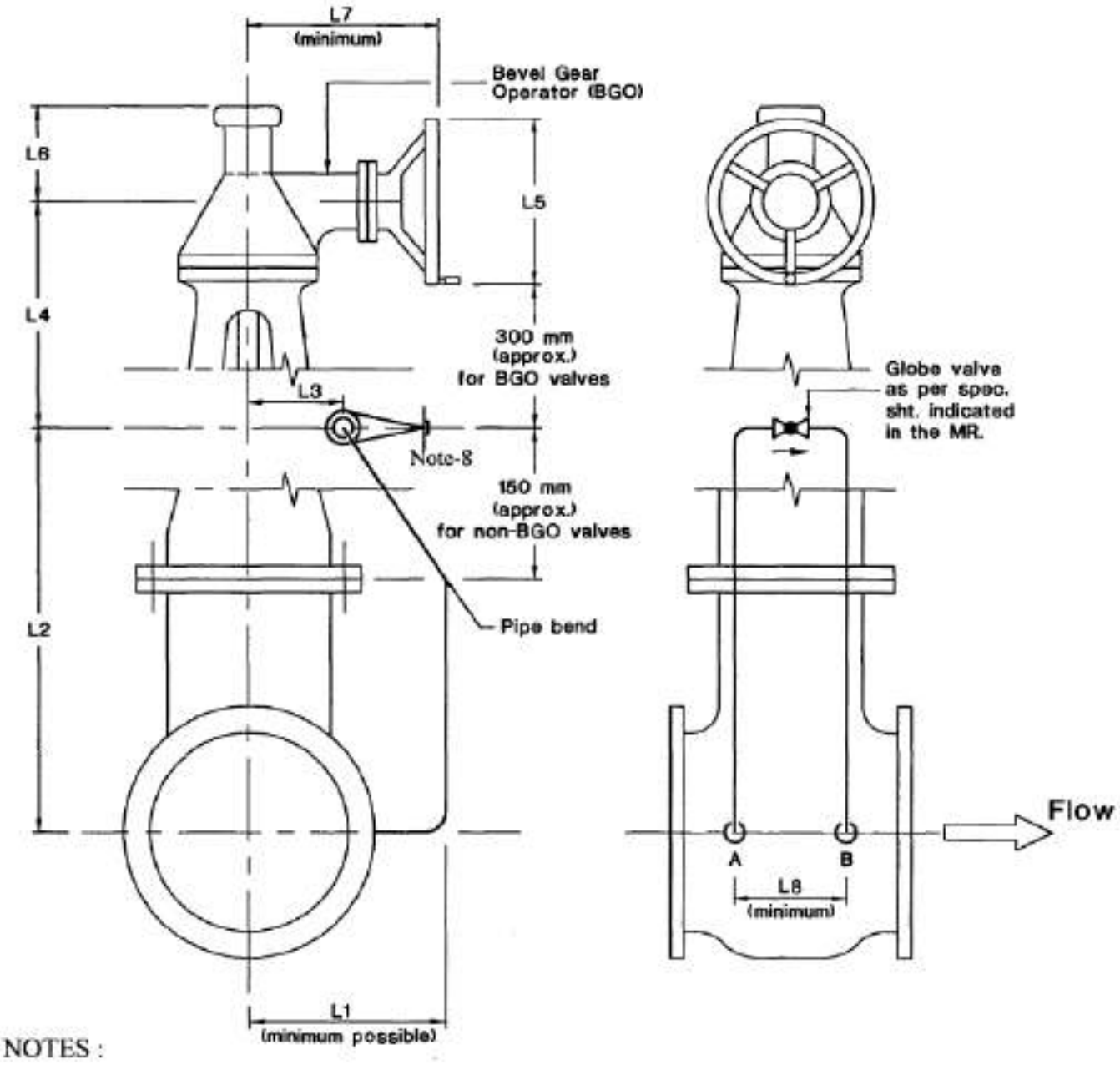
9.6 End protectors to be used on beveled end shall be securely and tightly attached.

9.7 For special service valves additional requirement for dispatch shall be as prescribed in data sheet.

10. ATTACHMENTS

SS-PI-012_A1	:	Bypass Piping Arrangement
SS-PI-012_A2	:	Special Requirements for Low Temperature and Cryogenic Valves

BYPASS PIPING ARRANGEMENT
(SS-PI-012-A1)



NOTES :

1. The orientation & location of hand wheel of bevel gear operator & the bypass arrangement shall be strictly as per this sketch.
2. The bypass connection ends shall be socket welded up to 600# and butt welded for 900#and above rating.
3. The bypass arrangement shall be properly clamped to & supported by the body of the main valve.
4. Basic design of bypass shall be to MSS-SP-45.
5. Material of bypass pipe & 90° elbows shall be same or equivalent to the body material.
6. Sketch is applicable for both BGO & NON-BGO Valves.

7. Vendor shall furnish dimensions L1 to L8.
8. Stem shall not be horizontal in the case of CRYO Valves

SPECIAL REQUIREMENTS FOR LOW TEMPERATURE & CRYOGENIC VALVES (SS-PI-012-A2)

11. SCOPE

All valves of Low Temperature Carbon Steel (LTCS) and all grades of austenitic (CRYO) materials are categorized as cryogenic valves. All these valves shall have extended bonnet as per BS 6364 except check valves.

Following qualification criteria shall be met by the valve vendors to quote valves for cryogenic services:

12. QUALIFICATION CRITERIA

I. Both cryogenic test (clause 2.1) and reference list (clause 2.2) together shall be for vendor qualification and vendor shall furnish the same, along with his offer.

II. Vendors who do not have cryogenic test reports and reference list covering valves of all materials and ratings required by MR, should confirm / furnish the following for consideration of their offer:

a. Evidence of having conducted successfully at least one cryogenic test as per BS 6364. Test certificate shall be furnished with the offer.

b. Vendor shall confirm to conduct cryogenic test per clauses 2.1 & 2.3 for the remaining valves not later than 12 weeks from the date of purchase order.

c. Vendor shall also furnish reference list for valves supplied for non-cryo service if reference list referred in 2.2.1 does not cover all the sizes of MR.

Offers of vendors who do not comply with above requirements would be rejected.

12.1 Cryogenic Test

Vendors to furnish copies of cryogenic test certificate for tests conducted as per given below:

12.1.1 Test shall be as per BS 6364.

12.1.2 Test temperature, unless specifically called for otherwise in the individual MR, shall be -45°C for LTCS and -196°C for all grades of austenitic stainless steel.

12.1.3 Tests carried out on a particular size of one type of valve, pressure rating and material shall qualify all sizes equal to and below the test valve size for the same type, pressure rating and material. In case of austenitic SS any one grade would qualify for all other grades of austenitic SS.

12.1.4 Tests should have been witnessed and certified by approved third party inspection agencies.

12.1.5 Cryogenic test need not be conducted for every order. Test conducted previously and witnessed by inspection agencies listed above shall be considered acceptable and need not be repeated.

12.2 Reference List

Vendor shall furnish reference list for valves supplied for cryogenic service indicating the name of client, year of supply, size, material, pressure rating, type of valve and quantity.

12.3 Post Order Testing Procedure

12.3.1 Before conducting post order testing, vendor shall submit the following for approval:

a. Test procedure (as per BS 6364).

b. Cross-section drawing of the valve with material of construction.

c. Schematic of test rig (as per BS 6364) with complete details.

12.3.2 Test has to be conducted irrespective of the service on largest size for each type of valve and for each material and class rating. Vendor shall offer one, two or three valves for selection of test valve by inspector depending upon whether quantity of largest valve in the order is one, two or three and more than three respectively.

In the event of failure of the test valve to meet the specification requirements, the vendor shall conduct test on two more valves. These two valves which pass test successfully, are of lower size, then the qualification will be valid only to sizes upto which test has been conducted successfully.

12.3.3 In case of non-conductance of cryogenic test(s) within 12 weeks or failure in the test(s) conducted after receipt of order, the owner reserves the right to invoke any of the of the purchase order including cancellation of the purchase order at the risk and cost of vendor.

13. Bonnet extension, wherever specified in the valve sheet to BS 6364 shall be for "non cold box application" unless otherwise specified in the MR. Even if not called for in valve sheet, valves indicated as "LT" or "CRYO" shall be supplied with bonnet extension.

14. Bonnet and Gland extension joints shall be of butt welded/integrally cast construction.

15. Repair welding procedure for austenitic stainless steel valves in "CRYO" service shall have to be qualified for impact test as per ASME B31.3. Minimum acceptable impact energy shall be 20 J or lateral expansion of 0.38 mm at temperature of -196°C.

16. Wherever impact test of SS studs / nuts is called for in the data sheet, the impact value shall be 27 J at the intended service temperature specified in the data sheets.

ENERGISING QUALITY

VCS QUALITY SERVICES PVT.LTD.

STANDARD SPECIFICATION
FOR
SEAMLESS (SMLS) LINE PIPE (ONSHORE)

VCS-PP-SS-2036

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
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CONTENTS

1. SCOPE

This specification establishes the minimum requirements for the manufacture of seamless steel line pipe for onshore service in accordance with the requirements of API (American Petroleum Institute) Specification 5L, Forty-Fifth Edition, 2012 and makes restrictive amendments to API Specification 5L. Unless modified and/or deleted by this specification, the requirements of API Specification 5L shall remain applicable.

The sections, paragraphs and annexes contained herein have the same numbering as that of API Spec 5L in order to facilitate reference. Additional requirements, which are not specified in API Spec 5L, have also been numbered and marked as "(New)".

The coverage by this specification is limited to line pipe to be used in onshore pipelines transporting non-sour hydrocarbons in liquid or gaseous phase. The product specification level for line pipe to be supplied as per this specification shall be "PSL 2".

The Manufacturer shall have a valid license to use API Monogram in accordance with the requirements of Specification 5L, Forty-Fifth Edition, 2012 for line pipe as Product Specification Level PSL 2.

1.1 Pipe Size

This Specification shall be applied to line pipe of size 4.5” OD thru 16" OD (both sizes included).

3. NORMATIVE REFERENCES

The latest edition (edition enforce at the time of issue of enquiry) of following additional references are included in this specification:

ASTM

ASTM E112: Standard Test Methods for Determining Average Grain size

6. PIPE GRADE, STEEL GRADE AND DELIVERY CONDITION

6.1 PIPE GRADE AND STEEL GRADE

6.1.2 Line pipe supplied to this specification shall conform to Product Specification Level 2 (PSL2) as given in Table 1 of this specification and consists of an alpha or alphanumeric designation that identifies the strength level of the pipe. The steel name (designating a steel grade), linked to the chemical composition of the steel, additionally includes a suffix that consists of a single letter (N or Q) that identifies the delivery condition as per Table 3 of this specification.

Table 1 of API Spec 5L stands replaced by Table 1 of this specification.

Table 1- Pipe grades, steel grades and acceptable delivery conditions

PSL	Delivery Condition	Pipe grade! steel grade [a,b]
PSL -2	Normalized	BN, X42N, X46N, X52N
	Quenched and tempered	BQ, X42Q, X46Q, X52Q, X56Q, X60Q, X65Q & X70Q
a Deleted b The suffix (N or Q) for PSL 2 grades belongs to steel grade		

6.2 DELIVERY CONDITION

6.2.2 The delivery condition for starting material shall be in accordance with Table 1 of this specification.

8 MANUFACTURING

8.1 PROCESS OF MANUFACTURE

Pipe furnished to this specification shall be manufactured in accordance with the applicable requirements and limitations given in Table 2 of API Spec 5L and Table 3 of this specification.

Table 3 of API Spec 5L stands replaced by Table 3 of this specification.

Table 3 - Acceptable manufacturing routes for PSL 2 pipe

Type of Pipe	Starting Material	Pipe forming	Pipe heat treatment	Delivery condition
SMLS	Ingots, Bloom or billet	Normalising forming	None	N
		Hot forming	Normalising or Quenched & Tempered	N or Q
		Hot forming and cold finishing		N or Q

8.3 STARTING MATERIAL

8.3.2 Line pipe furnished to this specification shall be made from steel produced in basic oxygen or electric arc furnace. Steel shall be made by continuous casting only.

8.3.3 The steel used for manufacture of pipe shall be fully killed and fine grained with ASTM grain size number 7 or finer as per ASTM E 112.

8.9 COLD SIZING AND COLD EXPANSION

8.9.1 Pipes furnished to this specification shall be non-expanded.

8.11 JOINTERS

8.11.1 Jointers on pipes are not permitted.

9 ACCEPTANCE CRITERIA

9.2 CHEMICAL COMPOSITION

9.2.2 For pipes supplied as per this specification, the chemical composition of each heat of steel on product analysis shall be as given in Table 5 of this specification.

Table 5 of API Spec 5L stands replaced by Table 5 of this specification.

Table 5 - Chemical composition for pipe

Element	Mass fraction based upon heat and product analyses (%)	
C [b]	0.16	max.
Si	0.15 [m(new)]	min.
	0.40	max. (For Grade B to X46)
	0.45	max. (For Grade X52 to X70)
Mn [b]	1.20	max. (For Grade B to X42)
	1.40	max. (For Grade X46 to X70) for delivery condition N
	1.50	max. (For Grade X46 to X 56) for delivery condition Q
	1.60	max. (For Grade X60 to X70) for delivery condition Q
P	0.020	max.
S	0.010	max.
V	c	(For Grade B)
	0.05	max. (For Grade X42 to X52)
	0.07[g]	max. (For Grade X56)
	0.08[g]	max. (For Grade X60 to X70)
Nb	c	(For Grade B)
	0.05[g]	max. (For Grade X42 to X70)
Ti	0.04[g]	max. (For Grade B to X60)
	0.06[g]	max. (For Grade X65 & X70)
Al [n (new)]	0.07	max.
Cr	0.20	
Mo	0.10	
Cu [o (new)]	0.35	
Ni [o (new)]	0.20	
N [n (new)]	0.012	
B	0.0005	

a Based upon product analysis as per clause 9.2.4 and 9.2.5 of API Spec 5L, the CE_{Pcm} limits apply if C ≤ 0.12% and CE_{IIW} limits apply if C > 0.12%. For pipes of all grades, sizes and wall thicknesses, Carbon Equivalent shall comply with the following limits:

$CE_{Pcm} \leq 0.20$ %

$CE_{IIW} \leq 0.40$ %

Boron content shall be considered in CE_{Pcm} formula even if it is less than 0.0005%.

b Deleted

c Nb + V ≤ 0.06%

d Deleted

e Deleted

f Deleted

g Nb + V + Ti ≤0.15%

h Deleted.

I Deleted

j Deleted
k Deleted
l Deleted
(New) m Minimum for Si is not applicable for Al killed steel.
(New) n Al/N shall be minimum 2 (not applicable to titanium-killed steel or titanium-treated steel).
(New) o Cu + Ni ≤0.40%

9.2.3 For heat analysis and product analysis, all the elements listed in Table 5 of this specification shall be analysed and reported, even if those are not purposely added but are present as residuals only.

If alloying elements other than those specified in Table 5 of this specification are added to the steel, the limits of the additional components shall be agreed with the Purchaser.

9.3 TENSILE PROPERTIES

9.3.2 The finished pipe (after all heat treatment & sizing operations) shall conform to the requirements of Table 7 of API Spec 5L and as modified herein.

The actual yield strength shall be as close as possible to the specified minimum yield strength (SMYS) but in no case it shall exceed the limits specified here under:

API Spec 5L Grade	Permissible in excess of SMYS, MPa (psi)
Up to and including X46	131 (19,000)
X52 to X60	125 (18,000)
X65 to X70	120 (17,400)

The ratio of body yield strength and body tensile strength of each test pipe on which yield strength and ultimate tensile strength are determined, shall not exceed 0.90.

The minimum elongation of base metal shall be determined in accordance with the formula given in foot note (f) of Table 7 of API Spec 5L, however, minimum elongation shall be at least 20% for t ≤ 12.7 mm and 22% for t > 12.7 mm.

8 CVN IMPACT TEST FOR PSL 2 PIPE

9.8.1 General

9.8.1.2 From the set of three Charpy V-notch impact test pieces, only one is allowed to be below the specified average absorbed energy value and shall meet the minimum single absorbed energy value requirement as specified in Table 8 of this specification.

9.8.2 Pipe body tests

9.8.2.1 The average (set of three test pieces) absorbed energy value (KvT) for each pipe body test shall be as specified in Table 8 of this specification, based upon full sized test pieces at a test temperature of 0°C(32°F) or at a lower test temperature as specified in the Purchase Order/Material Requisition /Data sheets.

Table 8 of API Spec 5L stands replaced by Table 8 of this specification.

Table 8 - CVN absorbed energy requirements

for pipe body of PSL 2 pipe

Pipe Grade	Full-size CVN absorbed energy (KvT) [a.b] [J]	
	Average	Minimum
B	40	33
X42	40	33
X46	40	33
X52	40	33
X56	40	33
X60	42	35
X65	45	38
X70	50	40

a. The required KvL (longitudinal direction test pieces) values shall be 50% higher than the required KvT values.

b. Testing shall be performed at a test temperature of 0° C (32°F) or at a lower temperature as specified in the Purchase Order/ Material Requistion/ Data sheet

9.8.2.2 The minimum average (set of three test pieces) shear fracture area shall be at least 85 % with one minimum value of 75%, based at a test temperature of 0 °C (32 °F) or at a lower test temperature as specified in the Purchase Order /Material Requisition/Data sheet.

9.10 SURFACE CONDITIONS, IMPERFECTIONS AND DEFECTS

9.10.1 General

9.10.1.2 All pipes shall be free from cracks, sweats, leaks and slivers. Pipe containing such defects shall be treated in accordance with clause C.3 b) or C.3 c) of API Spec 5L.

9.10.4 Laminations

Any lamination or inclusion either extending into the face or bevel of the pipe or present within 50 mm from pipe ends shall be classified as defect. Pipes that contain such defects shall be rejected or cut back until no lamination or inclusion is present at the pipe ends and shall be treated in accordance with clause C.3 b) or C.3 c) of API Spec 5L.

9.10.5 Geometric deviations

9.10.5.2 For dents, the length in any direction shall be ≤ 0.5 D and the depth, measured as the gap between the extreme point of the dent and the prolongation of the normal contour of the pipe, shall not exceed the following:

a) 2 mm for types of dents and not encroaching upon the minimum specified wall thickness

Dents that exceed the above specified limits shall be considered as defect and shall be treated in accordance with clause C.3 b) or C.3 c) of API Spec 5L. Acceptable cold-formed dents with sharp-bottom gouges shall be treated in accordance with clause C.2 of API Spec 5L & as modified in this specification.

9.10.6 Hard Spots

Any hard spot larger than 50 mm (2.0 in) in any direction and hardness greater than 248HV 10 shall be classified as defect and treated in accordance with clause C.3 of API Spec 5L.

9.10.7 Other surface imperfection

Other surface imperfections found by visual inspection or non-destructive inspection shall be investigated, classified and treated as follows:

a) Imperfections that have a depth ≤ 0.05 t and do not encroach on the minimum specified wall thickness shall be classified as acceptable imperfections and shall be treated in accordance with Clause C.1 of this specification.

b) Imperfections that have a depth > 0.05 t and do not encroach on the minimum specified wall thickness shall be classified as defects, and shall be dressed-out by grinding in accordance with Clause C.2 of API Spec 5L and as modified in this specification or shall be treated in accordance with clause C.3 of API Spec 5L.

c) Imperfections that have a depth > 0.05 t and encroach on the minimum specified wall thickness shall be classified as defects and treated in accordance with clause C.3 of API Spec 5L.

9.11 DIMENSIONS, MASS AND TOLERANCES

9.11.3 Tolerances for diameter, wall thickness, length and straightness

9.11.3.1 The diameter and out-of-roundness shall be within the tolerances given in Table 10 of this specification.

Table 10 of API Spec 5L stands replaced by Table 10 of this specification.

Table 10 - Tolerances for diameter and out-of-roundness

Specified outside Diameter (D) mm (inch)	Diameter tolerances [d]		Out-of-roundness	
	Pipe except the end [a]	Pipe end [a,b,c]	Pipe except the end [a]	Pipe end [a,b,c]
114.3 (4 1/2) ≤ D ≤ 168.3 (6.625)	± 0.0075 D	-0.4 mm to + 1.6mm	0.020D	2.0mm
168.3 (6.625) < D ≤ 273.1 (10.750)		±0.005 D, but maximum of ± 1.6mm		2.0mm
273.1 (10.750) < D ≤ 406.4 (16)				3.0mm

a. The pipe end includes a length of 100 mm at each of the pipe extremities.
b. Deleted
c. The diameter tolerance and out-of-roundness tolerance shall apply on inside diameter. The inside diameter, based on circumferential measurement, shall be calculated as ID = (D – 2t).
d. For determining compliance to the diameter tolerances, the pipe diameter is defined as the circumference of the pipe in any circumferential plane divided by Pi (π).
e(new). Out-of-roundness tolerances apply to maximum and minimum diameters as measured with bar gage, caliper, or device measuring actual, maximum and minimum diameters.

9.11.3.2 In addition to API requirements, the wall thickness of each pipe shall be checked along the circumference at both ends and at the mid location of pipe body at 12 O' clock, 3 O' clock, 6 O' clock and 9 O' clock positions. The tolerances for wall thickness shall be as given in Table 11 of this specification.

Table 11 of API Spec 5L stands replaced by Table 11 of this specification.

Table 11- Tolerances for wall thickness

Wall thickness (mm)	Tolerances c, d (mm)
t < 10.0	+0.225 t -0.05 t
10.0 ≤ t < 25.0	+0.20 t -0.05 t
t ≥ 25.0	+5.00 -1.25

a Deleted
b Deleted
c The + ve tolerance for wall thickness does not apply to the weld area.
d See 9.13.2 of API Spec 5L and as modified herein for additional restrictions.

9.11.3.3 All pipes shall be supplied with length between 11.5 m and 12.5 m. However pipe with length between 10.0 m and 11.5 m can also be accepted for a maximum of 5% of the ordered quantity. The minimum average length of the entire ordered quantity in any case shall be 12.0 m. Overall length tolerance shall be (-) Zero and (+) One pipe length to complete the ordered quantity. Table 12 of API Spec 5L stands deleted.

9.11.3.4 The tolerances for straightness shall be as follows:

a) The total deviation from a straight line over the entire pipe length shall not exceed 12 mm, as shown in Figure I of API Spec 5L.

b) The local deviation from straight line in 1.0 m (3.0 ft) portion at each pipe end shall be ≤ 3.0 mm (0.120 in), as shown in Figure 2 of API Spec 5L.

9.12 FINISH OF PIPE ENDS

9.12.5 Plain ends

9.12.5.6

(New) During removal of inside burrs at the pipe ends, care shall be taken not to remove excess metal and not to form an inside cavity on bevel. Removal of excess metal beyond the minimum wall thickness as indicated in clause 9.11.3.2 of this specification shall be a cause for re-bevelling. In case root face of bevel is less than that specified, the pipe ends shall be re-bevelled and rectification by filing or grinding shall not be done.

9.12.5.7

(New) Bevel Protectors

Both pipe ends of each pipe shall be provided with metallic or high impact plastic bevel protectors as per Manufacturer's standard. Bevel protectors shall be of a design such that they can be re-used by coating applicator for providing on externally anti-corrosion coated pipes subsequent to coating of line pipe.

10 INSPECTION

10.1 TYPES OF INSPECTION AND INSPECTION DOCUMENTS

10.1.3 Inspection documents for PSL 2 pipes

10.1.3.1 Inspection certificate 3.2 in accordance with EN 10204 shall be issued for each dispatched pipe by Purchaser's authorized representative.

10.2 SPECIFIC INSPECTION

10.2.1 Inspection frequency

10.2.1.2 For PSL 2 pipe, the inspection frequency shall be as given in Table 18 of this specification.

Table 18 of API Spec 5L stands replaced by Table 18 of this specification.

Table 18 - Inspection frequency of pipe

Sl. no.	Type of inspection	Frequency of inspection
1	Heat analysis [a]	One analysis per heat of steel
2	Product analysis [b]	Two pipes per lot (maximum 100 pipes) per heat
3	Tensile testing of the pipe body	Two pipes per lot (maximum 100 pipes) per heat
4	CVN impact testing of the pipe body	Once per test unit of not more than 100 pipes
5	Vickers hardness testing of Pipe body	Once per test unit of not more than 50 pipes

6	Hydrostatic testing	Each pipe
7	Visual inspection	Each pipe
8	Pipe diameter and out-of-roundness for pipe [d]	Each pipe
9	Wall thickness measurement [d]	Each pipe
10	Straightness [d]	At least 3 times per operating shift (12 hours maximum)
11	Other dimensional testing	Random testing, with the details left to the discretion of the manufacturer
12	Weighing of pipe	Each pipe shall be measured and recorded
13	Non-destructive inspection	In accordance with Annex E of API Spec 5L and as modified herein
14	Length	Each length of pipe shall be measured and recorded

a. Where the steel mill is not a part of an integrated pipe mill, heat analysis shall be reported by the Manufacturer prior to start of pipe production.
b. Pipes selected shall be such that one at the beginning of the heat and one at the end of the heat are also represented.
c. Deleted.
d. Measurement shall be recorded at least 3 times per operating shift (12 hrs maximum).
e. "Test unit" is as defined in clause 4.62 of API Spec 5L.

10.2.2 Samples and test pieces for product analysis

Samples shall be taken, and test pieces prepared, in accordance with ISO 14284 or ASTM E1806. Samples used for product analysis shall be taken from finished pipes only.

10.2.3 Samples and test pieces for mechanical tests

10.2.3.1 General

In addition to API Spec 5L requirements, samples and test pieces for various types of tests shall be taken from Figure 5 a) of API Spec 5L and Figure 10.2.4.8.1 of this specification, whichever is applicable, and as given in Table 20 of this specification.

Table 20 of API Spec 5L stands replaced by Table 20 of this specification.

Table 20 - Number, orientation and location of test pieces per sample for mechanical tests

Sample Location	Type of test	Number, Orientation and location of test pieces per sample [a]
Pipe body	Tensile	1L, 1T[b]

	CVN	3T
	Hardness	1T
a See figure 5 (b) of API Spec 5L for an explanation of the symbols used to designate orientation and location. b The transverse tensile tests shall be carried out on pipes of D ≥ 219.1 mm.		

10.2.3.2 Test pieces for the tensile test

Tensile test specimens shall be taken from finished pipes only. Heating or artificial ageing of tests pieces is not permitted.

Transverse test pieces shall have a round cross-section and shall be obtained from non - flattened samples prepared according to ASTM A370.

Longitudinal tensile tests shall be carried out on a strip specimen representing full wall thickness of the pipe prepared according to ASTM A370.

10.2.3.3 Test pieces for the CVN impact test

In addition to the API Spec 5L requirements, following shall also be applicable:

The test pieces shall be prepared in accordance with ASTM A370. Non-flattened test pieces shall be used. Test specimen shall be taken from the body of the finished pipe only. The axis of the notch shall be perpendicular to the pipe surface.

Charpy V-notch impact testing shall be performed on full-sized test pieces. However, if preparation of full size test piece is not possible, then standard sub-sized test pieces shall be prepared as per ASTM A370.

In case of lower pipe sizes wherein preparation of transverse sub-sized specimen is not possible, CVN impact testing shall be carried out on longitudinal test specimen [see Note 'a' of Table 8 of this specification].

10.2.3.8 Samples for hardness tests

(New) Samples for hardness tests shall be taken transverse to the pipe body [see Figure 5 a) key 2] from the pipe ends.

10.2.4 Test methods

10.2.4.3 CVN impact test

The Charpy test shall be carried out in accordance with ASTM A370.

10.2.4.8 Hardness test

In addition to the requirements of API Spec 5L, following shall also be applicable:

Vickers hardness tests shall be carried out in accordance with ISO 6507-1. The resulting Vickers hardness value at any point shall not exceed 248 HV_{10}. Hardness test locations shall be as shown in Figure 10.2.4.8.1 of this specification.

Modalities of retest shall be in accordance with clause 10.2.12.7 of API Spec 5L.

10.2.6 Hydrostatic test

10.2.6.1 Test pressure shall be held for a minimum period of 15 seconds for all sizes and grades of pipes.

10.2.6.2 In addition to the requirements of API Spec 5L, following shall also be applicable:

The pressure gauge used for hydrostatic testing shall have a minimum range of 1.5 times and maximum range of 4 times the test pressure. The test-pressure measuring device shall be calibrated by means of a dead-weight tester only. The test configuration shall permit bleeding of trapped air prior to pressurization of the pipe.

10.2.6.5 The test pressure for all sizes and grades of pipe shall be such that hoop stress (fibre stress) generated is at least 95% of SMYS, computed based on the Equation (6) indicated in clause 10.2.6.5 of API Spec 5L. Table 26 of API Spec 5L stands deleted.

10.2.7 Visual inspection

10.2.7.1 Each pipe shall be visually examined for entire external surface and internal surface to the extent feasible and shall be free of defects in finished condition. Visual examination shall be carried out in a sufficiently illuminated area; minimum 1000 1x. If required additional lights shall be used to obtain good contrast and relief effect between imperfections and backgrounds.

10.2.8 Dimensional testing

10.2.8.1 Diameter measurements shall be made with a circumferential tape only.

10.2.8.7 The measuring equipment requiring calibration or verification under the provisions of API Spec 5L shall be calibrated with manual instruments at least once per operating shift (12 hours maximum). Such calibration records shall be furnished to Purchaser's Representative on request.

10.2.10 Non-destructive inspection

Non-destructive inspection shall be performed in accordance with Annex E of API Spec 5L and as modified herein.

10.2.11 Reprocessing

This clause of API Spec 5L stands cancelled.

10.2.12 Retesting

10.2.12.1 Recheck analyses

Modalities of recheck analysis shall be as per API Spec 5L as applicable to the lot being tested (see Table 18 of this specification). However, during individual testing, each pipe shall be fully analysed to meet the requirements of Table 5 of this specification.

11 MARKING

11.1 GENERAL

11.1.1 Pipe manufactured in accordance with this specification shall be marked by the manufacturer as per the requirements of API Spec 5L and as modified herein. Marking shall be in English language and International System (SI) of Units.

11.1.5(New) Marking shall also include Purchase Order number, item number, pipe number and heat number.

11.2 Pipe markings

11.2.1 k) (New). Actual length in metres and actual pipe weight in kg shall be marked

11.2.2 c) (New). Paint used for stencil marking shall withstand a temperature up to 250°C expected to be experienced during further external anti-corrosion coating operations of line pipe by coating applicator.

11.2.3 The pipe number shall be placed by cold rolling or low stress dot marking or vibro-etching on the outside surface of the pipe at an approximate distance of 50 mm from both ends. In case of non-availability of either cold rolling or low stress dot marking facility in pipe mill, an alternative marking scheme of a permanent nature may be proposed by the Manufacturer

11.2.7 A colour code band shall be marked on inside surface of finished pipe for identification of pipes of same diameter but different wall thickness, as indicated in the Purchase Order.

The colour code band shall be 50 mm wide and shall be marked at a distance of 150 mm from the pipe ends.

12 COATINGS AND THREAD PROTECTORS

12.1.1 Unless otherwise specified in the Purchase Order, the pipes shall be delivered bare, free of any trace of oil, stain, grease and paint. Varnish coating shall be applied on the marking area. Bevels shall be free of any coating.

13 RETENTION OF RECORDS

In addition to the records indicated in API Spec 5L, the Manufacturer shall retain the records of all additional tests and calibration records mentioned in this specification including the hard copy records of ultrasonic testing carried out on pipe/coil as well as pipe ends.

14 PRODUCTION REPORT

(New) The Manufacturer shall provide one electronic copy and six hard copies of production report in English language indicating at least the following for each pipe. International system of units (SI) shall be adopted.

- Pipe number
- Heat number from which pipe is produced
- Pipe length and weight
- Pipe grade

The Manufacturer shall provide one electronic copy and six hard copies of acceptance certificates which shall include the results of all tests required as per this specification and performed on delivered material giving details of, but not limited to, the following:

- All test certificates as per clause 10.1.3 of API Spec 5L and as modified herein.
- Certified reports of dimensional inspection, surface imperfections & defects.
- Data on test failures, rejected heats/lots, etc.
- Information on production and shipping
- All other reports and results required as per this specification.

The certificates shall be valid only when signed by the Purchaser's Representative. Only those pipes, which have been certified by the Purchaser's Representative, shall be dispatched from the pipe mill.

In the event of small quantities of pipes supplied against this specification, the production report may consist of only test certificates required as per clause 10.1.3 of API Spec 5L and as modified herein and other test reports/results required as per this specification.

15 INSPECTION OF FIELD TESTS & WARRANTY

(New) Purchaser shall be reimbursed by Manufacturer for any pipe furnished on this order that fails under field hydrostatic test if such failure is caused by a material/ manufacturing defect in the pipe. The reimbursement cost shall include pipe, labour and equipment rental for finding, excavating, cutting out and installation of replaced pipe in position. The field hydrostatic test pressure will not exceed that value which will cause a calculated hoop stress equivalent to 95 percent of specified minimum yield strength.

In case Manufacturer so desires, he will be advised at least two weeks in advance so that his Representative may witness the hydrostatic test in field, however, the testing and leak (if any) finding and repair operation shall not be postponed because of absence of the Manufacturer's Representative.

Annex B

Manufacturing Procedure Qualification for PSL 2 Pipe

B.1 INTRODUCTION

B.1.1 This annex specifies additional provisions that apply for the PSL 2 pipes ordered as per this specification.

B.1.2 Two lengths each of completely finished pipes from two different heats (i.e. a total of four pipe lengths) shall be selected at random for testing as per clause B.5.1 of this specification to verify that the manufacturing procedure results in the quality of pipes which are in complete compliance with this specification. The pipes thus tested shall be considered to be the test pipes required per heat or per lot as per relevant clauses of this specification.

These manufacturing procedure qualification tests (MPQT) shall be repeated upon any change in the manufacturing procedure as deemed necessary by Purchaser's Representative. The manufacturing procedure qualification tests shall be carried out on pipes for each wall thickness, each diameter and each grade of steel.

B.1.3 Verification of the manufacturing procedure shall be by qualification in accordance with clause B.3, B.4 and B.5 of API Spec 5L and as modified herein.

Note: In the event of small quantities of pipes ordered against this specification, like those for bends and other similar applications, as specifically called out in the Purchase Order, the manufacturing procedure qualification test as per clause B.5.1 of this specification shall not be carried out. Pipes in such case shall be accepted based on regular production tests.

B.3 CHARACTERISTICS OF THE MANUFACTURING PROCEDURE SPECIFICATION

Before pipe production commences, Manufacturing Procedure Specification (MPS) for manufacturing of pipes and Statistical process control charts shall be prepared by pipe manufacturer and submitted for approval of the Purchaser.

B.5 MANUFACTURING PROCEDURE QUALIFICATION TESTS (MPQT)

B.5.1 For the qualification of the manufacturing procedure, all tests & inspections specified in Table 18 and clause B.5.2 of this specification shall be conducted on all the pipes selected for testing as per clause B.1.2 of this specification.

B.5.2 The Manufacturer shall submit to Purchaser a report giving the results of all tests mentioned below. The report shall be agreed and signed by Purchaser's Representative, prior to start of regular production.

The various tests to be conducted on each pipe shall be as follows. The test method and acceptance values shall be as per this specification unless specified differently in this Annex.

a. **Visual Examination**

All pipes shall be examined visually for dimensional tolerances and apparent surface defects.

b. **Ultrasonic Examination**

The weld seam of all pipes shall be examined ultrasonically by automatic ultrasonic equipment.

c. **Mechanical Properties**

The mechanical properties of all pipes shall be tested and shall meet the requirements of this specification. Purchaser's Representative will select the places in pipe from where the test pieces shall be extracted.

The following tests shall be conducted:

i. Tensile test

Tensile tests as per Table 20 and clause 10.2.3.2 of this specification shall be conducted on:

- Two (2) transverse test pieces for pipe of D ≥ 219.1 mm (8.625 inch):

- Two (2) longitudinal test pieces

ii. CVN impact testing

Four sets of three transverse specimens shall be extracted from base metal for CVN impact tests including fracture toughness testing. The specimen shall be tested at - 40°C, -10°C, 0°C, +20°C for shear area and absorbed energy to produce full transition curve. The value for shear area and absorbed energy at the test temperature specified in clause 9.8 and Table 8 of this specification respectively shall be complied with. For other temperatures, test values shall be for information only.

iii. Hardness test

Hardness test shall be conducted on selected pipes as per requirement of clause 10.2.4.8 of this specification.

In addition to the above tests, all the tests and inspections required to be conducted as per this specification shall be conducted on all the pipes selected for testing during MPQT.

Annex C

Treatment of surface imperfections and defects

C.1 TREATMENT OF SURFACE IMPERFECTIONS

Surface imperfection not classified as defect as per this specification shall be cosmetically dressed-out by grinding.

C.2 TREATMENT OF DRESSABLE SURFACE DEFECTS

C.2.3 Complete removal of defects shall be verified by local visual inspection and by suitable non-destructive inspection. To be acceptable, the wall thickness in the ground area shall be in accordance with clause 9.11.3.2 of this specification.

Annex E

Non-destructive inspection for other than sour service or offshore service

The Purchaser reserves the right to depute its Representative(s) to perform inspection and witness tests in all phases of manufacturing and testing starting from steelmaking to finished line pipe ready for shipment. Manufacturer shall comply with the provisions regarding inspection notice, plant access, compliance and rejection mentioned in the Annex Q (New) of this specification. The Manufacturer shall give the Purchaser reasonable notice of the starting date of normal production and the work schedule. Any action or omission on part of Purchaser's Representative shall not relieve the Manufacturer of his responsibility and obligation to supply material in strict accordance with this specification.

E.1 QUALIFICATION OF PERSONNEL

E.1.1 All personnel performing NOT activities shall be qualified in the technique applied, in accordance with latest edition of ISO 9712, ISO 11484 or ASNT No. ASNT-TC-IA or equivalent

All NDT shall be performed in accordance with written procedures. These procedures shall have prior approval of the Purchaser.

Inspector Qualification

Acceptable qualification for NOT inspectors shall be as specified below:

(i) For UT

For UT, at least one Level III qualified inspector shall be available to the mill for overall supervision. Level III inspectors shall be ASNT Level III or ACCP Professional Level III and certified in applicable method.

A level II inspector is required for shift supervision, manual weld inspection and calibration of all systems (both manual and automated).

(ii) For all other NDT methods

Evaluation of indications: Level II & Level III inspector

E.3 METHODS OF INSPECTION

E.3.1 General

E.3.1.2 All SMLS pipes shall be non-destructively inspected full length (100%) in accordance with applicable methods given in Table E.2 of API Spec 5L using automatic ultrasonic equipment in accordance with clause E.5 and as modified herein.

E.3.3 Pipe End Inspection - Welded Pipe

E.3.3.1 Pipe ends including weld at the pipe ends not covered by automatic ultrasonic equipment shall be inspected by manual ultrasonic equipment with same sensitivity and capability as automatic equipment, or, such non-inspected pipe end shall be cut-off. Records in accordance with E.5.4 of API Spec 5L shall be maintained.

E.3.3.2 Ultrasonic inspection in accordance with the method described in ISO 10893-8 shall be used to verify that the 50 mm (2.0 in) wide zone at each pipe end is free of any laminar imperfections in the circumferential direction.

E.3.3.3(New) Bevel face of each pipe end shall be magnetic particle inspected for the detection of laminar imperfections in accordance with ISO 10893-5

E.5 ULTRASONIC AND ELECTROMAGNETIC INSPECTION

E.5.1 Equipment

E.5.1.1 In addition to the API Spec 5L requirements, all automatic ultrasonic equipment shall have an alarm device, which continuously monitors the effectiveness of the coupling. The equipment for the automatic inspection shall allow the localization of both longitudinal and transverse defects corresponding to the signals exceeding the acceptance limits of the reference standard. The equipment shall be fitted with a paint spray or automatic marking device and alarm device for areas giving unacceptable ultrasonic indications. All ultrasonic testing equipment shall be provided with recording device.

E.5.2. Ultrasonic and electromagnetic inspection reference standards

E.5.2.1 The reference standard shall be, according to the cases, taken from the production to be controlled, and of such dimensions as to allow the static and dynamic calibration of the control system.

E.5.2.3 Reference standards

The primary reference sensitivity level shall be adjusted on the following reference reflectors:

Examination Type	Seamless
Lamination Detection	FBH (6.4mm)
Surface defect detection	Notch N5
Defect detection of body and pipe ends	Notch N5

Flat Bottomed Holes (FBH) for lamination detection shall have 6.4 mm (1/4inch) diameter and depth 0.5 t, where 't' is the specified wall thickness.

E.5.3 Instrument standardization

E.5.3.2 The instrument shall be calibrated with appropriate reference standard (refer E.5.2 of API Spec 5L and as modified herein) under the same inspection conditions of pipes of normal production at following intervals::

- Once at the beginning of each operating shift (12 hours maximum).
- Once in between of each operating shift i.e, 3 hrs to 4 hrs after the first
- Every time there is change in probes or working condition of the UT machine.
- Every time the running of the system gives rise to doubts on its efficiency.
- If during the calibration verification, it is found that notches or holes of the reference standard are not revealed or if the signals caused by notches and holes of the calibration samples do not switch on the automatic alarm or marking and selection device, all pipes already checked from the previous verification shall be re-inspected at manufacturer's cost.

E.5.5 Acceptance limits

E.5.5.2 For all examination types, indications exceeding the acceptance limit signals are unacceptable. For lamination detection in seamless pipe body and pipe ends, the acceptance limits shall be based on the lamination size and frequency as given below:

Any lamination in the body of the pipe exceeding both of the following is considered a defect:

a) Greater than or equal to 12.0 mm in the minor dimension.

b) Greater than or equal to 5000 mm^2 in area.

E.5.6 Disposition of defects found by ultrasonic and electromagnetic inspection

Disposition of any imperfection in pipe/coil that produces an indication greater than the acceptable limits of this specification shall be classified as defect and shall be given disposition as specified in (e) or (f) of E.10 of API Spec 5L.

E.5.8 LAMINAR IMPERFECTIONS IN THE PIPE BODY

(New) The individual laminations exceeding the acceptance limits as given in clause E.5.5.1 of this specification shall be classified as defects.

Compliance with such requirements shall be verified by ultrasonic inspection in accordance with ISO 10893-8 amended as follows:

- The distance between adjacent scanning tracks shall be sufficiently small to ensure detection of minimum allowed imperfection size.

The minimum coverage during automatic inspection shall be ≥ 25 %of the pipe surface.

E.5.9 Suspect pipe

(New) Pipe giving rise to indications producing a trigger/ alarm condition as a result of the specified non-destructive inspection operation shall be deemed suspect. Locations showing indications above the acceptance limits during ultrasonic inspection shall be re-examined by radiography. If no defects are located during re-examination, the original findings may be ignored. Additional scanning may be requested by the Purchaser Representative to check questionable areas.

E.7 RESIDUAL MAGNETISM

E.7.2 The longitudinal magnetic field shall be measured on all sizes of pipes. Measurement on pipe in stack shall not be considered valid. Such measurements shall be taken on the root face or square cut face of finished plain-end pipes.

E.7.3 Measurements shall be made using Hall- effect gaussmeter only.

E.7.4 Measurements shall be made on each end of a pipe for 5% of the pipes produced but at least once per 4 hr per operating shift (12 hrs maximum).

E.7.6 Four readings shall be taken approximately 90° apart around the circumference of each end of the pipe. The average of the four readings shall not exceed 2.0 mT (20 gauss) and no single reading shall exceed 2.5 mT (25 gauss). All residual magnetism measurements shall be recorded.

E.10 DISPOSITION OF PIPES CONTAINING DEFECTS

c) The repaired area shall be 100% rechecked by magnetic particle or ultrasonic inspection to ensure complete removal of defects. However, for repair of cosmetic type of defects, MPI may not be conducted if so directed by Purchaser's Representative on case to case basis. The pipes having a thickness less than the minimum allowed in accordance with this specification, after repair by grinding shall be treated for disposition in accordance with (e) or (f) of clause E.10 of API Spec 5L.

E.11 SUPPLEMENTARY NON-DESTRUCTIVE INSPECTION

(New)

E.11.1 (new) Pipe shall be 100% ultrasonically inspected for the detection of transverse imperfections and inclined embedded defects in accordance with ISO 10893-10 acceptance level U2/C.

E.11.2(new) Pipe shall be full-body inspected using the flux leakage method in accordance with ISO 10893-3 acceptance level F2 for the surface testing of the pipes for longitudinal and transverse imperfections.

Annex Q (New)

Purchaser Inspection

Q.1 INSPECTION NOTICE

Advance notice shall be given by the manufacturer prior to the start of production to the purchaser to inspect/witness the manufacturing activities including tests.

Q.2 PLANT ACCESS

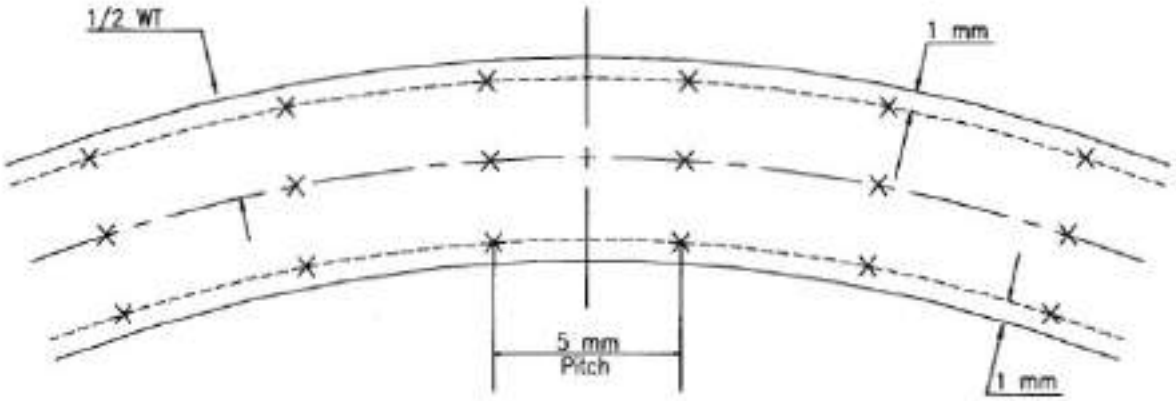
The inspector representing the purchaser shall have unrestricted access, at all times while work of the contract of the purchaser is being performed, to all parts of the manufacturer's works that will concern the manufacture of the pipe ordered. The manufacturer shall afford the inspector all reasonable facilities to satisfy the inspector that the pipe is being manufactured in accordance with this specification. All inspections should be made at the place of manufacture prior to shipment, unless otherwise specified on the purchase order, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Q.3 COMPLIANCE

The manufacturer is responsible for complying with all of the provisions of this specification. The purchaser may make any investigation necessary to be satisfied of compliance by the manufacturer and any reject any material that does not comply with this specification.

Q.4 REJECTION

If the Purchaser Representative rejects pipes repeatedly for any recurring cause, this shall be adequate reason to refuse final inspection of subsequent pipes until the cause has been investigated and corrective action taken by the Manufacturer.



Notes:

1. Number of hardness measurement required on each specimen shall be min. 12.

FIGURE: 10.2.4.8.1

LOCATIONS FOR HARDNESS MEASUREMENT

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION

FOR
ASSORTED PIPES

VCS – SS – PP - 2503

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
01	30.06.2022	RP	MC	HK	GW
00	28.01.2020	MB	AK	AD	SK

UNCONTROLLED COPY	:	If printed
CONTROLLED COPY	:	If in soft and signed

REVISION RECORD

Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	12.10.2019					
		MB	AK	AD	SK	
01	30.06.2022					VCS QMS Integration
		RP	MC	HK	GW	

ABBREVIATIONS:

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing & Materials
BHN	Brinell Hardness Number
BIS	Bureau of Indian Standards
E.FS.W	Electric Fusion Weld
E.R.W	Electric Resistance Weld
HAZ	Heat Affected Zone
HIC	Hydrogen Induced Cracking
IBR	Indian Boiler Regulations
IGC	Inter Granular Corrosion
IS	Indian Standard
LT	Low Temperature
MR	Material Requisition
NACE MR	National Association of Corrosion Engineers : Material Requirement
NB	Nominal Bore
NPT	Nominal Pipe Thread
PMI	Positive Material Identification
PR	Purchase Requisition
SMYS	Specified Minimum Yield Strength
SS	Stainless Steel

CONTENTS

1. GENERAL

1.1. All pipes and their dimensions, tolerances, chemical composition, physical properties, heat treatment, hydrostatic test and other testing and marking requirements shall conform to the latest codes and standards specified in the material requisition (MR). Supplier shall strictly comply with MR/ PR stipulations and no deviations shall be permitted.

1.2. Testing

1.2.1. Test reports shall be supplied for all mandatory tests as per the applicable material specifications. Test reports shall also be furnished for any supplementary tests as specified in the MR & Clauses 1.10 & 1.11.

1.2.2. Material test certificates (physical property, chemical composition & heat treatment report) shall also be furnished for the pipes supplied.

1.2.3. PMI shall be performed as per the scope and procedures at supplier`s work.

1.3. Manufacturing Processes

1.3.1. Steel made by acid Bessemer process shall not be acceptable.

1.3.2. All longitudinally welded pipes should employ only automatic welding.

1.4. Pipe shall be supplied in single or double random length of 4 to 7 and 7 to 14 meters respectively.

1.5. a. Seamless and E.R.W. pipes shall not have any circumferential seam joint in a random length. However, in case of E.FS.W pipe, in one random length one welded circumferential seam of same quality as longitudinal weld is permitted. This weld shall be at least 2.5 m from either end. The longitudinal seams of the two portions shall be staggered by 90°. Single random length in such cases shall be 5 to 7 m.

b. Unless otherwise mentioned in the respective material code, E.FS.W pipes < 36" shall not have more than one longitudinal seam joint and E.FS.W pipes ≥ 36" shall not have more than two longitudinal seam joints.

1.6. Pipe with screwed ends shall have NPT external taper pipe threads conforming to ASME/ANSI B1.20.1 up to 1.5" NB & IS 554 for 2" to 6" NB.

1.7. Pipe with beveled ends shall be in accordance with ASME B16.25. Weld contours shall be as follows

Material	Wall Thickness	Weld Contour
Carbon Steel Except Low Temp. Carbon Steel	Up to 22 mm	Figure 2 Type A
	> 22 mm	Figure 3 Type A
Alloy Steel, Stainless Steel & Low Temp. Carbon Steel	Up to 10 mm	Figure 4
	> 10 mm & Up to 25 mm	Figure 5 Type A
	> 25 mm	Figure 6 Type A

1.8. Galvanized pipes shall be coated with zinc by hot dip process conforming to IS 4736 / ASTM A 153.

1.9. All austenitic stainless steel pipes shall be supplied in solution annealed condition. All types of 321 or 347 stainless steel pipes shall be in a stabilized heat treated condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking time & holding temp. for stabilizing heat treatment shall be 4 hrs & 900°C respectively.

1.10. **I.G.C. (Inter Granular Corrosion) Test for Stainless Steels**

1.10.1. For all austenitic stainless steel pipes inter-granular corrosion test shall have to be conducted as per following:
ASTM A262 Practice "B" with acceptance criteria of "60 mils/year (max.)".

OR

ASTM A262 Practice E with acceptance criteria of no cracks at 20X magnification and microstructure to be observed at 250X magnification shall ensure the absence of any cracks/ fissures. When testing is conducted as per practice 'E' photograph of microstructure shall be submitted for record.

1.10.2. When specifically asked for in MR for high temperature application of some grades of austenitic stainless steel (eg.SS 309, 310, 316, 316H etc.) ASTM A262 Practice "C" with acceptance criteria of "15 mils/year (max.)" shall have to be conducted

1.10.3. For the IGC test as described in 1.10.1 & 1.10.2, two sets of samples shall be drawn from each solution annealing lot; one set corresponding to highest carbon content and the other set corresponding to the highest pipe thickness.

1.11. All welded pipes indicated as `CRYO' & 'LT' in MR shall be impact tested per requirement & acceptance criteria of ASME B31.3. The impact test temperature shall be -196°C & -45°C for stainless steel and carbon steel respectively unless specifically mentioned otherwise in MR.

1.12. **NACE/HIC Requirements**

1.12.1. Pipes under "NACE" category and those designated as "HIC1" shall meet the requirements given in NACE MR-0103 unless mentioned otherwise.

1.12.2. Pipes made from plates and designated as "HIC1" shall meet the HIC requirements of specification unless mentioned otherwise

1.13. Specified heat treatment for carbon steel and alloy steel and solution annealing for stainless steel pipes shall be carried out after weld repairs. Number of weld repairs at the same spot shall be restricted to maximum two by approved repair procedure.

1.14. For black or galvanized pipes to IS 1239, the minimum percentage of elongation shall be 20%.

1.15. All 1Cr-1/$_2$Mo and 1 ¼ Cr-1/$_2$Mo seamless pipes shall be normalized and tempered.

1.16. For all welded alloy steel pipes with mandatory requirement of heat treatment and radiography, radiography shall be performed after heat treatment.

1.17. For Hydrogen service pipes following special requirements shall also be met:

1.17.1. All carbon steel pipes having wall thickness 9.53 mm (0.375") and above shall be normalized. Cold drawn pipes shall be normalized after the final cold draw pass for all thicknesses.

1.17.2. All alloy steel (Cr-Mo) pipes shall be normalized and tempered. The normalizing and tempering shall be a separate heating operation and not a part of the hot forming operation. The maximum room temperature tensile strength shall be 100,000 psig.

1.17.3. For carbon steel Pipes, hardness of weld and HAZ shall be 200 BHN (max.). For alloy steel Pipes, hardness of weld and HAZ shall be 225 BHN (max.).

1.17.4. For all austenitic stainless steels, the weld deposit shall be checked for ferrite content. A Ferrite No.(FN) not less than 3% and not more than 10% is required to avoid sigma phase embrittlement during heat treatment. FN shall be determined by Ferrite scope prior to post weld heat treatment.

1.17.5. For all Carbon steel and Alloy steel pipes with wall thickness over 20mm, Charpy-V Notch impact testing shall be carried out in accordance with paragraph UG-84 of ASME Section VIII, Div-1 for weld metal and base metal from the thickest item per heat of material and per heat treating batch. Impact test specimen shall be in complete heat treated condition and accordance with ASTM A370. Impact energies at 0°Celsius shall average greater than 27J (20 ft-lb) per set of three specimens, with a minimum of 19J (15 ft-lb).

1.18. For dual grades of SS where specified, chemical composition and mechanical

properties of both grades specified shall be ensured.

2. IBR PIPES

2.1. IBR Documentation

2.1.1. Pipes under purview of IBR shall be accompanied with IBR certificate original in Form III-A duly approved and countersigned by IBR authority/local authority empowered by the Central Boiler Board of India (Photocopy of the original certificate duly attested by the local boiler inspector where the supplier is located is the minimum requirement for acceptance) or Form III-D [for well-known pipe manufacturers as per IBR] signed by Manufacturer's authorized representative. Well known pipe manufacturers, as recognized by IBR, shall submit a duly attested copy of Form XVI-G along with Form III-D.

2.1.2. For materials 1¼ Cr - ½ Mo (ASTM A335 Gr.P11 / A691 Gr. 1¼Cr), 2¼Cr - 1Mo (ASTM A335 Gr.P22 / A691 Gr. 2¼Cr) & 9Cr -1Mo-V (A335 Gr.P91/A691 Gr.91), Form III-A approved by IBR shall include the tabulation of Et, Sc & Sr values for the entire temperature range given below. Et, Sc & Sr values shall be such that throughout the temperature range

$$\left.\begin{array}{ll} E_t/1.5 & \geq \\ S_r/\ 1.5 & \geq \\ S_c & \geq \end{array}\right| S_A$$

where,

S_A Allowable stress at the working metal temperature.

E_t Yield point (0.2% proof stress at the working metal temperature)

S_c The average stress to produce elongation of 1%(creep) in 100000 hrs at the working metal temperature.

S_r The average stress to produce rupture in 100000 hrs at the working metal temperature and in no case more than 1.33 times the lowest stress to produce rupture at this temperature

SA (psi)												
Temp (°F) Material	**500**	**600**	**650**	**700**	**750**	**800**	**850**	**900**	**950**	**1000**	**1050**	**1100**
A335 Gr.P11	17200	16700	16200	15600	15200	15000	14500	12800	9300	6300	4200	2800
A691	18900	18300	18000	17600	17300	16800	16300	15000	9900	6300	4200	2800

SA (psi)												
Temp (°F) Material	**500**	**600**	**650**	**700**	**750**	**800**	**850**	**900**	**950**	**1000**	**1050**	**1100**
Gr. 1¼ Cr												
A335 Gr.P22 / A691 Gr. 2¼ Cr	17900	17900	17900	17900	17900	17800	14500	12800	10800	7800	5100	3200
A335 Gr.P91/ A691 Gr.91	28100	27700	27300	26700	25900	24900	23700	22300	20700	18000	14000	10300

Note : S_A values shall be as per the latest edition prevailing.

2.2. For carbon steel pipes under IBR the chemical composition shall conform to the following:

Carbon (max) : 0.25%

Others (S, P, Mn) : As prescribed in IBR.

The chemical composition as indicated in this clause is not applicable for pipes other than IBR services.

3. ACCEPTABLE DEVIATIONS

3.1. Pipes to IS 3589 Gr.410 are acceptable in place of IS 3589 Gr.330.

3.2. Pipes of Grades SS317 of corresponding material are acceptable in place of Grades SS316 or SS316(2.5 Mo min.).

3.3. Pipes of Grades SS317L of corresponding material are acceptable in place of Grades SS316L or SS316L(2.5Mo min.).

3.4. Seamless pipes are acceptable in place of welded pipes except in the case of welded

SS321/SS321H pipes with nominal thickness greater than 9.53mm.

4. HYDROSTATIC TEST

4.1. All pipes shall be hydrostatically tested.

4.2. The mill test pressure shall be as follows:

4.2.1. Seamless, E.R.W. & Spiral Welded

a) Carbon Steel

Material Std.	Test Pressure Std.
ASTM A106 Gr.B	ASTM A530
A*PI* 5L Gr.B, Seamless	API 5L
API 5L, E.R.W.	API 5L
API 5L, Spiral	API 5L
ASTM A333 Gr.3 & 6, Seamless	ASTM A530
ASTM A333 Gr.3 & 6, E.R.W.	ASTM A530

b) Seamless Alloy Steel

Material Std.	Test Pressure Std.
ASTM A335 Gr.P1, P12, P11, P22, P5, P9	ASTM A530
ASTM A268 TP 405, TP410	ASTM A530

c) Seamless Stainless Steel

Material Std.	Test Pressure Std.
ASTM A312 Gr.TP 304, 304L, 304H, 316, 316L, 316H, 321, 347.	ASTM A999

d) Seamless Nickel Alloy

Material Std.	Test Pressure Std.
ASTM B161 UNS No. 2200	ASTM B161
ASTM B165 UNS No. 4400	ASTM B165
ASTM B167 UNS No. 6600	ASTM B167
ASTM B407 UNS No. 8800	ASTM B407

e) Welded Nickel Alloy

Material Std.	Test Pressure Std.
ASTM B725 UNS No. 2200,4400	ASTM B725
ASTM B517 UNS No. 6600	ASTM B517

ASTM B514 UNS No. 8800	ASTM B514

4.2.2. Electric Fusion Weld

a) Carbon Steel & Alloy Steel E.FS.W (16" & above)

Material Std	Test Pressure Std.
API 5L Gr.B ASTM A671 Gr.CC65, 70 (Cl.32) ASTM A672 Gr.C60, 65, 70 (Cl.12,22) ASTM A671 Gr.CF60, 65, 66, 70 (Cl.32) ASTM A691 Gr. ½ Cr, 1Cr, 1¼ Cr, 2¼ Cr, 5Cr, 9Cr (Cl.42)	P = 2ST/D S = 90% of SMYS Except for API 5L Gr.B S = 85% of SMYS For API 5L Gr.B T = Nominal Wall Thickness D = O.D of Pipe

b) Stainless Steel E.FS.W (2" to 6")

The hydrostatic test pressure in kg/cm^2 for the following materials shall be as given below :

Material Gr.1 :ASTM A312 TP 304 / 304H / 316 / 316H / 321 / 347 welded.

Material Gr.2 :ASTM A312 TP 304L / 316L welded.

Size	Pipe Schedule : 10S		Pipe Schedule : 40S		Pipe Schedule : 80S	
	Material Gr. 1	Material Gr.2	Material Gr.1	Material Gr.2	Material Gr.1	Material Gr.2
2"	100	80	155	130	230	190
3"	80	60	155	130	230	190
4"	80	50	155	130	230	190
6"	65	35	90	75	155	130

c) Stainless Steel E.FS.W (8" and above).

Material Std	Test Pressure Std.
ASTM A358 TP 304L, 304, 304H, 316L,316, 316H, 321, 347 (Classes 1, 3 & 4)	P = 2ST/D S = 85% of SMYS T = Nominal Wall Thickness D = O.D of Pipe

ASTM A358 TP 304L, 304, 304H, 316L, 316, 316H, 321, 347 (Classes 2 & 5)	P = 2ST/D S = 72% of SMYS T = Nominal Wall Thickness D = O.D of Pipe

4.2.3. Carbon Steel Pipe to BIS Standards

Material Std	**Test Pressure Std.**
IS 1239	IS 1239
IS 3589	IS 3589

4.3. Hydrostatic pressure testing shall be performed using iron free water, which is clean and free of silt. Maximum chloride content in water for hydrostatic testing for SS piping shall be 50 ppm.

5. MARKING AND DESPATCH

5.1. All pipes shall be marked in accordance with the applicable codes, standards and specifications. In addition the purchase order number, the item code & special conditions like "IBR", "CRYO", "NACE", "H2" etc. shall also be marked.

5.2. Pipes under "IBR","CRYO", "NACE" & "H2" shall be painted with one circumferential stripe of colour red, light purple brown, canary yellow & white respectively for easy identification. Width of stripe shall be 12mm for pipe sizes less than 3" and 25mm for pipes 3" and above.

5.3. Paint or ink for marking shall not contain any harmful metal or metallic salts such as zinc, lead or copper which cause corrosive attack on heating.

5.4. Pipes shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.

5.5. Pipes shall be protected from rust & corrosion

5.6. Rust preventive used on machined surfaces to be welded shall be easily removable with a petroleum solvent and the same shall not be harmful to welding.

5.7. Both ends of the pipe shall be protected with the following material:

Plain end : Plastic cap

Bevel end : Wood, Metal or plastic cover

Threaded end : Metal or plastic threaded cap

5.8. Pipes may be provided with plastic push-fit type end caps/ steel caps without belt wire.

5.9. Steel end protectors to be used on galvanized pipes shall be galvanized. Plastic caps can also be used as end protectors for galvanised pipe ends.

ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

TECHNICAL NOTES

FOR
PIPES

VPC – SS – PI - 0011

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
00	12.01.2018	ISSUED AS STANDARD	AS	SM	AD

ABBREVIATIONS:

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing & Materials
BHN	Brinell Hardness Number
BIS	Bureau of Indian Standards
E.FS.W	Electric Fusion Weld
E.R.W	Electric Resistance Weld
HAZ	Heat Affected Zone
HIC	Hydrogen Induced Cracking
IBR	Indian Boiler Regulations
IGC	Inter Granular Corrosion
IS	Indian Standard
LT	Low Temperature
MR	Material Requisition
NACE MR	National Association of Corrosion Engineers : Material Requirement
NB	Nominal Bore
NPT	Nominal Pipe Thread
PMI	Positive Material Identification
PR	Purchase Requisition
SMYS	Specified Minimum Yield Strength
SS	Stainless Steel

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1.2.1. Test reports shall be supplied for all mandatory tests as per the applicable material specifications. Test reports shall also be furnished for any supplementary tests as specified in the MR & Clauses 1.10 & 1.11.

1.2.2. Material test certificates (physical property, chemical composition & heat treatment report) shall also be furnished for the pipes supplied.

1.2.3. PMI shall be performed as per the scope and procedures at supplier`s work.

1.3. Manufacturing Processes

1.3.1. Steel made by acid Bessemer process shall not be acceptable.

1.3.2. All longitudinally welded pipes should employ only automatic welding.

1.4. Pipe shall be supplied in single or double random length of 4 to 7 and 7 to 14 meters respectively.

1.5. a. Seamless and E.R.W. pipes shall not have any circumferential seam joint in a random length. However, in case of E.FS.W pipe, in one random length one welded circumferential seam of same quality as longitudinal weld is permitted. This weld shall be at least 2.5 m from either end. The longitudinal seams of the two portions shall be staggered by 90°. Single random length in such cases shall be 5 to 7 m.

b. Unless otherwise mentioned in the respective material code, E.FS.W pipes < 36" shall not have more than one longitudinal seam joint and E.FS.W pipes ≥ 36" shall not have more than two longitudinal seam joints.

1.6. Pipe with screwed ends shall have NPT external taper pipe threads conforming to ASME/ANSI B1.20.1 up to 1.5" NB & IS 554 for 2" to 6" NB.

1.7. Pipe with beveled ends shall be in accordance with ASME B16.25. Weld contours shall be as follows

Material	Wall Thickness	Weld Contour
Carbon Steel Except Low Temp. Carbon Steel	Up to 22 mm	Figure 2 Type A
	> 22 mm	Figure 3 Type A
Alloy Steel, Stainless Steel & Low Temp. Carbon Steel	Up to 10 mm	Figure 4
	> 10 mm & Up to 25 mm	Figure 5 Type A
	> 25 mm	Figure 6 Type A

1.8. Galvanized pipes shall be coated with zinc by hot dip process conforming to IS 4736 / ASTM A 153.

1.9. All austenitic stainless steel pipes shall be supplied in solution annealed condition. All types of 321 or 347 stainless steel pipes shall be in a stabilized heat treated condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking time & holding temp. for stabilizing heat treatment shall be 4 hrs & 900°C respectively.

1.10. I.G.C. (Inter Granular Corrosion) Test for Stainless Steels

1.10.1. For all austenitic stainless steel pipes inter-granular corrosion test shall have to be conducted as per following:
ASTM A262 Practice "B" with acceptance criteria of "60 mils/year (max.)".

OR

ASTM A262 Practice E with acceptance criteria of no cracks at 20X magnification and microstructure to be observed at 250X magnification shall ensure the absence of any cracks/ fissures. When testing is conducted as per practice 'E' photograph of microstructure shall be submitted for record.

1.10.2. When specifically asked for in MR for high temperature application of some grades of austenitic stainless steel (eg.SS 309, 310, 316, 316H etc.) ASTM A262 Practice "C" with acceptance criteria of "15 mils/year (max.)" shall have to be conducted

1.10.3. For the IGC test as described in 1.10.1 & 1.10.2, two sets of samples shall be drawn from each solution annealing lot; one set corresponding to highest carbon content and the other set corresponding to the highest pipe thickness.

1.11. All welded pipes indicated as `CRYO' & 'LT' in MR shall be impact tested per requirement & acceptance criteria of ASME B31.3. The impact test temperature shall be -196°C & -45°C for stainless steel and carbon steel respectively unless specifically mentioned otherwise in MR.

1.12. NACE/HIC Requirements

1.12.1. Pipes under "NACE" category and those designated as "HIC1" shall meet the requirements given in NACE MR-0103 unless mentioned otherwise.

1.12.2. Pipes made from plates and designated as "HIC1" shall meet the HIC requirements of specification unless mentioned otherwise

1.13. Specified heat treatment for carbon steel and alloy steel and solution annealing for stainless steel pipes shall be carried out after weld repairs. Number of weld repairs at the same spot shall be restricted to maximum two by approved repair procedure.

1.14. For black or galvanized pipes to IS 1239, the minimum percentage of elongation shall be 20%.

1.15. All 1Cr-1/$_2$Mo and 1 ¼ Cr-1/$_2$Mo seamless pipes shall be normalised and tempered.

1.16. For all welded alloy steel pipes with mandatory requirement of heat treatment and radiography, radiography shall be performed after heat treatment.

1.17. For Hydrogen service pipes following special requirements shall also be met:

1.17.1. All carbon steel pipes having wall thickness 9.53 mm (0.375") and above shall be normalized. Cold drawn pipes shall be normalized after the final cold draw pass for all thicknesses.

1.17.2. All alloy steel (Cr-Mo) pipes shall be normalized and tempered. The normalising and tempering shall be a separate heating operation and not a part of the hot forming operation. The maximum room temperature tensile strength shall be 100,000 psig.

1.17.3. For carbon steel Pipes, hardness of weld and HAZ shall be 200 BHN (max.). For alloy steel Pipes, hardness of weld and HAZ shall be 225 BHN (max.).

1.17.4. For all austenitic stainless steels, the weld deposit shall be checked for ferrite content. A Ferrite No.(FN) not less than 3% and not more than 10% is required to avoid sigma phase embrittlement during heat treatment. FN shall be determined by Ferritescope prior to post weld heat treatment.

1.17.5. For all Carbon steel and Alloy steel pipes with wall thickness over 20mm, Charpy-V Notch impact testing shall be carried out in accordance with paragraph UG-84 of ASME Section VIII, Div-1 for weld metal and base metal from the thickest item per heat of material and per heat treating batch. Impact test specimen shall be in complete heat treated condition and accordance with ASTM A370. Impact energies at 0°Celsius shall average greater than 27J (20 ft-lb) per set of three specimens, with a minimum of 19J (15 ft-lb).

1.18. For dual grades of SS where specified, chemical composition and mechanical properties of both grades specified shall be ensured.

2. IBR PIPES

2.1. IBR Documentation

2.1.1. Pipes under purview of IBR shall be accompanied with IBR certificate original in Form III-A duly approved and countersigned by IBR authority/local authority empowered by the Central Boiler Board of India (Photocopy of the original certificate duly attested by the local boiler inspector where the supplier is located is the minimum requirement for acceptance) or Form III-D [for well known pipe manufacturers as per IBR] signed by Manufacturer's authorized representative. Well known pipe manufacturers, as recognized by IBR, shall submit a duly attested copy of Form XVI-G along with Form III-D.

2.1.2. For materials 1¼ Cr - ½ Mo (ASTM A335 Gr.P11 / A691 Gr. 1¼Cr), 2¼Cr - 1Mo (ASTM A335 Gr.P22 / A691 Gr. 2¼Cr) & 9Cr -1Mo-V (A335 Gr.P91/A691 Gr.91), Form III-A approved by IBR shall include the tabulation of Et, Sc & Sr values for the entire temperature range given below. Et, Sc & Sr values shall be such that throughout the temperature range

$$\left.\begin{array}{ll} E_t/1.5 & \geq \\ S_r/\ 1.5 & \geq \\ S_c & \geq \end{array}\right| S_A$$

where,

S_A Allowable stress at the working metal temperature.

E_t Yield point (0.2% proof stress at the working metal temperature)

S_c The average stress to produce elongation of 1%(creep) in 100000 hrs at the working metal temperature.

S_r The average stress to produce rupture in 100000 hrs at the working metal temperature and in no case more than 1.33 times the lowest stress to produce rupture at this temperature

SA (psi)												
Temp (°F) Material	**500**	**600**	**650**	**700**	**750**	**800**	**850**	**900**	**950**	**1000**	**1050**	**1100**
A335 Gr.P11	17200	16700	16200	15600	15200	15000	14500	12800	9300	6300	4200	2800
A691 Gr. 1¼ Cr	18900	18300	18000	17600	17300	16800	16300	15000	9900	6300	4200	2800

SA (psi)												
Temp (°F) Material	**500**	**600**	**650**	**700**	**750**	**800**	**850**	**900**	**950**	**1000**	**1050**	**1100**
A335 Gr.P22 / A691 Gr. 2¼ Cr	17900	17900	17900	17900	17900	17800	14500	12800	10800	7800	5100	3200
A335 Gr.P91 / A691 Gr.91	28100	27700	27300	26700	25900	24900	23700	22300	20700	18000	14000	10300

Note : S_A values shall be as per the latest edition prevailing.

2.2. For carbon steel pipes under IBR the chemical composition shall conform to the following:

Carbon (max) : 0.25%

Others (S, P, Mn) : As prescribed in IBR.

The chemical composition as indicated in this clause is not applicable for pipes other than IBR services.

3. ACCEPTABLE DEVIATIONS

3.1. Pipes to IS 3589 Gr.410 are acceptable in place of IS 3589 Gr.330.

3.2. Pipes of Grades SS317 of corresponding material are acceptable in place of Grades SS316 or SS316(2.5 Mo min.).

3.3. Pipes of Grades SS317L of corresponding material are acceptable in place of Grades SS316L or SS316L(2.5Mo min.).

3.4. Seamless pipes are acceptable in place of welded pipes except in the case of welded

SS321/SS321H pipes with nominal thickness greater than 9.53mm.

4. HYDROSTATIC TEST

4.1. All pipes shall be hydrostatically tested.

4.2. The mill test pressure shall be as follows:

4.2.1. Seamless, E.R.W. & Spiral Welded

a) Carbon Steel

Material Std.	Test Pressure Std.
ASTM A106 Gr.B	ASTM A530
A*PI* 5L Gr.B, Seamless	API 5L
API 5L, E.R.W.	API 5L
API 5L, Spiral	API 5L
ASTM A333 Gr.3 & 6, Seamless	ASTM A530
ASTM A333 Gr.3 & 6, E.R.W.	ASTM A530

b) Seamless Alloy Steel

Material Std.	Test Pressure Std.
ASTM A335 Gr.P1, P12, P11, P22, P5, P9	ASTM A530
ASTM A268 TP 405, TP410	ASTM A530

c) Seamless Stainless Steel

Material Std.	Test Pressure Std.
ASTM A312 Gr.TP 304, 304L, 304H, 316, 316L, 316H, 321, 347.	ASTM A999

d) Seamless Nickel Alloy

Material Std.	Test Pressure Std.
ASTM B161 UNS No. 2200	ASTM B161
ASTM B165 UNS No. 4400	ASTM B165
ASTM B167 UNS No. 6600	ASTM B167
ASTM B407 UNS No. 8800	ASTM B407

e) Welded Nickel Alloy

Material Std.	Test Pressure Std.
ASTM B725 UNS No. 2200,4400	ASTM B725

ASTM B517 UNS No. 6600	ASTM B517
ASTM B514 UNS No. 8800	ASTM B514

4.2.2. Electric Fusion Weld

a) Carbon Steel & Alloy Steel E.FS.W (16" & above)

Material Std	**Test Pressure Std.**
API 5L Gr.B ASTM A671 Gr.CC65, 70 (CI.32) ASTM A672 Gr.C60, 65, 70 (CI.12,22) ASTM A671 Gr.CF60, 65, 66, 70 (CI.32) ASTM A691 Gr. ½ Cr, 1Cr, 1¼ Cr, 2¼ Cr, 5Cr, 9Cr (CI.42)	P = 2ST/D S = 90% of SMYS Except for API 5L Gr.B S = 85% of SMYS For API 5L Gr.B T = Nominal Wall Thickness D = O.D of Pipe

b) Stainless Steel E.FS.W (2" to 6")

The hydrostatic test pressure in kg/cm^2 for the following materials shall be as given below :

Material Gr.1 :ASTM A312 TP 304 / 304H / 316 / 316H / 321 / 347 welded.

Material Gr.2 :ASTM A312 TP 304L / 316L welded.

Size	**Pipe Schedule : 10S**		**Pipe Schedule : 40S**		**Pipe Schedule : 80S**	
	Material Gr. 1	**Material Gr.2**	**Material Gr.1**	**Material Gr.2**	**Material Gr.1**	**Material Gr.2**
2"	100	80	155	130	230	190
3"	80	60	155	130	230	190
4"	80	50	155	130	230	190
6"	65	35	90	75	155	130

c) Stainless Steel E.FS.W (8" and above).

Material Std	**Test Pressure Std.**
ASTM A358 TP 304L, 304, 304H, 316L,316, 316H, 321, 347 (Classes 1, 3 & 4)	P = 2ST/D S = 85% of SMYS T = Nominal Wall Thickness D = O.D of Pipe

ASTM A358 TP 304L, 304, 304H, 316L, 316, 316H, 321, 347 (Classes 2 & 5)	P = 2ST/D S = 72% of SMYS T = Nominal Wall Thickness D = O.D of Pipe

4.2.3. Carbon Steel Pipe to BIS Standards

Material Std	**Test Pressure Std.**
IS 1239	IS 1239
IS 3589	IS 3589

4.3. Hydrostatic pressure testing shall be performed using iron free water, which is clean and free of silt. Maximum chloride content in water for hydrostatic testing for SS piping shall be 50ppm.

5. MARKING AND DESPATCH

5.1. All pipes shall be marked in accordance with the applicable codes, standards and specifications. In addition the purchase order number, the item code & special conditions like "IBR", "CRYO", "NACE", "H2" etc. shall also be marked.

5.2. Pipes under "IBR","CRYO", "NACE" & "H2" shall be painted with one circumferential stripe of colour red, light purple brown, canary yellow & white respectively for easy identification. Width of stripe shall be 12mm for pipe sizes less than 3" and 25mm for pipes 3" and above.

5.3. Paint or ink for marking shall not contain any harmful metal or metallic salts such as zinc, lead or copper which cause corrosive attack on heating.

5.4. Pipes shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.

5.5. Pipes shall be protected from rust & corrosion

5.6. Rust preventive used on machined surfaces to be welded shall be easily removable with a

petroleum solvent and the same shall not be harmful to welding.

5.7. Both ends of the pipe shall be protected with the following material:

Plain end : Plastic cap

Bevel end : Wood, Metal or plastic cover

Threaded end : Metal or plastic threaded cap

5.8. Pipes may be provided with plastic push-fit type end caps/ steel caps without belt

wire.

5.9. Steel end protectors to be used on galvanized pipes shall be galvanized. Plastic caps can also be used as end protectors for galvanised pipe ends.

Energising Quality

VCS QULITY SERVICES PVT. LTD.

STANDARD SPECIFICATION
FOR
SEAMLESS FITTINGS AND FLANGES
{SIZE UPTO DN 400MM (16")}

VCS – SS – PP - 2024

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ABBREVIATIONS:

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
API	American Petroleum Institute
BHN	Brinell hardness number
HAZ	Heat Affected Zone
MSS-SP	Manufacturers Standardization Society - Standard Practice
RTJ	Ring Type Joint
SSPC	Steel Structures Painting Council
CE	Carbon Equivalent
LTCS	Low Temperature Carbon Steel
LPG	Liquefied Petroleum Gas

CONTENTS

1.0 SCOPE

This Technical specification specifies the minimum requirements for the design, manufacture and supply of following carbon steel flanges (such as welding neck flanges, blind flanges, spectacle blinds, spacers and blind etc.) and seamless fittings (such as tees, elbows, reducers, caps, outlets etc.) size DN up to 400 mm (16") to be installed in onshore pipeline systems handling non-sour hydrocarbons in liquid or gaseous phase including Liquefied Petroleum Gas (LPG).

2.0 REFERENCE DOCUMENTS

Reference has been made in this specification to the latest edition (edition enforce at the time of issue of enquiry unless specified otherwise) of the following Codes, Standards and Specification.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B31.4 : Pipeline Transportation system for liquid Hydrocarbon & other liquids.

B 31.8 : Gas Transmission and Distribution Piping Systems.

B16.5 : Pipe Flanges and Flanged Fitting.

B16.9 : Factory made Wrought Butt Weld Fittings.

B 16.11 : Forged Steel Fittings, Socket welding and Threaded.

B 16.48 : Steel Line Blanks.

Section VIII : Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels.

Section IX : Welding and Brazing Qualifications.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A370 : Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

MANUFACTURERS STANDARDIZATION SOCIETY (MSS)

SP-25 : Standard Marking System for Valves, Fittings, Flanges and Unions.

SP-97 : Forged Carbon Steel Branch Outlet Fittings-Socket Welding, Threaded and Butt Welding Ends

In case of conflict between various requirements of this specification and the requirements of above referred Codes and Standards, more stringent requirement shall apply unless otherwise agreed by Purchaser.

3.0 MATERIALS

The Material of flanges & fittings shall be as indicated in purchase requisition. In addition, the material shall also meet the requirements specified hereinafter.

3.1 The Carbon Steel used for the manufacture of flanges and fittings shall be fully killed.

3.2 The carbon equivalent (CE) shall not exceeding 0.45, based on check analysis calculated in accordance with following.

$$CE = C + \frac{Mn}{6} + \frac{Cr \square Mo + V}{5} + \frac{Cu + Ni}{15}$$

3.3 For flanges and fittings specified to be used for gas service or LPG service, Charpy V-notch test shall be conducted on each heat of steel. Unless specified otherwise, the Charpy V-notch test shall be conducted at 0^0 C in accordance with the impact test provisions of ASTM A 370 for flanges and MSS-SP-75 for all fittings.

The average absorbed impact energy values of three full-sized specimens shall be 27 joules. The minimum impact energy value of any one specimen of the three specimens analyzed as above shall not be less than 22 Joules.

When Low Temperature Carbon Steel (LTCS) materials are specified for flanges and fittings in Purchase Requisition, the Charpy V-notch test requirements of applicable material standard shall be complied with.

3.4 For flanges and fittings specified to be used for Gas service or LPG service, Hardness test shall be carried out as per ASTM A 370 for each heat of steel used. A full thickness cross section shall be taken for this purpose and the maximum hardness of base metal, Weld metal and heat affected zone shall not exceed 248 HV_{10}.

3.5 In case of RTJ (Ring Type Joint) flanges, the groove hardness shall be minimum 140 BHN. Ring Joint flanges shall have octagonal section of Ring joint.

4.0 DESIGN AND MANUFACTURE

4.1 Flanges such as weld neck flanges and blind flanges shall conform to the requirements of ASME B 16.5.

4.2 Spectacle blind and spacer & blind shall conform to the requirements of ASME B 16.48.

4.3 Fittings such as tees, elbows, reducers, etc. shall be seamless type and shall conform to ASME B 16.9 for sizes DN 50mm (2") to DN 400mm (16") (both sizes included) and ASME B 16.11 for sizes DN 15mm (1½") & below.

4.4 Fittings such as weldolets, sockolets, nippolets, etc. shall be manufactured in accordance with MSS-SP-97.

4.5 Repair by Welding on flanges and fitting is not permitted.

4.6 All butt weld ends shall be bevelled as per ASME B 16.5/ ASME B 16.9/ MSS-SP-97, as applicable

4.7 Type, face and finish of flanges shall be as specified in purchase requisition. The interpretation of range of face finish shall be as follows:

Serrated Finish/125 AARH	:	Serration with 125 to 250µ in AARH.
63 AARH	:	32 to 63µ in AARH.

4.8 Flanges and fittings manufactured from bar stock are not acceptable.

5.0 INSPECTION AND TESTS

The Manufacture shall perform all inspections and tests in accordance with the requirements of this specification and the relevant codes, at his works, prior to shipment. Such inspection and testing shall include, but not be limited to, the following:

5.1 TESTING OF MATERIALS

Chemical composition and mechanical tests including yield strength, ultimate tensile strength, impact test, elongation and hardness shall be carried out for each heat of steel used as per the applicable standard as referred to in this specification.

5.2 VISUAL INSPECTION AND DIMENSIONAL CHECK

All flanges and fittings shall be visually inspected. The internal and external surface of the flanges and fittings shall be free from any strikes, gauges and other detrimental defects.

Dimensional checks shall be carried out on finished products as per ASME B 16.5 for flanges, ASME B 16.48 for spacers and blinds and ASME B 16.9/MSS-SP-97 as applicable for fittings and as per this specification.

5.3 NON-DESTRUCTIVE EXAMINATION

All finished wrought weld ends subject to welding in field, shall be 100% tested for lamination type defects by ultrasonic test. Any lamination larger than 6.35 mm shall not be acceptable.

5.4 The Purchaser reserves the right to perform stage wise inspection and witness tests as indicated above, at the Manufacturer's works, prior to shipment. The Manufacturer shall give reasonable notice of date and time for such inspection and shall provide reasonable access and facilities required for inspection, to the Purchaser's Inspector.

The Purchaser reserves the right to require additional testing, at any time, to confirm Or further investigate a suspected fault. All costs incurred shall be for the Manufacturer's account. In no case shall any action of the Purchaser, or his Inspector, relieve the Manufacturer of his responsibility for material, design, quality, or Performance of the materials concerned. Inspection and tests performed/witnessed by the Purchaser's Inspector shall in no way relieve the Manufacturer of his obligation to perform the required inspection and tests.

6.0 PAINTING

Once all inspection and test have been carried out all external surface shall be thoroughly cleaned to remove grease, dust & rust. Standard mill coating shall be applied on external surface to protect against corrosion during transmit and storage. The coating shall be removable type in field.

7.0 MARKING

All Flanges & fittings shall be stamped with the requirements of applicable dimensional manufacturing standard. The marking shall also include following:

- PO Number.
- Item Code.

8.0 TEST CERTIFICATES

Manufacture who intends bidding for fittings must possess the records of a successful proof test, in accordance with the provision of ASME 16.9/MSS-SP-75, as applicable.

Manufacturer shall furnish the following certificates:

- Test certificates relevant to the chemical analysis and mechanical properties, including hardness of the materials used for manufacture of flanges and fittings in accordance with the requirement of relevant standards and this specification.
- Test reports on radiography, ultrasonic and magnetic particle examination.
- Certificates for each fitting stating that it is capable of withstanding without leakage a test pressure, which results in a hoop stress equivalent to 100% of the specified minimum yield strength for the pipe with which the fitting is to be attached without impairment of serviceability.

9.0 PACKING & SHIPPING

Ends of all fittings and weld neck flanges shall be suitable protected to avoid any damage during transit. Metallic or high impact plastic bevel protected shall be provided for flanges and fittings. Flanges face shall be suitably protected to avoid any damage during transit.

10.0 DOCUMENTATION

The Manufacturer shall supply documentation in accordance with the Vendor Data Requirements List (VDRL) as attached with Purchase Order.

VCS QUALITY SERVICES PVT. LTD.

TECHINCAL NOTES FOR GASKETS

VCS-SS-PP-2511

					
01	**30.06.2022**	**RP**	**MC**	**HK**	**GW**
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Abbreviations:

AARH	Average Arithmetic Root Height
BHN	Brinnel Hardness Number
CS	Carbon Steel
MR	Material Requisition
PMI	Positive Material Identification
RTJ	Ring Type Joint

CONTENTS

1.0 GENERAL

1.1 All gaskets shall conform to the codes/standards and specifications given in the requisition. Supplier shall strictly comply with MR/PR stipulations and no deviations shall be permitted.

1.2 Process of manufacture, dimensions and tolerances not specified in requisition shall be in accordance with the requirements of the manufacturer's standards.

1.3 Testing

1.3.1. Test reports shall be supplied for all mandatory tests for gaskets as per the standards specified in the requisition.

1.3.2. Chemical composition and hardness of RTJ gaskets shall also be furnished in the form of test reports on samples.

1.3.3. For Spiral wound material following shall be furnished:

a. Manufacturer's test certificate for filler material and spiral material as per the relevant material specifications.

b. Manufacturer's test certificate for raw materials and tests for compressibility! seal- ability & recovery as per the relevant material specifications.

1.3.4. Refer Specification no VCS-PL-ITP-0013 for 'Inspection & Test Plan for Gaskets'.

1.4 Full face gaskets shall have bolt holes punched out.

1.5 Filler material for spiral wound gaskets shall not have any colour or dye.

1.6 All spiral wound gaskets shall be supplied with Outer ring. Material of the outer ring shall be CS unless otherwise specified in the MR.

1.7 For spiral wound gaskets, material of Inner Compression ring shall be same as Spiral Strip material. Inner rings shall be provided for all Spiral Wound Gaskets.

1.8 Hardness of metallic RTJ gaskets shall not exceed the values specified below unless otherwise specified in MR:

Ring Gasket Material	**Maximum Hardness (BHN)**
Soft Iron	90
Carbon steel	120
5 Cr. $^{1}/_{2}$ Mo	130
Type 304, 316, 321, 347	140
Type 304L, 316L	120
Inconel UNS N06625	200
Incoloy UNS N08825	190
Duplex SS UNS N032205, N031803	230

1.3.5. Face finish of metallic RTJ gaskets shall be 32 to 63 AARH.

1.3.6. Gaskets of different types and sizes shall be placed in separate shipping containers and each container clearly marked with the size, rating, material specification and item code.

1.3.7. All items shall be inspected and approved by VCS.

1.3.8. Any additional requirements specified in the requisition, shall be fully complied with.

1.3.9. Non-metallic ring gaskets as per ASME B 16.21 shall match flanges to ASME B 16.5 upto 24" and to ASME B 16.47B above 24" unless specified otherwise.

1.3.10. Spiral wound gasket as per ASME B 16.20 shall match flanges to ASME B 16.5 upto 24" and to ASME B 16.47B above 24" unless specifically mentioned otherwise.

1.3.11. The following abbreviations have been used in the Material Requisition for Spiral Wound Gaskets:

(I)	:	Inner Ring
(O)	:	Outer Ring
GRAFJL	:	Grafoil Filler

1.3.12. Specialties mentioned in item description like "IBR", "LT", "HICI", "H2", etc. shall be ignored.

ENERGISING QUALITY

VCS QUALITY SERVICES PVT. LTD.

TECHINCAL NOTES FOR BOLTS AND NUTS

VCS-SS-PP-2510

					
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Abbreviations:

ASME	The American Society of Mechanical Engineers
ASTM	The American Society for Testing and Materials
MR	Material Requisition
SS	Stainless Steel

CONTENTS

1.0 GENERAL

1.1 The process of manufacture, heat treatment, chemical & mechanical requirements and marking for all stud bolts, m/c bolts, jack screws & nuts shall be in accordance with the codes/standards and specifications given in the requisition. The applicable identification symbol in accordance with the material specification shall be stamped on each bolt and nut. Supplier shall strictly comply with MRIPR stipulations and no deviation shall be permitted.

1.2 Testing

1.2.1. Test reports shall be supplied for all mandatory tests as per the relevant material specifications.

1.2.2. Material test certificate shall also be furnished. (Heat Analysis, Product Analysis and Mechanical Requirement)

1.2.3. Stress Rupture Test as detailed in ASTM A453 shall be carried out for all ASTM A453 bolting material irrespective of the temperature.

1.2.4. Refer Specification no VCS-PL-ITP-0012 for 'Inspection & Test Plan for Bolting Material'.

1.3 All bolting shall be as per ASME B 18.2.1 for studs, M/c bolts and jackscrews and ASME B 18.2.2 for nuts.

1.4 Threads shall be unified (UNC for up to 1" dia and 8UN for> 1" dia) as per ASME B1.1 with class 2A fit for studs, M/c bolts and jackscrews and class 2B fit for nuts.

1.5 Stud bolts shall be threaded full length with two heavy hexagonal nuts unless otherwise specified. Length tolerance shall be in accordance with the requirement of Table D2 of Annexure-D of ASME B 16.5.

1.6 The nuts shall be double chamfered, semi-finished, heavy hexagonal type and shall be made by the hot forged process and stamped as per respective material specification.

1.7 Heads of jackscrews and m/c bolts shall be heavy hexagonal type. Jackscrew end shall be rounded.

1.8 Each size of studs & m/c bolts with nuts and jackscrews shall be supplied in separate containers marked with size and material specifications. 'CRYO' shall be marked additionally in case 'CRYO' is specified in the requisition.

1.9 All items shall be inspected and approved (stage-wise) by VCS.

1.10 The heat treatment for stud bolts & nuts shall be as per code unless mentioned otherwise.

1.11 All austenitic stainless steel bolts, nuts, screws shall be supplied in solution annealed condition unless specified otherwise in the material specification.

1.12 Any additional requirements specified in the requisition shall be fully complied with.

1.13 Stud bolts, nuts & jackscrews shall be impact tested wherever specified in the material specification and also where the material specification is indicated as "CRYO". For S.S. nuts and bolts minimum impact energy absorption shall be 27 Joules and test temperature shall be -196DC unless mentioned otherwise. For other materials impact energy and test shall be as per respective code.

1.14 Bolts/nuts of material of construction B7M/2HM shall be 100% Hardness tested as per supplementary requirement S3 of ASTM A193.

1.15 When specified as galvanized, the studs, M/C bolts and nuts shall be 'hot dip zinc coated' in accordance with requirements of 'class C' of' ASTM A 153'. As an alternative, electro-galvanizing as per IS 1573, 'Service Grade Number 2' is also acceptable.

1.16 All Stud Bolts of Bolt diameter size 1" and above shall be provided with three nuts irrespective of whatever has been specified elsewhere in the MR.

1.17 Bolting shall be protected by non-corrosive oil or grease before dispatch to prevent rusting.

1.18 For stud bolt diameters not covered in ASTM A320, mechanical properties shall match the values specified for the matching grades and stud bolt diameters in ASTM A 193.

1.19 In cases where the lengths of Stud/Machine bolts specified in the MR are not multiples of 0.25", the length supplied shall be equal to the specified length rounded up to the next higher 0.25".

1.20 All Specialties mentioned in item description like "IBR", "L T", "H2", etc. other than **"CRYO" & "NACE**" shall be ignored.

2.0 ACCEPTABLE DEVIATIONS

2.1 Nuts' to ASTM A194Gr.7 are acceptable in place of ASTM A194Gr 4.

2.2 Stud Bolts to ASTM A453 Gr.660 C1.B are acceptable in lieu of ASTM A453 Gr.660C1.A and vice versa

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION

FOR
PAINTING

VCS – SS – PP - 2502

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CONTENTS

1.0 GENERAL

1.1 This technical specification shall be applicable for the work covered by the contract, and without prejudice to the provisions of various codes of practice, standard specifications etc. It is understood that contractor shall carry out the work in all respects with the best quality of materials and workmanship and in accordance with the best engineering practice and instructions of Engineer-In-Charge.

Wherever it is stated in the specification that a specific material is to be supplied or a specific work is to be done, it shall be deemed that the same shall be supplied or carried out by the contractor. Any deviation from this standard without written deviation permit from appropriate authority will result in rejection of job.

1.2 SCOPE

1.2.1 Scope of work covered in the specification shall include, without being limited to the following.

1.2.2 This specification defines the requirements for surface preparation, selection and application of primers and paints on external surfaces of equipment, vessels, machinery, piping, ducts, steel structures, external & internal protection of storage tanks for all services, MS Chimney without Refractory lining and Flare lines etc. The items listed in the heading of tables of paint systems is indicative only, however, the contractor is fully responsible for carrying out all the necessary painting, coating and lining on external and internal surfaces as per the tender requirement.

1.2.3 Extent of Work

1.2.3.1 The following surfaces and materials shall require shop, pre-erection and field painting:

a. All un-insulated C.S. & A.S. equipment like columns, vessels, drums, storage tanks (both external & internal surfaces), heat exchangers, pumps, compressors, electrical panels and motors etc.

b. All un-insulated carbon and low alloy piping, fittings and valves (including painting of identification marks), furnace ducts and stacks.

c. All items contained in a package unit as necessary.

d. All structural steel work, pipe, structural steel supports, walkways, handrails, ladders, platforms etc.

e. Flare lines, external surfaces of MS chimney with or without refractory lining and internal surfaces of MS chimney without refractory lining.

f. Identification colour bands on all piping as required including insulated aluminium clad, galvanised, SS and nonferrous piping.

g. Identification lettering/numbering on all painted surfaces of equipment/piping insulated aluminium clad, galvanized, SS and non-ferrous piping.

h. Marking / identification signs on painted surfaces of equipment/piping including hazardous service.

i. Supply of all primers, paints and all other materials required for painting (other than Owner supplied materials)

j. Over insulation surface of equipments and pipes wherever required.

k. Painting under insulation for carbon steel, alloy steel and stainless steel as specified.

l. Painting of pre-erection/fabrication and Shop primer.

m. Repair work of damaged pre-erection/fabrication and shop primer and weld joints in the field/site before and after erection as required.

n. All CS Piping, equipments, storage tanks and internal surfaces of RCC tanks in ETP plant.

1.2.3.2 The following surfaces and materials shall not require painting in general. However, if there is any specific requirement by the owner, the same shall be painted as per the relevant specifications:

a. Un-insulated austenitic stainless steel.
b. Plastic and/or plastic coated materials
c. Non-ferrous materials like aluminum.

1.2.4 Documents

1.2.4.1 The contractor shall perform the work in accordance with the following documents issued to him for execution of work.

a. Bill of quantities for piping, equipment, machinery and structures etc.
b. Piping Line List.
e. Painting specifications including special civil defence requirements.

1.2.5 Unless otherwise instructed, final painting on pre-erection/ shop primed pipes and equipments shall be painted in the field, only after the mechanical completion, testing on systems are completed as well as after completion of steam purging wherever required.

1.2.6 Changes and deviations required for any specific job due to clients requirement or otherwise shall be referred to VCS for deviation permit.

2.0 CODES & STANDARDS

Without prejudice to the specifications of the contract, the following codes and standards shall be followed for the work covered by this contract.

IS: 5 Colors for ready mixed paints and enamels.

RAL DUTCH International Standard for colour shade (Dutch Standard)

IS: 101 Methods of test for ready mixed paints and enamels,

IS: 161 Heat resistant paints.

IS: 2074 Specifications for ready mixed paint, red oxide zinc chrome priming.

IS: 2379 Color code for identification of pipelines.

IS: 2932 Specification for enamel, synthetic, exterior (a) undercoating. (b) Finishing.

3.0 CONDITIONS OF DELIVERY

Packaging

Every recipient will be fitted with a hermetically-sealed lid with an opening that is sufficiently large to allow the contents to be stirred: the outside and inside are protected against oxidation, and, the lid, are marked with a strip of color identical to the contents.

4.0 COMPOSITION OF THE PAINT PRODUCTS USED

a) Quality

The composition and quality of the products may not differ from batch to batch. A batch is all of the products of a specified manufacture. If the analyses of products bring to light that the composition does not conform to the specifications of the paint manufacturer, the OWNER may refuse to use this batch of products. The paint products must comply with the following conditions

- They must have the viscosity necessary for the described use and the established condition: use of the brush - paint roller (spray gun only for special cases and in the workshop)

b) Quality control - Sampling

While the works are in progress on the construction site, the OWNER may carry out sampling on the paint being used for the purpose of checking conformity. The paint products must be made available free of charge to the laboratory or the approved supervisory body in sufficient quantities so that all the tests can be carried out on the same batch.

If analyses reveal a non-conformity in the composition of the products used (tolerance of $\pm$ 3 % of the dosage of every component), the OWNER may refuse application of the product under consideration, halt the work and have the nonconforming product already applied removed.

Before proceeding the work, a product that does conform will be required. The only Purpose of the analysis is to reveal any nonconformity of the composition of the products. Their purpose is therefore not to assess the quality of the different components. The analyses concerned are not acceptance tests of the products supplied and in no way affect the obligations of the contractor specified in the contract towards the OWNER.

5.0 IDENTIFICATION

Every recipient will bear the following information:

- Name of the manufacturer
- Date and number of manufactures
- Name of the product type
- Batch no
- Net weight of the produced or the contents of the recipient
- Date of the expiry.

At the time of delivery, this packaging must bear labels in conformity with the legal stipulations in force.

Leaving the site after work

After completion of a job a general clean-up shall be carried out by the Contractor to remove all debris, materials or irregularities that his work has brought to the site so that it is left tidy:

The restoration work includes among other things:

- The removal of abrasives.
- The removal of the different protective coverings.

- The Contractor will make the required repairs to any damage after refitting the supports.

- The removal of paint and cleaning of the stains on the floor.

6.0 SURFACE PREPARATION STANDARDS

Following latest edition of standards shall be followed for surface preparations:

1. Swedish Standard Institution- SIS-05 5900-1967/ISO 8501-1

2. Steel Structures Painting Council, U.S.A. (Surface Preparation Specifications (SSPC-SP)

3. British Standards Institution (Surface Finish of Blast-cleaned for Painting) BS-4232.

4. National Association of Corrosion Engineers. U.S.A. (NACE).

5. IS-1477-1971 (Part-1) - Code of Practice for Painting of Ferrous metals in Buildings. (Part 1, Pre-treatment)

   a) The contractor shall arrange, at his own cost to keep a set of latest edition of above standards and codes at site.

   b) The paint manufacturer's instruction shall be followed as far as practicable at all times. Particular attention shall be paid to the following:

      - Proper storage to avoid exposure as well as extremes of temperature.
      - Surface preparation prior to painting.
      - Mixing and thinning.
      - Application of paints and the recommended limit on time intervals between coats.

   c) Any painting work (including surface preparation) on piping or equipment shall be commenced only after the system tests have been completed and clearance for taking up painting work is given by the OWNER, who may, however, at his discretion authorize in writing, the taking up of surface preparation or painting work in any specific location, even prior to completion of system test.

7.0 PREPARATION OF THE SURFACES

7.1 General Specifications

The cases that occur in practice on building sites, with regard to painted surfaces, can be broken down as follows:

- Material of which the oxide content disappears by natural oxidation.
- Material that has already been covered with a layer of paint in the workshop.
- Material that is covered with old paint layers that show different degrees of weathering.

Good preparation of surface is the best guarantee for good anti-corrosion protection.

Paintwork may never begin until the surface to be treated is dry and is independent of the base coat and cleared of dirt, dust, rust, scale, grease, salt attack, cement powder, cement mud-scale, sand, oil, etc.

Based on the environmental conditions of coastal and saline nature, the Painting specification for station pipes defines the complete requirements like:

- Surface preparation standards like NACE etc.
- Sand blasting process
- Color Codes for piping
- Paint materials types and their DFT measurement.
- Selection and application of paints on external surfaces.

The pipeline passes through the coastal and marine environment, the **Table-4** of this specification to be followed for the painting works.

The method of preparation of the surface will be implemented in accordance with the preparation methods described below:

- Bright blast-cleaning
- Mechanical or Power tool cleaning
- Manual or hand tool cleaning

The Contractor should have the required material at his disposal to clean the surfaces to be coated thoroughly in accordance with the preparation methods regardless of the form or the condition of such surfaces. The cleaning devices that might be damaged during the surface preparation shall be screened off by the Contractor.

7.2 Air blast cleaning with abrasive

Before beginning cleaning by blasting, the person carrying out the work will take the following measures:

- Clear the steel surface of oil and/or grease;
- Ensure that each flange collar (section where the sealing is applied) is properly screened off against the blasting and the subsequent works;
- Check that no blasting grains can act into the pipes during this process. Any openings not sealed off must be screened off;

- Where there are valves, regulators and other devices, the manufacturer's identification plate will be dismantled so that all surfaces can be treated. The plate will then be put back again.
- Screen off all non-metal structures such as rubber where there is a filter;
- With valves, operators and other devices, care should be taken to ensure that no metal filings or paint get into the apparatus:
- The OWNER reserves the right to carry out part or all of these works himself.

To prevent rust forming quickly as the result of humidity on the blasted surface, cleaning by blasting may only be carried out when the temperature of the steel surface is at least 3°C higher than the dew-point of the ambient air.

Blasting may not be carried out if the relative degree of humidity exceeds 80%. The choice of the type of blasting medium used depends on local circumstances such as the possible presence of gas and the material to be blasted.

The abrasive to be used must conform to the local law i.e. it may contain no carbon and less than 1% free silicon dioxide. The Sa 3 will always be requested and must at least reach Sa 2½ during the initial stage of the paintwork. For blasting followed by metallization, the surface preparation degree to be achieved is always Sa 3. The degree of cleanliness to be obtained will be inspected in accordance with the Swedish standard SVENSK STANDARD ISO 8501-1-1988 SIS 05.5900.

- Sa 3: surface blasted down to the bare metal; when the surface is inspected with a magnifying glass, scale, rust and foreign bodies must be completely removed and it should be possible to raise a metallic -shine on the treated surface.

- Sa 2 1/2: blasted very carefully. Scale, rust and foreign bodies must be removed in such a way that anything left behind will only be visible as nuances (shading) or strips.

The blast-cleaning will be carried out by means of compressed air free of water and oil.

After the blasting and before painting, the surface should be completely cleaned of blasting material and so forth with a soft brush, a dry cloth or dry compressed air.

7.3 Mechanical or Power tool cleaning

If sandblasting is not permitted or if the metal structures are not easily accessible for blasting or blasting for one reason or other is technically unfeasible, mechanical de rusting can be used instead. With mechanical cleaning by means of chipping, rotating steel brushes and sanding discs, a degree of cleanliness St. 3 should be reached.

St 3 : removal of the old paint layers of which the adhesion leaves something to be desired and/or of which the paint layer no longer fulfills the requirements.

If parts are present that are so corroded that St 3 is difficult to achieve, this should be notified to the OWNER representative prior to the start of the works.

N.B:
St. 3 : means removal of every old paint layer. Retouching means local polishing with St. 3 or Sa 3 followed by application of the desired painting system.

After mechanical cleaning, the surface should be made dust-flee with a cloth or a so brush, washed with an organic solvent and thoroughly dried off with a dry cloth (e.g. with 1.1.1. Trichoroethane such as Solvethane, Chloroethene).

7.4 Manual or Hand tool cleaning

Manual derusting with the aid of scrapers. steel brushes, sandpaper etc. shall only be permitted in exceptional cases for local repairs. Any deviation there from must be requested from the OWNER/ OWNER 's Representative.

With manual derusting, a surface preparation degree St 3 must be obtained. The length of the handles of the equipment used may not exceed 50 cm.

7.5 Preparation of a surface covered with a layer of paint in the workshop.

This layer is in general applied by the manufacturer, for example, on valves, regulators etc. Layers of this kind will be checked for their proper adhesion in accordance with ASTM D 3359, method A (Standard Test Method for measuring adhesion by tape test). The adhesion should be at least.

If the paint layer shows less adhesion or is incompatible with the rest of the system it should be completely removed. If the paint layer is not removed, the Contractor accepts it in the state in which the coating is found and the guarantee remains in force. The adhesion does not have to be examined if system 63 has already been applied in the workshop on behalf of the OWNER.

The Contractor, who must provide for the protection on the construction site, must therefore obtain the information regarding the treatment of the surface and the quality of the paint that was used and must, moreover, examine the adhesion of the layer on the construction site, the percentage of damage and weathering as well as the value of the preparation of the surface in the workshop together with the thickness thereof that must be supplemented if necessary.

a) Galvanized surface

Galvanized surfaces, both old and new will be carefully roughened up. Every foreign body (concrete splatters, chalk marks, grease and oil stains, etc.) will be removed. Thereafter, rub the surfaces with abundant water and, if necessary, with cleaning products.

To this end, nylon brushes will be used for every kind of dirt as well as for removing zinc salt residue. Thereafter, the surfaces will be treated in accordance with system 21. Where the zinc layer is lacking, it will be derusted manually to a degree of cleanliness St 3, after which a primer coat will be applied in accordance with system 22.

b) Metallized surfaces treated with an impregnation layer

- Degrease with the desired degreasing product:
- Clean under high pressure or with a product prescribed by the paint supplier.

If the paint layer adheres well and is applied on a clean base, the painting system described may be continued. If the percentage of damage and weathering does not exceed 5 % m. retouching may be considered. These partial repairs will be carried out.

If on the other hand, the percentage of damage does exceed 5 %/m or if the layer applied in the workshop comes loose the Contractor must draw the attention of the OWNER to this and carry out the complete application system.

7.6 Preparation of surfaces covered with earlier paint layers that show different degrees of weathering.

If the surfaces do not show deep weathering limited to the spread of rust by small pitted areas or non-penetrative rust in spots, it will very often be sufficient to clean the surfaces with abrasives or with an abrasive disc, then to rub them down with steel wool, remove the dust and wash off. If thick rust appears, in spots, scale rust and active rust canker, this should be removed with needle hammers or stripped away directly by blasting, removing the dust and washing off.

7.7 Preparation of concrete or cement plaster surfaces

Remove unsound paint layers and loose components with scrapers, blades or rotating steel brushes. Thoroughly clean the entire surface with water containing ammonia. Thoroughly remove moss, algae and fungal growths. Where these growths have been removed, treat the area with a fungicide in accordance with the instructions for use.

Once the entire area is completely dry, brush off the dead residue of moss, algae and fungus with a hard brush. In the case of reinforcement steel that has been laid bare, remove as rust, dust and grease as possible and treat with a printer coat. When painting concrete surfaces, they must first be checked for cracks. Cracks larger than 0.3 mm must be repaired with an appropriate system in accordance with the type and extent of the repairs (e.g. injection with epoxy mortar). Repair damage such as cracks and bursts to concrete parts with a two-component mortar or preferably with micro-mortars. Finally check the alkalinity of the surface with the aid of litmus paper and neutralize it if necessary.

7.8 Use of solvents

It is sometimes necessary to use solvents when the surfaces to be painted are streaked with grease or oil. In this case a suitable organic solvent should be applied. The operation should be carried out with the aid of clean brushes or rags and clean solvent.

All the legal specifications in connection with solvents etc. must be adhered to. The OWNER/OWNER's Representative will be informed in advance of any toxicity or flammability. All measures must be taken to prevent any risk of fire and to nick out any possibility of poisoning (ventilation). The Contractor will provide drip collectors to keep the environment free of pollution.

7.9 Condition of the metal after stripping

The Contractor must call in a representative of the OWNER/OWNER's representative or of the Approved supervisory Body responsible for checking the condition of the metal during stripping and informing the OWNER/OWNER's representative immediately of any damage that he might have noticed.

- Deep corrosion of the plates - rivets - bolts
- Faulty welding
- Fittings that appear to be dangerous because of their age.

7.10 Removing coating from surface pipelines

The Contractor must have the equipment necessary for the removal of asphalt from the pipe without damaging the latter (scratching, impact, etc,). The Contractor undertakes to carry out the work in accordance with an approved procedure.

TABLE-1 (FOR CLAUSE 7.0)
SURFACE PREPARATION STANDARDS

SL. NO.	DESCRIPTION	VARIOUS INTERNATIONAL STANDARDS (EQUIVALENT)			REMARKS
		ISO 8501-1/ SIS-05 59 00	SSPC-SP, USA	NACE, USA	
1	Manual or hand tool cleaning Removal of loose rust, loose mill scale and loose paint, chipping, scrapping, standing and wire brushing. Surface should have a faint metallic sheen	ST.2	SSPC-SP-2	-	This method is applied when the surface is exposed to normal atmospheric conditions when other methods cannot be adopted and also for spot cleaning during maintenance painting.
2	Mechanical or power tool cleaning Removal of loose rust loose mill scale and loose paint to degree specified by power tool chipping, de-scaling, sanding, wire brushing and grinding, after removal of dust, surface should have a pronounced metallic sheen.	ST.3	SSPC-SP-3	-	
3	Dry abrasive Blast cleaning There are four common grades of blast cleaning				

3.1	White metal Blast cleaning to white metal cleanliness. Removal of all visible rust. Mill scale, paint & foreign matter 100% cleanliness with desired surface profile.	SA 3	SSPC-SP-5	NACE#1	Where extremely clean surface can be expected for prolong life of paint system.
3.2	Near white metal Blast cleaning to near white metal cleanliness, until at least 95% of each element of surface area is free of all visible residues with desired surface profile.	SA 2½	SSPC-SP-10	NACE#2	The minimum requirement for chemically resistant paint systems such as epoxy, vinyl, polyurethane based and inorganic zinc silicate paints, also for conventional paint systems used under fairly corrosive conditions to obtain desired life of paint system.
3.3	Commercial Blast Blast cleaning until at least two-third of each element of surface area is free of all visible residues with desired surface profile.	SA 2	SSPC-SP-6	NO.3	For steel required to be painted with conventional paints for exposure to mildly corrosive atmosphere for longer life of the paint systems.
3.4	Brush-off Blast Blast cleaning to white metal cleanliness, removal of all visible rust, mill scale, paint & foreign matter. Surface profile is not so important.	SA 1	SSPC-SP-7	NO.4	

8.0 METALLISATION

8.1 Applying the metallization

Metallization must be carried out in accordance with ISO 2063,

Metallization is carried out as rapidly as possible after blasting in order to limit corrosion of the pipes (max. 3 hours later). With metallization, a surface preparation degree Sa 3 is compulsory. The roughness of the blasted surfaces should be from 25 to 50µ R_{Max}.

- The metallizing is always carried out on dry parts in good weather conditions (maximum relative humidity 80 %);

- For metallization, a wire composed of 85 % zinc and 15 % aluminum with a minimum guaranteed degree of purity of 99.5 % is used (subject to other specifications). The application thereof is always carried out in accordance with the conditions of the manufacturer and may at all times be submitted to the OWNER's representative.

- The sealant should be applied maximum 3 hours alter metallization.

- The sealant must be thinned and applied as per the present specifications. A visual inspection whereby the sealant completely covers the metallization will suffice here.

- When evaluating the metallization, a negative deviation from the minimum coating thickness, to 80 µ for 20% of the measurements will be permitted.

9.0 COATING PROCEDURE AND APPLICATION

9.1 Conditions for carrying out paintwork

Painting may not be carried out in unsuitable conditions.

All preparatory work and painting may only he carried out in dry weather and at a minimum temperature of 10℃, except for special eases requested by the OWNER's Representative.

Unless otherwise stipulated in the specifications of the paint supplier, application of the paint is forbidden if it is forecast that the temperature will fall to below 0℃ before the paint is dry. The temperature of-the surface to be painted must be at least 3°C higher than the dew point of the ambient air. Application of the paint is also not permitted if there is a danger that the coat of paint will not be dry before dew or condensation sets in.

The work must be stopped:

- If the temperature of the surface to be painted is higher than that described by the supplier.

- In rain, snow, mist or fog or when the relative humidity is higher than 80 %.

Coats that have not yet dried and have been exposed to frost, mist, snow or rain and might thereby be damaged must be removed after drying and the surfaces must be repainted at the expense of the Contractor.

Working in direct sunlight or in hot weather must be avoided,

The first coat of paint must be applied maximum 3 hours after the preparation of the surface of the relative humidity of the air is between 50% and 80%. This time span may be increased to 6 hours if the relative humidity is less than 50%. In all cases, the preparation of the surface must exhibit degree Sa 3 and at the very least the appearance of degree Sa 2 ½ at the time of painting.

The coats of paint may only be applied on carefully cleaned surfaces that must be dry and free of grease and dust.

9.2 Special conditions

Painting may be carried out when the Contractor can be sure that the instructions of the paint supplier have been scrupulously followed with regard to the parameters in the following (non-exhaustive) list:

- Ambient temperature.
- Surface temperature.
- Relative humidity.
- Dew point.
- Drying times.

The Contractor must in this respect be able to produce the instructions for the paint on the site. The OWNER/CONSULTANT will guarantee 100% supervision in this regard during the execution of the work.

In addition, the paintwork may only be carried out to a minimum ambient temperature of 5°C and/or to a maximum relative degree of humidity of 85 %. Application of the paint is also not permitted if there is a danger that the coat of paint will not be dry before dew or condensation sets in.

10.0 PAINT MATERIAL

Manufacturers shall furnish the characteristics of all paints indicating the suitability for the required service conditions. Primer and finish coats shall be of class-I quality and shall conform to the following:

a) Primer (P-1)

Red oxide Zinc Chromate Primer

Type and Composition	Single pack, Modified phenolic alkyd medium pigmented with red oxide and zinc chromate.
Volume solids	30 - 35% (min)
DFT	25 microns/coat (min)
Covering capacity	12 - 13 M^2/Lit/coat

b) Primer (P-2)

High build chlorinated rubber zinc phosphate primer

Type and Composition	Single pack, Air Drying Chlorinated rubber medium Plasticized with unsaponifiable plasticiser pigmented with zinc phosphate
Volume solids	35 - 40% (min)
DFT	30 - 40 microns/coat (min)
Covering capacity	7 - 8 M^2/Lit/Coat

c) Primer (P-3)

High build zinc phosphate primer

Type and Composition	Single Pack, Synthetic medium, pigmented with zinc phosphate.
Volume solids	40 - 45% (min)
DFT	35 - 50 microns/coat (min)
Covering capacity	10 - 12 M^2/Lit/coat
Heat resistance	Upto 80 ºC (dry)

d) Primer (P-4)

Etch Primer / Wash Primer

Type and Composition	Two pack Poly vinyl butyral resin medium cured with phosphoric acid solution pigmented with zinc tetroxy chromate.
Volume solids	7 - 8% (min)
DFT	8 - 10 microns/coat (min)
Covering capacity	7 - 8 M^2/lit/coat

e) Primer (P-5)

Epoxy Zinc Chromate Primer

Type and Composition	Two packs, Polyamide cured epoxy resin medium pigmented with zinc chromate.
Volume solids	40 % (min)
DFT	35 microns/coat (min)
Covering capacity	11 - 12 M^2/lit/Coat

f) Primer (P-6)

Epoxy Zinc Phosphate Primer

Type and Composition	Two packs, Polyamide cured Epoxy resin medium pigmented with zinc phosphate.
Volume solids	40% (min)
DFT	35 - 50 microns/coat (min)
Covering capacity	11 - 12 M^2/lit/coat

g) Primer (P-7)

Epoxy high build M10 Paint (Intermediate Coat)

Type and composition	two pack Poly Polyamide cured epoxy resin medium pigmented with micaceous iron oxide. Volume solids 7- 8%
Volume Solids	50% (min)
DFT	100 microns/coat (min)
Covering capacity	5.0 M^2/lit/coat

h) Primer (P-8)

Epoxy Red Oxide zinc phosphate primer

Type and Composition	two pack. Polyamine cured epoxy resin pigmented with Red oxide and Zinc phosphate.
Volume solids	42% (min)
DFT	30 microns/coat (min)
Covering capacity	13 - 14 M^2/lit/coat

i) Primer (P-9)

Epoxy based tie coat (suitable for conventional alkyd based coating prior to application of acrylic polyurethane epoxy finishing coat)

Type and Composition	Two packs, Polyamide cured epoxy resin medium suitably pigmented.
Volume solids	50 - 60% (min)
DFT	50 microns/coat (min)
Covering capacity	10 - 12 M^2/Lit/Coat

j) Finish Coats (F-1)

Synthetic Enamel

Type and Composition	Single pack, Alkyd medium pigmented with superior quality water and weather resistant pigments
Volume solids	30 - 40% (min)
DFT	20 - 25 microns/coat
Covering capacity	16 - 18 M^2/lit/Coat

k) Finish coat (F-2)

Acrylic Polyurethane paint

Type and Composition	Two pack, Acrylic resin and iso-cyanate hardener suitably pigmented.
Volume Solids	40% (min)
DFT	30 - 40 microns / coat
Covering Capacity	10 - 12 M^2/lit/ coat

l) Finish Coat (F-3)

Chlorinated Rubber Paint

Type and Composition	Single pack, Plasticised chlorinated rubber medium with chemical & weather resistant pigments.
Volume solids	40% (min)
DFT	30 - 40 microns/coat (min)
Covering capacity	8 - 10 M^2/lit /coat

m) Finish Coat (F-4)

High build chlorinated rubber M10 paint.

Type and Composition	Single pack Chlorinated rubber based high build pigmented with micaceous iron oxide.
Volume solids	40 - 50% (min)
DFT	65 - 75 microns/coat
Covering capacity	6.0 - 7.0 M^2/lit/coat

n) Finish coat (F-5)

Chemical Resistant Phenolic based Enamel

Type and Composition	Single pack phenolic medium suitably pigmented.
Volume solids	35 - 40% (min)
DFT	25 microns/ coat
Covering capacity	15.0 M^2/lit/coat

o) Finish Coat (F-6)

Epoxy High Building Coating

Type and Composition	Two pack. Polyamide-amine cured epoxy resin medium suitably pigmented.
Volume solids	60 - 65% (min)
DFT	100 microns/coat (min)
Covering capacity	6.0 - 6.5 M^2/lit/coat

p) Finish Coat (F-7)

High build Coal Tar Epoxy

Type and Composition	Two pack, Polyamine cured epoxy resin blended with Coal Tar.
Volume solids	65% (min)
DFT	100 - 125 microns/coat
Covering capacity	6.0 - 6.5 M^2/lit/coat

q) Finish Coat (F-8)

Self-priming epoxy high build coating (complete rust control coating)

Type and Composition	Two packs. Polyamide-amine cured epoxy resin suitably pigmented. Capable of adhering to manually prepared surface and old coatings.
Volume solids	65 - 80% (min)
DFT	125 - 150 microns/coat
Covering capacity	4 - 5 M^2/lit/coat

r) Finish Coat (F-9)

Inorganic Zinc Silicate coating

Type and Composition	Two packs, self-cured solvent based inorganic zinc silicate coating.
Volume solids	60% (min)
DFT	65 - 75 microns/coat
Covering capacity	8 - 9 M^2/lit/coat

s) Finish coat (F-10)

High build Black

Type and Composition	Single pack. Reinforced bituminous composition phenol based resin.
Volume solids	55 - 60% (min)
DFT	100 microns/coat (min)
Covering capacity	5.5 - 6.0 M^2/lit/coat

t) Finish Coat (F-11)

Heat Resistant Aluminium Paint Suitable up to 250°C.

Type and Composition	Duel container (paste & medium). Heat resistant spec varnish medium combined with aluminium flakes.
Volume solids	20 - 25% (min)
DFT	20 microns/coat (min)
Covering capacity	10 - 12 M^2/lit/coat

u) Finish Coat (F-12)

Heat Resistant Silicon Paint suitable up to 400º C.

Type and Composition	Single pack Silicone resin based with aluminium flakes.
Volume solids	20 - 25% (min)
DFT	20 microns/coat (min)
Covering capacity	10 - 12 M^2/lit/coat

v) Finish Coat (F-13)

Synthetic Rubber Based Aluminium Paint Suitable up to 1508C.

Type and Composition	Single Pack, Synthetic medium rubber medium combined with leafing Aluminium,
DFT	25 microns/coat (min)
Covering capacity	9.5 M^2/lit/coat

Notes:

1 Covering capacity and DFT depends on method of application Covering capacity specified above is theoretical. Allowing the losses during application, min specified DFT should be maintained.

2. All paints shall be applied in accordance with manufacturer's instructions for surface preparation, intervals, curing and application. The surface preparation quality and workmanship should be ensured.

3. Selected chlorinated rubber paint should have resistance to corrosive atmosphere and suitable for marine environment,

4 All primers and finish coats should be cold cured and air-drying unless otherwise specified.

5. Technical data sheets for all paints shall be supplied at the time of submission of quotations.

6. In case of use of epoxy tie coat, manufacturer should demonstrate satisfactory test for inter coat adhesion. In case of limited availability of epoxy tie coat (P-9) alternate system may be used taking into the service requirement of the system.

7. In case of F-6, F-9, F-1 1 & F-1 2 Finish Coats, No Primer are required.

MANUFACTURERS

The paints shall conform to the specifications given above and Class-I quality in their products range of any of the-following manufacturer or other approved vendors:

i) Asian Paints (India) Ltd.
ii) Bombay Paints
iii) Berger Paints India Ltd.
iv) Akzo Nobel
v) Jenson & Nicholson
vi) Shalimar Paints

STORAGE

All paints and painting material shall be stored only in rooms to be provided by contractor and approved by OWNER/ OWNER 's Representative for the purpose. AlI necessary precautions shall be taken to prevent fire. The storage building shall preferably be separate from adjacent, building.

A signboard bearing the words given below shall be clearly displayed outside:
PAINT STORAGE No NAKED LIGHT highly -inflammable

12.0 COLOR CODE FOR PIPING:

i) For identification of pipelines, the color code as per Table -1 shall be used.

ii) The color code scheme is intended for identification of the individual group of the pipeline. The system of color coding consists of a ground color and color bands superimposed on it.

iii) Colors (Ground) as given in Table-2 shall be applied throughout the entire length of un insulated pipes, on the metal cladding & on surfaces. Ground color coating of minimum 2m length or of adequate length not to be mistaken as color band shall be applied at places requiring color bands. Color bands shall be applied as per approved procedure.

iv) Line coating shall meet DIN 30670 standard for external coating and API 5L RP – 2 for internal coating.

v) The thickness for the epoxy should be 180 microns, adhesive 200 microns and balance should be PE .

vi) The minimum coating thickness on weld seam shall be 3.2 mm and minimum coating thickness on body should be 3.2.

vii) Minimum thickness for liquid epoxy for internal coating should be 100 ± 20 microns.
Max design temperature for coating should be considered +80 ºC.

COLOR CODE:

A) Ball Valve (Above Ground) : Off White
B) Globe Valve (Above Ground) : Oxford Blue-RAL 5005, IS-519941005
C) Check Valve(Above Ground) : Oxford Blue-RAL 5005, IS-519941005
D) Launcher / Receiver : Yellow Golden
E) Jib Crane / Trolley : Yellow Golden
F) All underground valves shall have epoxy base coating after surface finish of SA 2:5
G) Valves and above ground pipes need to be properly blasted to achieve surface finish of Sa 2:5 before the application of paints.

Table 12.1 Colour Coding Scheme for Pipes and Equipment

SI. No.	Description	Ground Color	First Color Band	Second Color Band
1	**COMPRESSED AIR**			
a)	Plant Air	Sky Blue	Silver Grey	-
b)	Instrument Air	Sea Green	Black	-
2	*GASES*			
a)	Charge Gas	Canary Yellow	Signal Red	Smoke Grey
b)	Regeneration Gas	Canary Yellow	White	Dark Violet
c)	Residue Gas	Canary Yellow	White	French Blue
d)	LPG	Canary Yellow	Brilliant Green	White
e)	Acetylene	Canary Yellow	Dark violet	-
	Flare Lines	Heat resistant aluminium		
f)	Fire water and Foam & Extinguisher	Post office red		
3	*ALL EQUIPMENT*			
a)	Vessels. Columns, exchangers, etc. containing non- hazardous fluids.	Light Grey		
b)	Base Frame/Structure	Black		
b)	All equipment containing hazardous fluids	Canary Yellow		

c)	Pipe carrying hazardous fluids	Bar is to be replaced by Hazardous Marking as per IS:2379 Clause 7.1C		

IDENTIFICATION SIGN

i) Colors of arrows shall be black or white and in contrast to the color on which they are superimposed.

ii) Product names shall be marked at pump inlet, outlet and battery limit in a suitable size as approved by OWNER.

iii) Size of arrow shall be either of the following:

a) Color Bands

Minimum width of color band shall be as per approved procedure.

b) Whenever it is required by the OWNER to indicate that a pipeline carries a hazardous material, a hazard marking of diagonal stripes of black and golden, yellow as per IS:2379 shall be painted on the ground color.

IDENTIFICATION OF EQUIPMENT

All equipment shall be stenciled in black or white on each vessels, column, equipment, and painting as per approved procedure.

INSPECTION AND TESTING

1. All painting materials including primers and thinners brought to site by contractor for application shall be procured directly from manufactures as per specifications and shall be accompanied by manufacturer's test certificates Paint formulations without certificates are not acceptable.

2. The painting work shall be subject to inspection by OWNER/ OWNER's Representative at all times. In particular, following stage wise inspection will be performed and contractor shall offer the work for inspection and approval at every stage before proceeding with the next stage.

In addition to above. record should include type of shop primer already applied on equipment e.g. Red oxide zinc chromate or zinc chromate or Red lead primer etc.

Any defect noticed during the various stages of inspection shall be rectified by the contractor to the entire satisfaction of OWNER/ OWNER's Representative before proceeding further. Irrespective of the inspection, repair and approval at intermediate stages of work. Contractor shall be responsible for making good any defects found during final inspection/guarantee period/defect liability period as defined in general condition of contract. Dry film thickness (DFT) shall be checked and recorded after application of each coat and extra coat of paint should be applied to make-up the DFT specified without any extra cost to OWNER.

PRIMER APPLICATION

i. The contractor shall provide standard thickness measurement instrument with appropriate range(s) for measuring.

   Dry film thickness of each coat, surface profile gauge for checking of surface profile in case of sand blasting. Holiday detectors and pinhole detector and protector whenever required for checking in case of immerse conditions.

ii. At the discretion of OWNER/ OWNER's Representative, contractor has to provide the paint manufacturers expert technical service at site as and when required. For this service, there should not be any extra cost to the OWNER.

iii. Final Inspection shall include measurement of paint dry film thickness, check of finish and workmanship. The thickness should be measured at as many points/ locations as decided by OWNER/ OWNER's Representative and shall be within +10% of the dry film thickness.

iv. The contractor shall produce test reports from manufacturer regarding the quality of the particular batch of paint supplied. The OWNER shall have the right to test wet samples of paint at random for quality of same. Batch test reports of the manufacturer's for each batch of paints supplied shall be made available by the contractor.

18.0 PAINT SYSTEMS

The paint system should vary, with type of environment envisaged in and around the plants. The types of environment as given below are considered for selection of paint system. The paint system is also given for specific requirements.

a) Normal Industrial Environment, Table 18.2.
b) Corrosive industrial Environment, Table 18.3
c) Coastal & Marine Environment, Table 18.4

Notes 1. Primers and finish coats for any particular paint systems shall be from same manufacturer in order to ensure compatibility.

TABLE 18.1: LIST OF PRIMERS & FINISH PAINTS

PRIMERS	
P-1	Red oxide Zinc chromate Primer
P-2	Chlorinated rubber zinc Phosphate Primer
P-3	High build Zinc phosphate Primer
P-4	Etch Primer/Wash Primer
P-5	Epoxy Zinc Chromate Primer
P-6	Two component Epoxy Zinc Phosphate Primer cured with polyamine hardener
P-8	Epoxy red oxide zinc phosphate primer
FINISH COATS / PAINTS	
F-1	Synthetic Enamel
F-2	Two component Acrylic – Polyurethane finish paint
F-3	Chlorinated Rubber finish paint
F-5	Chemical resistant phenolic based enamel
F-6	High Build Epoxy finish coating cured with **polyamide** hardener
F-7	High build Coal Tar Epoxy coating cured with **polyamine** hardener
F-8	Self priming surface Tolerant High Build epoxy coating. cured with **polyamine** hardener
F-9	Two component Inorganic Zinc Silicate coating
F-10	High build Reinforced bituminous composition phenol based resin.
F-11	Heat resistant synthetic medium based Aluminium paint suitable for 250 deg C
F-12	Two component Heat resistant Silicone Aluminium paint. suitable for 400 deg C
F-13	Synthetic based aluminium Paint suitable for 150 deg C

Table – 18.2: Painting System for Normal Industrial Environment for Piping and Equipment (Above Ground)

Sl. No.	Temp. Range	Surface Preparation	Primer	Finish Coat	Total DFT	Remarks
1	-10 to 20	SSPC-SP-3	One coat P-2 50 microns / coat (min)	One coat F-4 65 microns/ coat (min) Two coats F-3, 30 Microns/coat (min)	175	Primer and Finish coat can be applied at ambient temp.
2	21 to 60	SSPC-SP-6	Two coats P-1, 25 microns/ coat (min.)	Two coats of F-1, 20 microns/coat (min)	90	-
3	61 to 80	SSPC-SP-6	Two coats P-3, 50 microns/ coat (min)	Two coats of F-13, 25 microns/coat (min)	150	-
4	81 to 250	SSPC-SP-6	-	Three coats of F-11, 20 microns/ coat (min)	60	Paint application at ambient temp. curing at elevated temp. during start-up.
5	251 to 400	SSPC-SP-10	-	Three coats of F-12, 20 microns/ coat (min)	60	-do-

Table – 18.3: Painting System for Corrosive Industrial Environment for Piping and Equipment (Above Ground)

SI. No.	Temp. Range	Surface preparation	Primer	Finish Coat	Total DFT	Remarks
1	-14 to 80	SSPC-SP-10	Two coats P-6, 35 microns / coat (min.)	One coats F- 6, 100 microns coat (min.) and one coats F- 2 40 microns coat (min.)	210	Paint application at ambient temp.
2	81 to 250	SSPC-SP-10	-	Three coats F-11, 20 Microns / coat (min.)	60	Paint application at ambient temp. and curing at 250^{o}C for 4 hours
3	81 to 400	SSPC-SP-10	-	Three coats F-12, 20 Microns / coat (min.)	60	Paint application at ambient temp. and curing at 250^{o}C for 4 hours

Table – 18.4 :Painting System for Coastal and Marine Environment for Piping and Equipment (Above Ground)

SI. No.	Temp. Range	Surface Preparation	Primer	Finish Coat	Total DFT	Remarks
1	-14 to 80	SSPC-SP-10	Two coats P-6. 35 Microns. coat (Min.)	Two coats F- 6, 100 microns /coat (min.) and one coats F-2 40 Microns /coat (min.)	310	Primer and Finish coat application at Ambient temp.
2	81 to 400	SSPC-SP-I0	-	- Three coats F- 12, 20 Microns / coat (min.)	60	Paint application. at ambient temp, and curing at 250°C for 4 hours
3	401 to 550	SSPC-SP- 10	-	Three coats F- 12, 20 Microns / coat (min.	60	Paint application. at ambient temp, and curing at 250°C for 4 hours

Table – 18.5 : Painting System for External Side of Underground Tanks in all areas.

SI. No.	Temp. Range	Surface Preparation	Primer	Finish Coat	Total DFT	Remarks
External side of un-insulated underground storage tanks:						
1	-40 to 80	SSPC-SP-10	1 coat of F-9 @ 65-75µ DFT/ coat	3 coats of F-7 @ 100µ DFT/coat (3x100=300)	365-375	

18.2 Precautions to be taken

Neither the environment of the site nor the marking labels of devices may be covered with paint and they must be kept free of paint splashes. To this end, it is advisable to use removable masking tape.

Paint splashes, leaks, etc. on any adjacent installations such as measuring apparatus, valves, pipes. Sources of light, insulation, heat insulators, walls, concrete, etc, must immediately be wiped up and the damage repaired before the paint is dry.

Otherwise, the OWNER will be obliged to have the cleaning carried out at the expense of the Contractor. The paint recipient will only be opened at the time of use (unless otherwise specified by the manufacturer).

The product will be mixed in the recipient with the aid of suitable tools and thus homogenized.

18.3 Method of application

Normally, three methods of application will be used on the construction site for the paint products. i.e. with a brush, with a roller or with a spray gun.

- The brush method makes it possible to obtain good penetration of the paint over irregularities in the metal.
- Only this method will be used for application of the base coats, for retouching and for protrusions, welded areas, riveted joints or bolted joints:
- The roller method may be used on large flat surfaces for the intermediate and topcoats.
- The spray gun method must be used in accordance with the instructions of the manufacturer and carried out by qualified personnel.

The Contractor must guarantee that all safety measures have been taken for such work. The spray gun method may only he used on site for places that are difficult to reach with the brush. In this case, a request must be made to the OWNER/ OWNER's Representative for a deviation.

All paintwork will be carried out with good brushes or rollers that are suitable for the type of paint being used and for the form of the material to be painted and fitted with short handles. The maximum length of the brush and roller handles will be 50 cm; longer handles may only be used for places that are absolutely inaccessible. The maximum width of a brush will be 13 cm.

18.4 Application of the coating

Application of the paint will be carried out in accordance with best practice in order to obtain a homogeneous and continuous layer. The OWNER or the Approved Supervisory body demands that painting of a layer will only be started after acceptance by them of the surface preparation or of the previous layer of paint.

The layers of paint must have a uniform thickness. They must he spread in such a way that all concave parts are dried out and that the surface is completely covered and has a

glossy appearance without leaving brush marks and without exhibiting bubbles, foam, wrinkles, drips, craters, skins or gums that arise from weathered paint,

Each layer must have the color stipulated in the tables of the present specifications, which clearly differs from the previous layer, taking account of the Color of the top layer, all of which for the purpose of being able to identify the number of coats and their order of sequence. If the color of the coats is not mentioned in the tables the color difference in consecutive coats must, if possible, he at least 100 RAL. The color of the top layer is given in the table.

The coating power should be such that the underlying layer is not visible. Only 1 layer per day may be applied, unless otherwise specified by the OWNER or the Approved Supervisory Body.

The drying times prescribed by the paint manufacturer must be strictly observed in relation to the environmental conditions before proceeding with the application of the next layer.

The dry coating thickness indicated in the description of the paint systems are minimum thickness. In this connection, the Contractor is obliged to contact the paint manufacturer and conform to his guidelines. The Contractor must respect the thickness specified by the supplier.

18.5 Transporting treated items

In the case of works being carried out in a workshop, the metal structures will be surrounded by ventilated contraction film that prevents damage during transportation. This film may only be applied after complete polymerization of the paint.

19.0 GROUND-LEVEL TRANSITION POINT

19.1 Polyester protection system

The Contractor will provide system 02 over the entire length of the pipes above ground and below ground and up to a height of 20 cm and a depth of 40 cm. perpendicular to the ground level mark. In each case, he must ensure that the jointing below the asphalt is in good condition and assures' faultless adhesion. He will apply the following products over the entire surface area, prepared in accordance with is Sa 3:

1) The primer of system 01.

2) Reinforced polyester ± 20 cm above the ground level marker and ± 5 cm on the asphalt cleaned beforehand (application of reinforced polyester is carried out in accordance with the work method prescribed by the manufacturer). Moreover, in the case of PE, in contrast to asphalt, he will apply a polygon primer to PE immediately before applying the reinforced polyester.

3) He will then apply the other coats of system 01a to the surface section and thus cover the reinforced polyester with about 5 cm.

4) For new constructions, the polygon primer will be applied to PE and then subsequently processed as described under point 2.

20.0 USE OF SCAFFOLDING

Mounting, maintenance and dismantling of scaffolding for carrying out adaptation and/or paintwork to surface gas pipes or gas transport installations in use;

- The Contractor will specify the cost of scaffolding in the price list.
- The supplementary rental price for delays attributable to the Contractor will be charged to him:
- In his price quotation the Contractor should present the OWNER with diagrams of the scaffolding that he intends to install for carrying out the works of the OWNER.

21.0 QUALITY CONTROLS AND GUARANTEE

21.1 The Contractor is responsible for checking the weather conditions to ascertain whether the paintwork can be carried out within the technical specifications.

The Contractor should have the required calibrated monitoring apparatus for this purpose on site (with calibration certificates). The personnel who will have to use this apparatus should have the training for this purpose.

The OWNER or his representative and possibly the approved supervisory body indicated by the OWNER will maintain supervision during the works and inspect the works with random checks. A daily report will be drawn up in relation to the department that maintains supervision of these works.

The supplementary inspection and the supervision by the OWNER or the approved supervisory body do not diminish in any way the liability of the Contractor. The proper execution of the work and the materials used may be checked at any time.

21.2 Reference Surfaces

At the start of the works. The OWNER or the approved supervisory body will indicate a few surfaces that the Contractor will prepare and cover in accordance with the recognized method of operation under the inspection and to the satisfaction of all parties; the OWNER or his representative, the approved supervisory body, the contractor and possibly the paint manufacturer. These reference surfaces will serve as a point of comparison for the good adhesion of the paint on the installations as a whole. The parties will together

work out a system for the identification of these surfaces in order to be able to monitor the conditions of the coatings over time. If the paintwork on a section of the installations is in a worse condition than the reference surfaces, the Contractor may be obliged to treat these parts again.

21.3 Measures to be taken in the event of a dispute

If on delivery of the works no agreement can be reached between the Contractor and the OWNER regarding the conformity of the works to the requirements of these specifications, an Approved Supervisory Body will he Called in. The Approved Supervisory Body will then carry out inspections' on site whereby the following assessment criteria will be used:

- The Swedish standards ISO 8501-1 1988 SS 05.5900 concerning the degree of cleanliness of the areas derusted by blasting, by machine or by hand.

- The wet film thickness of the paint will be measured in accordance with ISO 2808 or ASTM DI 212;

- The dry layer thickness of the film will be measured electronically, will complete statistical information. in accordance will, ISO 2808 or ASTM D 1186.

- The thickness of each layer will be measured in accordance with ISO 2808. ASTM 4138 or DIN 50986.

- Adhesion tests will be carried out in accordance with ISO 2409. ASTM 3359 or DIN 53151.

- Traction tests will he carried out in conformity with ISO 4624 or ASTM D 4541.

- The rugosity will be measured electronically in accordance with DIN 4768;

- The non-porosity will be measured with a test tension depending on the type of coating, the layer thickness and after consultation with the Paint manufacturer.

- Any defects in the paint film may be inspected visually by means of a magnifying glass or microscope. If necessary a photographic report may be drawn up in accordance with ASTM Standard D 4121-82.

The final judgment of the Approved Supervisory Body is irrevocable and binding for the Contractor and the OWNER. In the event of non-conformity of the works with the criteria of these specifications, all costs arising from the inspection by the Approved Supervisory Body shall be borne by the Contractor.

21.4 Guarantee

a) General Principles

The Contractor declares that he is aware of:

- The maximum operating temperature of the surfaces to be covered.
- The maximum permitted degree of humidity of the bearing surface.

- The properties of the environment to which the surfaces to be covered are: subject.

b) Summary of the Guarantee.

The contractor fully guarantees the following without reservation:

- The observance of all stipulations of the specifications for paintwork regarding, among other things:
  - The preparation of the surfaces.
  - The thickness of each layer.
  - The total thickness of the covering.
- The uniformity of the materials used.
- The repair of all defects before delivery of the works.

The Contractor will carry out the requested repair work as promptly as possible.

Energizing Quality	**PROJECT NUMBER: C231099**	Goa Natural Gas Pvt.Ltd.

PIPING MATERIAL SPECIFICATION			Total Sheets		39
Document No	C231099	00	PP	PMS	2001

GOA NATURAL GAS PRIVATE LIMITED (GNGPL)

CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA

C1	07.07.2023	Issued for Client Review	VI	AK	SKN
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHKD**	**APPR**

ABBREVIATION

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AARH	Arithmetic Average Roughness Height
BS	British Standards
CS	Carbon Steel
MS	Mild Steel
IS	Indian Standard Code
NFPA	National Fire Protection Association
OISD	Oil Industry Safety Directorate
PNRGB	Petroleum & Natural Gas Board
ERW	Electric Resistance Welding
BE	Bevel End
BW	Butt Welded
FF	Flat Face
PBE	Plain Both End
PE	Plain End
RF	Raised Face
SCRF	Screwed End - Female
SCRM	Screwed End - Male
CA	Corrosion Allowance
M	To Match Pipe

CONTENTS

1.0 INTRODUCTION

This specification covers minimum requirements for the material specification for pipe, fittings, flanges, line blinds, bolts, gaskets, and valves that shall be used for natural gas pipeline and associated facilities in accordance with ASME B31.8, OISD-226 and PNGRB guideline.

This specification also defines, by piping class for each listed service, and defines the pressure/temperature limitations within which they may be used.

This specification shall be read in conjunction with various codes and standards as applicable.

2.0 CODES AND STANDARDS

Pipeline and pipeline terminal facilities envisaged as part of this project shall be designed and engineered primarily in accordance with the provisions of the latest edition of the following codes:

ASME 31.3	:	Process Piping
ASME 31.8	:	Gas Transmission and Distribution Piping Systems
OISD STD-226	:	Natural Gas Transmission Pipeline and City Gas Distribution Networks
PNGRB	:	Petroleum and Natural Gas Regulatory Board

All codes, standards and specifications referred herein shall be the latest edition of such documents.

For sake of brevity the initials of the society to which the codes are referred may be omitted in the specifications, for example, B16.5 is a code referring to ASME A106 is a code referring to ASTM.

In addition to this PMS, various piping and pipeline materials shall also be applicable.

3.0 MATERIAL SPECIFICATIONS

Individual piping class has been generally designed to cover a set of service operating within pressure-temperature consideration as per ASME B16.5/ B16.34 or part of it. Deviations of material from class specifications may occur due to specific design conditions and/or availability. These deviations are permissible if they equal or better the individual class requirements and shall be subjected to approval on case-to-case basis.

4.0 CLASS DESIGNATION CODE

The piping class designation shall generally consist of three digits made up of a letter, number & letter e.g. 15HC, 15HLT, 30HC, 30 HLT, 60HC etc. as follows:

First two numerals letter indicates ASME class rating, e.g.

15 - 150 Class

30 - 300 Class

60 - 300 Class

The first alphabet indicates differences in the Fluid Services within the same class rating and material, e. g. H stands for Hydrocarbon, W stands for Water, G stands for Galvanize etc.

The last one or two letter (as applicable) indicates type of material, e.g.

C - Carbon steel

LT - Low Temperature (Carbon Steel)

5.0 TECHNICAL REQUIREMENTS

5.1 General Notes

1. All piping materials selected under this specification shall be in compliance with the project specification.

2. Material selections shall comply with the maximum pressure and temperature limitation as specified in the service summary.

3. Substitution of equivalent materials is subject to approval of the Client /PMC. All requests for substitution shall be accompanied with sufficient data, drawings and descriptive details to permit evaluation by the Client /PMC.

4. Cast iron, ductile or malleable iron, aluminum, plastic or copper-bearing alloys shall not be used in hydrocarbon service.

5. Piping design pressure is based on flange maximum-allowable working pressure, unless otherwise noted in Job Specification.

6. When required, impact testing shall comply with applicable standards and material specifications.

7. All gaskets shall be asbestos free.

8. Aluminum jumper shall be provided across the flanged joint and length of the bolt shall be taken such that at least two threads remain exposed after the nut for fixing the continuity jumper.

5.2 Units

1. All units are expressed in SI system with the exception of nominal pipe sizes (NPS) and bolting diameters, which are in inches.
2. Pressures are gauge pressures (in Kg/cm^2g) and temperatures are in deg. Celsius (°C).
3. Pressures and Temperatures ratings are based ASME 16.5.

6.0 PIPELINE

- Line pipe material grade and wall thickness details are indicated in PMS.

7.0 PIPES

- Carbon steel pipe shall be made by open hearth, electric furnace or basic oxygen process only. The steel used shall be fully killed and made with fine grain structure. The grade and wall thickness of various sizes of pipes shall be as per piping material specification for the applicable class.
- Pipe dimensions shall be in accordance with ASME B 36.10 for carbon steel ASTM standard pipes & API 5L for carbon steel API 5L grade pipes.
- All pipe threads shall conform to American Standard taper as per ASME B 1.20.1 NPT, unless otherwise specified.
- For butt weld end, bevel shall be in accordance with API specification 5L or ASME B16.25 as applicable.
- Where difference in thickness of matching pipe ends exist, bevels for such matching pairs shall be prepared in accordance with ASME B 31.8.
- Pipes shall be supplied with beveled end. Beveling shall be in accordance with ASME B16.25. Where plain end pipes are specified, as for small bore pipes for socket welded piping, the pipes shall be supplied with square cut ends.
- All pipe threads shall conform to American Standard taper as per ASME B 1.20.1 NPT, unless otherwise specified.
- Dimensions of socket weld ends shall confirm to ASME B 16.11. Bore shall match pipe OD and pipe ID.
- Pipe to pipe joints shall be made as follows:

For sizes upto & including DN40	Socket weld/ As per Piping Class
For size DN50 and above	Butt Welded

8.0 FITTINGS

- Fully killed carbon steel shall be used in the manufacture of fittings. The fitting shall have carbon equivalent not exceeding 0.45, based on check analysis.
- Threaded joints, if used, shall conform to American Standard taper as per ASME B1.20.1 NPT.
- Dimensions of socket welded/screwed fittings shall conform to ASME B 16.11. Swage shall be as per BS 3799.
- Dimensions of steel butt welded fittings shall be as per ASME B 16.9.
- Bore of socket welded fittings shall suit outside diameter (OD) of pipe and its thickness.
- Butt welding ends shall conform to API specification 5L or ASME B 16.25 as applicable. In case of difference in thickness of matching ends, requirements of ASME B 31.4 shall apply.
- Integrally reinforced forged branch fittings such as Sockolet, Weldolet etc. shall be as per MSS-SP-97. Fittings not covered in ASME B16.9 and MSS-SP-97 shall conform to manufacturer's standard.
- Fittings thickness tolerances shall match pipe thickness tolerance.

9.0 BENDS

- Unless otherwise specified for process piping, elbow of radius R = 1.5 D shall only be used.
- In order to accommodate changes in vertical and horizontal alignment in piggable section of pipeline, Elastic bends/ Cold field bends/ Hot formed long radius bends shall be used. Radius of bend shall be as per Design Basis.

  D = Specified Outside Diameter
- Miters shall not be used.

10.0 FLANGES

- Pressure Temperature rating of flanges shall conform to B16.5/ MSS-SP44/ B16.47 Series A, as applicable.
- Dimensions of flanges shall be in accordance with B16.5/ MSS-SP44/ B16.47 Series A, as applicable.
- Neck of weld neck (WN) flanges shall suit pipe bore and thickness.
- Bore of socket welded (SW) flanges shall suit pipe O.D. and its thickness.
- Threads for screwed flanges, if used, shall conform to American Standard taper as per ASME B 1.20.1 NPT.
- Sizes for blind flanges shall be indicated by nominal pipe size.

- Unless specified otherwise in Piping Material Specification the flange face finish shall be as per ASME B16.5.
- Butt welding ends of WN flanges shall conform to ASME B 16.25.
- Spectacle blind/spacer & blinds shall be in accordance with ASME B 16.48/ manufacturer's standard.
- Flange face finish for raised face flanges shall be as per ASME B16.5/ ASME B 16.47 as applicable. For RTJ flanges groove finish shall be 32-63 micro inches AARH as per MSS-SP-6. Hardness of groove surface shall be minimum 140 BHN.
- Butt welding ends of WN flanges shall conform to ASME B 16.25.
- Spectacle blind/spacer & blinds shall be in accordance with ASME B16.48 / manufacturer's standard.
- Two jackscrews, 180° apart shall be provided for all RTJ flange assemblies and Spacer blind/ Figure 8 assemblies. Holes for jackscrews shall be drilled and tapped at site. Jackscrews shall be as per ASTM A193 Gr. B7. Heads of jackscrews shall be heavy hexagonal type and jackscrew end shall be rounded. Dimensions shall be as per ASME B18.2.1.
- Flanges shall be packed and shipped in such a way as to prevent damage of machined parts.
- All machined or threaded parts shall be protected in accordance with ASTM A700. Suitable protection shield, or cover shall be provided on the gasket contact surface.
- Carbon steel forgings shall be supplied with a maximum carbon content of 0.25% and CE of 0.45 by product analysis.
- The finish of contact faces of pipe flanges & connecting end flanges of valves & fittings shall be governed by ASME B16.5 & following:

  Roughness requirements (Finish: AARH standards per ASME B46.1):

  a) Raised Face (RF): Serrated finish 125 to 250 µin Ra.

  b) Flat Face (FF): Serrated finish 125 to 250 µin Ra.

  c) Ring Type Joint (RTJ): Extra-smooth finish 63 µin Ra max.
- Flat face flanges, unless specified on the Piping Specifications, shall not be used without specific Client/PMC approval. Full-face gaskets shall be used with flat-face flanges as per ASME B16.20.
- All flanged joints shall be installed with a single gasket between contact faces.
- Spectacle blank (figure 8 blank), blank (blind) & spacer shall confirm to the requirement of ASME B16.48 up to sizes 24". For 150#, 300# and 600# spectacle blank shall be used up to 8", blank (blind) & spacer for sizes 10" & above

11.0 GASKETS

- Spiral wound metallic gasket with Graphite filled winding with SS304 inner ring and CS outer ring/ Soft iron octagonal ring type joint gasket, and shall conform to ASME B 16.20/ API 601
- Spiral wound gaskets shall be self-aligning type.

12.0 BOLTING & THREADS

- Nuts for stud bolts shall be American Standard Hexagon Heavy Series and double chamfered.
- Dimension and tolerances for stud bolts and nuts shall be as per ASME B18.2.1 and 18.2.2 with full threading to ASME B 1.1 Class 2A thread for bolts and Class 2B for nuts. Diameter and length of stud bolts shall be as per ASME B16.5/ASME B16.47 with full threading.
- Threads for nuts shall be as per ASME B 1.1 as follows:

Nuts for stud bolts Dia ¼" to 1"	:	UNC-2B
Nuts for stud bolts Dia 1⅛" to 3¼"	:	8UN-2B

- Threads for stud bolts shall be as per ASME B 1.1, as follows:

Stud bolts Dia ¼" to 1"	:	UNC-2A
Stud bolts Dia 1⅛" to 3¼"	:	8UN-2A

- Threads for threaded pipe, fitting, flanges and valve shall be in accordance with B1.20.1 taper threads, unless specified otherwise.
- Heads of jack screws shall be heavy hexagonal type. Jack screw end shall be rounded. Stud bolts shall be fully threaded with two hexagonal nuts.

13.0 THREAD SEALANT

- Threaded joints shall be made with 1" wide PTFE jointing tape.

14.0 VALVES

- Valve ends shall be as per valve data sheets for various piping class.
- Sectionalizing valves, Block valves and other isolation valves installed on the main pipeline shall be ball valves with butt welding ends. All inline isolation valves on the mainline (pipeline) shall be full bore valves to allow smooth passage of cleaning as well as intelligent pigs.
- All buried valves shall be provided with stem extension shall have Butt Welded ends as per relevant specification/ data sheet.
- All valves in the piggable section of pipeline and Main Process Flow Line shall be Full Opening valve as per API 6D. Other valves shall be Reduced Opening type unless specified otherwise in P&ID.

- Flange dimensions and face finish of flanged end valves shall conform to clause 10.0 of this specification.
- Butt welding ends of Butt Welded valves shall conform to ASME B 16.25.
- Face to face and end to end dimensions shall conform to applicable standards.
- Valves shall conform to following standards unless specified otherwise in piping material specification for various piping class.

Flanged/Socket Welded end valves (1½" and below)
Design STD. for Process lines

Gate Valves	:	API 602
Globe Valves	:	BS EN ISO 15761
Check Valves	:	BS EN ISO 15761
Ball Valve	:	BS EN ISO 17292
Plug Valve	:	BS 5353

Flanged/Butt Welded end valves (2" and above)
Design STD. for Process Lines

Gate Valves	:	API 6D
Globe Valves	:	BS 1873
Check Valves	:	API 6D
Ball Valve	:	API 6D
Plug Valve	:	API 6D

- All manual operated valves shall be provided with wrench / hand wheel or gear operator as specified here in below.
- **Gate Valves**

For ANSI class 150 and 300	-	Hand wheel operated for size ≤ 12" NB. Gear operated for size ≥ 14" NB.
For ANSI class 600	-	Hand wheel operated for size ≤ 10" NB. Gear operated for size ≥ 12" NB.

- **Globe Valves**

For ANSI class 150, 300, 600 and 900 - Hand wheel operated for all Size.

- **Ball Valves & Plug Valves**

For all ANSI class	-	Wrench operated for size ≤ 4" NB. Gear operated for size ≥ 6" NB.

- **Actuated Valves**

  Actuated valves shall be as per P&IDs. The actuator shall have provision for remote operation as per P & IDs. All Actuated valves shall have additional provision of hand wheel operation.

15.0 QUICK OPENING END CLOSURE

Quick opening end closure to be installed on scraper traps shall be designed in accordance with Section VIII of ASME Boiler and Pressure Vessel Code and equipped with safety locking devices in compliance with Section VIII, division 1, UG-35.2 of ASME Boiler and Pressure Vessel Code.

16.0 HYDROTESTING VENTS AND DRAINS

In terminal piping, high point vents and low point drains required for the purpose of hydro testing shall be of size 0.75". These vents & drains shall consist of gate valves with blind flange assembly.

17.0 PIPING SPECIATLITY ITEMS

- Primary material Pipeline specialty items viz. flow tees, insulating joints, LR bends etc. shall be as per respective data sheets and specification.
- For mainline items, corrosion allowance shall be as per respective data sheet.

18.0 INSULATING GASKET, SLEEVE AND WASHER

The insulating gasket shall consist of a PTFE (Teflon) spring-energized face seal, or an elastomeric O-ring, seated in an isolating laminate, which shall be permanently bonded to a high strength metal gasket core. Due to this unique pressure activated sealing mechanism, the gasket requires far less bolt stress to seal than any other gasket. The gasket inner diameter shall be exactly matched to the flange bore to eliminate turbulent flow and flange face erosion/ corrosion. The seal elements shall be replaceable in the reusable gasket retainer. The core of gasket shall be made of annealed 316 stainless steel or other metals including duplex and Inconel etc.

Insulating gasket shall include the following applications,

- Flange isolation in conjunction with Cathodic protection.
- Isolation between dissimilar metals to prevent galvanic corrosion.

- Mating mismatched ring-joint to raised –face flanges.
- Eliminate fluid trap corrosion between ring-joint (RTJ) flanges where high concentrations of Co2, H2S and other aggressive hydrocarbon media are present.
- Eliminate turbulence and flow induced erosion between ring-joint (RTJ) flanges.
- Protect against coating impingement on coated flange faces.
- To seal between flanges subjected to vibration/ cavitation.

18.1 Insulating Gaskets, Sleeves and Washer Materials Properties

Compressive Strength	:	65000 psi
Average Dielectric Strength	:	15 kV or more
Electrical Resistance	:	>1 MΩ (When tested with 500-1000 V DC merger)
Max. Operating Temperature	:	302°F (150°C)
Min. Operating Temperature	:	(-) 200°F (-129°C)
Water Absorption	:	5%
Flexural Strength	:	70000 psi
Tensile Strength	:	50000 psi
Bond Strength	:	2600 lb.
Shear Strength	:	22000 lb.

18.2 Seal Material

The sealing elements shall intend to provide an impervious barrier through which no contained media or other substance can penetrate. The composite retainer backing material behind the seal remains uncontaminated and thus permanently holds the seal in place in a static, fully encapsulated manner.

Viton as a seal material shall consist following properties,

- General purpose oilfield elastomer.
- Excellent resistance to aliphatic hydrocarbons, glycols and H2S.
- Good resistance to aromatic hydrocarbons.

Isolating Sleeve

Mylar as a seal material shall consist following properties,

- Spiral wound Mylar is a general-purpose material recommended for bolting application with flange temperatures below 250°F.
- Material shall be fair resistance to crushing, cracking, breaking and thread pinch.

  Isolating washer: 1/8" (0.125) Thick washer

  Steel Washer: ZPS standard – Zinc plated steel washers.

Butt weld (BW) ends of the insulating assembly shall be protected by metallic or high impact plastic bevel protectors.

The dimensions of insulating components (gaskets, sleeves and washers) shall be as indicated in Data Sheet. The insulating gasket and washers shall have adequate compressive strength to permit proper tightening of flange bolts for leak proof joint.

The insulating material shall be suitable for pressure and temperature indicated in Data Sheet under connecting pipeline details and shall be resistant to the fluid to be handled through the pipeline.

I.D. and O.D. of insulating washers shall be designed to fit over insulating sleeves and within spot faces on flanges.

After the hydrostatic test, insulating flange assembly shall be tested with air at 5 kg/cm2 for 10 minutes. The tightness shall be checked by immersion or with a frothing agent. No leakage shall be accepted.

Insulating gasket, sleeve and washer after the field hydrostatic test shall be tested for dielectric integrity at 5000 V A.C., 50 Hz for one minute and the leakage current before and after shall be equal. Testing time, voltage and leakage shall be recorded and certified. The test shall be carried out in dry conditions.

19.0 CHARPY V-NOTCH TEST & HARDNESS TEST

All piping material like valves, fittings, flanges bolting etc. shall be Charpy impact tested. Charpy V-notch impact tests are required for the base metal weld metal and heat-affected zone (HAZ)

Appendix – A

Piping Material Specification – Index

Sr. No.	Piping Class	Rating	C. A. (MM)	Spl. Reqt.	Basic Material	Service	Remarks
1	15HC	150	1.5	NON IBR	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE /NONFLAMMABLE, NON LETHAL- HYDROCARBONS	Page 17
2	15HLT	150	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE /NON-FLAMMABLE, NON LETHAL- HYDROCARBONS	Page 22
3	30HC	300	1.5	NON IBR	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE / NONFLAMMABLE, NON LETHAL- HYDROCARBONS	Page 28
4	30HLT	300	1.5	LOW TEMPERATURE SERVICE	CARBON STEEL	NON-CORROSIVE PROCESS-FLAMMABLE / NONFLAMMABLE, NON LETHAL- HYDROCARBONS	Page 35

Appendix – B

Piping Class

PIPE CLASS	**15HC**
DESIGN CODE	ASME B31.8
RATING	150#
BASE MATERIAL	CARBON STEEL
CA	1.5 MM
SPECIAL REQUIREMENT	Non IBR
SERVICE	Natural Gas, Utilities (water, inst. air, plant air, nitrogen, carbon dioxide)

Temperature (Deg. C) and Pressure (Kg/cm^{2}g) Ratings

Temperature	-29	38	93	149	204	260	316	343	371
Pressure	20.03	20.03	18.28	16.17	14.06	11.95	9.84	8.78	7.73

NOTES:

1. All vents and drains shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID.
2. NDT of welds shall be as follows:

   Radiography : All butt welds 100%

   MPI : Socket welds 100%
3. Piping design as per ASME B 31.8, OISD 226 & PNGRB Guidelines
4. Charpy V notch test and hardness test shall be conducted for pipes, fittings and flanges at (-) 29°C.
5. All branch connections including vent, drain, pressure and temperature connection shall be as per branch connection table.
6. For valves, refer valve data sheets.

ITEM	SIZE	DESCRIPTION
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	SW coupling
	2.0" & ABOVE	Butt welded
Drains	ON LINES <= 1.5"	Refer std. Drawing
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. Drawing
Vents	ON LINES <= 1.5"	Refer std Drawing
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. Drawing

Temp. Connection	1.5"	Flanged, installation as per std. Drawing, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. Drawing

Branch Table

														T	**24**	**BRANCH PIPE (INCH)**
													T	T	**20**	
												T	T	T	**18**	
											T	T	T	T	**16**	
										T	T	T	T	T	**14**	
									T	T	T	T	T	T	**12**	
								T	T	T	T	T	T	T	**10**	
							T	T	T	T	T	T	T	W	**8**	
						T	T	T	T	T	T	W	W	W	**6**	
					T	T	T	W	W	W	W	W	W	W	**4**	
				T	T	T	W	W	W	W	W	W	W	W	**3**	
			T	T	T	W	W	W	W	W	W	W	W	W	**2**	
		T	T	T	T	S	S	S	S	S	S	S	S	S	**1.5**	
		T	T	T	S	S	S	S	S	S	S	S	S	S	**1**	
	T	T	T	T	S	S	S	S	S	S	S	S	S	S	**0.75**	
T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	**0.05**	
0.05	**0.75**	**1**	**1.5**	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	
PIPE RUN Size (INCH)																

CODES	DESCRIPTION
T	Tees
W	Weldolet
S	Sockolet

Item	Lower Size (Inch)	Upper Size (Inch)	Sch. / Thk.	Dmn. STD	Material (Charpy)	Description
PIPE GROUP						
PIPE	00.500	00.750	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS
PIPE	01.000	01.500	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS
PIPE	02.000	02.000	XS	B-36.10	ASTM A 106 GR.B (Charpy)	BE, SEAMLESS
PIPE	03.000	14.000	STD	B-36.10	ASTM A 106 GR.B (Charpy)	BE, SEAMLESS
PIPE	16.000	24.000	STD	B-36.10	ASTM A 672 B65 CL-12 (Charpy)	BE, E.FS.W
NIPPLE	00.500	01.500	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS
FLANGE GROUP						
FLNG.SW	00.500	01.500	M	B-16.5	ASTM A 105	150, RF/ 125AARH
FLNG.WN	2.000	24.000	M	B-16.5	ASTM A 105 (Charpy)	150, RF/ 125AARH
FLNG.BLIND	00.500	01.500		B-16.5	ASTM A 105	150, RF/ 125AARH
FLNG.BLIND	00.500	24.000		B-16.5	ASTM A 105 (Charpy)	150, RF/ 125AARH
FLNG.FIG.8	00.500	08.000		ASME B16.48	ASTM A 105 (Charpy)	150, FF/ 125AARH
SPCR&BLND	10.000	24.000		ASME B16.48	ASTM A 105 (Charpy)	150, FF/ 125AARH
FITTING GROUP						
ELBOW.90	00.500	01.500		B-16.11	ASTM A 105	SW, 6000
ELBOW.90	02.000	12.000	M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW, 1.5D
ELBOW.45	00.500	01.500		B-16.11	ASTM A 105	SW, 6000
ELBOW.45	02.000	24.000	M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW, 1.5D
T.EQUAL	00.500	01.500		B-16.11	ASTM A 105	SW, 6000
T.EQUAL	02.000	24.000	M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW
T.RED	00.500	01.500		B-16.11	ASTM A 105	SW, 6000

Item	Lower Size (Inch)	Upper Size (Inch)	Sch. / Thk.	Dmn. STD	Material (Charpy)	Description
T.RED	02.000	24.000	M, M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW
REDUC. CONC	02.000	24.000	M, M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW
REDUC. ECC	02.000	24.000	M, M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW
SWAGE. CONC	00.500	03.000	M, M	BS-3799	ASTM A 105 (Charpy)	PBE
SWAGE.ECC	00.500	03.000	M, M	BS-3799	ASTM A 105	PBE
CAP	00.500	00.750		B-16.11	ASTM A 105	SCRF, 6000
CAP	01.000	01.500		B-16.11	ASTM A 105	SCRF, 3000
CAP	02.000	24.000	M	B-16.9	ASTM A 234 GR.WPB (Charpy)	BW
PLUG	00.500	00.750		B-16.11	ASTM A 105	SCRM, 6000
O'let						
WELDOLET	02.000	06.000	M, S160	MSS-SP97	ASTM A 105 (Charpy)	BW
SOCKOLET	00.500	00.750		MSS-SP97	ASTM A 105	SCRF, 6000
SOCKOLET	01.000	01.500		MSS-SP97	ASTM A 105	SW, 3000
VALVES GROUP						
VLV.GLOBE	00.250	01.500		BS EN 1SO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM-13%CR STEEL	SW, 800, 3000, B-16.11
VLV.GLOBE	02.000	24.000		BS-1873	BODY-ASTM A 216 GR.WCB,TRIM- 13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH
VLV.CHECK	00.250	01.500		BS EN 1SO 15761	BODY-ASTM A 105,TRIM-STELLITED	SW, 800, 3000, B-16.11
VLV.CHECK	02.000	24.000		API-6D	BODY-ASTM A 216 GR.WCB,TRIM- 13% CR.STEEL	FLGD, 150, B-16.5, RF/125AARH

Item	Lower Size (Inch)	Upper Size (Inch)	Sch. / Thk.	Dmn. STD	Material (Charpy)	Description
VLV.BALL	00.500	01.500		BS EN 1SO 17292	BODY-ASTM A 105,TRIM-13% CR.STEEL, SEAT-RPTFE	SW, 800, B-16.5, RF/125AARH
VLV.BALL	02.000	24.000		API-6D	BODY-ASTM A216 GR.WCB,TRIM/BALL SEAT-(AISI 4140 + 0.003"ENP)/AISI 410	FLGD, 150, B-16.5, RF/125AARH
VLV.BALL	02.000	24.000		API-6D	BODY-ASTM A 216 GR.WCB, TRIM-BALL, SEAT-(AISI 4140 + 0.003"ENP) /AISI 410	BW, 150, B-16.25
VLV.PLUG	00.500	01.500		BS-5353	BODY-ASTM A 105,PLUG - A105 + 0.003" ENP	SW, 800, 3000, B-16.11,
VLV.PLUG	02.000	24.000		API-6D	BODY- A 216GR. WCB, PLUG: A216 GR.WCB + 0.003" ENP	FLGD, 150, B-16.5, RF/125AARH
VLV.PLUG	02.000	24.000	M	API-6D	BODY-ASTM A 216 GR.WCB, PLUG: A216 GR.WCB + 0.003"ENP	BW, 150, B-16.25
BOLT GROUP						
BOLT.STUD	00.500	48.000		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H	
GASKET GROUP						
GASKET	00.500	24.000		B-16.20-ANSI B16.5	SP.WND METTALIC WITH GRAPHITE FILLER	SPIRAL, 150
GASKET	26.000	48.000		B-16.20-ANSI B16.47A	SP.WND METTALIC WITH GRAPHITE FILLER	SPIRAL, 150

Note: For all Valves, valve data sheets shall also be referred, stringent requirement among data sheet and above details shall be followed.

PIPE CLASS	**15HLT**
DESIGN CODE	ASME B31.8
RATING	150#
BASE MATERIAL	CARBON STEEL
CA	1.5 MM
SPECIAL REQUIREMENT	Low Temperature Service
SERVICE	Natural Gas, Utilities (water, inst. air, plant air, nitrogen, carbon dioxide)

Temperature (Deg. C) and Pressure (Kg/cm^{2}g) Ratings

Temperature	-45	38	93
Pressure	18.63	18.63	17.92

NOTES:

1. All vents and drains shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID.
2. NDT of welds shall be as follows:

   Radiography : All butt welds 100%

   MPI : Socket welds 100%
3. Piping design as per ASME B 31.8, OISD 226 & PNGRB Guidelines
4. Charpy V notch test and hardness test shall be conducted for pipes, fittings and flanges at (-) 45°C.
5. All branch connections including vent, drain, pressure and temperature connection shall be as per branch connection table.
6. For valves, refer valve data sheets.

ITEM	SIZE	DESCRIPTION
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	SW coupling
	2.0" & ABOVE	Butt welded
Drains	ON LINES <= 1.5"	Refer std. Drawing
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. Drawing
Vents	ON LINES <= 1.5"	Refer std. Drawing
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std Drawing

Temp. Connection	1.5"	Flanged, installation as per std. Drawing, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. Drawing

Branch Table

							T	**6**	**BRANCH PIPE (INCH**
						T	T	**4**	
					T	T	T	**3**	
				T	T	T	W	**2**	
			T	T	T	T	S	**1.5**	
		T	T	T	S	S	S	**1**	
	T	T	T	T	S	S	S	**0.75**	
T	T	T	T	S	S	S	S	**0.05**	
0.05	**0.75**	**1**	**1.5**	**2**	**3**	**4**	**6**		
PIPE RUN Size (INCH)									

CODES	DESCRIPTION
T	Tees
W	Weldolet
S	Sockolet

Item	Lower Size (Inch)	Upper Size (Inch)	Sch. / Thk.	Dmn. STD	Material (Charpy)	Description
PIPE GROUP						
PIPE	00.500	00.750	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
PIPE	01.000	01.500	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
PIPE	02.000	02.000	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS
PIPE	03.000	06.000	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS
NIPPLE	00.500	01.500	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS
FLANGE GROUP						
FLNG.WN	00.500	06.00	M	B-16.5	ASTM A 350 GR.LF2	150, RF/125AARH
FLNG.BLIND	00.500	06.00		B-16.5	ASTM A 350 GR.LF2	150, RF/125AARH
FLNG.FIG.8	00.500	06.00		ASME B16.48	ASTM A 350 GR.LF2	150, FF/ 125AARH
FITTING GROUP						
ELBOW.90	00.500	00.75		B-16.11	ASTM A 350 GR.LF2	SW, 6000
ELBOW.90	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
ELBOW.90	02.000	6.000	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D
ELBOW.45	00.500	00.75		B-16.11	ASTM A 350 GR.LF2	SW, 6000
ELBOW.45	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
ELBOW.45	02.000	6.000	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D
T.EQUAL	00.500	00.75		B-16.11	ASTM A 350 GR.LF2	SW, 6000

Item	Lower Size (Inch)	Upper Size (Inch)	Sch. / Thk.	Dmn. STD	Material (Charpy)	Description
T.EQUAL	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
T.EQUAL	02.000	06.000	M	B-16.9	ASTM A 420 GR.WPL6	BW
T.RED	00.500	00.75		B-16.11	ASTM A 350 GR.LF2	SW, 6000
T.RED	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
T.RED	02.000	06.000	M, M	B-16.9	ASTM A 420 GR.WPL6	BW
REDUC. CONC	02.000	06.000	M, M	B-16.9	ASTM A 420 GR.WPL6	BW
REDUC. ECC	02.000	06.000	M, M	B-16.9	ASTM A 420 GR.WPL6	BW
SWAGE. CONC	00.500	03.000	M, M	BS-3799	ASTM A 350 GR.LF2	PBE
SWAGE.ECC	00.500	03.000	M, M	BS-3799	ASTM A 350 GR.LF2	PBE
CAP	00.500	01.500		B-16.11	ASTM A 350 GR.LF2	SCRF, 3000
CAP	02.000	06.000	M	B-16.9	ASTM A 420 GR.WPL6	BW
PLUG	00.500	01.500		B-16.11	ASTM A 350 GR.LF2	SCRM, 3000
COUPLING FULL	00.500	00.75		B-16.11	ASTM A 350 GR.LF2	SW, 6000
COUPLING FULL	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
COUPLING HALF	00.500	00.75		B-16.11	ASTM A 350 GR.LF2	SW, 6000
COUPLING HALF	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000

Item	Lower Size (Inch)	Upper Size (Inch)	Sch. / Thk.	Dmn. STD	Material (Charpy)	Description
O'let						
WELDOLET	02.000	06.000	M, XXS	MSS-SP97	ASTM A 350 GR.LF2	BW
SOCKOLET	00.500	00.750		MSS-SP97	ASTM A 350 GR.LF2	SW, 6000
SOCKOLET	01.000	01.500		MSS-SP97	ASTM A 350 GR.LF2	SW, 3000
VALVES GROUP						
VLV.GLOBE	00.50	01.500		BS EN 1SO 15761	BODY-ASTM A 350 GR.LF2,TRIMSTELLITED, STEMSS304	SW, 800, 3000, B-16.11
VLV.GLOBE	02.000	06.000		BS-1873	BODY-ASTM A 350 GR.LF2,/ ASTM A 352 GR.LCB	FLGD, 150, B-16.5, RF/125AARH
VLV.CHECK	00.50	01.500		BS EN 1SO 15761	BODY-ASTM A 350 GR.LF2,	SW, 800, 3000, B-16.11
VLV.CHECK	02.000	06.000		API-6D/BS-1868	BODY-ASTM A 350 GR.LF2,/ ASTM A 352 GR.LCB TRIM-STELLITED	FLGD, 150, B-16.5, RF/125AARH
VLV.BALL	00.500	01.500		BS EN 1SO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,TRIM-BODY SEAT-RPTFE	SW, 800, 3000, B-16.11
VLV.BALL	02.000	06.000		API-6D	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,	FLGD, 150, B-16.5, RF/125AARH
VLV.BALL	02.000	06.000		API-6D	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,	BW, 150, B-16.25
BOLT GROUP						

BOLT.STUD	00.500	6.000		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.4	
GASKET GROUP						
GASKET	00.500	6.000		B-16.20-ANSI B16.5	SP.WND SS316+ GRAFOIL	SPIRAL, 150

Note: For all Valves, valve data sheets shall also be referred, stringent requirement among data sheet and above details shall be followed.

PIPE CLASS **30HC**
DESIGN CODE ASME B31.8

RATING	300#
BASE MATERIAL	CARBON STEEL
CA	1.5 MM
SPECIAL REQUIREMENT	Non IBR
SERVICE	Natural Gas, Utilities (water, inst. air, plant air, nitrogen, carbon dioxide)

Temperature (Deg. C) and Pressure (Kg/cm^{2}g) Ratings

Temperature	-29	38	93	149	204	260	316
Pressure	52.02	52.02	47.45	46.05	44.64	42.18	40.66

NOTES:

1. All vents and drains shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID.
2. NDT of welds shall be as follows:

   Radiography : All butt welds 100%

   MPI : Socket welds 100%
3. Piping design as per ASME B 31.8, OISD 226 & PNGRB Guidelines
4. Charpy V notch test and hardness test shall be conducted for pipes, fittings and flanges at (-) 29°C.
5. Corrosion allowance of 1.5 mm has been considered for terminal piping.
6. All branch connections including vent, drain, pressure and temperature connection shall be as per branch connection table.
7. For valves, refer valve data sheets as enclosed.
8. Design Factor 0.5
9. 9. Ball Valve to be used in main pipeline shall have butt welded ends.

ITEM	SIZE	DESCRIPTION
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	SW coupling
	2.0" & ABOVE	Butt welded
Drains	ON LINES <= 1.5"	Refer std. drawing
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. drawing
Vents	ON LINES <= 1.5"	Refer std. drawing

	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. drawing
Temp. Connection	1.5"	Flanged, installation as per std. drawing, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std drawing

Branch Table

																		T	**42**	**BRANCH PIPE (INCH)**
																	T	T	**36**	
																T	T	T	**32**	
															T	T	T	T	**30**	
														T	T	T	T	T	**24**	
													T	T	T	T	T	T	**20**	
												T	T	T	T	T	T	T	**18**	
											T	T	T	T	T	T	T	T	**16**	
										T	T	T	T	T	T	T	T	T	**14**	
									T	T	T	T	T	T	T	T	T	T	**12**	
								T	T	T	T	T	T	T	T	T	T	T	**10**	
							T	T	T	T	T	T	T	W	W	W	W	W	**8**	
						T	T	T	T	T	T	W	W	W	W	W	W	W	**6**	
					T	T	T	T	W	W	W	W	W	W	W	W	W	W	**4**	
				T	T	T	W	W	W	W	W	W	W	W	W	W	W	W	**3**	
			T	T	T	W	W	W	W	W	W	W	W	W	W	W	W	W	**2**	
		T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	**1.5**	
	T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	S	**1**	
T	T	T	T	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	**0.75**	
0.05	**0.75**	**1**	**1.5**	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**30**	**32**	**36**	**42**	
PIPE RUN SIZE (INCH)																				

CODES	DESCRIPTION
T	Tees
W	Weldolet
S	Sockolet

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk	Dmn. STD	Material (Charpy)	Description
PIPE GROUP						
PIPE	00.500	00.750	S160	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS
PIPE	01.000	01.500	XS	B-36.10	ASTM A 106 GR.B	PE, SEAMLESS
PIPE	02.000	02.000	XS	B-36.10	ASTM A 106 GR.B (CHARPY)	BE, SEAMLESS
PIPE	03.000	14.000	STD	B-36.10	ASTM A 106 GR.B (CHARPY)	BE, SEAMLESS
PIPE	16.000	20.000	XS	B-36.10	ASTM A 672 Gr B65 CL-12 (CHARPY)	BE, E.FS.W
PIPE	24.000	24.000	S30	B-36.10	ASTM A 672 Gr B65 CL-12 (CHARPY)	BE, E.FS.W
NIPPLE	00.500	01.500	M	B-36.10	ASTM A 106 GR.B	PBE, SEAMLESS
FLANGE GROUP						
FLNG.SW	00.500	01.500	M	B-16.5	ASTM A 105	300, RF/125AARH
FLNG.WN	02.000	24.000	M	B-16.5	ASTM A 105 (CHARPY)	300, RF/125AARH
FLNG.BLIND	00.500	01.500		B-16.5	ASTM A 105	300, RF/125AARH
FLNG.BLIND	02.000	24.000		B-16.5	ASTM A 105 (CHARPY)	300, RF/125AARH
FLNG.FIG.8	00.500	01.500		ASME- B 16.48	ASTM A 105	300, FF/125AARH

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./ Thk	Dmn. STD	Material (Charpy)	Description
FLNG.FIG.8	02.000	08.000		ASME- B 16.48	ASTM A 105 (CHARPY)	300, FF/125AARH
SPCR&BLND	10.000	24.000		ASME- B 16.48	ASTM A 105 (CHARPY)	300, FF/125AARH
FITTING GROUP						
ELBOW.90	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
ELBOW.90	01.000	01.500		B-16.11	ASTM A 105	SW, 3000

ELBOW.90	02.000	24.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW, 1.5D
ELBOW.45	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
ELBOW.45	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
ELBOW.45	02.000	24.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW, 1.5D
T.EQUAL	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
T.EQUAL	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
T.EQUAL	02.000	24.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
T.RED	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
T.RED	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
T.RED	02.000	24.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
REDUC. CONC	02.000	24.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
REDUC. ECC	02.000	24.000	M, M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
SWAGE. CONC	00.500	03.000	M, M	BS-3799	ASTM A 105 (CHARPY)	PBE
SWAGE. ECC	00.500	03.000	M, M	BS-3799	ASTM A 105 (CHARPY)	PBE
CAP	00.500	00.750		B-16.11	ASTM A 105	SCRF, 6000
CAP	01.000	01.500		B-16.11	ASTM A 105	SCRF, 3000
CAP	02.000	24.000	M	B-16.9	ASTM A 234 GR.WPB (CHARPY)	BW
PLUG	00.500	00.750		B-16.11	ASTM A 105	SCRM, 6000
PLUG	01.000	01.500		B-16.11	STM A 105	SCRM, 3000
CPLNG.FULL	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
CPLNG.FULL	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.HALF	00.500	0.750		B-16.11	ASTM A 105	SW, 6000

Item	Lower Size (Inch)	Upper Size (Inch)	Sch./Thk.	Dmn. STD	Material (Charpy)	Description
CPLNG.HALF	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.LH	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
CPLNG.LH	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
CPLNG.RED	00.500	00.750		B-16.11	ASTM A 105	SW, 6000
CPLNG.RED	01.000	01.500		B-16.11	ASTM A 105	SW, 3000
O'let						
SOCKOLET	00.500	00.750		MSS-SP97	ASTM A 105	SW, 6000
SOCKOLET	01.000	01.500		MSS-SP97	ASTM A 105	SW, 3000
WELDOLET	02.000	08.000	M, XX	MSS-SP97	ASTM A 105 (CHARPY)	BW
VALVE GROUP						
VLV.GATE	00.500	01.500		API-602	BODY-ASTM A 105,TRIM-STELLITED,STEM 13%	SW, 800, 3000, B-16.11
VLV.GATE	02.000	24.000		API 600/ ISO 10434	BODY-ASTM A 105/ ASTM A 216 GR.WCB STELLITED, STEM- SS304	FLGD, 300, B-16.5, RF/125AARH
VLV.GLOBE	00.500	01.500		BS EN 1SO 15761	BODY-ASTM A 105,TRIM-STELLITED,STEM- 13%	SW, 800, 3000, B-16.11
VLV.GLOBE	02.000	24.000		BS 1873	BODY-ASTM A 105 / ASTM A 216 GR.WCB , TRIM-13% CR.STEEL	FLGD, 300, B-16.5, RF/125AARH
VLV.CHECK	00.500	01.500		BS EN 1SO 15761	BODY-ASTM A 105, TRIM- STELLITED	SW, 800, 3000, B-16.11
VLV.CHECK	02.000	24.000		API-6D/BS-1868	BODY-ASTM A 105 / ASTM A 216 GR.WCB	FLGD, 300, B-16.5, RF/125AARH
Item	**Lower Size (Inch)**	**Upper Size (Inch)**	**Sch./Thk.**	**Dmn. STD**	**Material (Charpy)**	**Description**

VLV.BALL	00.500	01.500		BS EN 1SO 17292	BODY-ASTM A 105,	SW, 800, B-16.5, RF/125AARH
VLV.BALL	02.000	24.000		API-6D	BODY-ASTM A 216 GR.WCB/ ASTM 105	FLGD, 300, B-16.5, RF/125AARH
VLV.BALL	02.000	24.000	M	API-6D	BODY-ASTM A 216 GR.WCB/ASTM 105,	BW, 300, B-16.25
VLV.PLUG	00.500	01.500		BS-5353	BODY-ASTM A 105,PLUG-A105 +0.003" ENP	SW, 800#, 3000, B-16.11
VLV.PLUG	02.000	24.000		API-6D	BODY- A 216GR. WCB, PLUG: A216 GR.WCB + 0.003" ENP	FLGD, 300, B-16.5, RF/125AARH
VLV.PLUG	02.000	24.000	M	API-6D	BODY-ASTM A 216 GR.WCB, PLUG: A216 GR.WCB + 0.003"ENP	BW, 300, B-16.25
BOLT GROUP						
BOLT.STUD	00.500	30.000		B-18.2	BOLT:A193 GR.B7, NUT:A194 GR.2H	
GASKET						
GASKET	00.500	24.000		B-16.20-ANSI B16.5	SP.WND METTALIC WITH GRAPHITEFILLER	SPIRAL, 300
GASKET	26.000	30.000		B-16.20-ANSI B16.47A	SP.WND METTALIC WITH GRAPHITEFILLER	SPIRAL, 300

Note: For Valve Material, valve data sheet shall also be referred, stringent requirement among data sheet and above details shall be followed.

PIPE CLASS	**30HLT**
DESIGN CODE	ASME B31.8
RATING	300#
BASE MATERIAL	CARBON STEEL
CA	1.5 MM
SPECIAL REQUIREMENT	Low Temperature Service
SERVICE	Natural Gas, Utilities (water, inst. air, plant air, nitrogen, carbon dioxide)

Temperature (Deg. C) and Pressure (Kg/cm^{2}g) Ratings

Temperature	-45	38	93	120	149	204
Pressure	48.86	48.86	46.05	45.54	44.99	43.59

NOTES:

1. All vents and drains shall be provided with gate valve with blind flange assembly unless otherwise indicated in P&ID.
2. NDT of welds shall be as follows:

   Radiography : All butt welds 100%

   MPI : Socket welds 100%
3. Piping design as per ASME B 31.8, OISD 226 & PNGRB Guidelines
4. Flanged end shall be as per ASME B 16.5 for valve up to 24" (excluding 22"), for 22" as per MSS-SP-44.
5. Charpy V notch test and hardness test shall be conducted for pipes, fittings and flanges at (-) 45°C.
6. All branch connections including vent, drain, pressure and temperature connection shall be as per branch connection table.
7. For valves, refer valve data sheets.

ITEM	SIZE	DESCRIPTION
Maintenance joints	ALL	Flanged, to be kept minimum
Pipe joints	1.5" & BELOW	SW coupling
	2.0" & ABOVE	Butt welded
Drains	ON LINES <= 1.5"	Refer std. drawing
	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. drawing
Vents	ON LINES <= 1.5"	Refer std. drawing

	ON LINES >= 2.0"	As per P&ID or 0.75". Refer std. drawing
Temp. Connection	1.5"	Flanged, installation as per std. drawing, except skin temperature measurement.
Press. Connection	0.75"	SW nipple with Plug/ Ball Valve to spec. as per Refer std. drawing

Branch Table

												T	**16**	**BRANCH PIPE (INCH)**
											T	T	**14**	
										T	T	T	**12**	
									T	T	T	T	**10**	
								T	T	T	T	T	**8**	
							T	T	T	T	T	T	**6**	
						T	T	T	T	W	W	W	**4**	
					T	T	T	W	W	W	W	W	**3**	
				T	T	T	W	W	W	W	W	W	**2**	
			T	T	T	T	S	S	S	S	S	S	**1.5**	
		T	T	T	S	S	S	S	S	S	S	S	**1**	
	T	T	T	T	S	S	S	S	S	S	S	S	**0.75**	
T	T	T	T	S	S	S	S	S	S	S	S	S	**0.05**	
0.05	**0.75**	**1**	**1.5**	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**		
PIPE RUN Size (INCH)														

CODES	DESCRIPTION
T	Tees
W	Weldolet
S	Sockolet

Item	Lower Size (Inch)	Upper Size (Inch)	Sch. / Thk.	Dmn. STD	Material (Charpy)	Description
PIPE GROUP						
PIPE	00.500	00.750	S160	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
PIPE	01.000	01.500	XS	B-36.10	ASTM A 333 GR.6	PE, SEAMLESS
PIPE	02.000	02.000	XS	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS
PIPE	03.000	14.000	STD	B-36.10	ASTM A 333 GR.6	BE, SEAMLESS
NIPPLE	00.500	00.750	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS
NIPPLE	01.000	01.500	M	B-36.10	ASTM A 333 GR.6	PBE, SEAMLESS
FLANGE GROUP						
FLNG.SW	00.500	01.500	M	B-16.5	ASTM A 350 GR.LF2	300, RF/125AARH
FLNG.WN	02.000	14.000	M	B-16.5	ASTM A 350 GR.LF2	300, RF/125AARH
FLNG.BLIND	00.500	14.000		B-16.5	ASTM A 350 GR.LF2	300, RF/125AARH
FLNG.FIG.8	00.500	08.000		ASME- B 16.48	ASTM A 350 GR.LF2	300, FF/125AARH
SPCR&BLND	10.000	14.000		ASME-B16.48	ASTM A 350 GR.LF2	300, FF/125AARH
FITTINGS						
ELBOW.90	00.500	00.750		B-16.11	ASTM A 350 GR.LF2	SW, 6000
ELBOW.90	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
ELBOW.90	02.000	14.000	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D
ELBOW.45	00.500	00.750		B-16.11	ASTM A 350 GR.LF2	SW, 6000
ELBOW.45	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
ELBOW.45	02.000	14.000	M	B-16.9	ASTM A 420 GR.WPL6	BW, 1.5D
T.EQUAL	00.500	00.750		B-16.11	ASTM A 350 GR.LF2	SW, 6000
T.EQUAL	01.000	01.500		B-16.11	ASTM A 350 GR.LF2	SW, 3000
Item	**Lower Size (Inch)**	**Upper Size (Inch)**	**Sch. / Thk.**	**Dmn. STD**	**Material (Charpy)**	**Description**

T.EQUAL	02.000	14.000	M	B-16.9	ASTM A 420 GR.WPL6	BW
VALVE GROUP						
VLV.BALL	00.500	01.500		BS EN 1SO 17292	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,	SW, 800, 3000, B-16.11
VLV.BALL	02.000	14.000		API-6D	BODY-ASTM A352 GR.LCB / ASTM A350 GR.LF2 CL.1,	FLGD, 300, B-16.5, RF/125AARH
VLV.GATE	00.500	01.500		API-602	BODY-ASTM A 350 GR.LF2,TRIM-STELLITED,STEM- SS	SW, 800, 3000, B-16.11
VLV.GATE	02.000	14.000		API 600/ ISO 10434	BODY-ASTM A 350 GR.LF2,/ ASTM A 352 GR.LCB STELLITED,STEM- SS304	FLGD, 300, B-16.5, RF/125AARH
VLV.GLOBE	00.500	01.500		BS EN ISO 15761	BODY-ASTM A 350 GR.LF2,TRIM-STELLITED,STEM- SS304	SW, 800, 3000, B-16.11
VLV.GLOBE	02.000	14.000		BS-1873	BODY-ASTM A 350 GR.LF2,/ ASTM A 352 GR.LCB	FLGD, 300, B-16.5, RF/125AARH
VLV.CHECK	00.500	01.500		BS EN ISO 15761	BODY-ASTM A 350 GR.LF2,TRIM- STELLITED	SW, 800, 3000, B-16.11
VLV.CHECK	02.000	14.000		API-6D/BS-1868	BODY-ASTM A 350 GR.LF2,/ ASTM A 352 GR.LCB TRIM-STELLITED	FLGD, 300, B-16.5, RF/125AARH
VLV.PLUG	00.500	01.500		BS-5353	BODY-ASTM A 350 GR.LF2, PLUG: A350 GR.LF2 + 0.003" ENP	SW, 800, 3000, B-16.11
VLV.PLUG	02.000	14.000		API-6D	BODY-ASTM A 352 GR.LCB / A350 GR.LF2,	FLGD, 300, B-16.5, RF/125AARH
VLV.PLUG	02.000	14.000		API-6D	BODY-ASTM A 352 GR.LCB/ ASTM A350GR.LF2,	BW, 300, B-16.25
BOLT & GASKET						

BOLT.STUD	00.500	14.000		B-18.2	BOLT:A320 GR.L7, NUT:A194 GR.4	
GASKET	00.500	14.000		B-16.20-ANSI B16.5	SP.WND METTALIC WITH GRAPHITEFILLER	SPIRAL, 300

Note: For all Valves, valve data sheets shall also be referred, stringent requirement among data sheet and above details shall be followed.

Energising Quality		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2001A	
		DATA SHEET OF FE/BW, ABOVEGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 300# , PIPING CLASS - 30HC, SPLIT /WELDED BODY DESIGN		No. of Pages : 02	Revision: C1 / 07.07.2023

Location		**-**		**MR No.**	**-**
Sr. No.		**-**		**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) / P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2004**	
4		Category		**Station Piping Ball Valve**	
5		Pipeline Line No		**Not Required**	
6		Class		**30HC**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
8		Type of Valve		**Trunnion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem, Split Body Design/ Fully Welded Body Design as specified in MR, Tight Shut Off (As Applicable)**	
9		Type of Port (Full/ Reduced)		**As per P&ID**	
10		Design Temperature (ºC)	Maximum	**65**	
11			Minimum	**-29**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**AboveGround**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
19		ASME Class		**300#**	
20		Stem Extension Requirement (If required, Note - 20)		**Not Required**	
21		Length of Stem Extension		**Not Applicable**	
22		Orientation of Stem		**Perpendicular to Valve axis**	
23		Type of Valve Operator		**DN ≤ 100 mm (4") - Wrench / Lever - Pull Force 350N max. DN ≥ 150 mm (6") - Gear Operated**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Required for Welded End Valves, as per Standard Valve Specification**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**As per Piping Material Specification**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**49 kg/cm^2**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 73.5 kg/cm^2 & Test Duration - 30 Minutes**	**Seat : 54 kg/cm^2 & Test Duration 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (º C)		**Yes (at -29 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-21)		**As per specification (Suitable for Highly Corrosive Environment) Note-21**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HC**	
54		Orientation of Pipe		**Suitable for all orientation**	

Energising Quality	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	JOB NO : C231099	
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	DOC. NO.: C231099-00-PP-DS-2001A	
	DATA SHEET OF FE/BW, ABOVEGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 300# , PIPING CLASS - 30HC, SPLIT /WELDED BODY DESIGN	No. of Pages : 02	Revision: C1 / 07.07.2023

Location	-	MR No.	-
Sr. No.	-	P.O No.	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body	**ASTM A216 GR. WCB/ASTM 105**	
57		Ball (Single Piece, Solid Construction)	**SS-304 / SS-316 (Solid) OR (ASTM A105/ ASTM A216 Gr. WCB) + 75 micron ENP**	
58		Seat Rings (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410/ SS 304/ SS 316**	
59		Seat Seal	**Primary Devlon V/ PEEK/ Viton with Secondary Metal to Metal**	
60		Stem (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410 / SS 304 / SS 316**	
61		Stem Seal	**GRAFOIL / R-PTFE**	
62		Body Seal	**GRAFOIL / R-PTFE**	
63		Gland	**13% Cr. Steel/ SS 316 / SS 304 / ASTM A105**	
64		Stud Bolts/Nut	**ASTM A 193 Gr. B7/ ASTM A 194 Gr. 2H**	
65		Handle / Lever / Hand Wheel	**Carbon Steel**	

66	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	NOTES	**NOTES:**
74		1. Bidder to submit in offer, Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
75		2. This Data Sheet shall be read in conjunction with Material Requisition, Piping Material Specification, valve Specification & other Tender Documents.
76		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
77		4. Manufacturer shall have valid API 6D license to use API monogram. API monogram is required.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -29°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2004) requirement at 0^{o}C
84		11. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
85		12. Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
86		13. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease
87		14. For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
88		15. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
89		16. Adequacy for Length of pup piece/ Nipple shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These nipples shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
90		17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
91		18. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
92		19. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
93		20. Stem extension length shall be finalized during drawing approval stage after award of order.
94		21.For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
95		22. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed". Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.
96		23. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
97		24. Not only during commissioning, but also during life cycle of all valves, sediments/corrosion deposits/ silica/ mill scale of less than 40 mesh percent in process fluid have to be tolerated by all valves with malfunctioning.
98		24.Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
99		25. Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.Vendor to guarantee the suitability of seat/ seal material for the given service condition
100		26. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
101		27. Cyclic test is required. The valve shall be subjected to at least 200 open close cycle with maximum differential pressure corresponding to valve rating.
102		28. Stem seal / body seal, gland packing materials shall be provided with corrosion inhibitor.
103		29. Vendor to guarantee the suitability of seat/ seal material for the given service condition

Energising Quality		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2001A	
		DATA SHEET OF FE/BW, UNDERGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 300# , PIPING CLASS - 30HC, SPLIT /WELDED BODY DESIGN		No. of Pages : 02	Revision C1 07.07.2023

Location		**-**		**MR No.**	**-**
Sr. No.		**-**		**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No. / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2004**	
4		Category		**Station Piping Ball Valve**	
5		Pipeline Line No		**Not Required**	
6		Class		**30HC**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
8		Type of Valve		**Trunnion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem, Split Body Design/ Fully Welded Body Design as specified in MR, Tight Shut Off (As Applicable)**	
9		Type of Port (Full/ Reduced)		**As per P&ID**	
10		Design Temperature (ºC)	Maximum	**65**	
11			Minimum	**-29**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**UnderGround**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
19		ASME Class		**300#**	
20		Stem Extension Requirement (If required, Note - 20)		**Required**	
21		Length of Stem Extension		**Note - 20**	
22		Orientation of Stem		**Perpendicular to Valve axis**	
23		Type of Valve Operator		**DN ≤ 100 mm (4") - Wrench / Lever - Pull Force 350N max. DN ≥ 150 mm (6") - Gear Operated**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Required for Welded End Valves, as per Standard Specification**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**As per Piping Material Specification**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**49 kg/cm^2**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 73.5 kg/cm^2 & Test Duration - 30 Minutes**	**Seat : 54 kg/cm^2 & Test Duration 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (º C)		**Yes (at -29 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-21)		**As per specification (Suitable for Highly Corrosive Environment) Note-21**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HC**	
54		Orientation of Pipe		**Suitable for all orientation**	

Energising Quality	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	JOB NO : C231099	
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	DOC. NO.: C231099-00-PP-DS-2001A	
	DATA SHEET OF FE/BW, UNDERGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 300# , PIPING CLASS - 30HC, SPLIT /WELDED BODY DESIGN	No. of Pages : 02	Revision: C1 / 07.07.2023

Location	-	MR No.	-
Sr. No.	-	P.O No.	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body	**ASTM A216 GR. WCB/ASTM 105**	
57		Ball (Single Piece, Solid Construction)	**SS-304 / SS-316 (Solid) OR (ASTM A105/ ASTM A216 Gr. WCB) + 75 micron ENP**	
58		Seat Rings (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410/ SS 304/ SS 316**	
59		Seat Seal	**Primary Devlon V/ PEEK/ Viton with Secondary Metal to Metal**	
60		Stem (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410 / SS 304 / SS 316**	
61		Stem Seal	**GRAFOIL / R-PTFE**	
62		Body Seal	**GRAFOIL / R-PTFE**	
63		Gland	**13% Cr. Steel/ SS 316 / SS 304 / ASTM A105**	
64		Stud Bolts/Nut	**ASTM A 193 Gr. B7/ ASTM A 194 Gr. 2H**	
65		Handle / Lever / Hand Wheel	**Carbon Steel**	

66	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	NOTES	**NOTES:**
74		1. Bidder to submit in offer, Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
75		2. This Data Sheet shall be read in conjunction with Material Requisition, Piping Material Specification, valve Specification & other Tender Documents.
76		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
77		4. Manufacturer shall have valid API 6D license to use API monogram. API monogram is required.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -29°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2004) requirement at 0^{o}C
84		11. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
85		12. Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
86		13. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease
87		14. For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
88		15. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
89		16. Adequacy for Length of pup piece/ Nipple shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These nipples shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
90		17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
91		18. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
92		19. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
93		20. Stem extension length shall be finalized during drawing approval stage after award of order.
94		21.For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
95		22. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed". Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.
96		23. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
97		24. Not only during commissioning, but also during life cycle of all valves, sediments/corrosion deposits/ silica/ mill scale of less than 40 mesh percent in process fluid have to be tolerated by all valves with malfunctioning.
98		24.Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
99		25. Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.Vendor to guarantee the suitability of seat/ seal material for the given service condition
100		26. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
101		27. Cyclic test is required. The valve shall be subjected to at least 200 open close cycle with maximum differential pressure corresponding to valve rating.
102		28. Stem seal / body seal, gland packing materials shall be provided with corrosion inhibitor.
103		29. Vendor to guarantee the suitability of seat/ seal material for the given service condition

Energising Quality		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	DOC. NO.: C231099-00-PP-DS-2001C	
		DATA SHEET OF FE/BW, ABOVEGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 300# , PIPING CLASS - 30HLT, SPLIT /WELDED BODY DESIGN	No. of Pages : 02	Revision: C1 / 07.07.2023

Location			**-**	**MR No.**	**-**
Sr. No.			**-**	**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2004**	
4		Category		**Station Piping Ball Valve**	
5		Pipeline Line No		**Not Required**	
6		Class		**30HLT**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
8		Type of Valve		**Trunnion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem, Split Body Design/ Fully Welded Body Design as specified in MR, Tight Shut Off (As Applicable)**	
9		Type of Port (Full/ Reduced)		**As per P&ID**	
10		Design Temperature (ºC)	Maximum	**65**	
11			Minimum	**-45**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**AboveGround**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
19		ASME Class		**300#**	
20		Stem Extension Requirement (If required, Note - 20)		**Not Required**	
21		Length of Stem Extension		**Not Applicable**	
22		Orientation of Stem		**Perpendicular to Valve axis**	
23		Type of Valve Operator		**DN ≤ 100 mm (4") - Wrench / Lever - Pull Force 350N max. DN ≥ 150 mm (6") - Gear Operated**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Required for Welded End Valves, as per Standard Valve Specification**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**As per Piping Material Specification**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**49 kg/cm^2**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 73.5 kg/cm^2 & Test Duration - 30 Minutes**	**Seat : 54 kg/cm^2 & Test Duration 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (º C)		**Yes (at -45 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-21)		**As per specification (Suitable for Highly Corrosive Environment) Note-21**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HLT**	
54		Orientation of Pipe		**Suitable for all orientation**	

Energising Quality	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	JOB NO : C231099	
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	DOC. NO.: C231099-00-PP-DS-2001C	
	DATA SHEET OF FE/BW, ABOVEGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 300# , PIPING CLASS - 30HLT, SPLIT /WELDED BODY DESIGN	No. of Pages : 02	Revision: C1 / 07.07.2023

Location	-	MR No.	-
Sr. No.	-	P.O No.	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body	ASTM A352 GR. LCB / ASTM A350 GR. LF2 CL. 1	
57		Ball (Single Piece, Solid Construction)	SS-304 / SS-316 (Solid)	
58		Seat Rings (No Casting)	(AISI 4140 +75 micron ENP)/ AISI 410/ SS 304/ SS 316	
59		Seat Seal	Primary Devlon V/ PEEK/ Viton with Secondary Metal to Metal	
60		Stem (No Casting)	SS - 304/SS - 316	
61		Stem Seal	GRAFOIL / R-PTFE	
62		Body Seal	GRAFOIL / R-PTFE	
63		Gland	ASTM A350 GR. LF2 CL. 1	
64		Stud Bolts/Nut	ASTM A320 GR. L4 / ASTM A194 GR. 4	
65		Handle / Lever / Hand Wheel	Carbon Steel	

66	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	NOTES	**NOTES:**
74		1. Bidder to submit in offer, Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
75		2. This Data Sheet shall be read in conjunction with Material Requisition, Piping Material Specification, valve Specification & other Tender Documents.
76		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
77		4. Manufacturer shall have valid API 6D license to use API monogram. API monogram is required.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -45°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2004) requirement at 0^{o}C
84		11. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
85		12. Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
86		13. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease
87		14. For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
88		15. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
89		16. Adequacy for Length of pup piece/ Nipple shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These nipples shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
90		17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
91		18. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
92		19. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
93		20. Stem extension length shall be finalized during drawing approval stage after award of order.
94		21.For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
95		22. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed". Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.
96		23. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
97		24. Not only during commissioning, but also during life cycle of all valves, sediments/corrosion deposits/ silica/ mill scale of less than 40 mesh percent in process fluid have to be tolerated by all valves with malfunctioning.
98		24.Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
99		25. Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.Vendor to guarantee the suitability of seat/ seal material for the given service condition
100		26. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
101		27. Cyclic test is required. The valve shall be subjected to at least 200 open close cycle with maximum differential pressure corresponding to valve rating.
102		28. Stem seal / body seal, gland packing materials shall be provided with corrosion inhibitor.
103		29. Vendor to guarantee the suitability of seat/ seal material for the given service condition

Energising Quality		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2001D	
		DATA SHEET OF FE/BW, UNDERGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 300# , PIPING CLASS - 30HLT, SPLIT /WELDED BODY DESIGN		No. of Pages : 02	Revision C1 / 07.07.2023

Location		**-**		**MR No.**	**-**
Sr. No.		**-**		**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2004**	
4		Category		**Station Piping Ball Valve**	
5		Pipeline Line No		**Not Required**	
6		Class		**30HLT**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
8		Type of Valve		**Trunnion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem, Split Body Design/ Fully Welded Body Design as specified in MR, Tight Shut Off (As Applicable)**	
9		Type of Port (Full/ Reduced)		**As per P&ID**	
10		Design Temperature (ºC)	Maximum	**65**	
11			Minimum	**-45**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**UnderGround**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
19		ASME Class		**300#**	
20		Stem Extension Requirement (If required, Note - 20)		**Required**	
21		Length of Stem Extension		**Note - 20**	
22		Orientation of Stem		**Perpendicular to Valve axis**	
23		Type of Valve Operator		**DN ≤ 100 mm (4") - Wrench / Lever - Pull Force 350N max. DN ≥ 150 mm (6") - Gear Operated**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Required for Welded End Valves, as per Standard Specification**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**As per Piping Material Specification**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**49 kg/cm^2**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 73.5 kg/cm^2 & Test Duration - 30 Minutes**	**Seat : 54 kg/cm^2 & Test Duration 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (º C)		**Yes (at -45 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-21)		**As per specification (Suitable for Highly Corrosive Environment) Note-21**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HLT**	
54		Orientation of Pipe		**Suitable for all orientation**	

Energising Quality	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	JOB NO : C231099	
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	DOC. NO.: C231099-00-PP-DS-2001D	
	DATA SHEET OF FE/BW, UNDERGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 300# , PIPING CLASS - 30HLT, SPLIT /WELDED BODY DESIGN	No. of Pages : 02	Revision: C1 / 07.07.2023

Location	-	MR No.	-
Sr. No.	-	P.O No.	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body	**ASTM A352 GR. LCB / ASTM A350 GR. LF2 CL. 1**	
57		Ball (Single Piece, Solid Construction)	**SS-304 / SS-316 (Solid)**	
58		Seat Rings (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410/ SS 304/ SS 316**	
59		Seat Seal	**Primary Devlon V/ PEEK/ Viton with Secondary Metal to Metal**	
60		Stem (No Casting)	**SS - 304/SS - 316**	
61		Stem Seal	**GRAFOIL / R-PTFE**	
62		Body Seal	**GRAFOIL / R-PTFE**	
63		Gland	**ASTM A350 GR. LF2 CL. 1**	
64		Stud Bolts/Nut	**ASTM A320 GR. L4 / ASTM A194 GR. 4**	
65		Handle / Lever / Hand Wheel	**Carbon Steel**	

66	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	NOTES	**NOTES:**
74		1. Bidder to submit in offer, Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
75		2. This Data Sheet shall be read in conjunction with Material Requisition, Piping Material Specification, valve Specification & other Tender Documents.
76		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
77		4. Manufacturer shall have valid API 6D license to use API monogram. API monogram is required.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -45°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2004) requirement at $0^{o}C$
84		11. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
85		12. Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
86		13. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease
87		14. For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
88		15. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
89		16. Adequacy for Length of pup piece/ Nipple shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These nipples shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
90		17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
91		18. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
92		19. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
93		20. Stem extension length shall be finalized during drawing approval stage after award of order.
94		21.For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
95		22. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed". Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.
96		23. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
97		24. Not only during commissioning, but also during life cycle of all valves, sediments/corrosion deposits/ silica/ mill scale of less than 40 mesh percent in process fluid have to be tolerated by all valves with malfunctioning.
98		24.Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
99		25. Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.Vendor to guarantee the suitability of seat/ seal material for the given service condition
100		26. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
101		27. Cyclic test is required. The valve shall be subjected to at least 200 open close cycle with maximum differential pressure corresponding to valve rating.
102		28. Stem seal / body seal, gland packing materials shall be provided with corrosion inhibitor.
103		29. Vendor to guarantee the suitability of seat/ seal material for the given service condition

Energising Quality		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2001E
		DATA SHEET OF FE/BW, ABOVEGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 150# , PIPING CLASS - 15HC, SPLIT /WELDED BODY DESIGN	No. of Pages : 02	Revision: C1 / 07.07.2023

Location			**-**	**MR No.**	**-**
Sr. No.			**-**	**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2004**	
4		Category		**Station Piping Ball Valve**	
5		Pipeline Line No		**Not Required**	
6		Class		**15HC**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
8		Type of Valve		**Trunnion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem, Split Body Design/ Fully Welded Body Design as specified in MR, Tight Shut Off (As Applicable)**	
9		Type of Port (Full/ Reduced)		**As per P&ID**	
10		Design Temperature (ºC)	Maximum	**65**	
11			Minimum	**-29**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**AboveGround**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
19		ASME Class		**150#**	
20		Stem Extension Requirement (If required, Note - 20)		**Not Required**	
21		Length of Stem Extension		**Not Applicable**	
22		Orientation of Stem		**Perpendicular to Valve axis**	
23		Type of Valve Operator		**DN ≤ 100 mm (4") - Wrench / Lever - Pull Force 350N max. DN ≥ 150 mm (6") - Gear Operated**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Required for Welded End Valves, as per Standard Valve Specification**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**As per Piping Material Specification**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**19 kg/cm^2**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 28.5 kg/cm^2 & Test Duration - 30 Minutes**	**Seat : 21 kg/cm^2 & Test Duration 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (º C)		**Yes (at -29 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-21)		**As per specification (Suitable for Highly Corrosive Environment) Note-21**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**150#**	
53		Piping Class		**15HC**	
54		Orientation of Pipe		**Suitable for all orientation**	

Energising Quality	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNPL)	JOB NO : C231099	
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	DOC. NO.: C231099-00-PP-DS-2001E	
	DATA SHEET OF FE/BW, ABOVEGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 150# , PIPING CLASS - 15HC, SPLIT /WELDED BODY DESIGN	No. of Pages : 02	Revision: C1 / 07.07.2023

Location	-	MR No.	-
Sr. No.	-	P.O No.	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body	**ASTM A216 GR. WCB/ASTM 105**	
57		Ball (Single Piece, Solid Construction)	**SS-304 / SS-316 (Solid) OR (ASTM A105/ ASTM A216 Gr. WCB) + 75 micron ENP**	
58		Seat Rings (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410/ SS 304/ SS 316**	
59		Seat Seal	**Primary Devlon V/ PEEK/ Viton with Secondary Metal to Metal**	
60		Stem (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410 / SS 304 / SS 316**	
61		Stem Seal	**GRAFOIL / R-PTFE**	
62		Body Seal	**GRAFOIL / R-PTFE**	
63		Gland	**13% Cr. Steel/ SS 316 / SS 304 / ASTM A105**	
64		Stud Bolts/Nut	**ASTM A 193 Gr. B7/ ASTM A 194 Gr. 2H**	
65		Handle / Lever / Hand Wheel	**Carbon Steel**	

66	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	NOTES	**NOTES:**
74		1. Bidder to submit in offer, Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
75		2. This Data Sheet shall be read in conjunction with Material Requisition, Piping Material Specification, valve Specification & other Tender Documents.
76		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
77		4. Manufacturer shall have valid API 6D license to use API monogram. API monogram is required.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -29°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2004) requirement at 0^{o}C
84		11. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
85		12. Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
86		13. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease
87		14. For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
88		15. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
89		16. Adequacy for Length of pup piece/ Nipple shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These nipples shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
90		17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
91		18. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
92		19. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
93		20. Stem extension length shall be finalized during drawing approval stage after award of order.
94		21.For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
95		22. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed". Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.
96		23. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
97		24. Not only during commissioning, but also during life cycle of all valves, sediments/corrosion deposits/ silica/ mill scale of less than 40 mesh percent in process fluid have to be tolerated by all valves with malfunctioning.
98		24.Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
99		25. Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.Vendor to guarantee the suitability of seat/ seal material for the given service condition
100		26. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
101		27. Cyclic test is required. The valve shall be subjected to at least 200 open close cycle with maximum differential pressure corresponding to valve rating.
102		28. Stem seal / body seal, gland packing materials shall be provided with corrosion inhibitor.
103		29. Vendor to guarantee the suitability of seat/ seal material for the given service condition

Energising Quality		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2001F	
		DATA SHEET OF FE/BW, UNDERGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 150# , PIPING CLASS - 15HC, SPLIT /WELDED BODY DESIGN		No. of Pages : 02	Revision: C1 / 07.07.2023

Location			**-**	**MR No.**	**-**
Sr. No.			**-**	**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2004**	
4		Category		**Station Piping Ball Valve**	
5		Pipeline Line No		**Not Required**	
6		Class		**15HC**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
8		Type of Valve		**Trunnion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem, Split Body Design/ Fully Welded Body Design as specified in MR, Tight Shut Off (As Applicable)**	
9		Type of Port (Full/ Reduced)		**As per P&ID**	
10		Design Temperature (ºC)	Maximum	**65**	
11			Minimum	**-29**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**UnderGround**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
19		ASME Class		**150#**	
20		Stem Extension Requirement (If required, Note - 20)		**Required**	
21		Length of Stem Extension		**Note - 20**	
22		Orientation of Stem		**Perpendicular to Valve axis**	
23		Type of Valve Operator		**DN ≤ 100 mm (4") - Wrench / Lever - Pull Force 350N max. DN ≥ 150 mm (6") - Gear Operated**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Required for Welded End Valves, as per Standard Specification**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**As per Piping Material Specification**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**19 kg/cm^2**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 28.5 kg/cm^2 & Test Duration - 30 Minutes**	**Seat : 21 kg/cm^2 & Test Duration 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (º C)		**Yes (at -29 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-21)		**As per specification (Suitable for Highly Corrosive Environment) Note-21**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**150#**	
53		Piping Class		**15HC**	
54		Orientation of Pipe		**Suitable for all orientation**	

Energising Quality	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	JOB NO : C231099	
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	DOC. NO.: C231099-00-PP-DS-2001F	
	DATA SHEET OF FE/BW, UNDERGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 150# , PIPING CLASS - 15HC, SPLIT /WELDED BODY DESIGN	No. of Pages : 02	Revision: C1 / 07.07.2023

Location	-	MR No.	-
Sr. No.	-	P.O No.	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body	**ASTM A216 GR. WCB/ASTM 105**	
57		Ball (Single Piece, Solid Construction)	**SS-304 / SS-316 (Solid) OR (ASTM A105/ ASTM A216 Gr. WCB) + 75 micron ENP**	
58		Seat Rings (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410/ SS 304/ SS 316**	
59		Seat Seal	**Primary Devlon V/ PEEK/ Viton with Secondary Metal to Metal**	
60		Stem (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410 / SS 304 / SS 316**	
61		Stem Seal	**GRAFOIL / R-PTFE**	
62		Body Seal	**GRAFOIL / R-PTFE**	
63		Gland	**13% Cr. Steel/ SS 316 / SS 304 / ASTM A105**	
64		Stud Bolts/Nut	**ASTM A 193 Gr. B7/ ASTM A 194 Gr. 2H**	
65		Handle / Lever / Hand Wheel	**Carbon Steel**	

66	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	NOTES	**NOTES:**
74		1. Bidder to submit in offer, Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
75		2. This Data Sheet shall be read in conjunction with Material Requisition, Piping Material Specification, valve Specification & other Tender Documents.
76		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
77		4. Manufacturer shall have valid API 6D license to use API monogram. API monogram is required.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -29°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2004) requirement at 0^{o}C
84		11. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
85		12. Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
86		13. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease
87		14. For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
88		15. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
89		16. Adequacy for Length of pup piece/ Nipple shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These nipples shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
90		17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
91		18. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
92		19. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
93		20. Stem extension length shall be finalized during drawing approval stage after award of order.
94		21.For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
95		22. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed". Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.
96		23. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
97		24. Not only during commissioning, but also during life cycle of all valves, sediments/corrosion deposits/ silica/ mill scale of less than 40 mesh percent in process fluid have to be tolerated by all valves with malfunctioning.
98		24.Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
99		25. Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.Vendor to guarantee the suitability of seat/ seal material for the given service condition
100		26. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
101		27. Cyclic test is required. The valve shall be subjected to at least 200 open close cycle with maximum differential pressure corresponding to valve rating.
102		28. Stem seal / body seal, gland packing materials shall be provided with corrosion inhibitor.
103		29. Vendor to guarantee the suitability of seat/ seal material for the given service condition

Energising Quality		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2001G	
		DATA SHEET OF FE/BW, ABOVEGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 150# , PIPING CLASS - 15HLT, SPLIT /WELDED BODY DESIGN		No. of Pages : 02	Revision C1 07.07.2023

Location		**-**		**MR No.**	**-**
Sr. No.		**-**		**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2004**	
4		Category		**Station Piping Ball Valve**	
5		Pipeline Line No		**Not Required**	
6		Class		**15HLT**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
8		Type of Valve		**Trunnion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem, Split Body Design/ Fully Welded Body Design as specified in MR, Tight Shut Off (As Applicable)**	
9		Type of Port (Full/ Reduced)		**As per P&ID**	
10		Design Temperature (ºC)	Maximum	**65**	
11			Minimum	**-45**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**AboveGround**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
19		ASME Class		**150#**	
20		Stem Extension Requirement (If required, Note - 20)		**Not Required**	
21		Length of Stem Extension		**Not Applicable**	
22		Orientation of Stem		**Perpendicular to Valve axis**	
23		Type of Valve Operator		**DN ≤ 100 mm (4") - Wrench / Lever - Pull Force 350N max. DN ≥ 150 mm (6") - Gear Operated**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Required for Welded End Valves, as per Standard Valve Specification**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**As per Piping Material Specification**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**19 kg/cm^2**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 28.5 kg/cm^2 & Test Duration - 30 Minutes**	**Seat : 21 kg/cm^2 & Test Duration 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (º C)		**Yes (at -45 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-21)		**As per specification (Suitable for Highly Corrosive Environment) Note-21**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**150#**	
53		Piping Class		**15HLT**	
54		Orientation of Pipe		**Suitable for all orientation**	

Energising Quality	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	JOB NO : C231099	
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	DOC. NO.: C231099-00-PP-DS-2001G	
	DATA SHEET OF FE/BW, ABOVEGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 150# , PIPING CLASS - 15HLT, SPLIT /WELDED BODY DESIGN	No. of Pages : 02	Revision: C1 / 07.07.2023

Location	-	MR No.	-
Sr. No.	-	P.O No.	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body	ASTM A352 GR. LCB / ASTM A350 GR. LF2 CL. 1	
57		Ball (Single Piece, Solid Construction)	SS-304 / SS-316 (Solid)	
58		Seat Rings (No Casting)	(AISI 4140 +75 micron ENP)/ AISI 410/ SS 304/ SS 316	
59		Seat Seal	Primary Devlon V/ PEEK/ Viton with Secondary Metal to Metal	
60		Stem (No Casting)	SS - 304/SS - 316	
61		Stem Seal	GRAFOIL / R-PTFE	
62		Body Seal	GRAFOIL / R-PTFE	
63		Gland	ASTM A350 GR. LF2 CL. 1	
64		Stud Bolts/Nut	ASTM A320 GR. L4 / ASTM A194 GR. 4	
65		Handle / Lever / Hand Wheel	Carbon Steel	

66	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	NOTES	**NOTES:**
74		1. Bidder to submit in offer, Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
75		2. This Data Sheet shall be read in conjunction with Material Requisition, Piping Material Specification, valve Specification & other Tender Documents.
76		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
77		4. Manufacturer shall have valid API 6D license to use API monogram. API monogram is required.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -45°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2004) requirement at 0°C
84		11. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
85		12. Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
86		13. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease
87		14. For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
88		15. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
89		16. Adequacy for Length of pup piece/ Nipple shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These nipples shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
90		17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
91		18. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
92		19. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
93		20. Stem extension length shall be finalized during drawing approval stage after award of order.
94		21.For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
95		22. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed". Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.
96		23. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
97		24. Not only during commissioning, but also during life cycle of all valves, sediments/corrosion deposits/ silica/ mill scale of less than 40 mesh percent in process fluid have to be tolerated by all valves with malfunctioning.
98		24.Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
99		25. Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.Vendor to guarantee the suitability of seat/ seal material for the given service condition
100		26. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
101		27. Cyclic test is required. The valve shall be subjected to at least 200 open close cycle with maximum differential pressure corresponding to valve rating.
102		28. Stem seal / body seal, gland packing materials shall be provided with corrosion inhibitor.
103		29. Vendor to guarantee the suitability of seat/ seal material for the given service condition

Energising Quality		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2001H	
		DATA SHEET OF FE/BW, UNDERGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 150# , PIPING CLASS - 15HLT, SPLIT /WELDED BODY DESIGN		No. of Pages : 02	Revision C1 07.07.2023

Location		**-**		**MR No.**	**-**
Sr. No.		**-**		**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2004**	
4		Category		**Station Piping Ball Valve**	
5		Pipeline Line No		**Not Required**	
6		Class		**15HLT**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
8		Type of Valve		**Trunnion Mounted, Double Block and Bleed, Antistatic, Vent Drain/ Flush Connection with Anti Blowout Stem, Split Body Design/ Fully Welded Body Design as specified in MR, Tight Shut Off (As Applicable)**	
9		Type of Port (Full/ Reduced)		**As per P&ID**	
10		Design Temperature (ºC)	Maximum	**65**	
11			Minimum	**-45**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**UnderGround**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
19		ASME Class		**150#**	
20		Stem Extension Requirement (If required, Note - 20)		**Required**	
21		Length of Stem Extension		**Note - 20**	
22		Orientation of Stem		**Perpendicular to Valve axis**	
23		Type of Valve Operator		**DN ≤ 100 mm (4") - Wrench / Lever - Pull Force 350N max. DN ≥ 150 mm (6") - Gear Operated**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Required for Welded End Valves, as per Standard Specification**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**As per Piping Material Specification**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**19 kg/cm^2**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 28.5 kg/cm^2 & Test Duration - 30 Minutes**	**Seat : 21 kg/cm^2 & Test Duration 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (º C)		**Yes (at -45 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-21)		**As per specification (Suitable for Highly Corrosive Environment) Note-21**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**150#**	
53		Piping Class		**15HLT**	
54		Orientation of Pipe		**Suitable for all orientation**	

Energising Quality	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	JOB NO : C231099	
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	DOC. NO.: C231099-00-PP-DS-2001H	
	DATA SHEET OF FE/BW, UNDERGROUND, MANUAL BALL VALVE DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 150# , PIPING CLASS - 15HLT, SPLIT /WELDED BODY DESIGN	No. of Pages : 02	Revision: C1 / 07.07.2023

Location	-	MR No.	-
Sr. No.	-	P.O No.	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body	**ASTM A352 GR. LCB / ASTM A350 GR. LF2 CL. 1**	
57		Ball (Single Piece, Solid Construction)	**SS-304 / SS-316 (Solid)**	
58		Seat Rings (No Casting)	**(AISI 4140 +75 micron ENP)/ AISI 410/ SS 304/ SS 316**	
59		Seat Seal	**Primary Devlon V/ PEEK/ Viton with Secondary Metal to Metal**	
60		Stem (No Casting)	**SS - 304/SS - 316**	
61		Stem Seal	**GRAFOIL / R-PTFE**	
62		Body Seal	**GRAFOIL / R-PTFE**	
63		Gland	**ASTM A350 GR. LF2 CL. 1**	
64		Stud Bolts/Nut	**ASTM A320 GR. L4 / ASTM A194 GR. 4**	
65		Handle / Lever / Hand Wheel	**Carbon Steel**	

66	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	NOTES	**NOTES:**
74		1. Bidder to submit in offer, Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
75		2. This Data Sheet shall be read in conjunction with Material Requisition, Piping Material Specification, valve Specification & other Tender Documents.
76		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
77		4. Manufacturer shall have valid API 6D license to use API monogram. API monogram is required.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -45°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2004) requirement at 0^{o}C
84		11. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
85		12. Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
86		13. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease
87		14. For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
88		15. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
89		16. Adequacy for Length of pup piece/ Nipple shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These nipples shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
90		17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
91		18. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
92		19. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
93		20. Stem extension length shall be finalized during drawing approval stage after award of order.
94		21.For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
95		22. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed". Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.
96		23. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
97		24. Not only during commissioning, but also during life cycle of all valves, sediments/corrosion deposits/ silica/ mill scale of less than 40 mesh percent in process fluid have to be tolerated by all valves with malfunctioning.
98		24.Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
99		25. Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.Vendor to guarantee the suitability of seat/ seal material for the given service condition
100		26. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
101		27. Cyclic test is required. The valve shall be subjected to at least 200 open close cycle with maximum differential pressure corresponding to valve rating.
102		28. Stem seal / body seal, gland packing materials shall be provided with corrosion inhibitor.
103		29. Vendor to guarantee the suitability of seat/ seal material for the given service condition

Energising Quality		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2002A	
		DATA SHEET OF FE/BW, ABOVEGROUND, PLUG VALVE DN 50 TO DN 200 (NPS 2" to NPS 8"), RATING 300# , PIPING CLASS - 30HC		No. of Pages : 02	Revision C1 07.07.2023

Location		**-**		**MR No.**	**-**
Sr. No.		**-**		**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2051**	
4		Category		**Plug Valve**	
5		Pipeline Line No		**Not Required**	
6		Class		**30HC**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
8		Type of Valve		**Regular Pattern**	
9		Type of Port (Full/ Reduced)		**As per P&ID**	
10		Design Temperature (ºC)	Maximum	**65**	
11			Minimum	**-29**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**AboveGround**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
19		ASME Class		**300#**	
20		Stem Extension Requirement (If required, Note - 20)		**Not Required**	
21		Length of Stem Extension		**Not Applicable**	
22		Orientation of Stem		**Perpendicular to Valve axis**	
23		Type of Valve Operator		**As per Standard Specification**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Required for Welded End Valves, as per Standard Valve Specification**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**As per Piping Material Specification**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**49 kg/cm^2**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 73.5 kg/cm^2 & Test Duration - 30 Minutes**	**Seat : 54 kg/cm^2 & Test Duration 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (º C)		**Yes (at -29 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-21)		**As per specification (Suitable for Highly Corrosive Environment) Note-21**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HC**	
54		Orientation of Pipe		**Suitable for all orientation**	

Energising Quality	**CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)**	**JOB NO : C231099**
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	**DOC. NO.: C231099-00-PP-DS-2002A**
	DATA SHEET OF FE/BW, ABOVEGROUND, PLUG VALVE DN 50 TO DN 200 (NPS 2" to NPS 8"), RATING 300# , PIPING CLASS - 30HC	**No. of Pages : 02** — **Revision** C1 / 07.07.2023

Location	-	**MR No.**	-
Sr. No.	-	**P.O No.**	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	**VALVE MATERIAL**			
56		Body	**ASTM A216 GR. WCB/ASTM 105**	
57		Cover (Bolted)	**ASTM A 105/ASTM A 216 GR.WCB**	
58		Plug	**(ASTM A216 GR. WCB/ASTM A105) + 75 microns ENP Coating / SS 304**	
59		Stem	**(ASTM A216 GR. WCB/ASTM A105) + 75 microns ENP Coating / SS 304**	
60		Gland	**ASTM A216 GR. WCB/ASTM 105**	
61		Stem Seal / Gland Packing	**GRAFOIL / R-PTFE**	
62		Cover Gasket	**SP WND SS 316 - GRAFOIL FILLER**	
63		Lubricant Screw	**SS 410/ASTM A105**	
64		Stud Bolts/Nut	**ASTM A 193 Gr. B7/ ASTM A 194 Gr. 2H**	
65		Handle / Lever / Hand Wheel	**Carbon Steel**	

66	**DATA TO BE PROVIDE BY VENDOR (if Applicable)**	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	**NOTES**	**NOTES:**
74		1. Bidder to submit in offer, Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
75		2. This Data Sheet shall be read in conjunction with Material Requisition, Piping Material Specification, valve Specification & other Tender Documents.
76		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
77		4. Manufacturer shall have valid API 6D license to use API monogram. API monogram is required.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -29°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2051) requirement at $0^{o}C$
84		11. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
85		12. Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
86		13. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease
87		14. For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
88		15. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
89		16. Adequacy for Length of pup piece/ Nipple shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These nipples shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
90		17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
91		18. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
92		19. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
93		20. Stem extension length shall be finalized during drawing approval stage after award of order.
94		21.For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
95		22. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed". Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.
96		23. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
97		24. Not only during commissioning, but also during life cycle of all valves, sediments/corrosion deposits/ silica/ mill scale of less than 40 mesh percent in process fluid have to be tolerated by all valves with malfunctioning.
98		24.Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
99		25. Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.Vendor to guarantee the suitability of seat/ seal material for the given service condition
100		26. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
101		27. Cyclic test is required. The valve shall be subjected to at least 200 open close cycle with maximum differential pressure corresponding to valve rating.
102		28. Stem seal / body seal, gland packing materials shall be provided with corrosion inhibitor.
103		29. Vendor to guarantee the suitability of seat/ seal material for the given service condition

Energising Quality		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2002B	
		DATA SHEET OF FE/BW, UNDERGROUND, PLUG VALVE DN 50 TO DN 200 (NPS 2" to NPS 8"), RATING 300# , PIPING CLASS - 30HC		No. of Pages : 02	Revision C1 07.07.2023

Location		-		**MR No.**	-
Sr. No.		-		**P.O No.**	#
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2051**	
4		Category		**Plug Valve**	
5		Pipeline Line No		**Not Required**	
6		Class		**30HC**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
8		Type of Valve		**Regular Pattern**	
9		Type of Port (Full/ Reduced)		**As per P&ID**	
10		Design Temperature (ºC)	Maximum	**65**	
11			Minimum	**-29**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**UnderGround**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
19		ASME Class		**300#**	
20		Stem Extension Requirement (If required, Note - 20)		**Required**	
21		Length of Stem Extension		**Note - 20**	
22		Orientation of Stem		**Perpendicular to Valve axis**	
23		Type of Valve Operator		**As per Standard Specification**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Required for Welded End Valves, as per Standard Specification**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**As per Piping Material Specification**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**49 kg/cm^2**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 73.5 kg/cm^2 & Test Duration - 30 Minutes**	**Seat : 54 kg/cm^2 & Test Duration 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (º C)		**Yes (at -29 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-21)		**As per specification (Suitable for Highly Corrosive Environment) Note-21**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HC**	
54		Orientation of Pipe		**Suitable for all orientation**	

Energising Quality	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	JOB NO : C231099	
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	DOC. NO.: C231099-00-PP-DS-2002B	
	DATA SHEET OF FE/BW, UNDERGROUND, PLUG VALVE DN 50 TO DN 200 (NPS 2" to NPS 8"), RATING 300# , PIPING CLASS - 30HC	No. of Pages : 02	Revision C1 07.07.2023

Location	-	MR No.	-
Sr. No.	-	P.O No.	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body	ASTM A216 GR. WCB/ASTM 105	
57		Cover (Bolted)	ASTM A 105/ASTM A 216 GR.WCB	
58		Plug	(ASTM A216 GR. WCB/ASTM A105) + 75 microns ENP Coating / SS 304	
59		Stem	(ASTM A216 GR. WCB/ASTM A105) + 75 microns ENP Coating / SS 304	
60		Gland	ASTM A216 GR. WCB/ASTM 105	
61		Stem Seal / Gland Packing	GRAFOIL / R-PTFE	
62		Cover Gasket	SP WND SS 316 - GRAFOIL FILLER	
63		Lubricant Screw	SS 410/ASTM A105	
64		Stud Bolts/Nut	ASTM A 193 Gr. B7/ ASTM A 194 Gr. 2H	
65		Handle / Lever / Hand Wheel	Carbon Steel	

66	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	NOTES	**NOTES:**
74		1. Bidder to submit in offer, Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during welding of valve ends at site.
75		2. This Data Sheet shall be read in conjunction with Material Requisition, Piping Material Specification, valve Specification & other Tender Documents.
76		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
77		4. Manufacturer shall have valid API 6D license to use API monogram. API monogram is required.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -29°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2051) requirement at 0^{o}C
84		11. A supplementary air seat test as per API 6D (Annex I, Para I.9 Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.
85		12. Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) is not liable to be damaged. The manufacture shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
86		13. Gear operators, when provided, shall have a self-locking provision and shall be fully encased in water proof/ splash proof enclosure and shall be filled with suitable grease
87		14. For the manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350N.
88		15. Manufacturer shall also indicate the number of turns of hand wheel in case of gear operators (along with their offer) required for Operating the valve from full open to full close position. The numbers of turn shall not exceed 250 for valves sizes up to 24" and 450 for valve size above 24".
89		16. Adequacy for Length of pup piece/ Nipple shall be confirmed by manufacturer so as to avoid damage to seats during field welding or post weld heat treatment.These nipples shall be welded to the valve body by the manufacturer before fitting the packings, seats & seals.
90		17. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
91		18. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
92		19. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
93		20. Stem extension length shall be finalized during drawing approval stage after award of order.
94		21.For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy(Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
95		22. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed". Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.
96		23. All Elastomereric material used for pressure tight sealing or drip sealing shall be of anti Explosive Decompression type and must be certified according to testing Procedures. Manufacturer shall submit test certificate confirming conformance with Anti Explosive Decompression. Manufacturer shall confirm the suitability of soft sealing and seating material for the pressure and temperature & service mentioned above in this data sheet.
97		24. Not only during commissioning, but also during life cycle of all valves, sediments/corrosion deposits/ silica/ mill scale of less than 40 mesh percent in process fluid have to be tolerated by all valves with malfunctioning.
98		24.Fire Safe test certificate qualifying the valves as per API 6FA/ API 607/ ISO 10497 carried out in last 10 years shall be furnished.
99		25. Flanges of flanged end cast/ forged body shall be integrally cast/ forged with the body of valve.Vendor to guarantee the suitability of seat/ seal material for the given service condition
100		26. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.
101		27. Cyclic test is required. The valve shall be subjected to at least 200 open close cycle with maximum differential pressure corresponding to valve rating.
102		28. Stem seal / body seal, gland packing materials shall be provided with corrosion inhibitor.
103		29. Vendor to guarantee the suitability of seat/ seal material for the given service condition

		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2003A	
		DATA SHEET OF FLANGED / BW, UNDERGROUND, GLOBE VALVE DN 50 TO DN 200 (NPS 2" TO NPS 8"), RATING 300# , PIPING CLASS - 30HC		No. of Pages : 02	Revision: C1 / 07.07.2023

Location		**-**		**MR No.**	**-**
SR.NO		**-**		**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2504**	
4		Category		**-**	
5		Pipeline Line No		**Not Required**	
6		Class		**30HC**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
8		Type of Valve		**Rising Stem, Plug type disc, OS & Y , Straight Pattern**	
9		Type of Port (Full / Reduced)		**Not Applicable**	
10		Design Temperature (º C)	Maximum	**65**	
11			Minimum	**-29**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**Underground**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends**	
17		Design Standards		**BS 1873, ASME 16.34 & API 598**	
18		End Connection Standard		**ASME B16.5 - Flanged End ASME B16.25 - Butt Welded End**	
19		ASME Class		**300#**	
20		Stem Extension Requirement		**Required**	
21		Length of Stem Extension (If required)		**Note - 15**	
22		Orientation of Stem		**Perpendicular to Valve Axis**	
23		Type of Valve Operator		**As per Standard Specification**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Integrally welded to the BW valve on each side)		**Not Applicable**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness		**Not Applicable**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**49 (kg/cm^2)**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 73.5 kg/cm^2 & Test Duration - 30 Minutes**	**Body : 54 kg/cm^2 & Test Duration - 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (ºC)		**Yes (at -29 °C)**	
33		Fire Safe Design (Note- 16 & 17)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per BS-1873 Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-14)		**As per specification (Suitable for Highly Corrosive Environment)**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HC**	
54		Orientation of Pipe		**Suitable for all orientation**	

	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	**JOB NO : C231099**
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	**DOC. NO.: C231099-00-PP-DS-2003A**
	DATA SHEET OF FLANGED / BW, UNDERGROUND, GLOBE VALVE DN 50 TO DN 200 (NPS 2" TO NPS 8"), RATING 300# , PIPING CLASS - 30HC	**No. of Pages : 02** — **Revision** C1 / 07.07.2023

Location	-	**MR No.**	-
SR.NO	-	**P.O No.**	#

55	**VALVE MATERIAL**	**Part Description**	**Material Specified**	**Material Offered (By Bidder)**
56		Body (Forged / Cast)	**ASTM A216 GR. WCB/ASTM 105**	
57		Bonnet (Pressure Seal Type)	**ASTM A216 GR. WCB/ASTM 105**	
58		Disc (Plug Type)	**Hard faced (Trim 5), Loose Plug, Conical**	
59		Stem (Rising)	**SS - 304 / SS - 316 (NO CASTING)**	
60		Body Seat Ring	**STELLITED-6**	
61		Gland / Stem Packing	**Corrosion inhibited die formed flexible graphite with braided anti-extrusion ring (Renewable with valve open on stream)**	
62		Bonnet Gasket	**Soft Iron (Max 90 BHN)/ Graphite with Braided Anti ExtrusionRing**	
63		Body Stud	**ASTM A 193 Gr. B7**	
64		Body Nut	**ASTM A 194 Gr. 2H**	
65		Handle / Lever / Hand Wheel	**Carbon Steel**	

66	**DATA TO BE PROVIDE BY VENDOR (if Applicable)**	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	**NOTES**	**NOTES:**
74		1. This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
75		2. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
76		3.All tests shall be carried out as per BS 1873 & BSEN 12266 part-1.
77		4. Gland packing assembly shall permit repair of gland packing under full line pressure.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -29°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2504) requirement at 0^{o}C
84		11. Design of Welded Valves shall be such that during field welding operation, the soft or plastic components of valve are not liable to be damages.
85		12. Gasket Material Graphite Shall Be Provided With Corrosion Inhibitor.
86		13. Valve wall thickness shall be as per ANSI B16.34 / API 623. Manufacturer shall have valid API 623 license to use API monogram. API monogram is required.
87		14 .For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy (Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
88		15. Stem extension length shall be finalized during drawing approval stage after award of order.
89		16. For Metal Seated Valves, Bidder to Confirm that in offered valves, there shall not be any external leakage during fire and valve is capable of handling fire for the mentioned time as specified in API 6FA/ ISO 10497/API 6FD. Bidder also to confirm that in case of fire, the valve shall be unseated from the closed position against the high test pressure and moved to the fully open position i.e. In case of fire, valve shall complete one open-close cycle. For Soft Seated Valves, Bidder to carry out Fire Safe Design & test as per API 6FA/ ISO 10497/API 6FD.
90		17. The offered valve shall deemed to have been fire-tested if vendor submit Fire Test Certificate (Approved & Certified by Governing TPIA) of earlier tested valve of similar design & size.(Qualification Size as per API 6FA/ ISO 10497/API 6FD Codes)
91		18. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.

		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2003B	
		DATA SHEET OF FLANGED / BW, ABOVEGROUND, GLOBE VALVE DN 50 TO DN 200 (NPS 2" TO NPS 8"), RATING 300# , PIPING CLASS - 30HC		No. of Pages : 02	Revision: C1 / 07.07.2023

Location		**-**		**MR No.**	**-**
SR.NO		**-**		**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2504**	
4		Category		**-**	
5		Pipeline Line No		**Not Required**	
6		Class		**30HC**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
8		Type of Valve		**Rising Stem, Plug type disc, OS & Y , Straight Pattern**	
9		Type of Port (Full / Reduced)		**Not Applicable**	
10		Design Temperature (º C)	Maximum	**65**	
11			Minimum	**-29**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**Aboveground**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends**	
17		Design Standards		**BS 1873, ASME 16.34 & API 598**	
18		End Connection Standard		**ASME B16.5 - Flanged End ASME B16.25 - Butt Welded End**	
19		ASME Class		**300#**	
20		Stem Extension Requirement		**Not Required**	
21		Length of Stem Extension (If required, Note - 15)		**Not Applicable**	
22		Orientation of Stem		**Perpendicular to Valve Axis**	
23		Type of Valve Operator		**As per Standard Specification**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Integrally welded to the BW valve on each side)		**Not Applicable**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness		**Not Applicable**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**49 (kg/cm^2)**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 73.5 kg/cm^2 & Test Duration - 30 Minutes**	**Body : 54 kg/cm^2 & Test Duration - 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (ºC)		**Yes (at -29 °C)**	
33		Fire Safe Design (Note- 16 & 17)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per BS-1873 Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-14)		**As per specification (Suitable for Highly Corrosive Environment)**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HC**	
54		Orientation of Pipe		**Suitable for all orientation**	

	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	**JOB NO : C231099**	
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	**DOC. NO.: C231099-00-PP-DS-2003B**	
	DATA SHEET OF FLANGED / BW, ABOVEGROUND, GLOBE VALVE DN 50 TO DN 200 (NPS 2" TO NPS 8"), RATING 300# , PIPING CLASS - 30HC	**No. of Pages : 02**	**Revision** C1 07.07.2023

Location	-	**MR No.**	-
SR.NO	-	**P.O No.**	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body (Forged / Cast)	**ASTM A216 GR. WCB/ASTM 105**	
57		Bonnet (Pressure Seal Type)	**ASTM A216 GR. WCB/ASTM 105**	
58		Disc (Plug Type)	**Hard faced (Trim 5), Loose Plug, Conical**	
59		Stem (Rising)	**SS - 304 / SS - 316 (NO CASTING)**	
60		Body Seat Ring	**STELLITED-6**	
61		Gland / Stem Packing	**Corrosion inhibited die formed flexible graphite with braided anti-extrusion ring (Renewable with valve open on stream)**	
62		Bonnet Gasket	**Soft Iron (Max 90 BHN)/ Graphite with Braided Anti ExtrusionRing**	
63		Body Stud	**ASTM A 193 Gr. B7**	
64		Body Nut	**ASTM A 194 Gr. 2H**	
65		Handle / Lever / Hand Wheel	**Carbon Steel**	

66	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	NOTES	**NOTES:**
74		1. This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
75		2. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
76		3.All tests shall be carried out as per BS 1873 & BSEN 12266 part-1.
77		4. Gland packing assembly shall permit repair of gland packing under full line pressure.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -29°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2504) requirement at 0^{o}C
84		11. Design of Welded Valves shall be such that during field welding operation, the soft or plastic components of valve are not liable to be damages.
85		12. Gasket Material Graphite Shall Be Provided With Corrosion Inhibitor.
86		13. Valve wall thickness shall be as per ANSI B16.34 / API 623. Manufacturer shall have valid API 623 license to use API monogram. API monogram is required.
87		14 .For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy (Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
88		15. Stem extension length shall be finalized during drawing approval stage after award of order.
89		16. For Metal Seated Valves, Bidder to Confirm that in offered valves, there shall not be any external leakage during fire and valve is capable of handling fire for the mentioned time as specified in API 6FA/ ISO 10497/API 6FD. Bidder also to confirm that in case of fire, the valve shall be unseated from the closed position against the high test pressure and moved to the fully open position i.e. In case of fire, valve shall complete one open-close cycle. For Soft Seated Valves, Bidder to carry out Fire Safe Design & test as per API 6FA/ ISO 10497/API 6FD.
90		17. The offered valve shall deemed to have been fire-tested if vendor submit Fire Test Certificate (Approved & Certified by Governing TPIA) of earlier tested valve of similar design & size.(Qualification Size as per API 6FA/ ISO 10497/API 6FD Codes)
91		18. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.

		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2003C	
		DATA SHEET OF FLANGED / BW, UNDERGROUND, GLOBE VALVE DN 50 TO DN 200 (NPS 2" TO NPS 8"), RATING 300# , PIPING CLASS - 30HLT		No. of Pages : 02	Revision C1 07.07.2023

Location		**-**		**MR No.**	**-**
SR.NO		**-**		**P.O No.**	**#**
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2504**	
4		Category		**-**	
5		Pipeline Line No		**Not Required**	
6		Class		**30HLT**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
8		Type of Valve		**Rising Stem, Plug type disc, OS & Y , Straight Pattern**	
9		Type of Port (Full / Reduced)		**Not Applicable**	
10		Design Temperature (º C)	Maximum	**65**	
11			Minimum	**-45**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**Underground**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends**	
17		Design Standards		**BS 1873, ASME 16.34 & API 598**	
18		End Connection Standard		**ASME B16.5 - Flanged End ASME B16.25 - Butt Welded End**	
19		ASME Class		**300#**	
20		Stem Extension Requirement		**Required**	
21		Length of Stem Extension (If required)		**Note - 15**	
22		Orientation of Stem		**Perpendicular to Valve Axis**	
23		Type of Valve Operator		**As per Standard Specification**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Integrally welded to the BW valve on each side)		**Not Applicable**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness		**Not Applicable**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**49 (kg/cm^2)**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 73.5 kg/cm^2 & Test Duration - 30 Minutes**	**Body : 54 kg/cm^2 & Test Duration - 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (ºC)		**Yes (at -45 °C)**	
33		Fire Safe Design (Note- 16 & 17)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per BS-1873 Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-14)		**As per specification (Suitable for Highly Corrosive Environment)**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HLT**	
54		Orientation of Pipe		**Suitable for all orientation**	

	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	**JOB NO : C231099**
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	**DOC. NO.: C231099-00-PP-DS-2003C**
	DATA SHEET OF FLANGED / BW, UNDERGROUND, GLOBE VALVE DN 50 TO DN 200 (NPS 2" TO NPS 8"), RATING 300# , PIPING CLASS - 30HLT	**No. of Pages : 02** — **Revision** C1 / 07.07.2023

Location	-	**MR No.**	-
SR.NO	-	**P.O No.**	#

55	**VALVE MATERIAL**	**Part Description**	**Material Specified**	**Material Offered (By Bidder)**
56		Body (Forged / Cast)	**ASTM A352 Gr.LCB/ ASTM A350 Gr.LF2 CL1**	
57		Bonnet (Pressure Seal Type)	**ASTM A352 Gr.LCB/ ASTM A350 Gr.LF2 CL1**	
58		Disc (Plug Type)	**Hard faced (Trim 5), Loose Plug, Conical**	
59		Stem	**SS - 304 / SS - 316 (NO CASTING)**	
60		Body Seat Ring	**STELLITED-6**	
61		Gland / Stem Packing	**Corrosion inhibited die formed flexible graphite with braided anti-extrusion ring (Renewable with valve open on stream)**	
62		Bonnet Gasket	**Soft Iron (Max 90 BHN)/ Graphite with Braided Anti ExtrusionRing**	
63		Body Stud	**ASTM A320 GR.L7**	
64		Body Nut	**ASTM A194 GR.4**	
65		Handle / Lever / Hand Wheel	**Malleable Iron/ Cast Steel/ Ductile Iron/Carbon Steel**	

66	**DATA TO BE PROVIDE BY VENDOR (if Applicable)**	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	**NOTES**	**NOTES:**
74		1. This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
75		2. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
76		3.All tests shall be carried out as per BS 1873 & BSEN 12266 part-1.
77		4. Gland packing assembly shall permit repair of gland packing under full line pressure.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -45°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2504) requirement at 0°C
84		11. Design of Welded Valves shall be such that during field welding operation, the soft or plastic components of valve are not liable to be damages.
85		12. Gasket Material Graphite Shall Be Provided With Corrosion Inhibitor.
86		13. Valve wall thickness shall be as per ANSI B16.34 / API 623. Manufacturer shall have valid API 623 license to use API monogram. API monogram is required.
87		14 .For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy (Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
88		15. Stem extension length shall be finalized during drawing approval stage after award of order.
89		16. For Metal Seated Valves, Bidder to Confirm that in offered valves, there shall not be any external leakage during fire and valve is capable of handling fire for the mentioned time as specified in API 6FA/ ISO 10497/API 6FD. Bidder also to confirm that in case of fire, the valve shall be unseated from the closed position against the high test pressure and moved to the fully open position i.e. In case of fire, valve shall complete one open-close cycle. For Soft Seated Valves, Bidder to carry out Fire Safe Design & test as per API 6FA/ ISO 10497/API 6FD.
90		17. The offered valve shall deemed to have been fire-tested if vendor submit Fire Test Certificate (Approved & Certified by Governing TPIA) of earlier tested valve of similar design & size.(Qualification Size as per API 6FA/ ISO 10497/API 6FD Codes)
91		18. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.

		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2003D	
		DATA SHEET OF FLANGED / BW, ABOVEGROUND, GLOBE VALVE DN 50 TO DN 200 (NPS 2" TO NPS 8"), RATING 300# , PIPING CLASS - 30HLT		No. of Pages : 02	Revision: C1 / 07.07.2023
Location		-		**MR No.**	-
SR.NO		-		**P.O No.**	#
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No / As per P&ID**	
3		Company's Specification No.		**VCS-SS-PP-2504**	
4		Category		**-**	
5		Pipeline Line No		**Not Required**	
6		Class		**30HLT**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
8		Type of Valve		**Rising Stem, Plug type disc, OS & Y , Straight Pattern**	
9		Type of Port (Full / Reduced)		**Not Applicable**	
10		Design Temperature (º C)	Maximum	**65**	
11			Minimum	**-45**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**Aboveground**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**As per P&ID**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends**	
17		Design Standards		**BS 1873, ASME 16.34 & API 598**	
18		End Connection Standard		**ASME B16.5 - Flanged End ASME B16.25 - Butt Welded End**	
19		ASME Class		**300#**	
20		Stem Extension Requirement		**Not Required**	
21		Length of Stem Extension (If required, Note - 15)		**Not Applicable**	
22		Orientation of Stem		**Perpendicular to Valve Axis**	
23		Type of Valve Operator		**As per Standard Specification**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**As per P&ID**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Integrally welded to the BW valve on each side)		**Not Applicable**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness		**Not Applicable**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (kg/cm^2)		**49 (kg/cm^2)**	
30		Hydrostatic Test Pressure (kg/cm^2) & Time		**Body : 73.5 kg/cm^2 & Test Duration - 30 Minutes**	**Body : 54 kg/cm^2 & Test Duration - 30 Minutes**
31		Pneumatic Test Pressure (kg/cm^2) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (ºC)		**Yes (at -45 °C)**	
33		Fire Safe Design (Note- 16 & 17)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per BS-1873 Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-14)		**As per specification (Suitable for Highly Corrosive Environment)**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**DN 50 (NPS 2") to DN 200 (NPS 8")**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HLT**	
54		Orientation of Pipe		**Suitable for all orientation**	

	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	**JOB NO : C231099**
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	**DOC. NO.: C231099-00-PP-DS-2003D**
	DATA SHEET OF FLANGED / BW, ABOVEGROUND, GLOBE VALVE DN 50 TO DN 200 (NPS 2" TO NPS 8"), RATING 300# , PIPING CLASS - 30HLT	**No. of Pages : 02** / **Revision** C1 / 07.07.2023

Location	-	**MR No.**	-
SR.NO	-	**P.O No.**	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body (Forged / Cast)	**ASTM A352 Gr.LCB/ ASTM A350 Gr.LF2 CL1**	
57		Bonnet (Pressure Seal Type)	**ASTM A352 Gr.LCB/ ASTM A350 Gr.LF2 CL1**	
58		Disc (Plug Type)	**Hard faced (Trim 5), Loose Plug, Conical**	
59		Stem	**SS - 304 / SS - 316 (NO CASTING)**	
60		Body Seat Ring	**STELLITED-6**	
61		Gland / Stem Packing	**Corrosion inhibited die formed flexible graphite with braided anti-extrusion ring (Renewable with valve open on stream)**	
62		Bonnet Gasket	**Soft Iron (Max 90 BHN)/ Graphite with Braided Anti ExtrusionRing**	
63		Body Stud	**ASTM A320 GR.L7**	
64		Body Nut	**ASTM A194 GR.4**	
65		Handle / Lever / Hand Wheel	**Malleable Iron/ Cast Steel/ Ductile Iron/Carbon Steel**	

66	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
67		Flow Coefficient, Kv (Cubic Meters per Hour)		*
68		Valve Cavity Volume(CC)	Open position	*
69			Closed position	*
70		Operator Manufacturer / Model No.		*
71		Break-away Torque Under Max. Diff Pressure(Nm)		*
72		Running Torque (Open - Close/Close - Open) (Nm)		*

73	NOTES	**NOTES:**
74		1. This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
75		2. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
76		3.All tests shall be carried out as per BS 1873 & BSEN 12266 part-1.
77		4. Gland packing assembly shall permit repair of gland packing under full line pressure.
78		5. Valve design shall ensure repair of stem seals / packing under full line pressure.
79		6. 100.0 % Valve castings shall undergo Radiographic Examination.
80		7. Valves shall have support foot & lifting lugs as per valve Specification.
81		8. Valve design shall ensure repair of stem seals / packing under full line pressure.
82		9. Wrench operated valves shall be supplied with wrench.
83		10. The Charpy Impact temperature shall be -45°C as specified in data sheet and it shall superceded the Specification (VCS-SS-PP-2504) requirement at 0°C
84		11. Design of Welded Valves shall be such that during field welding operation, the soft or plastic components of valve are not liable to be damages.
85		12. Gasket Material Graphite Shall Be Provided With Corrosion Inhibitor.
86		13. Valve wall thickness shall be as per ANSI B16.34 / API 623. Manufacturer shall have valid API 623 license to use API monogram. API monogram is required.
87		14 .For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy (Powercrete R-95) with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
88		15. Stem extension length shall be finalized during drawing approval stage after award of order.
89		16. For Metal Seated Valves, Bidder to Confirm that in offered valves, there shall not be any external leakage during fire and valve is capable of handling fire for the mentioned time as specified in API 6FA/ ISO 10497/API 6FD. Bidder also to confirm that in case of fire, the valve shall be unseated from the closed position against the high test pressure and moved to the fully open position i.e. In case of fire, valve shall complete one open-close cycle. For Soft Seated Valves, Bidder to carry out Fire Safe Design & test as per API 6FA/ ISO 10497/API 6FD.
90		17. The offered valve shall deemed to have been fire-tested if vendor submit Fire Test Certificate (Approved & Certified by Governing TPIA) of earlier tested valve of similar design & size.(Qualification Size as per API 6FA/ ISO 10497/API 6FD Codes)
91		18. Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.

		CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)		JOB NO : C231099	
		PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA		DOC. NO.: C231099-00-PP-DS-2004A	
		DATA SHEET OF FE/BW, CHECK VALVE, DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 300# , PIPING CLASS - 30HC		No. of Pages : 02	Revision: C1 / 07.07.2023
Location		-		MR No.	-
SR.NO		-		P.O No.	#
1	GENERAL	Valve Manufacturer			
2		Tag Numbers / Material Requisition Item No.		**Refer Material Requistion (MR) Item No**	
3		Company's Specification No.		**VCS-SS-PP-2006**	
4		Category		**-**	
5		Pipeline Line No		**Not Required**	
6		Class		**30HC**	
7	DESIGN AND TEST REQUIREMENTS	Size		**DN 50 (NPS 2") to DN 400 (NPS 16")**	
8		Type of Valve		**Swing Type**	
9		Type of Port (Full / Reduced)		**Not Applicable**	
10		Design Temperature (º C)	Maximum	**65**	
11			Minimum	**-29**	
12		Corrosion Allowance (mm)		**1.5**	
13		Installation (Aboveground/Underground)		**Aboveground**	
14		Service		**Natural Gas (NG)**	
15		End Connection		**ANSI B16.5 for Flanged Ends (As applicable)/ ANSI 16.25 for Butt Welded Ends (As applicable)**	
16		Flange Face Finish		**RF/125AARH for Flanged Ends (As applicable)**	
17		Design Standards		**API 6D**	
18		End Connection Standard		**ANSI B16.5 for Flanged Ends (As applicable)**	
19		ASME Class		**300#**	
20		Stem Extension Requirement		**Not Applicable**	
21		Length of Stem Extension		**Not Applicable**	
22		Orientation of Stem		**Not Applicable**	
23		Type of Valve Operator		**As per Standard Specification**	
24		Valve Actuator Operating Time		**Not Applicable**	
25		Requirement of Locking Mechanism (LO / LC)		**Not Applicable**	
26		Length of Pup Piece / Nipple (mm), (If Required) (Note-16) (Integrally welded to the BW valve on each side)		**Not Applicable**	
27		Pup Piece Size / Material Grade / Schdeule/ Thickness (Note-16)		**Not Applicable**	
28		Operator Specification No.		**Not Applicable**	
29		Valve Design Pressure (barg)		**49 kg/cm^2**	
30		Hydrostatic Test Pressure (barg) & Time		**Body : 73.5 kg/cm^2 & Test Duration - 30 Minutes**	**Seat : 54 kg/cm^2 & Test Duration 30 Minutes**
31		Pneumatic Test Pressure (barg) & Time		**7.0 kg/cm^2 & Test Duration - 15 Minutes**	
32		Charpy Impact Test (º C)		**Yes (at -29 °C)**	
33		Fire Safe Design (Note-24)		**API 6FA / ISO10497**	
34		Anti Static Testing Requirement		**As per API 6D Latest Edition**	
35		Hardness Test		**248 HV10 max**	
36		Painting (Note-17)		**As per specification (Suitable for Highly Corrosive Environment)**	
37		Operator Data Sheet No.		**Not Applicable**	
38	PROCESS DATA (Applicable for Actuator)	Flow (Min/Nor/Max) (m^3/hr)		**Not Applicable**	
39		Pressure (Min/Nor/Max) (barg)		**Not Applicable**	
40		Temperature (Min/Nor/Max) (º C)		**Not Applicable**	
41		Max Shutoff DP (barg)		**Not Applicable**	
42		Viscosity (cP)		**Not Applicable**	
43		Density (Kg/m^3)		**Not Applicable**	
44		Mol . Wt		**Not Applicable**	
45		Sp Heat Ratio (Cp/Cv)		**Not Applicable**	
46		Compressibility (Z)		**Not Applicable**	
47		Ambient Temperature		**Not Applicable**	
48	CONNECTING PIPE DETAIL	Outside Diameter (Inch)		**Size 2" to 16"**	
49		Thickness (mm) / Schedule		**As per Piping Material Specification**	
50		Pipe Material		**As per Piping Material Specification**	
51		Design Code		**ASME B31.8**	
52		ASME Rating		**300#**	
53		Piping Class		**30HC**	
54		Orientation of Pipe		**Suitable for all orientation**	

	CLIENT : GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	JOB NO : C231099	
	PROJECT : CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	DOC. NO.: C231099-00-PP-DS-2004A	
	DATA SHEET OF FE/BW, CHECK VALVE, DN 50 TO DN 400 (NPS 2" to NPS 16"), RATING 300# , PIPING CLASS - 30HC	No. of Pages : 02	Revision: C1 / 07.07.2023

Location	-	MR No.	-
SR.NO	-	P.O No.	#

		Part Description	Material Specified	Material Offered (By Bidder)
55	VALVE MATERIAL			
56		Body	**ASTM A216 Gr.WCB/ ASTM A105**	
57		Cover	**ASTM A216 Gr.WCB/ ASTM A105**	
58		Disc	**STELLITED-6**	
59		Seat Ring	**STELLITED-6**	
60		Disc Hinge	**SS 304 / SS 316**	
61		Hinge Pin	**SS 304 / SS 316 (NO CASTING)**	
62		Body Stud	**ASTM A320 GR.L4**	
63		Body Nut	**ASTM A194 GR.4/ GR.7**	
66		Cover Gasket	**SP WIND SS316 - CA FILLER**	

67	DATA TO BE PROVIDE BY VENDOR (if Applicable)	Valve Model No.		*
68		Flow Coefficient, Kv (Cubic Meters per Hour)		*
69		Valve Cavity Volume(CC)	Open position	*
70			Closed position	*
71		Operator Manufacturer / Model No.		*
72		Break-away Torque Under Max. Diff Pressure(Nm)		*
73		Running Torque (Open - Close/Close - Open) (Nm)		*

74	NOTES	**NOTES:**
75		1. Bidder to submit Soft Seal details and type, grade & class selected with manufacturer's recommendation like Pressure-Temperature Curve/Table for not to damage the soft seal during
76		2. This Data Sheet shall be read in conjunction with Piping Material Specification, valve Specification & other Tender Documents.
77		3. Dimension / Input Data as & where marked " * " shall be supplied by Vendor.
78		4. Manufacturer shall have valid API 6D license to use API monogram.
79		5. Full inspection by radiography shall be carried out on all welds of pressure containig parts. Acceptance criteria shall be as per ASME B31.4 or ASME B
80		6. 100.0 % Valve castings shall undergo Radiographic Examination.
81		7. Valves shall have support foot & lifting lugs as per valve Specification.
82		8. All Check Valves 3" & above shall be provided with drain connection with plug as per ASME B 16.34 in a position suitable to drain the valve completely.
83		9. Valve seat shall be non renewable and integral type.
84		10. The Charpy Impact temperature specified in this data sheet shall superceded the test requiremetn specified in Valve Specification (VCS-SS-PP-2006) at 0oC
85		11. Name plate material shall be minimum stainless steel. Marking shall be as per MSS-SP-25
86		12. Valve body & other pressure containing parts shall be designed as per ASME Sec-VIII Div-I. Minimum thickness shall not be less than ASME B16.34.
87		13. For tag No./ Fluid Data/ Operating Data refer Process Document , P&IDs
88		14. For the valves to be installed underground the external surfaces of buried portion of the valve shall be painted with 100% Solid high build epoxy (Powercrete R-95 with a minimum dry film thickness of 1000 microns or 1.5 mm thick polyurethane coating
89		15. Bidder shall clearly write all / any deviation against each part material of valve in the space provided for. Wherever bidder agrees with company's spec bidder shall indicate "agreed".
90		16. Bidder to confirm that in offered valves, there shall not be any external leakage during fire and valve is capable of handling fire for the mentioned time as specified in API 6FA/ ISO 10497/API 6FD. Bidder also to confirm that in case of fire, the valve shall be unseated from the closed position against the high test pressure and moved to the fully open position i.e. In case of fire, valve shall complete one open-close cycle.
91		17. As a evidence that offered valve are fire safe design, Bidder can submit Fire Test Certificate (Approved & Certified by Governing TPIA) of earlier tested valve of similar design & size.(Qualification Size as per API 6FA/ ISO 10497/API 6FD Codes)

	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	
PMC	VCS QUALITY SERVICES PVT. LTD.	

DATA SHEET : BALL VALVE (LESS THAN 2.0 INCH) SOCKET WELDED

GENERAL SPECIFICATION

Process Fluid	NG	**ANSI Pressure Rating**	800#
Design Temperature	(-)29°C to 65°C	**Design Pressure**	49 barg
Size, Inch (DN)	Less than 2" (50)		
Valve Type	Full Bore, Floating Ball		
End Connection Type	Socket Welded	**Design Standard**	BS EN ISO 17292
Face Finish	Not Applicable	**Locking Arrangement**	As per P&ID

VALVE DESIGN CONDITIONS

Corrosion Allowance	1.5 mm	**Design Factor**	0.5
Installation	Above Ground	**Stem Ext Length (mm)**	Not Applicable

VALVE OPERATION

Actuation Type	Not Applicable	**Type of Actuator**	Not Applicable

PUP PIECE DETAILS

100mm extension pups in ASTM A106 Gr.B, Sch 160 (for 3/4") and Sch XS (for 1 1/2")

VALVE MATERIAL SPECIFICATION

PART DESCRIPTION	MATERIAL SPECIFIED	MATERIAL OFFERED (Equivalent or Higher)
Body	ASTM A105	
Ball	13% Cr Steel	
Body Seat	RPTFE/ DELRIN	
Gland	13% Cr Steel	
Stem (No Casting)	13% Cr Steel	
Body Seal	Grafoil	
Stem Seal	Grafoil	
Body Studs/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H	

TESTING REQUIREMENT

Hydrostatic Test Pressure & Time	Body: 210 kg/cm^2 & 30 Minutes	Seat: 155 kg/cm^2 & 30 Minutes
Pneumatic Test Pressure & Time	7 kg/cm2 & 15 Minutes	
Hardness Test	248 HV10 max.	
Charpy Impact Test @ Temperature	Yes (at -29°C)	
Anti-Static Testing Requirement	As per BS EN ISO 17292	
Fire Safe Test	API 607 / API 6FA	

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	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	
PMC	VCS QUALITY SERVICES PVT. LTD.	

DATA SHEET : BALL VALVE (LESS THAN 2.0 INCH) SOCKET WELDED

Valve Painting Specification :

1	Surface Preparation by Short Blasting as per grade SA 2 1/2, Swedish Standard SIS-055 909.
2	For above ground installation - Three coats of corrosion resistant paint shall be applied with minimum thickness of 300 micron (Permissible thickness in each coat shalll be within 80 to 120 micron). Colour of paint shade shall be RAL-7038, however any change in colour shall be finalized during drawing approval stage.
3	Lock open/ lock close requirement : **As indicated in P&ID / Schedule of Rates (SOR).**

NOTES :

1	This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
2	Material test certificates and hydrostatic test reports shall be furnished prior to dispatch.
3	Gland Packing Assembly shall permit repair of gland packing under full line pressure.
4	Detailed dimensional drawings showing cross-section with part numbers and materials shall be submitted for purchaser's approval prior to manufacture of the valves.
5	All valves shall be provided with valve position indicator.
6	Separate wrench shall be provided with each wrench operated valve.
7	Stops shall be provided to ensure positive alignment of ball with ports and ensure proper installation of handle.
8	The Charpy Impact Test temperature specified in datasheet shall supersede the specification requirements.
9	Painting procedure of valves shall be as per Manufacturer's standard.
10	All tests shall be as per BS EN 12266.
11	Inspection and Testing shall be as per attached QAP, this datasheet, BS EN 12266, other relevant standards.
12	Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.

	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	
PMC	VCS QUALITY SERVICES PVT. LTD.	

DATA SHEET : GLOBE VALVE (LESS THAN 2.0 INCH) SOCKET WELDED

GENERAL SPECIFICATION

Process Fluid	NG	**ANSI Pressure Rating**	800#
Design Temperature	(-)29°C to 65°C	**Design Pressure**	49 barg
Size, Inch (DN)	Less than 2" (50)		
Valve Type	Rising Stem		
End Connection Type	Socket Welded	**Design Standard**	BS 5352
Face Finish	Not Applicable	**Locking Arrangement**	As per P&ID

VALVE DESIGN CONDITIONS

Corrosion Allowance	1.5 mm	**Design Factor**	0.5
Installation	Above Ground	**Stem Ext Length (mm)**	Not Applicable

VALVE OPERATION

Actuation Type	Not Applicable	**Type of Actuator**	Not Applicable

PUP PIECE DETAILS

100mm extension pups in ASTM A106 Gr.B, Sch 160 (for 3/4") and Sch XS (for 1 1/2")

VALVE MATERIAL SPECIFICATION

PART DESCRIPTION	MATERIAL SPECIFIED	MATERIAL OFFERED (Equivalent or Higher)
Body	ASTM A105	
Bonnet (Bolted)	ASTM A105	
Disc (Loose Plug/ Ball Type)	SS316 + Stellite	
Stem (Rising)	13% Cr Steel (No Casting)	
Body Seat Ring	SS316 + Stellite	
Stem Packing (Renewable with valve open on stream)	Corrosion inhibited die formed flexible graphite with braided anti extrusion rings	
Hand Wheel (Rising)	Malleable Iron/ Cast Steel/ Fab. Steel	
Bonnet Gasket	Spiral Wound SS316 + Grafoil	
Body Studs/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H	

TESTING REQUIREMENT

Hydrostatic Test Pressure & Time	Body: 210 kg/cm^2 & 30 Minutes	Seat: 155 kg/cm^2 & 30 Minutes
Pneumatic Test Pressure & Time	7 kg/cm2 & 15 Minutes	
Hardness Test	248 HV10 max.	
Charpy Impact Test @ Temperature	Yes (at -29°C)	
Fire Safe Test	API 607 / ISO10497	

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		D1	**07.07.2023**	**VI**	**AK**	**SKN**	**ISSUED FOR BID**
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	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	
PMC	VCS QUALITY SERVICES PVT. LTD.	

DATA SHEET : GLOBE VALVE (LESS THAN 2.0 INCH) SOCKET WELDED

Valve Painting Specification :

1	Surface Preparation by Short Blasting as per grade SA 2 1/2, Swedish Standard SIS-055 909.
2	For above ground installation - Three coats of corrosion resistant paint shall be applied with minimum thickness of 300 micron (Permissible thickness in each coat shalll be within 80 to 120 micron). Colour of paint shade shall be RAL-7038, however any change in colour shall be finalized during drawing approval stage.
3	Lock open/ lock close requirement : **As indicated in P&ID / Schedule of Rates (SOR).**

NOTES :

1	This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
2	Material test certificates and hydrostatic test reports shall be furnished prior to dispatch.
3	Stem packing shall be renewable with valve open on stream.
4	Detailed dimensional drawings showing cross-section with part numbers and materials shall be submitted for purchaser's approval prior to manufacture of the valves.
5	All tests shall be carried out as per BS 5352 & BS EN 12266 part-1.
6	Gland packing assembly shall permit repair of gland packing under full line pressure.
7	The Charpy Impact Test temperature specified in datasheet shall supersede the specification requirements.
8	Painting procedure of valves shall be as per Manufacturer's standard.
9	Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.

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		D1	**07.07.2023**	**VI**	**AK**	**SKN**	**ISSUED FOR BID**
SHEET NO.	**1 OF 2**	**REV**	**DATE**	**PRPD**	**CHKD**	**APVD**	**REMARKS**

	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	
PMC	VCS QUALITY SERVICES PVT. LTD.	

DATA SHEET : PLUG VALVE (LESS THAN 2.0 INCH) SOCKET WELDED

GENERAL SPECIFICATION			
Process Fluid	NG	**ANSI Pressure Rating**	800#
Design Temperature	(-)29°C to 65°C	**Design Pressure**	49 barg
Size, Inch (DN)	Less than 3/4" (20)		
Valve Type	Regular Pattern		
End Connection Type	Socket Welded	**Design Standard**	BS 5353
Face Finish	Not Applicable	**Locking Arrangement**	As per P&ID
VALVE DESIGN CONDITIONS			
Corrosion Allowance	1.5 mm	**Design Factor**	0.5
Installation	Above Ground	**Stem Ext Length (mm)**	Not Applicable
VALVE OPERATION			
Actuation Type	Not Applicable	**Type of Actuator**	Not Applicable

PUP PIECE DETAILS
100mm extension pups in ASTM A106 Gr.B, Sch 160 at both ends

VALVE MATERIAL SPECIFICATION		
PART DESCRIPTION	**MATERIAL SPECIFIED**	**MATERIAL OFFERED (Equivalent or Higher)**
Body	ASTM A105	
Plug (Lubricated)	ASTM A105 + 75 microns ENP	
Stem (No Casting)	(AISI 4140 + 75 microns ENP Coating)/ AISI 410	
Stem Seal	GRAFOIL/ PTFE V-RINGS + GRAFOIL	
Gland	ASTM A 105	
Gland Packing	Graphite/ PTFE	
Gasket	N.A	
Body Studs/ Nuts	ASTM A193 Gr. B7/ A194 Gr. 2H	
Lubricant Screw	Manufacturer's Standard	

TESTING REQUIREMENT		
Hydrostatic Test Pressure & Time	Body: 210 kg/cm^2 & 30 Minutes	Seat: 155 kg/cm^2 & 30 Minutes
Pneumatic Test Pressure & Time	7 kg/cm2 & 15 Minutes	
Hardness Test	248 HV10 max.	
Charpy Impact Test @ Temperature	Yes (at -29°C)	
Fire Safe Test	API 607 / API 6FA	

DOCUMENT NO.							
C231099-00-PP-DS-2005B							
		D1	**07.07.2023**	**VI**	**AK**	**SKN**	**ISSUED FOR BID**
SHEET NO.	**1 OF 2**	**REV**	**DATE**	**PRPD**	**CHKD**	**APVD**	**REMARKS**

	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	
CLIENT	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	
PMC	VCS QUALITY SERVICES PVT. LTD.	

DATA SHEET : PLUG VALVE (LESS THAN 2.0 INCH) SOCKET WELDED

Valve Painting Specification :

1	Surface Preparation by Short Blasting as per grade SA 2 1/2, Swedish Standard SIS-055 909.
2	For above ground installation - Three coats of corrosion resistant paint shall be applied with minimum thickness of 300 micron (Permissible thickness in each coat shalll be within 80 to 120 micron). Colour of paint shade shall be RAL-7038, however any change in colour shall be finalized during drawing approval stage.
3	Lock open/ lock close requirement : **As indicated in P&ID / Schedule of Rates (SOR).**

NOTES :

1	This Data Sheet shall be read in conjunction with Tender Documents & Specifications.
2	Material test certificates and hydrostatic test reports shall be furnished prior to dispatch.
3	Gland Packing Assembly shall permit repair of gland packing under full line pressure.
4	Valve shall have an inherent feature using the line pressure to ensure that the line pressure cannot cause taper locking of the plug / plug movement into the taper i.e. valves shall be of " pressure balanced design"
5	All valves shall be provided with valve position indicator.
6	Separate wrench shall be provided with each wrench operated valve.
7	Stops shall be provided to ensure positive alignment of plug with ports and ensure proper installation of handle.
8	Valve body & other pressure containg parts shall be designed as per ASME Sec-VII Div.-1. Minimum thickness shall not be less than ASME B16.34.
9	The Charpy Impact Test temperature specified in datasheet shall supersede the specification requirements.
10	Valve design shall ensure repair of stem seals / packing under full line pressure.
11	Painting procedure of valves shall be as per Manufacturer's standard.
12	Inspection and Testing shall be done as per data sheet, specification & BS:12266 (Part-I).
13	Minimum port area for regular pattern shall be 55%.
14	Minimum all pressure containing and controlling parts of the valve shall be provided with EN 10204-3.2 certificate.

Goa Natural Gas Pvt Ltd.	**PROJECT NUMBER: C231099**	Energising Quality

MECHANICAL DATA SHEET FOR FILTER	Client Job Number	C231099
	Total Sheets	5

DOCUMENT NO.	C231099	GOA	ME	DS	3014

GOA NATURAL GAS PRIVATE LIMITED

CITY GAS DISTRIBUTION PROJECT AT GEOGRAPHICAL AREAS OF GOA

REV	DATE	DESCRIPTION	PREP	CHKD	APPR
C1		Issued for client Review	Sk	MS	RZ

MECHANICAL DATA SHEET – CARTRIDGE FILTER
CITY GAS DISTRIBUTION PROJECT AT GEOGRAPHICAL AREAS OF GOA

Ref P&ID: C231099-GOA-PC-PID-1001 N

GENERAL DESIGN SPECIFICATIONS

SR. NO.	DESCRIPTION	Unit / UOM	DATA
1	FILTER SEPARATOR - TYPE	~	Cartridge Type
2	QUANTITY / TAG NO. / LOCATION	Nos.	4QTY / F-1001 A / B (1 WORKING + 1 STAND BY)
3	SERVICE FLUID	~	Natural Gas (Dry)
4	LIQUID TO BE REMOVED	~	Particulate matters+ Iron sulphides + pipe scales
5	VAPOUR SPACE MEDIUM	~	Hydrocarbon Gas
6	TYPE OF FILTER ELEMENTS	~	Cartridge
7	VESSEL DESIGN CODE	~	ASME Section VIII, Div 1 (U-stamped)
8	MOLECULAR WEIGHT OF GAS	kg/k-mol.	17.96 ~ 19
9	GAS COMPRESSIBILITY @ P, T(4.07 kg/cm2 , 48°C)	kg/cm2 & °C	Z= 0.886
10	GAS COMPRESSIBILITY @ P, T(2.03 kg/cm2 , 10°C)	kg/cm2 & °C	-
11	SPECIFIC ISOBAR HEAT CAPACITY(Cp)	Kj/ kg-k	-
12	SPECIFIC ISOCHOR HEAT CAPACITY(Cv)	Kj/ kg-k	1.52
13	GAS SPECIIFC GRAVITY @P,T & COMPOSITION		0.562
14	GAS DYNAMIC VISCOSITY @ P,T..	cP	-
15	GAS DENSITY @ P,T…	kg/m^3	0.25 ~ 4.0
16	LIQUID DENSITY @ P,T…	kg/m^3	995
17	LIQUID VISCOCITY @ P,T…	cP	.0144
18	DESIGN GAS FLOW RATE	SCMH	5000
19	OPERATING FLOW RATE (MIN. / MAX)	SCMH	500 TO 5000
20	OPERATING PRESSURE	Kg/cm2 g	4 Bar.g
21	OPERATING TEMPERATURE (MIN. / MAX.)	°C	10 to 48 °C
22	DESIGN TEMPERATURE (MIN. / MAX.)	°C	-29 to 65 °C
23	ALLOWABLE PRESSURE DROP (CLEAN/DIRTY)	Kg/cm2	0.1 / 0.3
24	FILTERATION EFFICIENCY	%	99 % for <= 5 micron

MATERIAL OF CONSTRUCTION

SR. NO.	DESCRIPTION	UOM	MATERIAL GRADE
25	SHELL,TUBE SHEET,ELLIPSOIDAL HEAD	~	SA516 Gr.70N / SA 106 Gr. B
26	NOZZLE NECK	~	SA 106 GR.B
27	NOZZLE FLANGES	~	SA105 N
28	EXTERNAL BOLTINGS	~	SA193 GR.B7 & SA 194 GR.2H (HOT DIP GALVANISHED)
29	INTERNAL BOLTINGS	~	SS316
30	STUD WITH HEAVY HEX NUT FOR 2" NB NOZZLE	~	SA193 GR.B7 & SA 194 GR.2H (HOT DIP GALVANISHED)
31	PIPE FITTINGS	~	SA 234 GR.WPB
32	INTERNAL GASKET, IF ANY	~	# (Suitable for Natural Gas)
33	EXTERNAL GASKET / O-RING, IF ANY	~	SPIRAL WOUND GRAPHITE FILLED SS 316 METAL WINDING WITH SS304 INNER RING & CS OUTER
34	FILTER ELEMENT / MESH	~	BOROSILICATE FIBRE GLASS ,SINTERED POLYETHYLENE, SINTERED CERAMIC OR EQUIVALENT
35	OTHER INTERNAL ATTACHMENT, IF ANY	~	SAME AS PARENT MATERIAL
36	PIPE FOR DRAIN OPENING	~	SA106 GR. B
37	LIFTING LUGS	~	SA516 GR. 70N

DESIGN CONSIDERATION

SR. NO.	DESCRIPTION	UOM	DATA
38	DESIGN CODE	~	ASME -SEC VIII DIV-1 (LATEST EDITION)
39	CODE STAMPING (ASME U-STAMP)	~	Required
40	CORROSION ALLOWANCE	mm	3.0
41	FILTER GROSS GAS VOLUMETRIC CAPACITY	m^3	#
42	DESIGN PRESSURE	kg/cm^2g	19.0
43	HYDROSTATIC TEST PRESSURE	kg/cm^2g	1.5 x Design Press. Or As per Code Calculations (Whichever is higher)
44	DESIGN TEMPERATURE (MIN. / MAX.)	^oC	(-)29 / (+)65
45	LIQUID HOLDING CAPACITY	m^3	#
46	MAKE / MODEL OF FILTER ELEMENT	~	#
47	NO. OF FILTER CARTRIDGES REQUIRED	Nos.	#
48	FILTER ELEMENT DIMENSION (OD x WIDTH)	mm	#
49	NOZZLE MAX. ALLOWABLE FORCES	N	#
50	NOZZLE MAX. ALLOWABLE MOMENTS	N-mm	#
51	HOUSING (DIA. × LENGTH)	mm	#
52	TOTAL SOLID HOLDING CAPACITY	m3	#
53	TOTAL NET / GROSS FILTERATION AREA	mm2	#
54	MAX. WITHSTAND DIFFERENTIAL PRESSURE@ P , T	Kg/cm2 g	#
55	BETA RATIO	mm2	#
56	PARTICLE / MESH SIZE	Micron	5 micron
57	MOST PENETRATING PARTICLE SIZE(MPPS)	µm	#
58	NAME OF FILTER ELEMENT MANUFACTURER	~	#
59	FIXING DETAIL OF FILTER ELEMENT	~	#
60	PRESSURE RATING OF FLANGES	psi / class	150 #
61	FINISHED SURFACE OF FLANGES	AARH	125
62	DESIGN WIND VELOCITY (AS PER IS-875 PART-III)-2020	m/s	47
63	SEISMIC ZONE (AS PER IS-1893-RSM)	~	As per respective GA
64	EIEMENTS & VESSEL WALL CLEARANCE	mm2	#
65	PRESSURE DROP AT INLET DUE EXPANSION & CONTRACTION	kg/cm2 g	#
66	PRESSURE DROP AT OUTLET DUE EXPANSION & CONTRACTION	kg/cm2 g	#
67	FILTER CARTRIDGE BURSTING PRESSURE	kg/cm2 g	#
68	VELOCITY OF GAS AT INLET & OUTLET	m/sec.	#
69	VELOCITY OF GAS AT SHELL	m/sec.	#
70	FLOW VS INLET PRESSURE CURVE	~	#
71	FLOW VS PRESSURE DROP CURVE	~	#
72	DESIGN GAS FLOW RATE	SCMH	#
73	DESIGN LIFE	Years	30
74	ALL NOZZLE ORIENTAION	° / Radians	#

NOZZLE DETAIL

SR. NO.	NOZZLE NO.	DESCRIPTION	UOM	FLANGE SIZE, PRESSURE RATING & FLANGE TYPE / DETAILS, PIPEING CLASS
75	N1	GAS INLET	Inch	3" NB, 150#, WNRF,15HC
76	N2	GAS OUTLET	Inch	3" NB, 150#, WNRF,15HC
77	N3	DRAIN	Inch	2" NB, 150# WNRF, 15HC
78	N4	PRESSURE SAFETY VALVE	Inch	2" NB, 150#, WNRF, 15HC

END

DIMENSION & WEIGHT

SR. NO.	DESCRIPTION	UOM	DATA
79	BOTTOM OF SADDLE SUPPORT TO TOP OF INLET FLANGE	mm	#
80	OVERALL LENGTH (INCLUDING HEAD)	mm	#
81	SHELL INSIDE DIA. & TOTAL LENGTH	mm	#
82	EMPTY WEIGHT	kg	#
83	OPERATING WEIGHT	kg	#
84	HYDROSTATIC TEST WEIGHT	kg	#
85	OVERALL FILTER WATER LITRE CAPACITY	Ltr.	#

ACCESSORIES

SR. NO.	DESCRIPTION	UOM	DATA
86	TYPE OF END CLOSURE	~	Blind frange with davitor
87	LIFTING LUGS	~	As required
88	ANCHOR / FOUNDATION BOLTS & NUTS	~	#
89	BLIND FLANGES, BOLTS, NUTS & GASKETS AS PER NOZZLE DETAIL	~	Required
90	LADDER / PLATFORM	~	As applicable

INSPECTION & TESTING

SR. NO.	DESCRIPTION	UOM	DATA
91	RADIOGRAPHY	%	100
92	PWHT	~	As per Code
93	HYDROSTATIC TEST	~	Required
94	DP / MPI / UT / IMPACT TEST	~	Required
95	PAINTING	~	Required (As per VCS Doc. No. VPC-SS-PP-2502)
96	PNEUMATIC TEST PROCEDURE	~	#
97	HYDRO TEST PROCEDURE	~	#
98	PWHT PROCEDURE	~	#
99	PT & RT PROCEDURE	~	#
100	OPERATION & MAINTENANCE PROCEDURE	~	#

NOTES :

i	VENDOR TO PROVIDE THE DATA AS MARKED **"#".**
ii	THIS DATA SHEET TO BE READ IN CONJUNCTION WITH THE P&ID **(DOC. NO. C221085/86-02-PC-PID-1001)** & TENDER DOCUMENTS.
iii	FLANGES AND GASKETS SHALL CONFORM TO ASME B16.5 & ASME B16.20 RESPECTIVELY.
iv	FILTER ELEMENT MUST WITHSTAND A DIFFERENTIAL PRESSURE OF 1 KG/CM2 WITHOUT CRACKING AND FAILING.
v	BIDDER TO PROVIDE LOAD CALCULATIONS FOR NOZZLES MENTIONING ALLOWABLE FORCES AND MOMENTS.
vi	ALL GASKETS USED FOR HYDROSTATIC TESTING SHALL BE SAME AS SERVICE GASKETS.
vii	ALL NOZZLE BOLT HOLES SHALL STRADDLE VESSEL PRINCIPAL CENTRE LINES.
viii	ALL BUTT WELDED JOINTS SHALL BE FULL PENETRATION WELD & ROOT RUN SHALL BE CARRIED OUT BY TIG, IF ACCESSIBLE FROM OTHER SIDES SHALL BACK CHIPPED TO SOUND METAL & REWELD.
ix	FILLET WELDS SHALL BE EXAMINED BY MPI / DP METHOD.
x	EARTHING LUG SHALL NOT BE GALVANISED OR PAINTED.
xi	BIDDER TO SIZE AND PROVIDE COALESCER FILTER ELEMENT TO MEET FILTERATION EFFICIENCY.
xii	DESIGN LIFE OF CARTRIDGE FILTER SHALL BE 30 YEARS.
xiii	GAS IS NORMALLY DRY IN NATURE ,HOWEVER EVENTUAL MOISTURE PRESENCE IN GAS ,VENDOR SHALL TAKE CARE OF ITS REMOVAL.
xiv	VENDOR TO ENSURE THAT FILTER SHALL BE SIZED FOR MINIMUM FLOW FOR 10% OF DESIGN FLOW.(TURN DOWN RATIO 10:1)
xv	ALL FASTENERS SHALL BE HOT DIP GALVANISED AS PER ISO 10683 / ASTM A153.
xvi	ALL INSTRUMENTS SHOULD BE ACCESSIBLE i.e VISIBLE FOR OPERATORS & CAN BE OPEARTED AT REASONABLE ELEVATION.
xvii	EQUIPMENT NOZZLE & PIPING ORIENATION TO BE CONFIRMED DURING DETAILED ENGINEERING
xviii	DURING FILTER SIZING CALCULATION THERMAL CONDITION TO BE CONSIDER ISOTHERMAL STEADY STATE CONDITION & PRESSURE DROP EXCLUDING ELEVATION
xix	FILTRATION FOULING TO BE CONSIDERED AT 0.0 %
xx	VENDOR SHALL CONFIRM CARTRIDGE FILTER ELEMENTS FLOW PATTERN DURING GAS FLOW FROM INLET TO OUTLET.
xxi	THE VENDOR SHALL REFER SOR FOR FILTER QUANTITY AS MARKED **(**)**

INSTRUMENT DATASHEETS			**TOTAL SHEETS**		13
DOCUMENT No.	C231099	CGD	IN	DS	5003

GOA NATURAL GAS PRIVATE LIMITED (GNGPL)

CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA

INSTRUMENT DATASHEETS

C1	26.10.2023	ISSUED FOR CLIENT	AK	RA	KNC
B1	25.10.2023	ISSUED FOR IDC	AK	RA	KNC
A1	23.10.2023	ISSUED FOR INTERNAL REVIEW	AK	RA	KNC
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

INDEX				Rev.
S.NO	**ITEM DESCRIPTION**	**SHEET NUMBER**	**REMARKS**	
1	Pressure Gauge	Sheet 3 of 13		
2	Diff. Pressure Gauge	Sheet 4 of 13		
3	Temperature Gauge	Sheet 5 of 13		
4	Slam Shut Valve	Sheet 6 of 13		
5	Self actuated pressure control valve	Sheet 7 of 13		
6	Pressure Safety Valve	Sheet 8 of 13		
7	Creep Relief Valve	Sheet 9 of 13		
8	Junction Box	Sheet 10 of 13		
9	Turbine Flow Meter	Sheet 11 of 13		
11	Electronic Volume Corrector	Sheet 12 of 13		
12	Restriction orifice	Sheet 13 of 13		

CLIENT:	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	C1	26.10.2023	AK	RA	KNC
		B1	25.10.2023	AK	RA	KNC
PROJECT:	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	A1	23.10.2023	AK	RA	KNC
		REV.	**DATE**	**PRP**	**CHKD**	**APPD**

Document No.: C231099-CGD-IN-DS-5003

		PRESSURE GAUGE				**Rev.**
GENERAL	1	Tag Number	Quantity	Refer P&ID	Refer P&ID	
	2	Line No	Equipment No.	Refer P&ID	Refer P&ID	
	3	P&ID Number	Vendor	C231099-GOA-PC-PID-1001N	*	
	4	Manufacturer	Model No.	*	*	
	5	Design Pressure	Design Temperature	Refer P&ID	-29 to 65 Deg C	
	6	Service		Natural Gas		
	7	Flow (Min/Max)		Refer P&ID		
GAUGE	8	Type		Bourdon		
	9	Case	Type	Direct		
	10		Material	SS 316		
	11		Mounting	Local		
	12		Bezel	Bayonet		
	13		Glass Type	Shatter Proof Glass (3 mm)		
	14		Blowout Device	Required		
	15		Gasket Material	*		
	16	Dial Size	Dial Color	150 mm	White with Black Marking	
	17	Enclosure Class		IP - 65		
	18	Range		*		
	19					
	20					
ELEMENT	21	Type	Accuracy	C-type Bourdon*	±1% FSD	
	22	Element Material	Socket Material	SS316	SS316	
	23	Movement Material		SS316		
	24	Conn. Size/Type	Connection Location	1/2" NPT	Bottom	
	25	Zero Adjustment		Micropointer		
	26	Blow Out Protection	Over-Rng Protection	Required	Required, 130% of Full Scale	
	27					
	28					
SEAL	29	Type	Model No.	N/A		
	30	Wetted Parts Mat'l	Seal Material			
	31	Housing Lower Mat'l	Housing Upper Mat'l			
	32	Conn. Size/Type	Connection Rating			
	33	Seal Flush Conn.	O-Ring Material			
	34	Seal Fill Fluid				
	35	Design Pressure				
	36					
	37					
MISC.	38	Snubber Type	Model No.	*	*	
	39	Siphon Type	Model No.	*	*	
	40	Pulsation Dampner	Model No.	*	*	
	41	Manifold	Model No.	2 valve 3-way Manifold	*	
	42					

Notes:

1. * By Vendor
2. Calibration, material and certificates shall be provided by the Vendor.
3. Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).
4. Pressure gauge shall be selected in such a manner that normal operating pressure is approximately in the middle third of full scale (30% - 70% of range).
5. Pressure gauge shall be fitted with blow-out protection at back and shall have a over-range protection of 130% of max. reading.

CLIENT:	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	C1	26.10.2023	AK	RA	KNC
		B1	25.10.2023	AK	RA	KNC
PROJECT:	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	A1	23.10.2023	AK	RA	KNC
		REV.	DATE	PRPD	CHKD	APPD

Document No.: C231099-CGD-IN-DS-5003

DIFFERENTIAL PRESSURE GAUGE						Rev.
GENERAL	1	Tag Number	Quantity	Refer P&ID	Refer MR and P&ID	
	2	Line No	Equipment No.	Refer P&ID	Refer P&ID	
	3	P&ID Number	Vendor	C231099-GOA-PC-PID-1001N	*	
	4	Manufacturer	Model No.	*	*	
PROCESS DATA	5	Service		Natural Gas		
	6	Design Temperature (DegC)		-29 to 65		
	7	Design Pressure (barg)		Refer P&ID		
	8	Operating Pressure (Min./Nor/Max.)				
	9	Operating Temperature (DegC) (Min./Nor/Max.)				
	10	Flow(Min/Max)		Refer P&ID		
GAUGE	11	Type		Diaphragm/ Piston		
	12	Case	Type	Direct		
	13		Material	SS 304		
	14		Mounting	Local		
	15		Bezel	Bayonet		
	16		Glass Type	Shatter Proof Glass (3 mm)		
	17		Blowout Device	Required		
	18		Gasket Material	*		
	19	Dial Size	Dial Color	150 mm	White with Black Marking	
	20	Enclosure Class		IP - 65		
	21	Range		*		
	22					
	23					
ELEMENT	24	Type	Accuracy	Diaphragm/ Piston	±2% FSD	
	25	Element Material	Socket Material	SS 316	SS 316	
	26	Movement Material		SS 316		
	27	Conn. Size/Type	Process Connection	1/2" NPT	3/4" NPT	
	28	Zero Adjustment		Micropointer		
	29	Blow Out Protection	Over-Rng Protection	Required	Required, 130% of Full Scale	
	30					
	31					
SEAL	32	Type	Model No.	N/A		
	33	Wetted Parts Mat'l	Seal Material			
	34	Housing Lower Mat'l	Housing Upper Mat'l			
	35	Conn. Size/Type	Connection Rating			
	36	Seal Flush Conn.	O-Ring Material			
	37	Seal Fill Fluid				
	38	Design Pressure				
	39					
	40					
MISC.	41	Snubber Type	Model No.	*	*	
	42	Siphon Type	Model No.	*	*	
	43	Pulsation Dampner	Model No.	*	*	
	44	Manifold	Model No.	5-way Manifold	*	
	45					

Notes:

1. * By Vendor
2. Calibration, material and certificates shall be provided by the Vendor.
3. Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).
4. Differential Pressure gauge shall be selected in such a manner that normal operating pressure is approximately in the middle third of full scale (30% - 70% of range).
5. Differential Pressure gauge shall be fitted with blow-out protection at back and shall have a over-range protection of 130% of max.

CLIENT:	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	C1	26.10.2023	AK	RA	KNC
		B1	25.10.2023	AK	RA	KNC
PROJECT:	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	A1	23.10.2023	AK	RA	KNC
		REV.	DATE	PRPD	CHKD	APPD

Document No.: C231099-CGD-IN-DS-5003

TEMPERATURE GAUGE						Rev.
GENERAL	1	Tag Number	Quantity	Refer P&ID	Refer MR and P&ID	
	2	Line No	Equipment No.	Refer P&ID	Refer P&ID	
	3	P&ID Number	Vendor	C231099-GOA-PC-PID-1001N	*	
	4	Manufacturer	Model No.	*	*	
	5					
	6					
PROCESS DATA	7	Service fluid		Natural gas		
	8	Fluid state	Phase	Gas	Single	
	9	Operating Pressure (Barg)	Design Pressure (Barg)	Refer P&ID	Refer P&ID	
	10	Operating Temperature (Deg.C)(Deg.C)	Design Temperature (Deg.C)	Refer P&ID	-29 to 65	
	11	Flow		Refer P&ID		
	12	Viscosity (cP)	Density (Kg/m^3)	-	-	
	13	Velocity (m/s)		*		
GAUGE	14	Type	Well	Bi-Metalllic	Required	
	15	Mounting		Direct		
	16	Case Material		SS 316		
	17	Dial Size	Scale Type	150 mm	All Angle Rotatable	
	18	Dial Color	Scale Color	White with Black Marking		
	19	Dial Material		Aluminium		
	20	Lens / Window Material		Shatter Proof Glass (3mm)		
	21	Accuracy		±1% FSD		
	22	Over Range Protection		130 % of Range		
	23	Zero Adjustment		External Zero Adjustment		
	24	Enclosure Class		IP - 65		
	25					
	26					
BIMETAL ELEMENT	27	Type		Adjustable Union		
	28	Element Material		SS 316		
	29	Connection Size		1/2" NPTM		
	30	Stem Length (L Dim)	Stem Diameter	*	To suit well	
	31	Zero Adjustment	Temp. Range	Micrometer Pointer	*	
	32					
	33					
FILLED SYSTEM	34	Compensation	SAMA Class	N/A		
	35	Bulb Type	Bulb Material			
	36	Bulb Extension Type	Bulb Dia.			
	37	Capillary Length	Capillary Material			
	38	Armour Flexible	Armour Material			
	39					
	40					
THERMOWELL	41	Type		Tapered		
	42	Construction	Material	Drilled Bar Stock	SS 316	
	43	Process Connection	Instrument Conn.	1.5" Flanged,300#	1/2 " NPT F	
	44	Outside Dia (OD)	Bore	*	*	
	45	Tip Diameter	Tip Thickness	*	*	
	46	Maximum Allowable Insertion (U Max)		*		
	47					
	48					

Notes:

1. * By Vendor
2. Calibration, material and certificates shall be provided by the Vendor.
3. Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).
4. Temperature gauge shall be selected in such a manner that normal operating temperature is approximately in the middle third of full scale.(30% - 70% of range).
5. Thermowell wake frequency calculation shall be provided along with datasheet

CLIENT:	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	C1	26.10.2023	AK	RA	KNC
		B1	25.10.2023	AK	RA	KNC
PROJECT:	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	A1	23.10.2023	AK	RA	KNC
		REV.	DATE	PRPD	CHKD	APPD

		SLAM SHUT OFF VALVE					Rev.
GENERAL	1	Tag Numbers			Refer P&ID		
	2	Quantity			Refer MR and P&ID		
	3	Service			Down stream pressure protection		
	4	Governing standard			BS EN 14382:2005+A1:2009		
	5	Inlet Line No.			Refer P&ID		
	6	Outlet Line No.			Refer P&ID		
	7	Line Size & Schedule			Refer P&ID		
	8						
PROCESS DATA	9	Fluid	State		NG	Gas	
	10	Flow Gas	Min.	Nor. / Max.	Refer P&ID's		
	11	Inlet Pressure			Refer P&ID		
	12	Pressure Drop at Various Flow Rates			*		
	13	Shut Off Pressure			*		
	14	Temp.	Oper.	Max.	Refer P&ID		
	15	Oper S.G	Mol Wt.		*		
	16	Cp/Cv	Compress. Factor		*		
BODY	17	Type of Valve			Slam Shut		
	18	Body Size	Port Size		*		
	19	End Conn: Flgd. Size & Rating			Refer P&ID		
	20	Facing & Finish			Flanged & RF		
	21	Body Material			ASTM A 216 WCB or equivalent		
	22	Trim Material			SS 316		
	23	Other Wetted Parts			SS 316		
	24	Leakage Class			Class VI as per FCI 70.2		
	25	Closing Time			Less than 2 secs		
OPTIONS	26	Pilot Operated			Integral Pilot Required		
	27	Manual Reset			Required		
	28	Failure Position			Close		
	29	Limit Switch			2 Nos. (Open/Close)		
	30	Cable Entry			Required		
	31	Valve Position Indicator (Local)			Required		
	32	Radiography			Required		
	33	Charpy V-Notch			Required		
	34	Impulse Tubing/Fittings			Required		
	35	Pressure Indicator			*		
	36	Installation			Horizontal		
MISC.	37	Kg or Cg Min.	Kg or Cg Max.		*		
	38	Kg or Cg Selected			*		
	39	Predicted Sound Level (dBA)			less than 85 dBA		
	40	Inlet Velocity (meters/second)			As per PNGRB guidelines		
	41	Valve Setpoint	Adjustable Range		*		
	42	OPSO	UPSO		*		
	43	Model No.	Make		*		
	44				`		
	45						

Notes:

1	* By Bidder
2	Calibration, material and certificates shall be provided by the Vendor.
3	Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire(1 mm).
5	Vendor to provide over pressure shut off (OPSO) and under pressure shut off (UPSO) along with sizing calculations of slam shut off valve for review and approval.
6	Vendor shall submit detailed GA drawing along with part names and MOC of the part along with MOC.
7	Vendor shall submit detailed catalogue with model decodification with datasheet.

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SELF ACTUATED PRESSURE CONTROL VALVE								Rev.
GENERAL	1	Tag Numbers				Refer P&ID		
	2	Quantity				Refer MR and P&ID		
	3	P&ID Number				C231099-GOA-PC-PID-1001N		
	4	Service				Down stream pressure protection		
	5	Governing standard				EN 334: 2005+A1:2009		
	6	Sensing Type				External		
	7	Line Size & Schedule				Refer P&ID		
	8							
PROCESS DATA	9	Fluid	State			Natural Gas	Gas	
	10	Flow Gas	Min.	Nor.	Max.	Refer P&ID		
	11	Inlet Pressure (Barg)				Refer P&ID		
	12	Pressure Drop at Various Flow Rates				*		
	13	Shut Off Pressure				*		
	14	Temp.	Oper.		Max.	Refer P&ID		
	15	Oper S.G	Mol Wt.			-	-	
	16	Cp/Cv	Compress. Factor			-	-	
	17							
BODY	18	Type of Valve				Self Actuating Pressure Reduction		
	19	Body Size	Port Size			*		
	20	End Conn: Flgd. Size & Rating				Refer P&ID		
	21	Facing & Finish				Flanged & RF		
	22	Body Material				ASTM A 216 WCB or equivalent		
	23	Trim Material				SS 316		
	24	Other Wetted Parts				SS 316		
	25	Leakage Class				Class VI as per FCI 70.2		
	26	Closing Time				Less than 2 secs		
	27	Diaphragm				Synthetic rubber or equivalent		
	28							
OPTIONS	29	Pilot Operated				Self actuated Pilot Operated		
	30	Manual Reset				Required		
	31	Failure Position				Closed		
	32	Limit Switch				N/A		
	33	Cable Entry				Required		
	34	Valve Position Indicator (Local)				Required		
	35	Radiography				Required		
	36	Charpy V-Notch				Required		
	37	Impulse Tubing/Fittings				Required		
	38	Pressure Indicator				*		
	39	Installation				Horizontal		
	40							
MISC.	41	Kg or Cg Min.	Kg or Cg Max.			*		
	42	Kg or Cg Selected				*		
	43	Predicted Sound Level (dBA)				less than 85 dBA		
	44	Inlet Velocity (meters/second)				As per PNGRB guidelines		
	45	Valve Setpoint	Adjustable Range			*		
	46	Make	Model No.			*		
	47							

Notes:

1	* By Vendor
2	Calibration, material and certificates shall be provided by the Vendor.
3	Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).
4	Monitor Pressure regulator with integral Slam shut valve shall be fail to close type and Active Pressure regulator shall be fail to open type.
5	Accuracy of pressure reguation shall be +/- 2.5 % or better than of the set pressure for the entire inlet pressure and flow range.
6	Pressure drop across the valve shall be selected by the Vendor considering the given set points (staggered set point of the two regulators and the Slam Shut valves) and the given inlet pressure conditions.
7	Regulator shall be sized to deliver the maximum flow at minimum pressure condition and the minimum flow at the maximum pressure condition
9	Vendor to provide sizing calculations of self actuated pressure control valve for review and approval.
10	Vendor shall submit deatailed GA drawing along with part name and MOC of the parts with datasheet.
11	Vendor shall submit catalogue with model decodification sheet with datasheet.

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		PRESSURE SAFETY VALVE								Rev.
GENERAL	1	Tag Number		Quantity		Refer P&ID		Refer MR and P&ID		
	2	P&ID Number				C231099-GOA-PC-PID-1001N				
	3	Line No/Equipment No.				Refer P&ID				
	4	Inlet Line Size/Sch		Outlet Line Size/Sch		Refer P&ID				
	5	Inlet Line Material		Outlet Line Material		*		*		
	6	Corrosion Allowance				As per PMS				
	7									
PROCESS DATA	8	Service				Natural Gas				
	9	State		Phase		Gas		Single		
	10	Corrosive		Erosive		N/A		N/A		
	11	Flow(min/max)	SCMH	Max. Oper Pressure	barg	Refer P&ID		*		
	12	Set Pressure	Barg	%Allow Overpressure		47	Barg	21%		
	13	Back Pressure (barg)		Constant		*				
	14			Variable						
	15			Total						
	16	Oper Temperature	DegC	Relief Temperature	DegC	Refer P&ID		*	DegC	
	17	SG @ Relief		Visc @ Relief		*		*		
	18	MW @ Relief		Density @ Relief		*		*		
	19	Sp HT Ratio (Cp/Cv)		Compressibility (Z)		*		*		
	20	Design Pressure	barg	Design Temperature	DegC	Refer P&ID	barg	-29 / 65	DegC	
	21	Latent Heat of Vap		Barometric Pressure		*		-		
	22	Wetted Surface Area (m2)				N/A				
	23									
DESIGN BASIS	24	Nozzle				Full Nozzle				
	25	Type				Conventional				
	26	Bonnet Type				Closed				
	27	Design Code				API 520 I/II, API 521, API 526 & API 527				
	28	Sizing Basis				Fire Case				
	29	Relieves To				Vent to Atmosphere				
	30	Calculated Area		Selected Area		*		*		
	31	Orifice Designation				*				
	32	Calculated Capacity				*				
	33									
CONNECTOR	34	Size				*		*		
	35	Type				RF*		RF*		
	36	Rating				*		*		
	37									
	38									
	39									
	40									
MATERIAL	41	Body		Bonnet		ASTM A216 GR. WCB		ASTM A216 GR. WCB		
	42	Nozzle (Seat)		Nozzle Ring		SS 316		*		
	43	Spring		Disc		SS 304		SS 316		
	44	Bellows		Guide		N/A		*		
	45	Main Valve Seat / Seal				*				
	46									
MISC.	47	Cap				Bolted				
	48	Lever		Lever Type		N/A		-		
	49	Test Gag		Range		Required		-		
	50	Rupture Disc		Tag No		N/A		-		
	51	Manufacturer		Model No.		*		*		
	52									

Notes:

1. * By Vendor
2. Calibration, material and certificates shall be provided by the Vendor.
3. Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).
4. Pressure safety Valve shall be sized as per API 520 & 526. Vendor to provide sizing calculations and select material as per detail engineering.
5. Vendor shall submit detailed catalogue with model decodification sheet with datasheet.
6. Vendor shall submit detailed GA drawing along with part names and MOC of the parts along with datasheets.

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CREEP RELIEF VALVE										Rev.
GENERAL	1	Tag Number		Quantity		Refer P&ID		Refer MR and P&ID		
	2	P&ID Number				C231099-GOA-PC-PID-1001N				
	3	Line No/Equipment No.				Refer P&ID				
	4	Inlet Line Size/Sch		Outlet Line Size/Sch		Refer table below				
	5	Inlet Line Material		Outlet Line Material		*		*		
	6	Corrosion Allowance				As per PMS				
	7									
PROCESS DATA	8	Service				Natural Gas				
	9	State		Phase		Gas		Single		
	10	Corrosive		Erosive		N/A		N/A		
	11	Flow (Min./Max.)	SCMH	Max. Oper Pressure	Barg	Refer P&ID		Refer P&ID		
	12	Set Pressure	Barg	%Allow Overpressure		Refer P&ID	Barg	10%		
	13	Back Pressure (barg)		Constant		*				
	14			Variable						
	15			Total						
	16	Oper Temperature	DegC	Relief Temperature	DegC	Refer P&ID		*	DegC	
	17	SG @ Relief		Visc @ Relief		*		*		
	18	MW @ Relief		Density @ Relief		*		*		
	19	Sp HT Ratio (Cp/Cv)		Compressibility (Z)		*		*		
	20	Design Pressure	Barg	Design Temperature	DegC	19	barg	-29 / 65	DegC	
	21	Latent Heat of Vap		Barometric Pressure		*		-		
	22	Wetted Surface Area (m2)				N/A				
	23									
DESIGN BASIS	24	Nozzle				Full Nozzle				
	25	Type				Conventional				
	26	Bonnet Type				Closed				
	27	Design Code				To meet the PNGRB requirement for Creep Relief				
	28	Sizing Basis				Creep Relief				
	29	Relieves To				Vent to Atmosphere				
	30	Calculated Area		Selected Area		*		*		
	31	Orifice Designation				*				
	32	Calculated Capacity				*				
	33									
CONNECTOR	34	Size				*		*		
	35	Type				RF		RF		
	36	Rating				*		*		
	37									
	38									
	39									
	40									
MATERIAL	41	Body		Bonnet		ASTM A216 GR. WCB		ASTM A216 GR. WCB		
	42	Nozzle (Seat)		Nozzle Ring		SS 316		*		
	43	Spring		Disc		SS 304		SS 316		
	44	Bellows		Guide		N/A		*		
	45	Main Valve Seat / Seal				*				
	46									
MISC.	47	Cap				Bolted				
	48	Lever		Lever Type		N/A		-		
	49	Test Gag		Range		Required		-		
	50	Rupture Disc		Tag No		N/A		-		
	51	Manufacturer		Model No.		*		*		
	52									

Notes:

1	* By Vendor
2	Calibration, material and certificates shall be provided by the Vendor.
3	Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).
4	Creep Relief Valve shall be sized as per PNGRB requirements. Vendor to provide sizing calculations and select material as per detail engineering.
5	Vendor shall submit detailed catalogue with model decodification sheet with datasheet.
6	Vendor shall submit detailed GA drawing along with part names and MOC of the parts along with datasheets.

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JUNCTION BOX						Rev.
GENERAL	1	Tag Number	Quantity	*	*	
	2	Application		For Termination Instrument IS Cables		
	3	Suitable for		*		
	4	Area Classification		Zone 1 Group IIA /IIB as per IEC, T3		
	5	Enclosure Rating		EEx'd' (Explosion Proof)		
	6	Ingress Protection		WP to IP-65 as per IEC-60529 / IS-2147		
	7	Material of Construction		Corrosion resistant , Cast Aluminum LM6 /25 or FRP		
	8	Overall Dimension		*		
	9	Cover		Bolted		
	10	Painting / Finish		Grey		
	11	Rating		Upto 500 VAC		
	12					
	13					
SINGLE CABLE	14	No. of Entry	Left Side	-		
	15		Right Side	-		
	16		Top Side	-		
	17		Bottom Side	*		
	18		Other	-		
	19	Cable Gland	Type	Ex'd', Double Compression Type,Brass with Zinc/ Nickel plated		
	20		Size	*		
	21		Qty	*		
	22	Plugs	Type	Ex'd', Brass with Zinc/ Nickel plated		
	23		Size	*		
	24		Qty	*		
MULTI CABLE	25	No. of Entry	Left Side	-		
	26		Right Side	-		
	27		Top Side	-		
	28		Bottom Side	*		
	29		Other	-		
	30	Cable Gland	Type	Ex'd', Double Compression Type,Brass with Zinc/ Nickel plated		
	31		Size	*		
	32		Qty	*		
	33	Plugs	Type	N/A		
	34		Size	N/A		
	35		Qty	N/A		
TERMINALS	36	Type		Spring Loaded, anti-loosening, vibration proof, screwless		
	37	Quantity		*		
	38	No. of Rows		*		
	39	Numbering System		Terminal strip and terminals shall be suitably numbered		
	40	Size		1.5 mm²		
	41	Make		*		
	42					
ACCESSORIES	43	Earthing Busbar (Internal)		Required		
	44	Earthing Screw (External)		Required		
	45	Rail(s) for Terminals		Required		
	46	PVC Shroud along with Cable Gland		Required		
	47	Nameplate Fixture		Required		
	48	Gasket		Required		
	49	Mounting		Suitable for mounting on wall, column and steel structure		
	50					
OTHERS	51	Manufacturer		*		
	52	Model		*		
	53	Certification		DGMS/PESO certified		
	54					

Notes:

1	* By Vendor
2	Calibration, material and certificates shall be provided by the Vendor.
3	Material certificates shall be provided by the Vendor.
4	Vendor to provide general arrangement drawing of JB supplied , indicating dimensions , layout etc and hazardous area certificates .
5	Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm)

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		TURBINE FLOW METER					Rev.
GENERAL	1	Tag Number			Refer P&ID		
	2	Quanity			Refer P&ID		
	3	P&ID Number			C231099-GOA-PC-PID-1001N		
	4	Hazardous Area Classification			Zone 1, Gas Group IIA/IIB, T3		
	5	Line Size/Sch	Line No.		*	*	
	6						
	7						
PROCESS DATA	8	Service			Natural Gas		
	9	Fluid	Phase		Natural Gas	Single	
	10	Corrosive	Erosive		N/A	N/A	
	11	Flow (Min/Nor/Max)		SCMH	Refer P&ID	Refer P&ID	
	12	Pressure (Min/Nor/Max)		kg/cm2g	Refer P&ID		
	13	Pressure Drop (Min/Max)		bar	*		
	14	Temperature (Min/Nor/Max)		deg C	10 - 48		
	15	Max. Alllowable Pressure Drop		bar	max. 1 bar		
	16	Design Pressure (kg/cm2g)	Design Temperature (deg C)		49	-29 / 65	
	17	Viscosity (cP)			*		
	18	Density (kg/m3)	Mol. Wt		*	*	
	19	Sp Heat Ratio(Cp/Cv)	Compressibility(Z)		*	*	
	20						
FLOWMETER	21	End Connection	Size and Rating		DN 150 and 150#		
	22		Facing & Finish		RF		
	23	Pulses / M3			1 LF & 1 HF		
	24	Flow Range (SCMH)			(250 - 5000) SCMH		
	25	Accuracy	Rangeability		±1% from Q_{min} to 0.2Q_{max} and ± 0.5% from 0.2 Q_{max} to Q_{max}	01:30	
	26	Material	Body		CS		
	27		End Connections		Flanged RF		
	28		Rotor		AL		
	29		Bearing		SS316		
	30		Other Wetted Parts		SS316		
	31	Enclosure Protection			Ex 'd' , IP-65		
	32	Cable Entry			*		
	33						
	34						
TRANSMITTER	35	Type - 2 wire / 3 wire			2 - wire		
	36	Pre-amplifier Location			Meter Mounted		
	37	Power Supply			*		
	38	Cable Entry			*		
	39	Enclosure			Ex 'd' , IP-65		
	40	Hazardous Area Classification			Zone 1 Group IIA /IIB as per IEC, T3		
	41	Mounting	Accessories		Integral with turbine flow meter	Required	
	42	Input					
	43	Output			Pulse from pulse generator of turbine flow meter		
	45						
	49						
	50						
OPTIONS	51	Compensation - Viscosity			N/A		
	52	Straighting Vanes Type			Integral		
	53	Local Counter			9 Digit, Mechanical display		
	54	Air Eliminator	End Connection		*	*	
	55	Strainer	Size and Mesh		*	*	
	56	Pressure Tap on Meter Body			Required		
		Temperature tap on meter body			Required		
	57	Lubricator with Accessories			Required		
	58	Radiography			100 % required for all welded joints (As applicable)		
	59						
MISC.	60	Make & Model No.			*		
	61	Maximum & Minimum Meter Flow Rate (ACMH and SCMH)			*		
	62	Meter F-F distance			*		
	63	G rating			G-1000 (Refer note 4)		
	64	Transmitter			*		

Notes:

1	Vendor to specify. *
2	This datasheet is preliminary as part of DFR and shall be further detailed during detail engineering.
3	Design of Turbine meter shall comply to AGA 7/EN 12261.
4	Tagplate (SS316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm).
5	Vendor to furnish meter sizing calculations based on process conditions and to finalize the meter size.
6	Turbine meters shall be cerified by international agencies for custody transfer application.
7	Vendor offer shall include mandatory spares and operating spares for 2 years.
8	Vendor shall provide detailed GA drawing along with all parts name and MOC for the turbine flow meter along with data sheet.
9	Vendor shall submit code compliance/type approval certificate as per governing standard along with the datasheet.
9	Turbine meter shall have upstream & downstream meter run, as per AGA-7.

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DATA SHEET FOR ELECTRONIC VOLUME CORRECTOR				Rev.
General	1	Type	Microprocessor based battery operated volume corrector with integral pressure transmitter and temperature sensor suitable for mounting in the field location and applicable for custody transfer	
	2	Service	Natural Gas	
	3	Site conditions	Temp.: 0 - 55 deg.C, Hot, Humid, tropical, Saline environment	
	4	Governing Standard	EN 12405-1+A1 or Latest	
	5	Approval	Type Approval Certificate as per Governing Standard	
	6	Area Classification	Zone 1 Group IIA /IIB T3 Ex ' d'	
	7	Enclosure Protection	IP 65	
	8	Quantity	As per SOR	
	9	Function	To measure actual gas volume, pressure, temperature, and compressibility factors of the gas and based on which calculates standard volume of gas. The unit shall be complete in all respects to achieve functionality.	
	10	Accuracy	Typical accuracy better than ±0.5% as per governing standard	
	11			
Electronic Volume Corrector	12	Input	1.EVC input shall be either LF/ HF pulse	
	13		2.Temperature signal form RTD measured value PT100/1000.All interconnecting cable shall be screened and armored	
	14		3.Pressure sensor shall be directly mounted on the meter and wired to EVC with a range in accordance with max. working pressure and design pressure	
	15	Output	1.Correct Flow rate in standard cubic meter per hour (SCMH)	
	16		2.Correct Totalized volume (sm3)	
	17		3.Temperature	
	18		4.Pressure	
	19		5.Correction factor	
	20		6.Uncorrected flow rate	
	21		7.Uncorrected volume	
	22	Isolation	All Inputs, Outputs and power supply shall be individually isolated	
	23	Display	2-line LCD with 16 characters / 1 Line LCD with 8 characters	
	24	Power Supply (Note 5)	Lithium battery along with mounting hardware.	
	25	Calculations / Corrections	Compressibility: AGA8 (Detail method), NX-18,S-GERG	
	26	Features	Built in diagnostics to detect proper functioning	
	27		Data security to password / key-lock. Hardware and software seals required.	
	28		Parameters and programmed constants shall be stored in EEPROM / non- volatile memory	
	29		Conduit connection of 1/2" NPTF with plugs shall be provided for output.	
	30		Alarm output for unit malfunctioning.	
	31		EVC can store hourly data for 60 days	
	32		Large and configurable database and can store hourly, daily, monthly data with date & time stamp for pressure, temperature and corrected flow and consumption up to 1500 records or better.	
	33		Facility for entry and accessing live and stored data through Keypad / Laptop / SCADA system.	
	34	Identification	Unique Addressing Facility	
	35	Communication Ports	1. RS 232/ 485 serial port for SCADA facility (configurable up to 9600 bps) along with required connector, convertor, and cable for USB output.	
			2. EVC shall have a GSM module compatible port for data communication.	
	36	Software	Suitable communication protocol adaptor with 2.5 mtr of communication cable along with driver software to communicate with EVC and Windows 7 and Windows 10 based laptop shall be supplied with each EVC	
	37	Automatic Meter Reading (AMR)	Required, In built AMR with compatible technology for Data transmission	
	38	Mounting Accessories	Required	
	39	Fittings	1. Pressure sensor: 1/4"NPTM	
			2. Temperature Sensor: 1/4" NPTM (RTD Diameter Max.6mm)	
	40	Cable Entry	1/2" NPTF	
	41	Canopy	Prefabricated FRP canopy with required installation accessories	
	42	Communication Cable	Required, 2.5 mtrs length	
Misc.	44	Make	*	
	45	Model	*	

Notes:

1	Vendor to specify. *
2	EVC shall be certified for type test from NMI / PTB or equivalent independent international laboratories as per EN standards.
3	The Calibration certificate for RTD, PT and EVC (original + soft copy) shall be provided to GNGPL. One copy of the certificate shall be provided within the packing box of each EVC.
4	Vendor shall provide 5 sets of volume corrector documentation including product literature, software / hardware manual, operation manual, maintenance instruction, certificates etc.
5	Battery life shall be not less than 5 years if replaceable if not replaceable battery life shall be 10 years. Battery capacity shall be sufficient for 24 hr. continuous operation with all the equipment powered.
6	The communication protocol and message structure details to be used on the RS 232 / 485 serial communication port (for SCADA) shall be supplied after placement of order.
7	Ingress protection of EVC Enclosure shall be IP-67 or better. EVC shall be mounted in field / skid in a Ex- proof enclosure with canopy from top and side, in order to protect the EVC & the enclosure from rain & dust.
8	

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RESTRICTION ORIFICE						Rev.
GENERAL	1	Tag Number		Refer P&ID		
	2	P&ID Number		C231099-GOA-PC-PID-1001N		
	3	Quantity		Refer MR and P&ID		
	4	Line No		Refer P&ID		
	5	LineID (mm)		Refer P&ID		
	6	Line OD (mm)		Refer P&ID		
	7	Flange Rating		*		
	8	Line Size / Line Schedule		Refer P&ID	*	
	9	Line Class & Rating		Refer P&ID	-	
	10	Line Material		*		
	11	Connecting Flange Material		*		
PROCESS CONDITIONS		Fluid	State	Natural Gas	Gas	
	13	Flammable /Toxic		Yes	No	
	14	Liquid Density at WT (kg/m3)		-		
	15	Viscosity at WP & WT(Cp)		-		
	16	Allowable ΔP at above flow rate (barg)		Refer P&ID		
	17	Flow Rate (Min. / Nor. / Design)		Refer P&ID		
	18	Pressure (Min. / Nor. / Max.)		Refer P&ID		
	19	Temperature (Min. / Max.)		Refer P&ID		
	20	Gas compressibility at WP & WT		-		
	21	Design Pressure (barg)		Refer P&ID		
	22	Design temperature (Min. / Max.)		Refer P&ID		
	23	Gas Specific Gravity (MW/29)		-		
	24	Ratio of Specific Heat (Cp/Cv)		-		
	25	Vapour Pressure at WT		-		
	26	Critical pressure		-		
	27	Critical temperature		-		
	28	Reynolds Number		-		
ORIFICE PLATE	29	Plate Type		Concentric		
	30	Orifice bore type		Square Edge Orifice		
	31	Plate material		SS316		
	32	Plate thickness		*		
	33	Plate outside diameter		*		
	34	Plate Holder		Not Required		
	35	Diameter ratio (Beta d/D)		*		
	36	Orifice bore diameter (d) in mm		*		
	37	Vent / Drain Hole	Size	Required	*	
ORIFICE FLANGE	38	Flange type		*		
	39	Flange size	Rating	N/A		
	40	Flange material				
	41	Flange Facing	Finish			
	42	Studs				
	43	Bolts & Nuts Material				
	44	Gasket material				
	45	Gasket Thickness				
	46	Pressure tap type	Number of Sets			
	47	Pressure tap size				
	48	Pressure tap orientation				
PHYSICAL DATA	49	Estimated weight		*		
	50	Removal clearance		*		
	51	Face-to-face Dimension		*		
	52					
	53					

Notes:

1	Vendor to specify. *
2	Vendor shall submit detailed GA drawing along with part names and MOC of the parts along with sizing calculation and datasheet.
3	Restriction Orifice shall be designed in accordance with ISO 5167 part-2. Vendor to submit sizing calculation for approval.
4	Tagplate (SS 316) stamped with instrument tag number and service in 10mm characters shall be attached via SS wire (1 mm)

CLIENT:	GOA NATURAL GAS PRIVATE LIMITED (GNGPL)	C1	26.10.2023	AK	RA	KNC
		B1	25.10.2023	AK	RA	KNC
PROJECT:	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	A1	23.10.2023	AK	RA	KNC
		REV.	**DATE**	**PRPD**	**CHKD**	**APPD**

ENERGISING QUALITY	**City Gas Distribution Project of GOA NATURAL GAS PRIVATE LIMITED (GNGPL)**	Goa Natural Gas Pvt.Ltd. A Joint Venture of GAIL Gas Ltd & BPCL

INSPECTION AND TEST PLAN (ITP) INSTRUMENTS			**TOTAL SHEETS**	3	
DOCUMENT NO	C231099	CGD	IN	ITP	5004

GOA NATURAL GAS PRIVATE LIMITED (GNGPL)

INSPECTION AND TEST PLAN (ITP) INSTRUMENTS

C1	26.10.2023	Issued for Client Review	AK	RA	KNC
B1	25.10.2023	Issued for IDC	AK	RA	KNC
A1	23.10.2023	Issued for Internal Review	AK	RA	KNC
REV	**DATE**	**DESCRIPTION**	**PREPD**	**CHKD**	**APPRD**

INSTRUCTIONS FOR FILLING UP:

1. QAP shall be submitted for each equipment separately with breakup of assembly / sub-assembly & part/component or for group of equipment having same specification.
2. Use numerical codes as indicated for extent of inspection & tests and submission of test certificates & documents. Additional codes & description for extent of inspection & test may be added as applicable for the plant and equipment's.
3. Separate identification number with quantity for equipment shall be indicated wherever equipment having same specifications belonging to different facilities are grouped together.
4. Weight in kilogram must be indicated under column 5 for each item. Estimated weights may be indicated wherever actual weights are not available.

ABBREVIATION USED:
CONTR : CONTRACTOR
MFR : MANUFACTURER
TPI : THRID PARTY INSPECTION AGENCY
* : Vendor / Bidder to provide
P / W/ R : P : Performer , R : Review ; W : Witness
EN 10204, Type 3.1 certificates shall be provided for bought out items. Those shall be inspected by TPI appointed by Vendor.

CODES FOR EXTENT OF INSPECTION, TESTS, TEST CERTIFICATES & DOCUMENTS :

CODE DESCRIPTION	CODE DESCRIPTION	CODE DESCRIPTION	CODE DESCRIPTION
1. Visual 2. Dimensional 3. fitment & alignment 4. Physical Test (Sample) 5. Chemical test(Sample) 6. Ultrasonic test 7. Magnetic particle test(MPT) 8. Radiography test 9. Dye Penetrant test 10. Measurement of IR value a) Before HV test b) After HV test 11. High voltage test/Dielectric Test	12. Routine test as per relevant IS other standard 13. Type test as per relevant IS/ other standard 14. Impulse Test 15. Partial Discharge Test 16. Heat run risk test/temper 17. Enclosure protection test 18. Calibration 19. Noise & Vibration 20. Test certificate of bought out components 21. Tank pressure test 22. Paint shed vibration	23. Short time rating 24. Operational & functional test 25. Over speed test 26. Flame proof Test 27. Clearance and creep age distance 28. Acceptance test 29 Honing Test 30 Hydro test/ Shell leak test 31 Pneumatic Seat leak test 32 Impact test	D1. Approved GA Drawing. D2. Approved single line/ schematic diagram D3. Test certificates D4. Approved Bill of materials D5. Un-priced P.O. copy D6. Calibration certificates of all measuring instrument And gauges.

Equipment Details							Inspection & Test								
							In-Process Stage			Final Inspection					
S No.	Item	Identification Number	Qty	Weight Kg	Exp Date of Inspection	MFR Name & Address	MFR	CONTR & TPI	CLIENT	MFR	CONTR & TPI	CLIENT	Test certificate & Document to be submitted to CLIENT	Acceptance Criteria standards/ IS/BS/ASME/ Norms and documents	Remark / Sampling Plan
1.	Gauges(PG, DPG)	Refer P&ID	*	*	*	CLIENT Approved	1,2,3,4, 5 – P	-	-	1,2,3,18, 20,24 – P	1,2,3,18,20 -R ,24 - W	1,2,3,18,20 ,24 – R	1,2,3,4,5, 18,20,24, D3, D6	D3,D6, Tech. spec	100%

2.	Gas Meter	As per P&ID	*	*	*	CLIENT Approved	1,2,3,4 5,8,30, 32 – P	-	-	1,2,3,5,8, 20,18,24, 31 – P	1,2,3,5,8,2 0,18,24,30 , 31,32 -R	1,2,3,5,8, 20,18,24, 30, 31,32 -R	1,2,3,5,8, 18,20, 24, 30, 31,32 D1, D3, D4,D6	D3,D6, Tech. spec	100%
3.	PRV+SSV	As per P&ID	*	*	*	CLIENT Approved	1,2,3,4 5,8,30, 32 – P	-	-	1,2,3,5,8, 20,18,24, 31 – P	1,2,3,5,8,1 8, 20 -R, 24,30, 31,32 -W	1,2,3,5,8, 20,18,24, 30, 31,32 -R	1,2,3,5,8, 18,20, 24, 30, 31,32 D1, D3, D4,D6	D3,D6, Tech. spec	100%
4.	CRV	Refer P&ID	*	*	*	CLIENT Approved	1,2,3,4 5,8,30, 32 – P	-	-	1,2,3,5,8, 20,18,24, 31 – P	1,2,3,5,8,1 8, 20 -R, 24,30, 31,32 -W	1,2,3,5,8, 20,18,24, 30, 31,32 -R	1,2,3,5,8, 18,20, 24, 30, 31,32 D1, D3, D4,D6	D3,D6, Tech. spec	100%
5.	PSV	Refer P&ID	*	*	*	CLIENT Approved	1,2,3,4 5,8,30, 32 – P	-	-	1,2,3,5,8, 20,18,24, 31 – P	1,2,3,5,8,1 8, 20 -R, 24,30, 31,32 -W	1,2,3,5,8, 20,18,24, 30, 31,32 -R	1,2,3,5,8, 18,20, 24, 30, 31,32 D1, D3, D4,D6	D3,D6, Tech. spec	100%
6.	EVC	Refer P&ID	*	*	*	CLIENT Approved	1,2,3,4, 5 – P	-	-	1,2,3,18, 20,24 – P	1,2,3,18,2 0 -R ,24 - W	1,2,3,18, 20,24 – R	1,2,3,4,5, 18,20,24, D3, D6	D3,D6, Tech. spec	100%

	INSPECTION TEST PLAN (ITP) FOR MRS SKID							Doc No : C231099-IN-ITP-5004 Prepared by AK Checked by RA Approved by KCN				
Sr.No	**Description**	**Characteristic**	**Class**	**Type of Check**	**Quantum of Check**	**Reference Document**	**Acceptance Norms**	**Format Of Records**	**Inspection By**			**Remarks**
									M	**TPIA**	**Owner**	
1	**Incoming Material for skid spool fabrication**											
1.1	Pipe	As per Specification	Major	laboratory + Dimensional	1 piece per pipe size	ASTM A106 Gr. B (Seamless)	ASTM A106 Gr. B (Seamless)	Mfr / lab cert.	P	R	R/W	
1.2	Pipe Fittings	As per Specification	Minor	laboratory	Per heat	ASTM A105	ASTM A105	Mfr / lab cert.	P	R	R/W	
			Major	laboratory	Per heat	ASTM A105	ASTM A105	Mfr / lab cert.	P	R	R/W	
			Minor	Visual	10%	ANSI B16.9	ANSI B16.9	Mfr cert.	P	R	R/W	
1.3	Flanges	As per Specification	Minor	laboratory	100%	ASTM A105	ASTM A105	lab cert.	P	R	R/W	
			Major	laboratory	Per heat	ASTM A105	ASTM A105	Mfr / lab cert.	P	R	R/W	
			Minor	Visual	10%	ANSI 16.5	ANSI 16.5	Mfr cert.	P	R	R/W	
1.4	Stud and Bolts/ gaskets	Chemical, physical and impact test	Minor	Visual +10% Dimensional	Random selection one piece/size	ASME Sec II and ANSI B1.1	ASME Sec II and ANSI B1.1	Mfr cert.	P	R	R/W	
1.5	Structure	Dimensional	Minor	Visual + Dimensional	100%	as per IS 2062	as per IS 2062	Mfr cert.	P	R	R/W	Fabricator W/S
2	**Welding, NDT & Testing for skid Piping fabrication**											
2.1	WPS/WQP/PQR	Welders Qualification & Welding Procedure	Major	Welders Qualification & Welding Procedure	100%	Approved WPS/WQR/PQR	ASME Sec.IX	WPS/WQP/PQR	P	R	R	
2.2	UT or DPTof Non Radiography for Joints	DPT after Final Welding	Major	DPT on other than butweld joints + UT Report	100%	DPT Report + UT Report	ASME + Sec. V	DPT Report + UT Report	P	10%W	R/W	UT / DPT Report 100% Review
2.3	Radiography Test	Radiography after Final Welding	Major	100% Process Piping	100%	Radiography Report	ASME Sec.VIII/ Div.1 & ASME Sec. V	Radiography Report	P	* R	R	* Film to be Reviewed
2.4	Hydro Test for Interconnecting Pipe spools (with 0.2% Inhibitor)	Hydro Test at 1.4 times the Design Pressure	Major	Strength	100%	GA Drawing and hydro test procedure	ASME B 31.8, IGE/TD/13. No Leakage	Hydro Test Report	P	W	R/W	
2.5	Internal Cleaning of Pipe Spools after Hydro Test.	Internal Surface Finish	Major	Visual	100%	Internal Report	Internal Report	Internal Report	P	R	R/W	
2.6	Surface Preparation and Painting of Skid	Surface Preparation and Painting	Major	Visual + DFT Measurement	100%	Approved Painting Specification	Approved Painting Specification	Inspection Report	P	W	R	Random DFT Measurement Witness
2.7	Pneumatic Leak Test for skid	Pneumatic Leak Test at 7.7 Bar for 30 min.	Major	leakage	100%	GA Drawing and Pneumatic test procedure attached	ASME B 31.8, IGE/TD/13. No Leakage	Pneumatic Report	P	W	R/W	
2.8	Final Inspection of Assembled Skid with all Instruments	Tender Specs.	Major	Visual	100%	GA Drawing + P&ID	Approved Specification	Internal Report	P	W	R/W	
2.9	Skid Preservation with N2 purging	N2 Purging - 2Kg/cm2g Preservation-0.3Kg/cm2g	Major	Visual	100%	GA & N2 Drg.+Preservation Procedure	No Leakage	Internal Report	P	R	R	
2.10	Necessary Protection during Transportation		Major	Visual	100%	Protection Procedure	Protection Procedure	Internal Report	P	R	R	

		INSPECTION TEST PLAN (ITP) FOR MRS SKID						Doc No C231099-CGD-IN-ITP-5004 Prepared by AK Checked by RA Approved by KNC				
Sr.No	Description	Characteristic	Class	Type of Check	Quantum of Check	Reference Document	Acceptance Norms	Format Of Records	Inspection By			Remarks
									M	TPIA	Owner	
3	**Incoming Material Identification of Boughtout Items**											
3.1	Ball Valve	As per specifications	Major	As per specifications	As per specifications	As per specifications	Approved Specification	MFR's TC	P	R	R	
3.2	Globe Valve / Check valve	As per specifications	Major	As per specifications	As per specifications	As per specifications	Approved Data Sheet	MFR's TC	P	R	R	
3.3	Pressure Safety Valve	As per attached QAP	Major	As per attached QAP	100%	As per attached QAP	Approved Data Sheet	MFR's TC	P	R	R	
3.4	Pressure &Temperature Transmitter/Level Gauge, DPT,LT etc	As per attached QAP	Major	As per attached QAP	As per attached QAP	Vendor's QAP	Approved Data Sheet	MFR's TC	P	R	R	
3.5	Mass Flow Meter/RPD Flow meter and USM/Turbine meter with meter run & flow profiler.	Dimensional Drawing	Major	Dimensional, Visual, Model Operation of Orifice Assembly	100%	Vendor's Manual	Approved Data Sheet	MFR's TC	P	R	R	
3.6	Panel / FC /EVC	Physical / Electrical	Major	Continuity check	100%	Loop Diagram, Panel GA	Approved Data Sheet	MFR's TC	P	R	R	
3.7	Natural Gas Filter	As per specifications	Major	As per specifications	As per specifications	As per specifications	Approved Data Sheet	MFR's TC	P	R	R	
3.8	Slam Shut Valve + Regulators	As per attached QAP	Major	As per attached QAP	As per attached QAP	As per attached QAP	Approved Data Sheet	MFR's TC	P	R	R	
3.9	SS Fittings	As per specifications	Major	As per specifications	As per specifications	As per specifications	Approved Data Sheet	MFR's TC	P	R	R	
3.10	Pressure Gauge/Temperature Gauge/DPG	As per attached QAP	Major	Calibration, Dimensional, Range Model & Visual	100%	Approved Data Sheet	Approved Data Sheet	MFR's TC	P	R	R	
3.11	Cable	Test Reports	Major	MTC, Visual & Dimensional	100%	MTC's, tender Specification	Approved Data Sheet	MFR's TC	P	R	R	
3.12	Junction Box & Cable Gland	Visual & Dimensional Review of Certificates	Major	Visual & Dimensional	100%	Approved P&ID and GA Drawing	Approved P&ID and GA Drawing	MFR's TC	P	R	R	

		INSPECTION TEST PLAN (ITP) FOR MRS SKID						**Doc No** :C231099-CGD-IN-ITP-5004 **Prepared by** AK **Checked by** RA **Approved by** KNC				
Sr.No	**Description**	**Characteristic**	**Class**	**Type of Check**	**Quantum of Check**	**Reference Document**	**Acceptance Norms**	**Format Of Records**	**Inspection By**			**Remarks**
									M	**TPIA**	**Owner**	
4	**Final Inspection**											
4.1	Factory Acceptance Test (Panel)	FAT as per Submitted FAT Manual	Major	FAT Procedure	100%	Approved FAT Manual	Approved FAT Manual	Inspection Report	P	W	W/R	
4.2	Completeness + Inspection Release Certificate (IRC)	---	Major	Visual + Dimensions	100%	Approved Bill of Material	Approved Bill of Material	Inspection Report	P	W	W/R	
5	**Packing and Shipping Control**											
5.1	Dispatch	---	Major	Verification of Documentation	100%	Verification of Documentation	Verification of Documentation	Dispatch Cleatance by Client	---	R	W/R	
5.2	Name Plate Verification	Name Plate Verification	---	Name Plate Verification	100%	Approved Drawing	Approved Drawing	Approved Drawing	---	R	W/R	
6	**Site Acceptance Test**											
6.1	Pneumatic Leak Test for Skid Assembly	Pneumatic Leak Test at 7.7 Bar for 30 min.	Major	Strength	100%	Approved P&ID and GA Drawing	No Leakage	Inspection Report	---	W	W/R	
6.2	Site Acceptance Test	SAT as per submitted SAT Manual	Major	SAT Procedure	100%	Approved SAT Manual & FDS	Approved SAT Manual & FDS	Inspection Report	---	W	W/R	
7	**Final Documentation**											
7.1	Design and Calculation, Material TC, Calibration, Inspection and Test Report, As Built GA Drawing and P&ID	As per Tender Copy	Major	Verification of Documentation	100%	Approved Specification & As per Tender Doc.	Approved Specification & As per Tender Doc.	Vendor Document Report	---	R	W/R	

Legend

M	Manufacturer	P	Perform
C	Client/Owner	R	Review
TPIA	Third Party Inspection Agency appointed by bidder.	W	Witness
		W/R	Witness of Test & Review of Certificates & Documents as per QAP

Bought-out items may be procured under 3.1 certification. However, TPIA carrying out the final inspection of the skid will review all 3.1 certification of bought-out items and include the details in the final inspection report.

NOTE

1. The Above Testing and acceptance critera are minimum requirements, however, equipment supplier shall ensure that the product also comply to the additional requirements as per Technical specifications and data sheets.
2. The supplier shall submit their own detailed QAP prepared on the basis of the above for approval of Owner/Owner's representative and TPIA.
3. TPIA will have Right to Inspect minimum 10% of all manufacturing activities on each day or as specified above.
4. TPIA along with Owner/Owner's representative shall review/approve all the documents related to QAP/Quality manuals/Drawings etc.submitted by supplier.
5. Review of existing WPS/PQR by TPIA for suitabling . If not suitable, Testing has to be carried out under witness of TPIA
6. Pressure Regulators and Slam shut valve shall be witnessed by TPIA for functionality check at Manufacturer's work.

CHECKLIST – TECHNICAL

Bidder confirms following, as a minimum, has been enclosed in the offer.

S.NO.	Requirements	Compiled by Bidder(Tick)
1	Reference List of previous supply of Procured item	☐
2	Filled – up Data Sheets, duly signed and stamped by bidder enclosed.	☐
3	List of recommended commissioning spares and accessories for Procured item.	☐
4	List of recommended spares and accessories for two year normal operation for procured item.	☐
5	Compliance statement duly filled and stamped enclosed.	☐
6	GA & assembly drawings, cross section drawings including part list & material list enclosed.	☐
7	Other technical details & vendor's product catalogues enclosed.	☐

COMPLIANCE STATEMENT

S.No	Requirement	Bidder's Confirmation
1	Bidder confirms that all materials proposed by the bidder are same/ superior to those specified in specification/ data sheets enclosed.	
2	Bidder confirms that the offer is in total compliance with the Technical requirements of the Material Requisition. Bidder confirms that deviation expressed or implied anywhere else in the offer shall not be considered valid.	
3	Bidder confirms that all spares and accessories required for two years of normal operation have been quoted separately.	
4	Bidder confirms that prices for start-up/commissioning spares and accessories have been included in the quoted items.	
5	Bidder confirms that in the event of securing order for the requisitioned item(s), good for manufacturing drawings of ordered item(s) shall have complete details with dimensions, part list and material list including back-up calculations in the first submission, failing which the vendor shall be solely responsible for any likely delay in delivery of item(s).	

Bidder's Signature with Stamp

	DEVIATION SHEET	VCS-SD-DS-001

DEVIATION/ EXCEPTION/ CLARIFICATION SHEET

Sr. No.	Contractor's Inquiry Reference	Contractor's Requirement	Proposed Deviation by Supplier, with Technical Justification	Cost Impact, if any	Contractor's Conclusions

NOTES

1- Bidder confirms that apart of from the deviations/exceptions/clarifications listed above, the bid is in full compliance with Inquiry requisition.
2- Bidder shall submit this sheet duly filled up and signed by him along with his bid. In case there is no deviation, then also supplier shall submit this sheet along with his bid indicating NIL deviation.

(Contractor's Name and Signature with Seal)

0	25.05.2017	ISSUED AS STANDARDS	AS	GS	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

	DRAWINGS & DOCUMENTS	VCS-SD-DD-001

INFORMATION/ DOCUMENTS / DRAWINGS TO BE SUBMITTED BY SUCCESSFUL BIDDER

Successful Bidder shall submit four copies unless noted otherwise, each of the following:

1. Inspection & test reports for all mandatory tests as per the applicable code as well as test reports for any supplementary tests, in nicely bound volumes.

2. Filled in Quality Assurance Plan (QAP) for Purchaser's/ Consultant's approval. These QAPs shall be submitted in two copies within 15 days from LOI/ FOI.

3. Detailed completion schedule activity wise (Bar Chart), within one week of placement of order.

Note : All drawings, instructions, catalogues, etc., shall be in English language and all dimensions shall be metric units.

0	25.05.2017	ISSUED AS STANDARDS	AS	GS	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

	INSTRUCTION TO BIDDER	VCS-SD-ITB-001

INSTRUCTION TO BIDDERS

1. Bidder to note that no correspondence shall be entered into or entertained after the bid submission.

2. Bidder shall furnish quotation only in case he can supply material strictly as per this Material Requisition and specification/data sheet forming part of Material Requisition.

3. If the offer contains any technical deviations or clarifications or stipulates any technical specifications (even if in line with MR requirements) and does not include complete scope & technical / performance data required to be submitted with the offer, the offer shall be liable for rejection.

4. Bidder must submit all documents as listed in checklist with his offer.

5. Supplier must note that stage wise inspection for complete fabrication, testing including the raw material inspected to be carried out.

6. Vendors for bought out items to be restricted to the approved vendor list attached with bid document. Approval of additional vendor if required, for all critical bought out items shall be obtained by the supplier from the purchaser before placement of order. Credentials/PTR of the additional vendor proposed to be submitted by supplier for review and approval of Purchaser/ Purchaser's representative

0	25.05.2017	ISSUED AS STANDARDS	AS	GS	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

	LIST OF SPARES	VCS-SD-LS-001

LIST OF SPARES

S.No.	Part No.	Description	Quantity(Minimum)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

0	25.05.2017	ISSUED AS STANDARD	AS	GS	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

	REFERENCE LIST	VCS-SD-RL-001

REFERENCE LIST

Sl No.	Project	Year of Supply	Client , Address and Contact No.	Email	Size and Rating / thk	Service	Bidder's Signature with stamp

REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	25.05.2017	ISSUED AS STANDARDS	AS	GS	AD

Energising Quality	**PROJECT:**	CITY GAS DISTRIBUTION PROJECT OF NORTH GOA GA	Gas Natural Gas Pvt Ltd.
	CLIENT:	GOA NATURAL GAS PRIVAT E LIMITED (GNGPL)	
	CONSULTANT:	VCS QUALITY SERVICES PVT. LTD.	

LIST OF RECOMMENDED THIRD PARTY INSPECTION AGENCY (TPIA)

SL. NO	NAME OF TPI	ADDRESS	PHONE NO	FAX NO
1	Tata Projects Ltd.	22,Sarvodaya Society,Nizampura,Baroda-390002	0265-2392863	0265-2785952
2	Bax counsel Insepection Bureau Pvt. Ltd.	303, Madhava,Bandra Kurla Complex, Bandra(E),Mumbai-400051	022-26591526,022-26590236	022-26591526
3	Germanischer Lloyd	4th Floor, Dakshna Building, Sec-11, Plot NO.2, CBD Belapur, Navi Mumbai 400 614	022-4078 1000	022-4024 2935
4	ABS Industrial Verification Ltd., Mumbai	404,Mayuresh Chambers,Sector-11,CBD Belapur(E),Navi Mumbai-400614	022-27578780 /1 /2	022-27578784 / 5
5	Certification Engineers International Ltd.	EIL Bhavan,5th floor,1,Bhikaji Camma Place,New Delhi-110066	011-26167539,26102121	011-26101419
6	Dalal Mott MacDonald	501, Sakar -II, Ellisbridge,Ahemedabad-380006	079-26575550	079-6575558
7	International Certification Systems	E-7,Chand Society, Juhu Road, Juhu, Mumbai-4000049	022-26245747	022-226248167
8	SGS	SGS India Pvt. Ltd.,SGS House,4B,A.S.Marg,Vikhroli(W),Mumba i-400083	022-25798421 to 28	022-25798431 to 33
9	Intertek Moody	9th Floor, Kanchenjunga Building, 18-Barakhamba Road, New Delhi-110001	011-4713 3900	011-4713 3999
10	TUV SUD South Asia	C-153/1, Okhla Industrial Ara, Phase-1, New Delhi-110020	011-3088 9611/9797	011-3088 9598
11	TUV Rheinland (India) Pvt. Ltd.	F-51, Kailash Complex GF, Veer Savarkar Marg, Vikhroli Park Site, Vikhroli(W), Mumbai-400079	022-4215 5435	022-4215 5434
12	Vincott International India Assessment Service Pvt. Ltd.	C-301, Mangalya Premises Cooperative Soc. Ltd, Off. Marol Maroshi Road, Andheri(E), Mumbai-400959	022-4247 4100	022-4247 4101
13	Meenar Global Consultants	Mr. Nitin Taneja (Project Manager)	M: +91-9711212783 T: +91-129-4072836	Web : www.meenaar.in Email : nitin.taneja@meenaar.in

	LIST OF RECOMMENDED VENDORS FOR BOUGHT OUT ITEMS		
		TOTAL SHEETS	59
DOCUMENT NO		VCS-00-00-VL-0001	

LIST OF RECOMMENDED VENDORS FOR BOUGHT OUT ITEMS

05	31-05-2023	Issued for Vendor's	Vineeta Pandey	Safdar Ali	Rachna Shukla
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

TABLE OF CONTENT

A. MECHANICAL & PIPELINE

1.0 CARBON STEEL PIPES

1.1 PIPE CARBON STEEL TO INDIAN STANDARDS

a. A.S.T. Pipes Pvt. Ltd. (AST Group)
b. Advance Steel Tube Ltd.
c. Apl Apollo Tubes Ltd. (Er. Bihar Tubes Ltd.
d. Asian Mills Pvt. Ltd.
e. Asrani Tubes Limited
f. Dadu Pipes (P) Ltd.
g. Essar Steel Limited(Er Hazira Pipes Mill)
h. Gaurang Products Pvt Ltd. (Ast Group)
i. Goodluck Steel Tubes Ltd.
j. Hi-Tech Pipes Limited
k. Indus Tube Limited
l. Jindal Industries Ltd
m. Jindal Pipes Ltd.
n. Jindal Saw Ltd (Kosi Works)
o. Jotindra Steel & Tube Ltd
p. Lalit Pipes And Pipes Ltd.
q. Maharashtra Seamless Ltd.
r. Man Industries (India) Ltd. – Pithampur
s. Man Industries (India) Ltd. Anjar
t. Mukat Tanks & Vessels Ltd.
u. Nezone Tubes Limited
v. North Eastern Tubes Limited
w. Pratibha Industries Limited
x. Pratibha Pipes & Structural Ltd.
y. Psl Ltd (Chennai)
z. Psl Ltd (V1, V2 & NC)
aa. Rama Steel Tubes Ltd.
bb. Ratnamani Metals And Tubes Ltd.
cc. Ravindra Tubes Limited
dd. Samshi Pipe Industries Limited
ee. Surya Roshni Ltd.

ff. Swastik Pipes Ltd.

gg. Utkarsh Tubes & Pipes Ltd. (Formly Bmw)

hh. Welspun Corp. Limited (Dahej)

ii. Zenith Birla (India) Limited

1.2 PIPE & TUBULARS TO A.P.I. STANDARDS

a. Arcelormittal Tubular Products Roman Sa, Romania

b. Bhel (Trichy),India

c. Dalmine Spa (Enquiry To Tenaris),Uae

d. Eewkorea Co. Ltd (Germany), Korea

e. Eew Korea Co. Ltd. (Korea), Korea

f. Eisenbau Kramer Gmbh, Germany

g. Hyundai Rb Co. Ltd. South Korea

h. Ilva Lamiere E Tubi Srl (Enq To Ilva Spa, Italy

i. Inox Tech. Spa, Italy

j. ISMT Ltd. Ahmedngr, India

k. TATA Steel, India

l. PSL

m. Jindal Pipes Ltd., India

n. Jindal Saw Ltd. (Kosi Works), India

o. Jindal Saw Ltd. (Nashik Works), India

p. Lalit Pipes And Pipes Ltd. India

q. Maharashtra Seamless Ltd., India

r. Man Industries (I) Ltd. (Pithampur), India

s. Mukat Tanks & Vessels Ltd., India

t. Pratibha Industries Limited, India

u. Ratnamani Metals And Tubes Ltd., India

v. Siderca S.A.I.C (Enquiry Totenaris), Uae

w. Sumitomo Metal Ind. Ltd., India

x. Surya Roshni Ltd., India

y. Swastik Pipes Ltd, India

z. Tata Steel Uk Limited (Formerly C702)

aa. Tubos De Acero De Mexico Sa (Enq. Tenaris), Uae

bb. Tubos Reunidos Sa Spain

cc. Umran Steel Pipe Inc (Turkey), Turkey

dd. Valcovny Trub Chomutov, Czech Republic

ee. Vallourec And Mannesmann Tubes, France

ff. Welspun Corp Limited (Dahej), India

1.3 PIPE/TUBE CS (SEAMLESS) TO ASTM STANDARDS

a. Arcelormittal Tubular Products Roman Sa, Romania

b. Bhel (Trichy), India

c. Changshu Seamless Steel Tube Co. Ltd., China

d. Dalmine Spa (Enquiry To Tenaris, Uae

e. Heavy Metals & Tubes Limited (Mehsana), India

f. Ismt Ltd. Ahmedngr, India

g. Ismt Ltd. Baramati India

h. Jfe Steel Corporation, Uae

i. Jindal Sdaw Ltd (Nashik Works) India

j. Klt Automotive And Tubular Products Ltd., India

k. Mahalaxmi Seamless Limited, India

l. Maharashtra Seamless Ltd, India

m. Products Tubulares S.A.U, Spain

n. Ratnadeep Metal Tubes Ltd., India

o. Staineest Tubes Pvt Ltd., India

p. Sumitomo Metal Ind. Ltd., India

q. Tubos Reunidos Sa Spain

r. Valcovny Trub Chomutov, Czech Republic

s. Vallourec Andmannesmann Tubes France

t. Yangzhou Chengde Steel Pipe Co. Ltd Dubai (UAE)

1.4 PIPE CARBON STEEL (WELDED) TO ASTM STANDARDS

a. Eew Korea Co. Ltd. (Germany), Korea

b. Eew Korea Co. Ltd. (Korea), Korea

c. Eisenbau Kramer Gmbh, Germany

d. Hyundai Rb Co. Ltd., South Korea

e. Inox Tech. Spa, Italy

f. Jindal Saw Ltd (Kosi Works), India

g. Lalit Pipes and Pipes Ltd., India

h. Man Industeries (I) Ltd.(Pithampur), India

i. Man Industries (India) Ltd. Anjar, India

j. Mukat Tanks & Vessels Ltd., India
k. Ratnamani Metals And Tubes Ltd., India
l. Sumitomo Metal India Ltd., India
m. Tata Steel Uk Limited

2.0 VALVES

2.1 GLOBE VALVES

a. BDK (New Delhi)
b. Datre Corpn (Calcutta)
c. KSB Pumps (New Delhi)
d. L&T (New Delhi)
e. Neco Schuber & Salzer Ltd. (New Delhi)
f. Niton Valve (Mumbai)
g. Ornate Valves (Mumbai)
h. Panchavati Valves (Mumbai)
i. AV Valves Ltd.
j. BHEL (Trichy), India
k. Econo Valves Pvt Ltd, India
l. Fouress Engg (I) Ltd (Aurangabad)
m. Guru Industrial Valves Pvt Ltd
n. Leader Valves Ltd, India
o. NSSL Ltd. (Neco Schubert & Salzerltd)
p. Oswal Industries Ltd, India
q. Petrochemical Engineering Enterprises, India
r. Sakhi Engineers Pvt Ltd
s. Shalimar Valves Pvt Ltd
t. Steel Strong Valves India Pvt Ltd, India
u. Petro Valves Pvt. Limited, Ahmedabad
v. Hawa Engineers Limited, Ahmedabad

2.2 CHECK VALVES

a. Advance Valves Pvt. Ltd., Noida
b. Aksons & Mechanical Enterprises, Mumbai
c. Larsen & Toubro Limited (Audco India Limited, Chennai)
d. AV valves Ltd., Agra
e. BDK engineering India Ltd., Hubli

f. BHEL, OFE&OE Group, New Delhi
g. Datre Coroportion Limited, Calcutta
h. Leader Valves Ltd., Jalandhar
i. Neco schubert & Salzer Ltd., New Delhi
j. Niton Valves Industries (P) Ltd., Mumbai
k. Precision Engg. Co., Mumbai
l. Econo Valves Pvt Ltd, India
m. Fouress Engg (I) Ltd (Aurangabad)
n. KSB Pumps Ltd (Coimbatore), India
o. NSSL Ltd. (Neco Schubert & Salzer Ltd)
p. Oswal Industries Ltd, India
q. Panchvati Valves & Flanges Pvt Ltd, India
r. Petrochemical Engineering Enterprises, India
s. Sakhi Engineers Pvt Ltd
t. Shalimar Valves Pvt Ltd
u. Steel Strong Valves India Pvt Ltd, India

2.3 PLUG VALVES

a. Breda Energia Sesto Industria Spa, Italy
b. Fisher Sanmar Ltd., Chennai
c. Larsen & Toubro Ltd., New Delhi
d. Nordstrom Valves, USA
e. Serck Audco Valves, UK
f. Sumitomo Corporation India Pvt. Ltd., New Delhi
g. Z Corporation, Korea
h. Hawa Valves (India) Pvt. Ltd., Mumbai
i. Steel Strong Valves India Pvt. Ltd., Navi Mumbai
j. Econo Valves
k. Flow-Serve PTE (Mfr. SERCK), India

2.4 BALL VALVES

a. Hawa Valves (India) Pvt. Ltd, Navi Mumbai
b. Larsen & Toubro, Delhi
c. Microfinish Valves Pvt. Ltd., Noida
d. Oswal Industries Ltd., Gandhi nagar
e. Virgo Engineers Ltd., Delhi

f. Boteli Valve Group Co. Ltd., China
g. Cameron (Malaysia) SDN BHD, Malaysia
h. Dafram S.P.A., Italy
i. Fangyuan Valve Group Co. Ltd., China
j. Franz Schuck GmbH, Germany
k. O.M.S. Saleri (Italy)
l. Pibi Viesse S.P.A (Italy)
m. Nuovo Pignone (Italy)
n. Perar S.P.A (Italy)
o. Pietro Fiorentini (Italy)
p. Cooper Cameron Valv Italy SRL-FRM, Itly
q. Petrol Valves SRL
r. Tormene Gas Technology S.P.A (VALVITALIA)
s. Petro Valves Pvt. Limited, Ahmedabad

3.0 TEE

3.1 FLOW TEE

a. Coprosider SPA, Italy
b. GEA Energy System India Limited, Chennai
c. Multitex Filteration
d. Pipeline Engineering, UK
e. Scomark Engg. Limited (U.K.)
f. Skeltonhall Limited, Engaland(U.K.)
g. Technospecial SPA, Italy
h. Tectubi SPA, Italy
i. RMA Germany
j. Pipefit Engineers Pvt. Ltd.
k. Vee Kay Vikram & Co.

3.2 SPLIT TEE

a. IPSCO, Canda
b. TD Willamsons, USA
c. Plant-Tech Power Technical Services Pvt Ltd
d. Teemans, UK
e. Vee Kay Vikram & CO.

4.0 FLANGES

a. Aditya Forge Ltd., Vadodara
b. Amforge Industries Ltd., Mumbai
c. CD Engineering Co., Ghaziabad
d. Echjay Forgings Pvt. Ltd. (Bombay), Mumbai
e. Echjay Industries Ltd., Rajkot
f. Forge & Forge Pvt. Ltd., Rajkot
g. Golden Iron & Steel Works, New Delhi
h. JK Forgings, New Delhi
i. Metal Forgings Pvt. Ltd., Mumbai
j. Perfect Marketings Pvt. Ltd., New Delhi
k. Sky Forge, Faridabad
l. S&G, Faridabad
m. Chaudhry Hammer Works Ltd, India
n. JAV Forgings (P) Ltd, India
o. Kunj Forgings Pvt Ltd, India
p. MS Fittings
q. R.N. Gupta & Co. Ltd, India
r. R.P. Engineering Pvt Ltd, India
s. Sanghvi Forgings & Engineering Ltd
t. Shri Ganesh Forgings Ltd., India
u. Uma Shankar Khandelwal & Co., India
v. Sawan Engineers, Baroda
w. Stewarts & Lloyds of India Ltd., Kolkata
x. Engineering Services Enterprises
y. Pipefit Engineers Pvt. Ltd.
z. Jindal Forging
aa. Vivial Forges

5.0 FITTINGS

a. Commercial Supplying Agency, Mumbai
b. Dee Development Engineers Ltd.
c. Eby Industries, Mumbai
d. Flash Forge Pvt. Ltd., Vishakhapatnam
e. Gujarat Infra Pipes Pvt. Ltd., Vadodara

f. M.S. Fittings Mfg. Co. Pvt. Ltd., Kolkata
g. Stewarts & Lloyds of India Ltd., Kolkata
h. Teekay Tubes Pvt. Ltd., Mumbai
i. Pipe Fit, Baroda
j. Sky Forge, Faridabad
k. S&G, Faridabad
l. Sawan Engineers, Baroda
m. Eby Fasteners, India
n. Leader Valves Ltd, India
o. R.N. Gupta & Co. Ltd, India
p. Exten Engg Pvt Ltd
q. Sivananda Pipe & Fittings Ltd
r. Jindal Forging
s. Vivial Forges
t. PK Tubes Rajasthan
u. CSA Fitting
v. Gujarat Infrapipes pvt ltd, Vadodara
w. KS Pipes Fitting Pvt Ltd, Palwal
x. Tube Bend, Kolkata

6.0 PIG LAUNCHERS/ RECEIVERS/ PIG SIGNALERS

a. Bassi Luigi Fittings B.V., Holland
b. BRAUN STAHL PIPE TEC, GERMANY
c. FORAIN, ITALY
d. Fluidel SRL, ITALY
e. RMA Maschinen- und, GERMANY
f. Siiritec Nigi, Itlay
g. SCHUCK ARMATUREN, GERMANY
h. T.D. Williamson Inc., USA
i. Tectubi SPA, Italy
j. Taylor Forge Engineering System INC, USA
k. Tormene Americana S.A. (Argentina)
l. Tormene Gas Technology S.p.A., Italy
m. PIPELINE ENGINEERING, UNITED KINGDOM

n. Krohne, Oil & Gas BV, Drive Houston,

o. Multitex Filtration Engrs. Ltd, New Delhi

p. BGR ENERGY SYSTEMS LIMITED New Delhi

q. Glapwell Contracting Services Ltd. UK

r. FULGOSI GIOVANNI S.n.c di Corrado & C, ITALY

s. VEEKAY VIKRAM & CO, GUJRAT

t. GBM S.R.L, ITALY

u. Cardew Ltd., Alexeander

v. Forain S.R.L.

w. GD Engineering, India

x. Pipeline Engineering, UK

y. Siirtec Nigi SPA

z. Control Plus

aa. Oswal Infrastructure

7.0 LONG RADIUS BENDS

a. Jindal Saw Ltd. (Kosi Works), India

b. PSL Limited (Gandhidham – Mfrg), India

c. BHEL, Trichy, Tamilnadu

d. Welspun, Gujarat

e. Sawan

f. Gujarat Infra

g. P K Tubes

h. DEE Development

i. Pipefit Engineers Pvt. Ltd.

8.0 CLEAN AGENT SYSTEM

a. ADN Fire Safety Pvt Ltd (Vashi East, Thane)

b. Chetan Corporation (Ahmedabad)

c. Chetan Engineers (Ahmedabad)

d. Mx Systems International Pvt. Ltd. (Mumbai)

e. New Fire Engineers (P) Ltd (Sil Vassa)

f. Nitin Fire Protection Industries Ltd (New Bombay)

g. Nohmi Bosai (India) Private Limited

h. Tyco Fire & Security India Pvt. Ltd (Bangalore)

i. Vimal Fire Controls Pvt Ltd (Vadodara)

9.0 INSULATING JOINTS

a. IGP Engineers
b. V K Vikram
c. Advance Electronics
d. Nupros INC

10.0 GASKETS

a. IGP Engineers (P) Ltd., Madras
b. Madras Industrial Products, Madras
c. Dikson & Company, Bombay
d. Banco Products (P) Ltd., Vadodara
e. Goodrich Gaskets Pvt Ltd
f. Starflex Sealing India Pvt Ltd, India
g. Teekay Meta Flex Pvt Ltd
h. UNIKLINGER Ltd
i. HEM Engg. Corp.
j. Unique Industrial Packing Pvt. Ltd.

11.0 FASTENERS

a. Nireka Engg. Co. (P) Ltd., Calcutta
b. Precision Taps & Dies, Bombay
c. AEP Company, Vithal Udyoug Nagar
d. Fix Fit Fasteners, Calcutta
e. Precision Engg. Industries, Baroda
f. Echjay Forgings Pvt. Ltd., Bombay
g. Capital Industries, Bombay
h. Boltmaster India Pvt Ltd, India
i. Deepak Fasteners Limited, India
j. Fasteners & Allied Products Pvt Ltd, India
k. Hardwin Fasteners Pvt Ltd, India
l. J.J. Industries, India
m. Multi Fasteners Pvt Ltd, India
n. Nexo Industries, India
o. Pacific Forging & Fasteners Pvt Ltd, India
p. Pioneer Nuts & Bolts Pvt Ltd, India
q. Precision Auto Engineers, India

r. President Engineering Works, India

s. Sandeep Engineering Works, India

t. Syndicate Engineering Industries, India

12.0 WELDING ELECTRODES FOR PIPELINE/PIPING WORK

a. For Mainline – Lincoln/ Bohler make

b. For Terminal – For root pass –Lincoln/ Bohler make

For other passes – Lincoln, D&H or equivalent makeLincon

13.0 STRAINERS

a. Bombay Chemical Equipments

b. Gujarat Auto filed

c. Multitex Filtration Engineering Limited

d. Grand Prix Engineering Limited

14.0 COLD APPLIED TAPES

a. Denso GmbH

b. Raychem

15.0 HEAT SHRINKABLE SLEEVE/ FIBREGLAS REINFORCED SLEEVE

a. Covalence - Seal For Life India Pvt. Ltd. (Formerly Covalence Raychem- Berry Plastics Corporation)

b. Canussa-CPS

16.0 STUD BOLTS WITH NUTS

a. Multi Thread Fasteners, Baroda

b. Darukhanwala

c. Precision Engineers, Baroda

d. Unbrako

e. TVC

17.0 WARNING MAT

a. Sparco Multiplast Pvt. Ltd., Ahmedabad

b. Singhal Industries , Ahemdabad

c. Puja Packing, Mumbai

d. Bina Enterprises, Mumbai

e. Shree Vijay Wire & Cable Industries

18.0 HDPE PIPES/DUCT

a. Climax Synthetics (P) Ltd., Vadodra
b. Indian Poly Pipes, Calcutta
c. Jain Irrigation Systems Ltd., Jalgaon
d. Kirti Industries (India) Ltd., Indore
e. Ori Plast Limited, Calcutta
f. Phoel Industries Limited, Delhi
g. Sangir Plastics (P) Ltd., Mumbai
h. Veekay Plast,Jaipur
i. Kisan Irrigation
j. Dutron Polymers Ltd.
k. Manikya Plastichem (P) Ltd
l. Himalyan Pipe Industries

19.0 DRY GAS FILTER & FILTER SEPERATOR

a. Grand Prix Fab (Pvt.) Ltd. (New Delhi)
b. Perry Equipment, USA
c. Faudi Filter, Germany
d. Forain S.r.l., Italy
e. ABB, Faridabad
f. Burgess Manning, USA
g. Multitex Filtration Engineers India
h. Triveni Plenty Engg. Ltd. (New Delhi)
i. Siirtec International Contractor S.P.A (Italy)
j. Flashpoint, Pune india
k. Filteration Engineers (I) Pvt Ltd, India
l. Gujarat Otofilt, India
m. Tormene Gas Technology
n. Ultrafilter (India) Pvt Ltd, India
o. Ravi Techno Systems Pvt Ltd, India
p. Siirtec Nigi S.P.A
q. Filtan Filter Anlagenbau Gmbh
r. Fairley Arlon BV
s. PECO Facet
t. EPE Epenstenner GMBH

u. Filtrex srl
v. Petromar Engineered Soln
w. Plenty Filter
x. Eurofiltec
y. PTI Technologies Inc

20.0 FILTER ELEMENT

a. Peco – Facet
b. Velcon
c. Pall – Filterite
d. Burgress Manning

21.0 NDT AGENCY

a. NDT Services, Ahmedabad
b. GEECY Industrial Services Pvt. Ltd., Mumbai
c. Corrosion Control Services, Mumbai
d. Perfect Metal Testing & Inspection Agency, Calcutta
e. Inter Ocean Shipping Co., New Delhi
f. RTD, Mumbai
g. Sievert, Mumbai
h. X-Tech, Vizag
i. Industrial X Ray and Allied Radiographers (I) Pvt. Ltd.
j. Inspection Technology

22.0 Cold Applied Tapes

a. Denso GmBH
b. Polyken (Berry Plastics Corporation)

23.0 PUR Coating

a. Powercrete (Berry Plastics Corporation)

24.0 Casing End Closure

a. Raci, Italy
b. Raychem RPG Limited

25.0 Casing Insulators

a. Raci, Italy
b. Raychem RPG Limited

c. VeekayVikram

26.0 FIRE FIGHTING EQUIPMENT

26.1 FIRE EXTINGUISHERS

a. Avon Services (Production & Agencies) Pvt. Ltd., Bombay
b. Kooverji Devshi & Co., Bombay
c. Reliable (Fire Protection) India Ltd., Bombay
d. Zenith Fire Services, Bombay
e. Safex Fire Services, Bombay
f. Brij Basi Hi
g. tech Udyog
h. Bharat Engg Works, India
i. Gunnebo India Ltd
j. Nitin Fire Protection Industries Ltd, India
k. Supremex Equipments, India
l. Vimal Fire Controls Pvt Ltd., India

26.2 FIRE HYDRANTS, MONITORS, DELUGE VALVE, NOZZLES

a. Zenith
b. Minimax
c. Newage
d. HD Fire
e. Vijay Fire
f. Asco Strumech Pvt Ltd, India
g. Brij Basi Hi
h. tech Udyog
i. Gunnebo India Ltd
j. Nitin Fire Protection Pvt Ltd
k. Shah Bhogilal Jethamal & Brothers
l. Venus Pumps & Engineering Works

26.3 RRL Hose

a. Jayshree
b. Newage

26.4 HOSES

a. Ashit Sales Corporation, Bombay

b. Royal India Corporation, Bombay

c. Gayatri Industrial Corporation

d. Simplex Rubber Products Ltd., Ahmedabad

e. Zaverchand Marketing Pvt. Ltd., Baroda

f. Presidency Rubber Mill, Calcutta

g. The Cosmopolite, Calcutta

h. Simplex Rubber Products, Thane

NOTE:

1) For procuring bought out items from vendors other than those listed above, the same may be acceptable subject to the following: -

   a) The vendor/ supplier of bought out item(s) is a manufacturer/ supplier of said item(s) for intended services and the sizes being offered is in their regular manufacturing supply range.

   b) The vendor / supplier should not be in the Holiday list of CLIENT / VCS / other PSU.

   c) Should have supplied at least one single random length (i.e. 5.5 meters to 6.5 meters) for item assorted pipes / tubes and for other items, which are to be supplied in quantity on number-basis (other than assorted pipes / tubes) minimum 01 (One) number of same or higher in terms of size and rating as required for intended services. The bidder should enclose documentary evidences i.e. PO copies, Inspection Certificate etc. for the above, along with their bids.

2) For any other item(s) for which the vendor list is not provided, bidders can supply those item(s) from vendors/ suppliers who have earlier supplied same item(s) for the intended services in earlier projects and the item(s) offered is in their regular manufacturing/ supply range. The bidder is not required to enclose documentary evidences (PO copies, Inspection Certificate etc.) along with their offer, however in case of successful bidder, these documents shall require to be submitted by them within 30 days from date of Placement of Order for approval to CLIENT / VCS.

3) The details of vendors indicated in this list are based on the information available with VCS, Contractor shall verify capabilities of each vendor for producing the required quantity with. PMC does not guarantee any responsibility on the performance of the vendor. It is the contractor's responsibility to verify the correct status of vendor and quality control of each parties and also to expedite the material in time.

B. CIVIL AND STRUCTURAL

Sr. No.	Items/ Name of Products	Make/ Brands/ Manufactures
1.	Reinforcement Steel	TATA, SAIL, RINL, JSW.
2.	Cement	Ambuja, ACC, JK, Grasim, Ultratech, Birla, L&T, Cement Corporation of India
3.	Structural Steel	TATA, SAIL, RINL, IISCO, ESSAR
4.	Structural Steel Tubes ISI Marked	TATA, JINDAL, SURYA
5.	Mineral wool for thermal insulation of ceilings (Under deck insulation)	Rock wool (india) Ltd. Minwool Rock Fibres Ltd., Lloyd Insulation.
6.	Synthetic Enamel Paint (1st quality only)	ICI Paint (Dulux), Asian Paint (Apcolite), Berger Paints (Luxol). Goodlass Nerolac Paints (Nerolac), Jenson & Nicholson Paints Ltd (Borolac)
7.	G.I SHEET	ESSAR, JSW, SAIL
8.	Sheeting Screw	Corroshield, Buildex,
9.	Chemical for Antitermite treatment	DE- NOCIL Bombay, Pest Control of India, Trishul
10.	Factory made Panelled Door shutter	Century; Godrej ; M/s Hindustan Housing factory Ltd., New Delhi ; M/s Delhi Construction Eqp, Sadar Bazar, Delhi ; M/s Joinery manufacturing Co., Calcutta;
11.	PVC Panel Door (Solid Core)	Rajshri Plastiwood Limited, Sintex, Hindopan, Marino
12.	Pressed steel door frames/ cupboard and window frames (manufacturers)	M/s SAIL, M/s TATA
13.	Pressed steel door frames/ cupboard and window frames (fabricators)	M/s Loyal safe works Mayapuri, N/Delhi M/s Multiwyn Industrial Corpn Calcutta M/s Metal Window Corpn N/Delhi M/s Chhabra Steel Udyog, 260 Sadar Bazar, Meerut Cantt. M/s Delite safe works, Rani Jhansi Road, N/Delhi
14.	Steel Windows, Ventilators (as per IS- 1038 of 1983) & frames pressed steel door/window	M/S Multiwyn Industrial Corpn, Calcutta ; M/S Metal Window Corp, N/ Delhi ; M/S Chhabra Steel Udyog 260, Sadar Bazar, Meerut Cantt ; Agent steel MFG Pvt Ltd, Ahmedabad ; Godrej ;
15.	AI Section for AI Door/ Window/ Partitions	Hindalco, Ajit India, Jindal
16.	AluminumI Door/ Window/ Glazing Fabricated and	M/s Alumilite Pvt Ltd, M/s Ajit India Pvt Ltd, M/s Ramniklal S Raste Agra, Argent Industries, M/s Aluminium Tech Industries, I-2249 DSIDC Narela,

	Anodized	Delhi, M/s VR Associates, GH-14/242 Paschim Vihar, Delhi
17.	Aluminium door and windows Fittings	M/s Elite Enterprises C/6 Shalimar Hardware 133, Jarg Mahal, Dhobitalao Mumbai 400002. M/s Mohan Metal Industries 178/2-A, Bhole Nath Nagar, Shahadara, Delhi 110032. Mepro, Argent New Delhi, Classic, New Delhi. Jindal, Argent New Delhi,Golden Industries Pvt. Ltd. ECIE
18.	Aluminium Grill	Alu Grill, Arihant Aluminium Corporation, Decogrille
19.	Door Closer	Everite, Golden, Gandhi,
20.	Floor Spring	Prabhat, Everite
21.	Plywood for general purpose (IS-303)	National Plywood Inds Pvt Ltd, S Fancy lane, 8th floor, Calcutta-700001, Merino Plywood, Archid Ply, Ply, Swastik, Universal, Century, Greenply, National.
22.	Pre laminated Particle board	Kitply, Bhutan board, Ecoboard, Novapan, Archid ply, Merinova, Merino
23.	Laminated Sheets	Formica, Merino Lam, Greenlam, National,Century
24.	Modular Partitions	Godrej, Blowplast
25.	False Ceiling (Mineral Fibre Board)	Armstrong, Daiken, Luxalon, Llyods, Gypboard, Trac, Aerolite
26.	Aluminium False Ceiling	Lloyds, Armstrong, Luxlon,Trac
27.	Flooring Tiles (Mosaic / Terrazzo / PCC) (1st quality only)	Kajaria Ceramics, NITCO, Royal Tiles, Gem Tiles, Hindustan Tiles, M/S National Tiles & Industries, Ultra Tiles
28.	Glazed Ceramic Tiles, Non-Skid (Floor/Wall), (1st quality only)	Kajaria, Somany, NITCO. Murudeshwar Ceramic Ltd (Navin Diamond tile), Johnson (Marbonite),
29.	Vitrified/ Designer Vitrified Tiles (1st quality only)	Asian, Marbonite (Johnson), Kerrogres (Kajaria), NITCO, Orient
30.	PVC Tiles/Flooring (IS 3461) (1st quality only)	Marblex Tiles, Krishna Tiles, Polyfin, Armstrong, Wonder floor.
31.	False Flooring	Godrej or equivalent
32.	Glass Mosaic Tiles (1st quality only)	Paladio, Coral, Accura, Bisazza, Italia, Mridul.
33.	Designer Paver Tiles/ Interlocking tiles ISI marked/ Grass-jointed Tiles. (1st quality only)	Pavit, Ultra, Hindustan, Eurocon, Vyara, National Tiles, Gem, Unistone, Konkrete, Unitile
34.	Wall care Putty for Base preparation (1st quality only)	Birla Wall care putty, Berger, Jenson & Nicholson, JK White

35.	White Cement (1st quality only)	Birla, JK
36.	Cement based Paints (1st quality only)	Super Snowcem, Duracem, Super Acrocem.
37.	Dry Distemper / Oil bound Distemper (1st quality only)	Goodlass Nerolac Paint, Shalimar Paint, Jenson & Nicholson, Asian Paint, Berger. ICI Dulux
38.	Acrylic Washable Distemper (1st quality only)	Asian, Berger, ICI Dulux, Jenson & Nicholson, Nerolac, Shalimar, Garware & Goodlass
39.	Plastic Emulsion Paint (1st quality only)	Asian, Berger, ICI, Nerolac, Jenson & Nicholson, Shalimar,Garware & Goodlass
40.	Exterior Acrylic Emulsion (1st quality only)	ICI (Weathercoat), Excel (Nerolac), Apex (Asian), Berger, Jenson & Nicholson, Shalimar,Garware & Goodlass
41.	Polymer based Paint	STP, CICO
42.	Textured Paint / Wall Tile (1st quality only)	Unitile, Heritage, Spectrum, Iokos, Acropaints, Asian
43.	Flexible board for Expansion joint	STP or equivalent
44.	Grout	Shrinkomp, Fosroc,Fairmate
45.	Integral water proofing compound	STP, Pidilite, Fosroc, CICO, Sika.
46.	Concrete Admixture	Pidilite, Fosroc, CICO, Sika.
47.	Water proofing for cementations surface IS-2645	Acrocrete & Acrocote, CICO, Fosroc, STP
48.	Bituminous Product	M/s Faridabad Spinning & Woolen Mills Pvt Ltd, 837, SP Mukherjee Marg Delhi, M/s STP Ltd (Formerly Shalimar Tar Products) M/s Bitufelt Pvt Ltd 123/377 Fazalm Ganj Kanpur 208012, Texas, Texas India Ltd, Multiplas
49.	Hardeners	Ironite, Ferrok, Hardonate
50.	Construction Chemicals	Choksey, CICO, Forsroc, Sika
51.	Stainless Steel Cladding	Jindal
52.	Punch Tape Concertina Coil	Global Technocrat, S.G. Engineers Delhi
53.	Stainless Steel Railing	Jindal
54.	FRP/ HDPE Garbage Bins	Sintex, Swift, Nutech, Sheetal
55.	Sanitary ware	Neycer Kermag (standard), Hindustan Sanitary Ware (Ist quality), Parryware (superfine), Cera (Ist quality), Classica (Ist / standard)

56.	WC seat cover ISI Marked	Parryware, Neycer Kermag (standard), Hindustan Sanitary Ware (Ist quality), Cera (Ist quality), Classica (Ist / standard)
57.	PVC Flushing Cistern IS: 774-1984 (ISI Certified)	Parryware, Hindustan Sanitary Wares, Cera.
58.	Faucets & Taps, Stop Valves & Pillar Taps, Surgical basin mixer, Shower rose etc.	Gem, Parko, Parryware, HSW, Jaquar
59.	Kitchen Stainless Steel Sink	Diamond, Nirali, Neel Kanth, Jayna
60.	Looking Mirror	Saint Gobain, Modi Float, Triveni Float Glass, Crown, Atul.
61.	Readymade Bathroom Cabinets	Commander Gratings (I) Pvt Ltd, Gratolite Cabinet, A- 4 Sector Viii Noida-202701, Alpina, Cera.
62.	Float Valve	Leader, Bombay Metal & Alloy Co, Bombay superflow.
63.	SGSW Pipes (IS-651) ISI Marked	Perfect Agra, Devraj Ind Gaziabad, Buran, RK, Prince,
64.	CI (Centrifugally Cast) Pipes for sewage disposal ISI marked	NICCO, SRIF, A-1 Singhal Casting Co Agra, Jindal Saw, Kesoram, NECO
65.	PVC rain water/sewage pipes (IS-4985)	Reliance, Finolex, Supreme, Kisan, Prince, Hindustan Plastic & machine corporation, Polypack industries (P) Ltd.
66.	HDPE Water storage tanks (Rotational Moulded)	Sintex, Swift, Nutech, Sheetal
67.	Cast Iron Pipes and Fittings	Hindustan Engineering Products Company Calcutta, S.L.C., Standard approved manufacturers of any other brand of fittings having ISI marking, RIF, BIS
68.	RCC Pipes	Indian Hume Pipe Company, Delhi / Allahabad / Chandigarh / Lucknow; Hindustan Pressure Pipes, Kolhapur; Dhere Concrete Products, Pune or any other approved manufacturer conforming B.I.S. Standard
69.	Brass Fittings	Leader Engineering Works, Jalandhar; L & K Mathura; Luster Sanitary, Jalandhar; Annapurna Metal Works, Calcutta; Neta Metal Works, Jalandhar
70.	C.P. Fittings	Ego Metal Works, Ballabhgarh; Jaquar Industries, Delhi; Soma Plumbing Fixtures Limited, Calcutta; Gem Sanitary Appliances Pvt. Ltd., Delhi; Essco Sanitations, Delhi.
71.	Stone Ware (Salt-Glazed) Pipes	Hind Ceramics Limited, Orissa; Ceramic Industries Limited, Sambalpur; Shrikamakshi Agencies, Madras; Binary Udyog Pvt. Limited, Howrah; Tirumati Moulds Limited, Nagpur.
72.	Asbestos Cement Pipes and Fittings	Ganga Asbestos Limited, U.P.; Hyderabad Asbestos Cement Products Limited; J.K. Super Pipe Industries, Nanded; Konark Cement and Asbestos Limited, Orissa; Maharashtra Asbestos Limited, Bombay.

List of Recommended Vender/Suppliers of Major Bought-Out Items: Unless otherwise specifically mentioned in the Schedule of Items, Contractor has to use materials as listed below, of only these brand names/Company's names, which are mentioned in the RECOMMENDED list for structural items thereon.

Sl. No.	Items/Name of Products	Makes/Brands/Manufactures
1	Structural Steel	SAIL / TATA / RINL / IISCO / ESSAR / ISPAT
2	Structural Steel Tubes ISI Marked	TATA / JINDAL / SURYA / SWASTIK
3	Synthetic Enamel Paint 1st Quality only	ICI Paint (Deluxe), Asian Paint (Apcolite), Shalimar Paint (Superlac), Goodlass,Nerolac Paint (Nerolac), Berger Paints

Any materials not fully specified in these specifications and which may be offered for use in the works shall be subject to approval of Engineer, without which it shall not be used anywhere in the construction works.

C. ELECTRICAL

LIST OF SUPPLIERS OF MAJOR BOUGHT-OUT ITEMS

1.0 AIR CONDITIONER

a. O General.
b. Daikin.
c. Hitachi.
d. LG.
e. Samsung.
f. Blue star.
g. Haier.
h. Voltas.
i. Videocon.

2.0 BATTERIES (LEAD ACID)

a. Amco Batteries Ltd.
b. Exide Industries Ltd.
c. HBL Power System Ltd.
d. Amara Raja Batteries Ltd.
e. Luminous Power Technologies Pvt Ltd.
f. Su-Kam Power Systems Ltd.
g. Base Corporation Ltd.
h. Okaya Power Ltd.
i. Southern Batteries Pvt Ltd.
j. True Power International Ltd.
k. Evolute Solutions Pvt Ltd.
l. Greenvision Technologies Pvt Ltd.
m. Artheon Electronics Ltd.

3.0 BATTERIES (NICKEL CADMIUM)

a. Amco Batteries Ltd.
b. HBL Power Systems Ltd.
c. SAFT.

4.0 BATTERY CHARGER/DC-DC CONVERTER

a. Amara Raja Power System(P)Ltd.

b. BCH.
c. Chhabi Electricals Pvt. Ltd..
d. Caldyne Automatics Limited.
e. Dubas.
f. HBL Nife Power Systems Ltd..
g. Universal Industries Products.
h. Universal Instrument Mfg. Co Pvt Ltd.
i. Hitachi HI-REL Power Electronics P. Ltd
j. Mass-Tech Controls Pvt Ltd
k. Dubas Engineering Pvt Ltd
l. Chloride Power Systems & Solutions Ltd

5.0 CABLE – FIRE ALARM & COMMUNICATION CABLES

a. Cords Cable Industries Ltd.
b. CMI.
c. Delton cables Ltd.
d. ELKAY Telelinks.
e. KEI Industries Ltd.
f. Reliance Engineers Ltd.

6.0 CABLE – HT(XLPE)

a. Universal Cable Ltd.
b. KEI Industries Ltd.
c. Industrial Cables.
d. NICCO Corporation Ltd.
e. Uniflex.
f. Polycab.
g. Torrent cables Ltd.

7.0 CABLE – LT / MV POWER AND CONTROL

a. Cords Cable Industries Ltd.
b. Universal Cable Ltd.
c. KEI Industries Ltd.
d. Havells.
e. Delton.
f. Elkay Telelinks.

g. Evershine Electricals.
h. Ecko.
i. Ravin.
j. Rallison.
k. Suyog.
l. Netco.
m. Uniflex.
n. Paramount.
o. Gloster.
p. Associated cables Pvt Ltd.
q. CMI.
r. Gemscab.
s. Industrial cables.
t. NICCO.
u. Polycab.
v. Torrent.

8.0 CABLE – GLAND

a. Baliga.
b. Comet.
c. Flexpro.
d. Flameproof.
e. FCG.
f. Electro Werke.
g. Dowels.
h. CCI.
i. Sudhir Switchigear
j. Keyson Techno Equipments,

9.0 CABLE – LUGS & TERMINAL BLOCKS

a. Dowels.
b. Jainson.
c. Sharma Electrical
d. Punitam
e. Yamuna Powers
f. Rapid Manufacturer

g. Varun Controls.

10.0 CABLE – TRAY

a. Ercon Composites.
b. Yamuna Power & Infrastructure Ltd.
c. MEM
d. Bharti
e. Profab.
f. Ratan.
g. Slotco.

11.0 CABLE TERMINATION AND JOINTING KIT

a. CCI.
b. Raychem.
c. M-Seal.

12.0 CEILING/EXHAUST/PEDESTAL FANS & CIRCULATORS

a. Bajaj Electricals Ltd.
b. Crompton Greaves Ltd.
c. Khaitan Electricals Ltd.
d. Havell's.

13.0 CONTRACTORS – AC POWER

a. Andrew Yule.
b. ABB.
c. BHEL.
d. C&S.
e. Havell's.
f. L&T.
g. Schneider.
h. Siemens Ltd.
i. Telemechanique.

14.0 CONTROL TRANSFORMER

a. AE.
b. Indushree.
c. Intra Vidyut.
d. Kalpa Electricals.

e. Transpower Industries Ltd.

f. Siemens.

15.0 GAS GENERATOR/DIESEL GENERATOR SET

a. Sterling and Wilson.

b. Jackson Limited.

c. Sudhir Gensets.

d. Power Engineering (India) Pvt Ltd.

e. Prasha Technologies Limited.

f. Kumar Generator house.

g. Ashok Leyland Ltd.

h. Powerica Limited.

i. Supernova Engineers Limited.

j. Bhaskar Power Products (P) Ltd.

k. Caterpillar India (P) Ltd.

l. Cummins India Ltd.

m. Escorts Ltd.

n. Greaves Cotton Ltd.

o. Kirloskar ltd.

p. Mahindra & Mahindra Ltd.

q. Honda.

r. Perkins.

s. Eicher.

t. Tata Motors.

u. Ashok Leyland.

16.0 EARTHING MATERIALS

a. Rukmani Electrical & Components Pvt Ltd.

b. Indiana Grating Pvt Ltd.

c. Jef Techno Solutions Pvt Ltd.

d. Flame proof LDB's/ JB,s/Control Station/ switches

e. FCG

f. Sudhir

g. Prompt Engineering Works

h. Flame Proof equipments pvt. Ltd.

i. Baliga Lighting Equipments Pvt. Ltd.

j. Flexpro Electricals Pvt. Ltd.

17.0 FLAME PROOF LDB'S/ JB'S/CONTROL STATION/ SWITCHES

a. FCG.
b. Sudhir switchgears.
c. Prompt Engineering Works
d. Flame Proof equipments pvt. Ltd.
e. Baliga Lighting Equipments Pvt. Ltd.
f. Flexpro Electricals Pvt. Ltd.
g. Exprotecta, Beroda.
h. FFLP Control Gears.
i. Sterling.

18.0 HIGH MAST

a. Bajaj Electricals Limited.
b. Crompton Greaves Limited.
c. Philips India Limited.
d. Surya Roshani.

19.0 HIGH VOLTAGE PCC/ MCC PANELS

a. BHEL.
b. Control and Switchgear.
c. Siemens.
d. Tricolite Electrical Industries.
e. Schneider.
f. CGL.
g. L&T.
h. ABB.

20.0 INDICATING LAMPS

a. Alstom Ltd.
b. BCH.
c. L&T Ltd.
d. Siemens Ltd.
e. Vaishno Electricals.
f. Tecknik
g. ABB

21.0 INDICATING METERS

a. ABB.
b. AMCO.
c. AE.
d. Alstom Ltd. (EE).
e. Conzerv/Schneider
f. Elecon Measurement Pvt. Ltd.
g. HPL Electric & Power Pvt. Ltd.
h. MECO Instruments Ltd.
i. Minilec.
j. Rishabh Instruments Pvt. Ltd.
k. Trinity energy system.
l. Kaycee.
m. Salzer.

22.0 LIGHTING FIXTURES

a. GE Lighting Pvt. Ltd.
b. Bajaj Electricals Ltd.
c. Crompton Greaves Ltd.
d. Philips India Ltd.

23.0 LIGHTING FIXTURES – FLAMEPROOF

a. Bajaj Electricals Ltd.
b. Baliga Lighting Equipment Pvt. Ltd.
c. Crompton Greaves Ltd.
d. CEAG Flameproof Controlgear Pvt. Ltd.
e. Flexpro Electricals Pvt. Ltd.
f. Philips India Ltd.
g. Sudhir Switchgears Pvt. Ltd.
h. FCG.

24.0 MINIATURE CIRCUIT BREAKERS (MCBS) AND LIGHTING DB

a. ABB.
b. Hagger.
c. Havell's India Ltd.
d. Indo Asian Fusegear Ltd.

e. Legrand.

f. MDS Switchgear Ltd.

g. Schneider.

h. Siemens Ltd..

i. HPL.

j. L & T

25.0 MOULDED CASE CIRCUIT BREAKER (MCCBS)

k. ABB.

l. Andrew Yule.

m. Larsen & Toubro.

n. Schneider.

o. Siemens.

p. Control and Switchgear.

q. Indo Asian,

r. Hager.

s. Merlin Gerin.

t. Havell's India Ltd

26.0 PROTECTION RELAYS – THERMAL

a. BCH.

b. L&T Ltd.

c. Siemens Ltd.

d. Tele-menchanique & Controls (India) Ltd.

27.0 LOW/MEDIUM VOLTAGE POWER CONTROL CENTER (PCC)/ MCC/ PDB/ MLDB/ LDB

a. ABB.

b. BCH.

c. BHEL.

d. C & S.

e. Elecmech Switchgear & Instrumentation.

f. KMG ATOZ.

g. L&T.

h. Pyrotech Electronics Pvt. Ltd.

i. Risha control Engineers Pvt. Ltd.

j. UDKAM PROCESS EQUIPMENT INDIA PVT. LTD

k. Tricolite Electrical Industries.

l. Unilec Engineers ltd.

m. Vidyut Control India Pvt. Ltd.

n. Control and Schematic.

o. Zenith Engineering.

p. Schneider Electric,

q. AEG,

r. HAVELL'S,

s. MDS.

28.0 PUSH BUTTONS

a. BCH.

b. Alstom Ltd.

c. L&T.

d. Siemens Ltd.

e. Tele-Menchanique & Controls (India) Ltd.

f. Vaishno Electricals.

29.0 SWITCHES-CONTROL

a. BCH.

b. Easum Reyrolle Relays & Devices Ltd.

c. Alstom.

d. Kaycee Industries Ltd..

e. L&T.

f. Siemens Ltd.

30.0 SWITCHES – 5/15A PIANO/ PLATE, SWITCH SOCKET

a. Anchor Electronics & Electricals Pvt. Ltd.

b. Kingal Electricals Pvt. Ltd.

c. North-West Switchgear Ltd.

31.0 SWITCH SOCKET OUTLETS (INDUSTRIAL)

a. Alstom Ltd.

b. Best & Cromption Engineering Ltd.

c. BCH.

d. Crompton Greaves Ltd.

e. Essen Engineering Company Pvt. Ltd.

32.0 SOLAR POWER SYSTEM MODULES

a. Tata Power Solar Systems Ltd
b. REIL,
c. CEIL,.
d. HBL Power.
e. Vikram Solar.
f. Waaree Solar.
g. Solar Semiconductor.
h. Sonali.

33.0 SOLAR STREET LIGHTING

a. Tata BP Solar (I) Ltd.
b. REIL, Jaipur.
c. CEIL, Sahibabad.
d. HBL.

34.0 TERMINALS BLOCKS

a. Connectwell.
b. Controls & Switchgear Co. Ltd.
c. Elmex Controls Pvt. Ltd.
d. Essen Engineering Co. Pvt. Ltd.

35.0 TRANSFORMERS

a. ABB.
b. Andrew Yule.
c. Areva.
d. BHEL.
e. Bharat Bijlee
f. Crompton Greaves.
g. EMCO Ltd..
h. Intra Vidyut.
i. Indushree.
j. Indcoil
k. Kirloskar.
l. Skippers Electricals.
m. Transformers & Rectifiers (I) Ltd.

n. Voltamp.

36.0 UPS SYSTEM AND INVERTER

a. DB Power.
b. Keltron.
c. Hi-Rel/HITACHI.
d. Dubas.
e. Toshiba Corporation.
f. Fuzi Electric Co Ltd.
g. Emerson.
h. Synergy System.
i. Eaton.

37.0 GI-OCTAGONAL POLE

a. Bajaj.
b. Transrail.
c. Wipro.
d. K.L. Industries.

38.0 ELECTRICAL MOTORS

a. Siemens.
b. Crompton Greaves.
c. Kirloskar.
d. BHEL.
e. Bharat Bijlee.
f. Hindustan motors.
g. Alstom.
h. Texmo.
i. GE India.
j. National Motors.
k. ABB.

39.0 LIST OF RECOMMENDED MANUFACTURERS FOR HEATER

a. Escorts Limited, Faridabad, Haryana.
b. Spherehot / Kanti Lal Chuni Lal & Sons Appliances Pvt Ltd.Surat.
c. Kerone, Bhayander(E), Thane – 401105.
d. Excel Heaters, Andheri (West), Mumbai - 400 053, India.

e. Nirmal Industrial Controls Pvt. Ltd., Mulund(W), Mumbai - 400 080.

40.0 CATHODIC PROTECTION AGENCIES/CONTRACTOR/ VENDERS

a. Raychem-RPG Private Limited.
b. CALTECH Engineering Service.
c. Universal Corrosion Prevention India.
d. Cathodic Technology Limited.
e. Cathodic Control Company Pvt. Ltd.
f. CORRTECH International Pvt Ltd.
g. MITCORR Cathodic Protection Pvt Ltd.
h. Underground Pipeline & NDTS Pvt. Ltd.
i. JG Corrosion Solution.
j. Mercury Cathodic Protection Service.
k. UNDTS Corrosion Service.

41.0 BACKUP AGENCY FOR INTERFERENCE SURVEY & MITIGATION

a. PLE Germany
b. Vendor Velde
c. Nippon Japan
d. SSS India CIPL / interference survey.
e. Balslev Denmark, .
f. SSS Germany

42.0 PERMANENT REFERENCE CELL

a. PERMACELL/ HARCO (USA)
b. CORRTECH (ZULU), INDIA
c. TINKER RASOR, USA
d. SILVION, UK

43.0 CP CABLES

a. Brooks Cables.
b. Nicco Corporation Ltd.
c. CCI Ltd.
d. Delton Cables Ltd.
e. KEI Industries.

f. Torrent Cables.

g. Universal cables.

h. Victor Cables.

i. Associated Flexible & Wires Pvt Ltd.

j. Asain Cables (RPG Cables).

k. Fort Gloster (Gloster Cables Ltd).

l. Finolex Cable.

m. Rediant Cables.

n. NETCO Cables Pvt Ltd.

o. Havells Ltd.

44.0 CP SACRIFICIAL ANODES

a. Scientific Metals Engineers Pvt. Ltd., Karaikudi

b. PSL Holding Pvt. Ltd., Mumbai.

c. Cathodic Controls, Bangalore.

d. BHEL, Bhopal.

e. Nippon Corrosion, Japan.

f. AFIC, KSA.

g. Platt Bros. and Company, USA

h. Wilson Walton International.

i. Impalloy International.

j. Corrpro International.

k. HOCKWAY, UK

l. NAKABOHTEC, Japan .

m. Cortech International

n. Titanor Component

45.0 CP PORTABLE REFERENCE CELL

a. MC Miller (USA) .

b. Borin, USA

c. Krick

d. corrtech.

46.0 CP PERMANENT REFERENCE CELL

a. Borin Manufacturer USA

b. MC Miller USA

c. Corrtech

d. Krick

47.0 CPTR (AC OPERATED)

a. Canara Electric

b. (Raychem RPG Ltd)

c. CATHODIC CONTROL COMPANY PVT LTD.

d. Raychem RPG Ltd

e. Kriston Systems

48.0 PIN BRAZING

a. SAFETRACK, SWEDEN

b. BAC, UK

49.0 THERMITWELD

a. ERICO, USA

b. THERMOWELD, USA

c. ERICO, EUROPE

50.0 CP SURGE DIVERTER/SPARK GAP ARRESTOR (EX-D)

a. Dhen, OBO

b. Corrpro system

c. Sohne

51.0 DIGITAL MULTIMETER

a. MOTWANE,

b. Rishabh,

c. Fluke .

52.0 CTSU

a. Kriston systems .

53.0 CP SOLID STATE POLARISATION CELL.

a. Dairyland

b. Corrpro systems

c. Mc Miller

d. Krik Engineering

54.0 PETROLEUM COKE BREEZE:

a. Goa Carbon , Goa

b. India carbon, Durgapur (WB)

55.0 PIN BRAZING

a. BAC

b. Safetrack

56.0 CP ANODE (MMO TYPE):

a. Corrtech

b. Scientific Metal Engineers Karaikudi

c. Titanor Component Ltd., Goa, India.

d. Denora Permelic S.P.A (Italy). .

e. Oronzio De Nora S.A. Ingano Switzerland

f. CER Anode Technologies International USA

g. ACTEL, UK

h. ELTECH System Corporation, Texas

i. MAGNETO-CHEMIE, Netherlands

j. MATCOR (USA)

57.0 CP ANODE BACKFILL MATERIAL

a. Goa Carbon (Goa).

b. India Carbon (Calcutta),

c. Petro carbon & Chemical Company (Haldia).

58.0 HEAT SHRINK CAP FOR CP ANODE

a. RAYCHEM

b. MATCOR (USA) To Cable Joint

59.0 ER- PROBE (EXTERNAL CORROSION)

a. Rose Corrosion Services UK

b. Metal Samples, USA. .

c. Monitoring) Roharbak Cosasco USA

d. Caproco UK

60.0 ER- PROBE & CORROSION COUPON

a. Rose Corrosion Services UK

b. Metal Samples

c. USA Assembly. .

d. Roharbak Cosasco, USA

e. Caproco, UK

61.0 HEAT SHRINK CAP FOR ANODE TO CABLE JOINT

a. Raychem, USA

b. Matcor (USA)

62.0 MMO WIRE ANODES (WITH FACTORY PRE-PACKED COKE BREEZE)

a. Matcor (USA)

b. Covalence (USA)

c. Berry Plastics (USA) – (Seal for Life Industries)

63.0 MMO WIRE ANODES (WITHOUT FACTORY PRE-PACKED COKE BREEZE)

a. GROUPPO DENORA, GOA, INDIA

b. CERANODE TECHNOLOGIES, USA

c. TELPRO, USA

64.0 MMO TUBULAR/ STRIP/ RIBBON ANODES

a. GROUPPO DENORA, GOA, INDIA

b. ORANZIO DE NORA, ITALY

c. MAGNETOCHEMIE, HOLLAND

d. ACTEL LTD., U.K.

e. ELTECH SYSTEMS CORPORATION, USA

f. CERANODE TECHNOLOGIES, USA

g. MATCOR (USA)

65.0 EARTHING SYSTEM AND LIGHTING PROTECTION SYSTEM

a. JMV LPS LIMITED

Note: -

For any other brought out item(s) for which the vendor list is not provided in the tender , bidders can supply those item(s) from vendors/ suppliers who have earlier supplied similar item(s) for the intended services in earlier Oil and Gas projects and the item(s) offered is in their regular manufacturing/ supply range.

1) The vendor/supplier should not be in the Holiday list of OWNER/ ONSULTANT/other PSU

2) The bidder is not required to enclose documentary evidences (PO copies, Inspection & Completion with satisfactory working certificates etc.) along with their offer, however in case of successful bidder, these documents shall required to be

submitted by them within 30 days from date of Placement of Order for approval to OWNER / CONSULTANT.

D. INSTRUMENTATION

LIST OF RECOMMENDED VENDER/SUPPLIERS OF MAJOR BOUGHT-OUT ITEMS

1.0 PRESSURE GAUGES

a. AN Instruments Pvt Ltd
b. Badotherm Process Instruments B.V.
c. Baumer Bourdon Haenni S.A.S
d. British Rototherm Co Ltd
e. Budenberg Gauge Co Ltd
f. Dresser Inc
g. Forbes Marshall (Hyd) Pvt Ltd
h. General Instrument Consortium
i. H. Guru Instruments (South India) Pvt Ltd
j. Manometer (India) Pvt Ltd
k. Nagano Keiki Seisakusho Ltd
l. Hirlekar Precision, India
m. Waaree Instruments Ltd
n. Walchandnagar Industries Ltd (Tiwac Divn)
o. Wika Alexander Wiegand & Co GmbH
p. Wika Instruments India Pvt Ltd
q. Ashcroft India Pvt Ltd.

2.0 TEMPERATURE GAUGES

a. AN Instruments Pvt Ltd.
b. Badotherm Process Instruments B.V.
c. Bourdon Haenni S.A.
d. Dresser Inc.
e. General Instruments Consortium
f. H. Guru Instruments (South India) Pvt Ltd
g. Nagano Keiki Seisakusho Ltd
h. Solartron ISA
i. Walchandnagar Industries Ltd (Tiwac Divn)
j. Wika Alexander Wiegand & Co GmbH
k. Wika Instruments India Pvt Ltd

l. Pyro Electric, Goa

m. Ashcroft India Pvt Ltd.

3.0 TEMPERATURE ELEMENTS INCLUDING SKIN TYPE

a. ABB Automation Ltd

b. Altop Industries Ltd

c. Bourdon Haenni S.A.

d. Detriv Instrumentation & Electronics Ltd

e. General Instruments Consortium

f. Japan Thermowell Co Ltd

g. Tecnomatic S.P.A

h. Tempsen Instrument India Ltd

i. Thermo Electric Co. Inc.

j. Thermo-Couple Products Co

k. Thermo-Electra B.V.

l. Wika Alexander Wiegand & Co GmbH

m. Altop Industries Ltd., Baroda

n. Nagman Sensors (Pvt.) Ltd.

o. Pyro Electric, Goa

4.0 POSITIVE DISPLACEMENT FLOW METERS

a. RMG (Germany)

b. Elster Instromet

c. Romet

d. Dresser

e. Itron

f. FMG

g. Common

h. Metreg

i. Raychem RPG

j. Vemmtec

5.0 TURBINE FLOW METER

a. Daniel

b. Elster Instromet

c. Itron

d. RMG

e. Rockwin

6.0 ELECTRONIC VOLUME CORRECTOR

a. Elgas

b. Itron

c. Plum

d. Pietro Fiorentini

7.0 ORIFICES (METER RUN, FLOW CONDITIONER, ORIFICE PLATE AND ASSEMBLY)

a. Emerson

b. FMC, USA

c. Pietro Fiorentini S.P.A (Italy)

d. Canalta Controls, Canada

8.0 ULTRASONIC FLOW METERS

a. Daniel (USA)

b. RMG (Germany)

c. Instromet International (Belgium)

d. Sick Maihak, Germany

e. FMC, Germany

9.0 MASS FLOW METERS

a. Daniel Measurement & Control Asia Pacific

b. Endress + Hauser Instruments International

c. FMC Measurements Solutions

d. Heinrichs Messtechnik GMBH

e. Rheonik MessGerate GMBH

10.0 FIELD INSTRUMENTS (P, DP, F, L, T)

a. ABB Ltd

b. Honeywell
c. Fuji Electric Instruments Co Ltd
d. Yokogawa
e. Invensys India Pvt.Ltd

11.0 LEVEL GAUGES/ LEVEL INSTRUMENTS

a. Bliss Anand
b. Chemtrols
c. V-Automat
d. Levcon
e. Nivo Controls
f. Sbeletro Mechanicals
g. TRAC

12.0 PRESSURE REGULATOR AND SLAM SHUT VALVE

a. Pietro Fiorentini S.P.A. (Italy)
b. Emerson
c. RMG-Regel Messtechnik (Germany
d. Mokveld Valves BV (Netherlands)
e. Schlumberger (USA)
f. Gorter Controls B V (Netherlands)
g. Instromet International NV
h. Nirmal Industrial Controls Pvt Ltd. (up to 6” size only)
i. ESME Valves Ltd
j. Kaye & Macdonald Inc.
k. Nuovo Pignone S.P.A (Italy) (GE Oil Co.)
l. Richards Industries (Formerly Treloar)
m. Samson AG Mess-und Regeltechnik
n. Tormene Gas Technology
o. Dresser Inc, USA (upto 8” size, 300# class only)

13.0 PRESSURE SAFETY VALVES

a. Keystone Valves (India) Pvt. Ltd.

b. Larson & Toubro Ltd.
c. Lesser GmbH & Co KG
d. Mekaster Engg Ltd..
e. Tyco Sanmar Ltd. (New Delhi)
f. Anderson Greenwood Crosby
g. BHEL (Trichy)
h. Curtiss Wright Flow Control Corporation
i. Dresser Inc.
j. Fukui Seisakusho Co. Ltd
k. Nakakita Seisakusho Co Ltd
l. Nuovo Pignone S.P.A (Italy) (GE Oil co)
m. Parcol S.P.A
n. Safety Systems UK Ltd
o. Tai Milano S.P.A
p. Weir Valves & Controls France
q. Bliss Anand Pvt Ltd.

14.0 CONTROL PANEL & ACCESSORIES

a. Keltron Controls Ltd., Kerala
b. Elechmec Corporation Ltd., Mumbai
c. Industrial Controls & Appliances Pvt. Ltd.,
d. Alstom System Ltd., Noida
e. Emerson Process Management (I) Pvt. Ltd.
f. ABB Instruments Ltd., New Delhi
g. Larsen & Toubro Ltd.
h. Control & Automation, New Delhi
i. GE Fanuc Systems Pvt. Ltd., New Delhi
j. Rockwell Automation (I) Ltd., Ghaziabad
k. Honeywell Automation Ltd.
l. Rittal
m. Pyrotech Elcronics Pvt Ltd.
n. Positronics Pvt Ltd.
o. Electronics Corporation of India Ltd.

15.0 JUNCTION BOXES AND CABLES GLANDS

a. Ex-Protecta

b. Flameproof Control Gears

c. Baliga

d. Flexpro Electricals

16.0 CONTROL AND SIGNAL CABLES

a. Associated Cables

b. Brook

c. Associated Flexibles & Wires (Pvt) Ltd

d. Universal Cables Ltd,India

e. Delton Cables Ltd, India

f. KEI Industries Ltd INDIA

g. CMI Limited

h. Cords Cable Industries Ltd, India

i. Elkay Telelinks (P) Ltd., India

j. Udey Pyrocables Pvt Ltd, India

k. Goyolene Fibres (I) Pvt Ltd, India

l. Netco Cable Industries Pvt Ltd, India

m. Nicco Corporation Ltd, India

n. Paramount Communications Ltd, India

o. Polycab Wires Pvt Ltd, India

p. Radiant Cables Pvt Ltd, India

q. Reliance Engineers Ltd., India

r. Suyog Electricals Ltd, India

s. Thermo Cables Ltd

17.0 GAS DETECTION SYSTEM

a. Crowcon Detection Instruments Ltd

b. Detection Instruments (I) Pvt Ltd

c. Detector Electronics Corporation

d. Drager Safety AG & Co. KGAA

e. General Monitors Ireland Ltd

f. Mine Safety Appliances Company

g. MSA – Mines Safety Appliances(India) Ltd

h. Industrial Scientific Oldham France S.A.

i. Riken Keiki Co Ltd

j. Simrad Optronics Icare

k. Honeywell Analytics

l. Net Safety Monitoring Inc.

m. Simtronics SAS

18.0 MOV ACTUATOR:

a. Rotork- UK, USA & INDIA

b. Limitorque

c. Auma- India

d. Biffi- Italy

19.0 PNEUMATIC ACTUATOR (SOLENOID OPERATED ON-OFF TYPE)

a. Metso Automation

b. Tyco

c. Samson Controls

d. L&T

e. Emerson

f. Fisher

g. Masoneilan Process Control

h. Instrumentation Limited (IL)-Palghat

i. Micro Finish

j. Rotex

20.0 SOLENOID VALVES

a. Avcon

b. Festo

21.0 ELECTRO – HYDRAULIC ACTUATOR

a. Avcon Rotork controls (Deutchland Gmbh)

b. Biffi Italia Srl

c. Ledeen (Italy)

d. Virgo Valves and Controls ltd.-India

e. Limittorque

f. Reineke

g. Voith

h. Bettis

i. Rotork- UK, USA & INDIA
j. Rotex
k. Schuck Group

22.0 GAS OVER OIL ACTUATOR

l. Biffi Italia Srl,
m. Ledeen(Italy)
n. Virgo Valves & Control ltd.-India,
o. Voith,
p. Bettis,
q. Rotork-UK, USA, India,
r. Rotex,
s. Schuck Group,
t. Valve Italia.

23.0 OFC

Manufacture/ Procurement, Testing and supply of suitable OFC Joint closures including all necessary accessories of any of the following make:

a. Raychem
b. 3M
c. Siemens
d. Any other make from the approved vendor list of client with supporting paper.

24.0 FLOW CONTROL VALVES

e. Fouress Engg. (New Delhi)
f. Fisher Xomox (New Delhi)
g. MIL Control Ltd. (Noida)
h. KOSO India Pvt ltd
i. Samson Control (Thane)
j. Dresser Valves India Pvt Ltd.
k. Fisher Controls
l. Valvitalia Italy
m. CCI Valve technology
n. Flowserve Pvt Ltd.
o. Metso Singapore Pvt Ltd.

p. Instrumentation Ltd Palghat

q. Dresser Inc. USA

25.0 FLOW COMPUTERS

r. Emerson

s. Instromet International (Belgium)

t. FMC Measurement Solutions (UK)

u. RMG (Germany)

v. OMNI Flow Computers Inc.

w. Thermo Fisher, USA

26.0 INDICATORS & CONTROLLERS

x. Yokogawa

y. Eurotherm Chessel

z. Honeywell

aa. Emerson

27.0 BARRIERS

bb. MTL

cc. STHAL

dd. P&F

ee. Phoenix

28.0 GAS CHROMATOGRAPH

ff. ABB

gg. Emerson

hh. Instromet International, NV

ii. RMG Regal+Messtechnik GmbH

jj. Yokogawa

29.0 I/P CONVERTERS

kk. ABB

ll. Emerson

mm. IMI Watson Smith Ltd.

nn. Moore Controls Ltd

oo. Shreyas Instruments Pvt Ltd, India

pp. Thermo Brandt Instruments

30.0 SS FITTINGS, INSTRUMENT VALVES & MANIFOLDS

30.1 FOR CNG WORK:

qq. DK-LOK

rr. Swagelok Co.

ss. Parker

30.2 EXCEPT CNG WORK:

a. Swagelok Co.

b. Parker

c. Aura INC.

d. HOKE

e. Excelsior Engineering works

f. Swastik Engineering works India

g. Comfit and valves pvt ltd

h. Arya craft and engineering Pvt ltd

i. DK lok

31.0 SS TUBES

31.1 FOR CNG WORK:

a. Swagelok Co.

b. Parker

c. Sandvik

31.2 EXCEPT CNG WORK:

a. Swagelok Co.

b. Parker

c. Sandvik

d. Heavy metal and tube limited

e. Nuclear fuel complex India

f. Scorodite

g. Ratnamani Metals and Tubes

h. Jindal Saw

E. SHOP & FIELD PAINTING

LIST OF RECOMMENDED VENDER/SUPPLIERS OF MAJOR BOUGHT-OUT ITEMS

1.0 INDIAN VENDORS

a. Asian Paints (I) Ltd.

b. Berger Paints Ltd.

c. Goodlass Nerlolac Paints Ltd.

d. Jenson And Nicholson Paint Ltd & chokuGu Jenson & Nicholson Ltd.

e. Shalimar Paints Ltd.

f. Sigma Coating, Mumabai

g. CDC Carboline Ltd.

h. Premier Products Ltd.

i. Coromandel Paints & Chemicals Ltd.

j. Anupam Enterprises

k. Grand Polycoats

l. Bombay Paints Ltd.

m. Vanaprabha Esters & Glycer, Mumbai

n. Sunil Paints and Varnishes Pvt. Ltd.

o. Courtaulds Coating & Sealants India (Pvt.) Ltd.

p. Mark-chem Incorporated, Mumbai (for phosphating chemicals only)

q. VCM Polyurethane Paint (for polyurethane Paint only)

2.0 FOREIGN VENDORS FOR OVERSEAS PRODUCTS

a. Sigma Coating, Singapore

b. Ameron, USA

c. Kansai Paint, Japan

d. Hempel Paint, USA

e. Valspar Corporation, USA

f. Courtaulds Coating, UK.

Notes:

1. Bidder can select equipment of two different makes, selected from this VENDOR LIST and mention the same in the checklist for technical evaluation attached with the tender. The offered bid must include filled datasheet indicating make, model, size, rating of offered instrument/ equipment duly supported by sizing calculation of offered equipment (wherever applicable).

2. Vendors who have already supplied above equipment in other terminals of client, shall also be considered qualified for this tender provided the supplied equipment are commissioned and running successfully and they have not been put on holiday.

3. Equipment / Instruments of any make which is offered by one bidder and acceptable to client shall be accepted for other bidder also. After placement of order, on request of the successful bidder list of other qualified makes for a particular item (for which successful bidder wants to change the vendor) shall be provided.

4. Bidder shall take prior approval of the make / model no of the offered item and it shall be from the list given above. However additional vendors will be considered in exceptional cases, provided they have supplied for similar application to reputed gas transmission/distribution companies, in quantities at least half the numbers being supplied for this tender, and working satisfactorily for minimum 6 months. Documentary evidence substantiating above shall be submitted for taking approval.

F. FOR PE & LMC WORK (GI/CU)

1.0 MDPE FITTINGS & MDPE VALVES

a. Aliaxis,
b. George Fischer,
c. Al-Aziz,
d. Kimplas,
e. Banides,
f. Agru,
g. Friatech,
h. Plasson

2.0 GI PIPE

a. Swastik Pipe Ltd.
b. Jindal Industries Ltd.
c. Vishal Pipes Ltd.
d. Indus Tubes Ltd
e. Advance steel Tubes Ltd.
f. Good Luck Tubes Ltd.
g. Surya Roshni Limited
h. APL Apollo Tubes Limited
i. Jindal Pipes Limited
j. RK Steel Manufacturing Company Private Limited
k. PSL Tubes Limited

3.0 CASTING GI FITTINGS

a. Sarin Industries Ltd.
b. Jupiter Metal Industries Ltd.
c. Jainsons Industries Ltd.
d. Jinan Meide Casting Co. Ltd.
e. Green Malleable Pvt. Ltd.

4.0 FORGED GI FITTING (FOR HIGH RISE SEGMENT)

a. Jainsons Industries
b. B.M. Meters Pvt. Ltd.

5.0 COPPER TUBES & FITTINGS

a. Jay Banas Mehta Tubes Limited- Trade Mark "MEXFLOW"

b. Rajco metal (Tubes & Fittings)

c. Paras Industries

d. MERCURE METAL & ALLOYS PVT LTD

6.0 BRASS FITTINGS

a. Chandan Enterprises

b. Paras Industries Ltd.

7.0 BRASS VALVES

a. Universal srl, Italy

b. Tiemme Raccorderie Sede, Italy

c. Enolgas Bonimu s.a.s., Italy

d. Fratelli Fortis s.r.l, Italy

e. Giacomo Climbrio, Italy

f. Parker Hannifin S.P.A., USA

g. Singapore Valve & Amp; Fittings Pte Limited, Singapore /Bengaluru

h. Rubinetterie Utensilerie Bonomi (RUB), Italy

i. Zhegiang Valogin Technology Co. Ltd., China,

j. Ningbo Zhiqing Industrial Co. Ltd., China,

k. Zhegiang Dunan Valve Co. Ltd.,

l. Ningbo Huaping, China.

8.0 BRASS FITTINGS

a. Chandan Enterprises

b. Paras Industries Ltd.

c. Chokhawala Distributors – Brass Adaptor.

9.0 STEEL RE-INFORCED RUBBER HOSE (TYPE-4)

a. Super Seal Flexible Hose Ltd.

b. Suraksha Products Pvt. Ltd.

c. Vansh Industries

d. T & L Gases

10.0 CORRUGATED FLEXIBLE METAL HOSES (ANACONDA)

a. KPC Flex Tubes

b. Vestas Hose Division

c. Alpha Flexi Tubes

d. Chandan Enterprises

Note:

1. Vendor may procure material from any of approved vendors listed.
2. For equipment/components other than the above, vendor shall submit past track record for the proposed sub-vendors and obtain written approval from Owner / Consultant before placing order.
3. In case of exigencies like long delivery periods from approved vendors, the contractor shall list down the proposed suppliers/vendors for such items and submit the same for owner review/approval along with necessary documents/PTR.
4. Non-acceptance of a particular proposed vendor due to any reasons whatsoever shall not be a cause of schedule and cost implication. If equipment is sourced from outside India, vendor shall obtain prior approval for make of equipment before placement of order.

Above mentioned vendor list is tentative and further addition/deletion may be done as per discretion of Owner/VCS.