REVISION RECORD

Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
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		Satish Singh	RN Rai	RN Rai	Suresh Kumar	
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		Satish Singh	RN Rai	RN Rai	Suresh Kumar	
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		Rajesh Patra	Roohe Zafar	Mahesh Chand	Hashim Khan	
						

ABBREVIATION

DCP	Dry Chemical Powder
IS	Indian Standard
OISO	Oil Industry Safety Directorate
PESO	Petroleum Explosive Safety Organization (formerly known as CCOE)

CONTENTS

1.0 SCOPE

This specification lays down the requirements regarding material, shape, construction, chemical charges, anticorrosive treatment, painting and test for trolley mounted dry powder fire extinguishers of capacities 50 kg and 75 kg.

2.0 CODES AND STANDARDS

IS: 10658	Specification for Higher Capacity Dry Powder Fire Extinguisher (Trolley Mounted).
OISD-GDN-115	Guidelines on Fire Fighting, Equipment and Appliances in Petroleum Industry.

Note: - Latest Edition of all standard documents shall be followed.

3.0 DESIGN REQUIREMENTS

3.1 The method of expulsion of dry powder shall be by means of pressure produced from compressed or liquefied gas from gas cylinder attached to the body or gas cartridge attached to the cap.

3.2 The total capacity of the dry powder extinguisher when filled for the various capacities shall be as under:

Nominal Size (Kg)	Dry Powder content (Kg. minimum.)
50	50
75	75

3.3 Discharge hose length shall be 5.0 M.

3.4 The expellant gas shall be CO2 unless otherwise specified.

4.0 MATERIAL OF CONSTRUCTION

4.1 The material of construction shall be as per IS: 10658 Standard Specification for Higher Capacity Dry Powder Extinguisher (Trolley Mounted).

4.2 Construction, anticorrosive treatment, painting, test requirement, wheeled carriage and other design criteria shall be as per IS: 10658.

5.0 SAFETY CLIP

Safety Clip should be provided to prevent accidental actuation of piercing mechanism.

6.0 MARKING

Each extinguisher shall be clearly and permanently marked with the information specified in IS:10658 along with the BIS certification mark and purchaser's name.

7.0 APPROVALS AND INSPECTION

A clearance/approval certificate from the PESO, Nagpur shall be submitted for each N2 cylinder I gas cartridge supplied with the DCP extinguishers.

VCS or its authorized representatives shall have access at all reasonable times to the manufacturer's works where the extinguishers are being manufactured or being tested.

8.0 INFORMATION REQUIRED FROM VENDOR

8.1 The vendor shall furnish the following information along with the offer and for approval prior to fabrication.

- General arrangement of trolley mounted extinguisher showing plan and elevation.
- Fabrication details and plate thickness calculation for pressure vessel.
- Catalogues for all bought out items with Model No. If any.

8.2 Following information shall be furnished by the vendor along with the supply of extinguisher:

- Instruction book(s) - Instruction book(s) for guidance of the user including both the operating and normal maintenance procedures shall be supplied. The book(s) shall include an itemized and illustrated part list/spare parts list giving reference number of all the wearing parts.
- Duly approved final drawings listed in clause 8.1.
- A clearance/approval certificate from PESO as described in clause 7.

Energising Quality

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION
FOR
PORTABLE FIRE EXINTGUISHER

VCS-SS-ME-3006

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
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		Rajesh Patra	Roohe Zafar	Mahesh Chand	Hashim Khan	
						

ABBREVIATION

MS	MILD STELL
IS	INDIAN STANDARD
PESO	PETROLEUM EXPLOSIVE SAFETY ORGANISATION

CONTENTS

1.0 SCOPE

This standard lays down requirements regarding material, shape, construction, method of operation, performance and tests of portable fire extinguisher of Carbon Dioxide type, Dry Chemical Powder Type Fire Extinguisher and water based or foam based (Gas Pressure) Fire Extinguishers.

The extinguisher shall be supplied along with respective extinguishing media duly charged.

2.0 CODES AND STANDARDS

IS:5	Colors for ready mixed paints and enamels
IS: 2932	Enamel, synthetic, exterior; a) undercoating, b) finishing - specification
IS: 4308	Dry Chemical Powder for Fighting Band C Class Fires
IS: 4861	Dry Chemical Powder for Fighting Fires in Burning Metals
IS: 4989	Foam concentrate for producing mechanical foam for firefighting specification
IS: 14609	Dry Chemical Powder for Fighting A, B, C Class Fires
IS: 15222	Carbon dioxide as the extinguishing media for fire protection - Specification
IS: 15683	Portable Fire Extinguishers, Performance and Construction - Specification

Note: Latest Edition of all standard documents shall be followed

3.0 MATERIAL OF CONSTRUCTION & BASIC REQUIREMENT

3.1 The material, shape, construction, method of operation, performance, contents and test shall comply with IS: 15683.

3.2 Carbon dioxide used in extinguishers shall comply with IS: 15222

3.3 Dry powder conforming to IS: 14609, 1S. 4308 or IS: 4861 shall be used for charging the extinguishers.

3.4 The extinguishing media for water or / and foam based fire extinguishers shall be pure water or water with additives such as wetting agents, viscosity increasing agents, flame retardants or foaming agents etc. as per the requirement. Foam concentration shall be as per the requirements specified in IS: 4989.

4.0 APPROVALS

Portable extinguishers shall have approval from PESO, Government of India

5.0 COLOR & MARKING

The color of extinguisher bodies shall be red conforming to shade no.536 or 538 of IS: 5. The paint shall conform to IS: 2932. Each extinguisher shall be clearly and permanently marked with the information specified in IS: 15683, along with IS certification mark and purchaser's name.

6.0 ACCESSORIES

Each extinguisher shall be supplied with MS bracket, screws and spanner as may be necessary. The details of the bracket shall be submitted with the offer.

7.0 INSPECTION

Owner's / VCS authorized representative shall have access at all reasonable times to vendor's works where Extinguishers are being manufactured and/or tested. Vendor shall arrange for all tests and inspection facilities for checking material, design and fabrication, workmanship, finish, performance (operating performance and performance required for test fires), and testing as per IS: 15683.

INFORMATION REQUIRED FROM VENDOR

Following information shall be furnished by the vendor along with the supply of extinguisher:

Instruction book(s) - Instruction book(s) for guidance of the user including both the operating and normal maintenance procedures shall be supplied. The book(s) shall include an itemized and illustrated part list/spare parts list giving reference number of all the wearing parts.

Approval certificate from PESO as described in clause 4.

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.

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION
FOR
DOCUMENTATION REQUIREMENTS
FROM SUPPLIERS

VCS – SS – PP - 2043

01	30.07.2022	RKP	MC	HK	GW
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00	20.07.2020					
		MB	MC	AD	SK	
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		RKP	MC	HK	GW	

Abbreviations:

DCI	:	Document Control Index
edms	:	Electronic Document Management System
FOA	:	Fax of Acceptance
HOD	:	Head of Division / Department
IC	:	Inspection Certificate
IRN	:	Inspection Release Note
ITP	:	Inspection and Test Plan
LOA	:	Letter of Acceptance
MOU	:	Memorandum of Understanding
MR	:	Material Requisition
PO	:	Purchase Order
PR	:	Purchase Requisition
PVC	:	Polyvinyl Chloride
QMS	:	Quality Management System
TPIA	:	Third Party Inspection Agency
URL	:	Universal Resource Locator

CONTENTS

1.0 SCOPE

This specification establishes the Documentation Requirements from Suppliers. All documents/data against the PO / PR / MR shall be developed and submitted to OWNER by the suppliers for review / records, in line with this specification.

2.0 DEFINITIONS

2.1 Supplier

For the purpose of this specification, the word "SUPPLIER" means the person(s), firm, company or organization who is under the process of being contracted by OWNER for delivery of some products (including service). The word is considered synonymous to bidder, contractor or vendor.

2.2 Owner

Owner means the owner of the project for which services / products are being purchased and includes their representatives, successors and assignees.

3.0 REFERENCE DOCUMENTS

VCS-SS-PP-2044 Standard Specification for Quality Management System Requirements from Vendors

4.0 DOCUMENTATION REQUIREMENTS

4.1 Documents/Data to be Submitted by the Supplier

4.1.1 The Supplier shall submit the documents and data against the PO/PR/MR as per the list given in respective PO/PR/MR.

4.1.2 Review of the supplier drawings by PMC/ OWNER would be only to review the compatibility with basic designs and concepts and in no way absolve the supplier of his responsibility/contractual obligation to comply with PR requirements, applicable codes, specifications and statutory rules/regulations. Any error/deficiency noticed during any stage of manufacturing/execution/installation shall be promptly corrected by the supplier without any time and cost implications, irrespective of comments on the same were received from OWNER during the drawing review stage or not.

4.1.3 Unless otherwise specified, submission of documents for Review/Records shall commence as follows from the date of Fax of Intent / Letter of Intent/ Fax of Acceptance (FOA)/ Letter of Acceptance (LOA):

QMS - 1 week

Drawing/Document Control Index - 2 weeks

Other Documents/Drawings - As per approved Drawing/Document Control

Index/Schedule

4.1.4 Documents as specified in PO/PR/MR are minimum requirements. Supplier shall submit any other document/data required for completion of the job as per OWNERs instructions.

4.2 Style and Formatting

4.2.1 All Documents shall be in ENGLISH language and in M.K.S System of units.

4.2.2 Before forwarding the drawings and documents, contractor shall ensure that the following information are properly mentioned in each drawing:

Purchase Requisition Number

Name of Equipment / Package

Equipment / Package Tag No.

Name of Project

Client

Drawing / Document Title

Drawing / Document No.

Drawing / Document Revision No. and Date

4.3 Review and Approval of Documents by Supplier

4.3.1 The Drawing/Documents shall be reviewed, checked, approved and duly signed/stamped by supplier before submission. Revision number shall be changed during submission of the revised supplier documents and all revisions shall be highlighted by clouds. Whenever the supplier requires any sub-supplier drawings to be reviewed by OWNER, the same shall be submitted by the supplier after duly reviewed, approved and stamped by the supplier. Direct submission of sub-supplier's drawings without contractor's approval shall not be entertained.

4.4 Document Category

4.4.1 Review Category

Following review codes shall be used for review of supplier Drawings/Documents:

Review Code A	-	No comments. Proceed with manufacture/ fabrication as per the document.
Review Code B	-	Proceed with manufacture/fabrication as per commented document. Revised document required.
Review Code C	-	Document does not conform to basic requirements as marked. Resubmit for review
Review Code D	-	Document Rejected
Review Code F	-	For information
R	-	Document is retained for Records. Proceed with manufacture/fabrication.
V	-	Void

4.5 Methodology for Submission of Documents to PMC/Owner

4.5.1 Document Control Index (DCI)

Supplier shall create and submit Document Control Index (DCI) for review based on PO/PR/MR along with schedule date of submission of each drawing/document on OWNERs eDMS. The DCI shall be specific with regard to drawing/document no. and the exact title. Proper sequencing of the drawings/documents should be ensured in scheduled date of submission on of the job as per OWNER.

4.5.2 Submission of Drawings/Documents

Drawings/documents and data shall be uploaded on the eDMS Portal as per DCI

4.5.3 Statutory Approvals

Wherever approval by any statutory body is required to be taken by Supplier, the Supplier shall submit copy of approval by the authority to PMC/OWNER.

4.5.4 Details of Contact Persons of Supplier

After placement of order supplier shall assign a Project Manager for that order. The details are to be filled online through the portal. The details include e-mail address, mailing address, telephone nos., fax nos. and name of Project Manager. All the system generated emails pertaining to that order shall be sent to the assigned Project Manager.

4.5.5 Schedule and Progress Reporting

Supplier shall submit monthly progress report and updated procurement, engineering and manufacturing status (schedule vs. actual) every month, beginning within 2 weeks from FOA/LOA . In case of exigencies, PMC/Owner can ask for report submission as required on weekly/fortnightly/adhoc basis depending upon supply status and supplier shall furnish such reports promptly without any price implication. Format for progress report shall be submitted by the Supplier during kick off meeting or within one week of receiving FOA/LOA, whichever is earlier.

4.5.6 Quality Assurance Plan/Inspection and Test Plan

Inspection and test plans (ITP) attached if any, to the MR/PR are to be followed.

However for cases wherein ITPs have not been attached with MR/PR, Supplier shall submit within one week of receiving FOA/LOA, the Quality Assurance Plan for manufacturing, covering quality control of critical bought out items/materials, inspection& testing at various stages of production, quality control records and site assembly &testing as may be applicable to the specific order and obtain approval from OWNER /PMC/ third party inspection agency, as applicable.

For Package equipment contracts, the supplier shall prepare a list of items/ equipment's and their inspection categorization plan for all items included in the scope of supply immediately after receipt of order and obtains approval for the same from OWNER. The

items shall be categorized into different categories depending upon their criticality for the scope of inspection of TPIA and/or OWNER/ OWNER appointed PMC.

4.5.7 Inspection Release Note (IRN)/ Inspection Certificate (IC)

IRN/ IC shall be issued by PMC Inspector/ third party inspection agency on the basis of successful inspection, review of certificates as per specifications & agreed quality plan (as applicable) and only after all the drawings/documents as per DCI are submitted and are accepted under review code-A or code R. Supplier shall ensure that necessary documents/manufacturing and test certificates are made available to PMC/TPIA as and when desired.

Note: Non fulfilling above requirement shall result into appropriate penalty or withholding of payment as per conditions of PO/PR/MR.

Transportation Plan for Over Dimensional Consignments (ODC), if any, shall be submitted within 2 weeks of receiving FOA/LOA, for approval. Consignment with parameters greater than following shall be considered as over dimensional.

Dimensions: 4 meters width x 4 meters height x 20 meters length

Weight: 32 MT

4.6 Final Documentation

4.6.1 As Built Drawings

Shop changes made by Supplier after approval of drawings under `Code A' by OWNER/OWNER appointed PMC and deviations granted through online system , if any, shall be marked in hard copies of drawings which shall then be stamped 'As-built' by the supplier. These 'As-built' drawings shall be reviewed and stamped by PMC Inspector/TPIA also. Supplier shall prepare scanned images files of all marked — up 'As — built drawings. Simultaneously Supplier shall incorporate the shop changes in the native soft files of the drawings also.

4.6.2 As Built Final Documents

As built final documents shall be submitted as listed in PO/PR/MR.

4.6.3 Packing/Presentation of Final Documents

Final Documents shall be legible photocopies in A4, A3 size only. Drawings will be inserted in plastic pockets (both sides transparent, sheet thickness minimum 0.1 mm) with an extra strip of 12 mm wide for punching so that drawings are well placed.

Final Documentation shall be bound in Hard board Plastic folder(s) of size 265 mm x 315 mm (101 /2 inch x 12 1 /2 inch) and shall not be more that 75 mm thick. It may be of several volumes and each volume shall have a volume number, index of volumes and index of contents of that particular volume. Where number of volumes are more, 90mm thickness can be used. Each volume shall have top PVC sheet of minimum 0.15mm thick duly fixed and pressed on folder cover and will have 2 lever clips. In case of imported items documents, 4 lever clips shall also be accepted. All four corners of folders shall be properly metal clamped. Indexing of contents with page numbering must be incorporated by supplier. Spiral/Spico bound documents shall not be acceptable. As mentioned above,

books should be in hard board plastic folders with sheets punched and having 2/4 lever clips arrangement.

Each volume shall contain on cover a Title Block indicating package Equipment Tag No. & Name, PO/Purchase Requisition No., Name of Project and Name of Customer. Each volume will have hard front cover and a reinforced spine to fit thickness of book. These spines will also have the title printed on them. Title shall include also volume number (say 11 of 15) etc.

4.6.4 Submission of Soft Copies

Supplier shall submit to OWNER, the scanned images files as well as the native files of

Drawings / documents, along with proper index.

In addition to hard copies, Supplier shall submit electronic file (CD-ROM) covering soft

copies of all the final drawings and documents, all text documents prepared on computer, scanned images of all important documents (not available as soft files), all relevant catalogues, manuals available as soft files (editable copies of drawings/text documents, while for catalogues/manuals/proprietary information and data, PDF files can be furnished).

All the above documents shall also be uploaded on the OWNERs eDMS portal.

4.6.5 Completeness of Final Documentation

Supplier shall get the completeness of final documentation verified by PMC appointed TPIA and attach the Format for Completeness of Final Documentation Format duly signed by OWNER/ OWNER appointed PMC/ Inspector or TPIA as applicable to the document folder.

ANNEUXRE-1

COMPLETENESS OF FINAL DOCUMENTATION

Name of Supplier/Contractor :

Customer :

Project :

OWNER's Job No. :

Purchase Order No./

Contract No. :

Purchase Requisition No./

Tender No. : Rev. No. :

Name of the Work/

Equipment :

Tag. No. :

Supplier's/ Contractor's

Works Order No. :

Certified that the Engineering Documents/ Manufacturing & Test Certificates submitted by the supplier is complete in accordance with the Vendor Data Requirements of Purchase Requisition.

Signature :..... Signature:.....

Date :..... Date:.....

Name :..... Name:.....

Designation :..... Designation:.....

Department :..... Department:.....

Supplier/Contractor **OWNER/PMC/TPIA**

ENERGISING QUALITY

VCS QUALITY SERVICES PRIVATE LIMITED

STANDARD SPECIFICATION

FOR

FABRICATION AND ERECTION OF PIPING

VCS – SS – PL - 0008

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
00	23.06.2017	ISSUED AS STANDARD	AS	SM	AD

ABBREVIATIONS:

NACE	National Association of Corrosion Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing of Materials
BHN	Brinell hardness number
MSS-SP	Manufacturers Standardization Society - Standard Practice
LTCS	Low temperature Carbon Steel AS Alloy Steel

CONTENTS

1.0 SCOPE

This specification sets out the basic requirements for fabrication and erection/ installation of above ground and trench piping systems at site. This specification covers the scope of work, basis of work to be carried out by the contractor and standards, specifications, normal practice which shall apply to all piping installed by or pre-fabricated for installation by contractor.

2.0 REFERENCE DOCUMENTS

Reference has also 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)

B 31.3 : Process Piping.

B 31.4 : Pipeline Transportation System for liquid Hydrocarbon and other liquids.

B 31.8 : Gas Transmission and Distribution Piping Systems.

3.0 SCOPE OF WORK OF CONTRACTOR

Scope of work of contractor shall include the following else otherwise specified:

3.1 Transportation of required piping materials (as described in Cl. 2.1.1), pipe supports materials (as described in Cl. 2.3) and all other necessary piping materials from owner's storage areas or contractor's storage point (in case of contractor's scope of supply) to work site/ shop including raising store requisitions for issue of materials in the prescribed format and maintaining an account of the materials received from owner's stores.

3.1.1 Piping materials include the following but not limited to the same.

a) Pipes (All sizes and schedule).

b) Fittings (All sizes, types & schedule).

c) Flanges (All sizes, types & Pressure ratings).

d) Valves & Gaskets (All sizes, types & Ratings).

e) Bolts, Nuts or M/C Bolts (All types), Studs and Expansion joint/ bellows (All sizes).

f) Specialty items like online Filters, Scrubber, Scraper, Pumps, Compressors, Strainers and Air traps etc.

g) Online instruments like control valves, orifice flange, rotameter, safety valves etc.

3.2 Shop and field fabrication and erection of piping in accordance with documents listed under Cl.3.0 including erection of all piping materials listed above.

3.3 Fabrication and erection of pipe supports like shoe, saddle, guide, stops, anchors, clips, cradles, hangers, turn buckles, supporting fixtures, brackets cantilevers, struts, tee posts, including erection of spring supports and sway braces.

3.4 Fabrication of plain and threaded nipples from pipes as required during erection.

3.5 Fabrication of swage nipples as and when required.

3.6 Fabrication of odd angle elbow like 60°, 30° or any other angle from 90/ 45° elbows as and when required.

3.7 Fabrication of flange, reducing flange, blind flange, spectacle blinds as and when required.

3.8 Fabrication of stub-in connection with or without reinforcement.

3.9 Grinding of edges of pipes, fittings, flanges etc. to match mating edges of uneven/ different thickness wherever required.

3.10 Modifications like providing additional cleats, extension of stem of valve, locking arrangement of valves etc. as and when required.

3.11 Preparation of isometrics, bill of materials, supporting details upto 2-1/2" within the unit battery limit and get subsequent approval from Company Representative as and when called for.

3.12 Obtaining approval for drawings prepared by contractor from statutory authority, if required.

3.13 Spun concrete lining at inside of pipes 3" NB and above including fittings and flanges as required in accordance with specification.

3.14 Rubber lining inside pipes, fittings, flanges as and when required, in accordance with specification.

3.15 Radiography, stress relieving, dye penetration, magnetic particle test etc. as required in specification.

3.16 Casting of concrete pedestals and fabrication and erection of small structures for pipe supports including supply of necessary materials.

3.17 Providing insert plates from concrete structures and repair of platform gratings around pipe openings.

3.18 Making material reconciliation statement and return of owner's supply left over materials to owner's storage.

3.19 Flushing and testing of all piping systems as per standard specification for inspection, flushing and testing of piping systems.

3.20 Pickling (as and when applicable) as per standard specification for chemical cleaning of C.S. suction piping of compressors.

3.21 Submission of job execution procedure for review and approval of Company Representative covering all above activities.

4.0 BASIS FOR WORK

4.1 The complete piping work shall be carried out in accordance with the following:

4.1.1 "Approved for construction" drawings and sketches issued by vcs to the Contractor, Plan and/ or Isometrics.

4.1.2 "Approved for construction" drawings and sketches issued by Turn-key bidders to the Contractor, Plan and/ or Isometrics.

4.1.3 Approved process licensor's standards and specifications.

4.1.4 Drawing, sketches and documents prepared by contractor duly approved by Company.

4.1.5 Approved construction job procedures prepared by contractor as stipulated in 2.20.

4.1.6 VCS specifications/ documents as below:

a) Process and Instrument Diagram.
b) Piping materials specification.
c) Piping support standards.
d) Line list
e) Piping support indices (only in offsite), if support are not shown in plan.
f) Standard specification of non-destructive requirement of piping.
g) Welding specification charts for piping classes.
h) Standard specification for pressure testing of erected piping system.
i) Welding specification for fabrication of piping.
j) Any other VCS or Other specifications attached with piping material specification or special condition of contract.

4.1.7 Following codes, standards and regulations:

a)	ASME B 31.8	: Gas Transmission and Distribution piping systems.
	ASME B 31.4	: Pipeline Transportation systems for Liquid Hydrocarbons and Other Liquids.
b)	ASME B 31.3	: Process Piping.
c)	ASME Sec. VII	: Code for unfired pressure vessel.
d)	IS: 823	: Code for procedure for manual metal arc welding of mild steel (For structural steel).
e)	NACE Std.	: Code for sour services material requirements MR-01-75.

Note: All codes referred shall be of latest edition, at the time of award of contract.

4.2 DEVIATIONS

Where a deviation from the "Basis of Work" and approved job procedure described above is required or where the basis of work does not cover a particular situation, the matter shall be brought to the notice of Company Representative and the work carried out only after obtaining written approval from him in each case.

5.0 FABRICATION

5.1 PIPING MATERIAL

Pipe, pipe fittings, flanges, valves, gaskets, studs bolts etc. used in a given piping system shall be strictly as per the "Piping material specification" for the "Pipe class" specified for that system. To ensure the above requirement, all piping material supplied by the owner/ contractor shall have proper identification marks as per relevant standards/ VCS specifications/ Licensors specification. Contractor shall provide identification marks on left over pipe lengths wherever marked up pipe lengths have been fabricated/ erected. Material traceability is to be maintained for A.S., S.S., NACE, LTCS, material for hydrogen

service and other exotic materials by way of transferring heat number, etc. (hard punching) as per approved procedure. This shall be in addition to color coding for all piping materials to avoid mix-up.

For the purpose of common understanding of construction job procedure, to be submitted by the contractor, shall include proposal for

a) Maximizing prefabrication, inspection and testing at fabrication shop with minimum field joints.
b) Positive material identification, handling, storage and preservation (if required).

5.2 DIMENSIONAL TOLERANCES

Dimensional tolerances for piping fabrication shall be as per Company Standard. The contractor shall be responsible for working to the dimensions shown on the drawings. However the contractor shall bear in mind that there may be variations between the dimensions shown in the drawing and those actually existing at site due to minor variations in the location of equipments, inserts structures etc. To take care of these variations "Field Welds" shall be provided during piping fabrication. An extra pipe length of 100 mm over and above the dimensions indicated in the drawing may be left on one side of the pipe at each of the field welds. During erection, the pipe end with extra length at each field weld shall be cut to obtain the actual dimension occurring at site. Isometrics, if supplied may have the field welds marked on them. However it is the responsibility of the contractor to provide adequate number of field welds. In any case no extra claim will be entertained from the contractor on this account. Wherever errors/ omissions occur in drawings and Bills of Materials it shall be the contractor's responsibility to notify the Company Representative prior to fabrication.

5.3 PIPE JOINTS

The piping class of each line specifies the type of pipe joints to be adopted. In general, joining of lines 2" and above in process and utility piping shall be accomplished by butt welds. Joining of lines 1-1/2" and below shall be by socket welding/ threaded joints as specified in "Piping material specifications". However, in piping 1 ½" and below where socket welding/ threaded joints are specified, butt weld may be used with the approval of Company Representative for pipe to pipe joint in long run of piping. This is only application for non-galvanized piping without lining.

Flange joints shall be used at connections to vessels, equipment's, valves and where required for ease of erection and maintenance as indicated in drawings.

5.4 BUTT WELDED AND SOCKET WELDED PIPING

End preparation, alignment and fit-up of pipe pieces to be welded, welding, pre-heating, post-heating and heat treatment shall be as described in the welding specification and NDT specification.

5.5 SCREWED PIPING

In general, galvanized piping shall have threads as per IS: 554 or ANSI B2.1 NPT as required matching threads on fitting, valves etc. All other piping shall have threads as per ANSI B2.1, tapered unless specified otherwise.

Threads shall be clean cut, without any burrs or stripping and the ends shall be reamed. Threading of pipes shall be done preferably after bending, forging or heat treating operations. If it is not possible, threads shall be gauge checked and chased after welding heat treatment etc.

During assembly of threads joints, all threads of pipes and fittings shall be thoroughly cleaned of cuttings, dirt, oil or any other foreign matter. The male threads shall be coated with thread sealant and the joint tightened sufficiently for the threads to seize and give a leak proof joint.

Threaded joint to be seal-welded shall be cleaned of all foreign matter, including sealant and make up to full thread engagement before seal welding.

5.6 FLANGES CONNECTIONS

All flanges facings shall be true and perpendicular to the axis of pipe to which they are attached. Flanged bolt holes shall straddle the normal centerlines unless different orientation is shown in the drawing. All bolts shall be equally tightened.

Wherever a spectacle blind is to be provided, drilling and the jack screws in the flange shall be done welding it to the pipe.

5.7 BRANCH CONNECTIONS

Branch connections shall be as indicated in the piping material specifications. For end preparation, alignment, spacing, fit-up and welding of branch connections refer welding specifications. Templates shall be used wherever required to ensure cutting and proper fit-up.

For all branch connections accomplished either by pipe to pipe connections or by using forged tees the rates quoted for piping shall be inclusive of this work.

Reinforcement pads shall be provided whether indicated in drawings/ specifications etc.

5.8 BENDING

Bending shall be as per ASME B31.3 except that corrugated or creased bends shall not be used.

Cold bends for lines 1-1/2” and below, with a bend radius of 6 times the nominal diameter shall be used as required in place of elbow wherever allowed by piping specifications. Bending of pipe 2” and above may be required in some cases like that for headers around heaters, reactors etc.

The completed bend shall have a smooth surface, free from cracks, buckles, wrinkles, bulges, flat spots and other serious defects. They shall be true to dimensions. The flattening of a bend, as measured by the difference between the maximum and minimum diameters at any cross-section, shall not exceed 8% and 3% of the normal outside diameter, for internal and external pressure respectively.

5.9 MITRE BENDS AND FABRICATED REDUCERS

The specific application of welded miter bends and fabricated reducers shall be governed by the piping material specifications. Generally all 90° mitres shall be 4-

piece 3-weld type and 45° mitres shall be 3-piece 2-weld type as per standard unless otherwise specified. Reducers shall be fabricated as per directions of Company Representative. The radiographic requirements shall be as per material specifications for process and utility systems.

5.10 CUTTING AND TRIMMING OF STANDARD FITTING AND PIPES

Components like pipes, elbows, couplings, half-couplings etc. shall be cut/ trimmed/ edge prepared whether required to meet fabrication and erection requirements, as per drawings and instructions of Company Representative. Nipples as required shall be prepared from straight length piping.

5.11 GALVANISED PIPING

Galvanised carbon steel piping shall be completely cold worked, so as not to damage galvanized surfaces. This piping involves only threaded joints and additional external threading on pipes may be required to be done as per requirement.

5.12 JACKETED PIPING

The jacketing shall be done in accordance with specification or Licensors specification as suggested in material specification or special condition of contract.

Pre-assembly of jacketed elements to the maximum extent possible shall be accomplished at shop by contractor. Position of jump over and nozzles on the jacket pipes, fittings etc. shall be marked according to pipe disposition and those shall be prefabricated to avoid damaging of inner pipe and obstruction of jacket space. However valves, flow glasses, in line instruments or even fittings shall be supplied as jacketed.

5.13 SHOP FABRICATION/ PREFABRICATION

The purpose of shop fabrication or pre-fabrication is to minimize work during erection to the extent possible. Piping spool, after fabrication, shall be stacked with proper identification marks, so as facilitate their withdrawal at any time during erection. During this period all flange (gasket contact faces) and threads shall be adequately fabricated by coating with removable rust preventive. Care shall also be avoiding any physical damage to flange faces and threads.

5.14 FORGING AND FORMING

Forging and forming of small bore fittings, like reducing nipples for piping 1 ½" and below, shall be as per ASME B 31.3.

5.15 MISCELLANEOUS

5.15.1 Contractor shall fabricate miscellaneous elements like flash pot, seal pot, sample cooler, supporting elements like turn buckles, extension of spindles and interlocking arrangement of valves, operating platforms as required by Company Representative.

5.15.2 Span Concrete Lining

The work of inside spun concrete lining of pipes and specials of diameter 3" and above shall be done as per material specifications and special condition contract.

5.15.3 Fabrication of pipes from plate

Pipes shall be fabricated at site as and when required as per the specifications attached with contract document and the actual piping material specification.

6.0 ERECTION

6.1 CLEANING OF PIPING

On completion of fabrication, all pipes and fittings shall be cleaned inside and outside by suitable means (mechanical cleaning tool, wire brush, etc.) before erection to ensure that assembly is free from all loose foreign material such as scale, sand, weld spatter particles, cutting chips etc.

All field-fabricated piping shall also be cleaned at the completion of the fabrication. All burrs, welding circles and weld spatter shall be removed by suitable means (mechanical tools, wire brush etc.)

Special cleaning requirements for some services, if any shall be as specified in the piping material specification or isometric or line list. S.S. jacketed piping requiring pickling shall be pickled to remove oxidation and discoloring due to welding.

6.2 PIPING ROUTING

No deviations from the piping route indicated in drawings shall be permitted without the consent of Company Representative.

Pipe to pipe to structure/ equipments distances/ clearances as shown in the drawings shall be strictly followed as these clearances may be required for the free expansion of piping/ equipment. No deviations from these clearances shall be permissible without the approval of Company Representative.

In case of fouling of a line with other piping, structure, equipment etc. the matter shall be brought to the notice of Company Representative and corrective action shall be taken as per his instructions.

6.3 SLOPES

Slopes specified for various lines in the drawings/ P&ID shall be maintained by the contractor. Corrective action shall be taken by the contractor in consultation with Company Representative wherever the contractor is not able to maintain the specified slope.

6.4 VENTS AND DRAINS

High point vents and low point drains shall be provided as per the instructions of Company Representative, even if these are not shown in the drawings. The details of vents and drains shall be as per piping material specifications/ job standards.

6.5 VALVES

Valves shall be installed with spindle/ actuator orientation/ position as shown in the layout drawings. In case of any difficulty in doing this or if the spindle orientation/ position is not shown in the drawings, the Company Representative shall be consulted and work done as per his instructions. Care shall be exercised to ensure that globe valves, check valves and

other uni-directional valves are installed with the "flow direction arrow" on the valve body pointing in the correct direction. If the direction of arrow is not marked on such valves, this shall be done in the presence of Company Representative before installation.

Fabrication of stem extensions, locking arrangements and interlocking arrangements of valves (if called for), shall be carried out as per drawings/ instructions of Company Representative.

6.6 INSTRUMENTS

Installation of in-line instruments such as restriction orifices, control valves, safety valves, relief valves, Rota meters, orifice flange assembly, venturimeters, flow meters etc. shall form a part of piping erection work.

Fabrication and erection of piping up to first block valve/ nozzle/ flange for installation of offline instruments for measurement of level, pressure, temperature; flow etc. shall also form part of piping construction work. The limits of piping and instrumentation work will be shown in drawing/ standards/ specifications. Orientations/ locations of take-offs for temperature, pressure, flow, level connections etc. shown in drawings shall be maintained.

Flushing and testing of piping systems which include instruments mentioned above and the precautions to be taken are covered in flushing, testing and inspection of piping Specification. Care shall be exercised and adequate precautions taken to avoid damage and entry foreign matter into instruments during transportation, installation, testing etc.

6.7 LINE MOUNTED EQUIPMENTS/ ITEMS

Installation of line mounted items line filters, strainers, steam traps, air traps, desuperheaters, ejectors, sample coolers, mixers, flame arrestors, sight glasses etc. Including their supporting arrangements shall form part of piping erection work.

6.8 BOLTS AND NUTS

The contractor shall apply moly coat grease mixed with graphite power (unless otherwise specified in the piping class) al bolts and nuts during storage, after erection and wherever flange connection are broken and made-up for any purpose whatsoever. The grease and graphite powder shall be supplied by the contractor within the rates for piping work.

6.9 PIPE SUPPORTS

Pipe supports are designed and located to effectively sustain the weight and thermal effects of the piping system and to prevent its vibrations. Location and design of pipe supports will be shown in drawings for lines 3"NB and above for line below 3"NB contractor shall locate and design pipe supports in line with VCS standards and
obtain approval of Company Representative on drawings prepared by contractor, before erection. However any extra support designed by Company Representative shall also be installed.

No pipe shoe/ cradle shall be offset unless specifically shown in the drawings.

Hanger rod shall be installed in a direction opposite in a direction opposite to the direction in which the pipe move during expansion.

Preset pins of all spring supports shall be removed only after only after hydrostatic testing and insulation is over. Springs shall be checked for range of movement and adjusted if necessary to obtain the correct position in cold condition. These shall be subsequently adjusted to hot setting in operating condition. The following points shall be checked after installation, with Company Representative and necessary confirmation in written obtained certifying that:

a) All restraints have been installed correctly.
b) Clearances have been maintained as per support drawings.
c) Insulation does not restrict thermal expansion.
d) All temporary tack welds provided during erection have been fully removed.
e) All welded supports have been fully welded.

ENERGISING QUALITY

VCS QUALITY SERVICES PRIVATE LIMITED

STANDARD SPECIFICATION FOR

STAINLESS STEEL – MULTI TUBES

FOR

CNG STATION

VCS – SS – PI - 0012

REV. No.	DATE	Purpose	Prepared By	Checked By	Approved By
00	04.06.2019	ISSUED AS STANDARD	PNS	SM	AD

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
SSPC	Steel Structures Painting Council

CONTENTS

1.0 INTRODUCTION

The Concept of Stainless-Steel Bundle Tubes / Multi tubes is to be used for construction of CNG Station. The Proposal is to replace the conventional method of connecting between Compressor Priority panels to Dispenser with SS tubes of 6-meter length and having connection with Ferrule fitting of two adjacent SS tubes and many other open joints with valves and fittings. As these tubes are connected with multiple joints, these tubes have to be installed within the Concrete duct which is kept open to atmosphere. All this leads to compromise the safety of tubes, and CNG station. It is also observed that over the time, the possibility of open SS fittings get damage is more, which lead for gas leakage. The leakage within SS fittings also leads for commercial losses due to shut down of CNG Station.

2.0 SCOPE

This document is prepared to define the technical requirement of Stainless-Steel Bundle / Multi flexible tubes with PE protection. This document also provides the Installation guidelines for contractor.

3.0 ADVANTAGES OF BUNDLE / MULTIFLEXIABLE TUBES

a) The Bundle Tube length is available for more than 2000 Meters, so No joints between compressors to Dispenser tubes.

b) Can install underground which neglect the damage or corrosion of tubes avoiding further the gas leakage.

c) Cost saving due to not requirement of concrete duct, chambers, SS fittings and etc.

d) Good Control over LUAG and which can lead to saving of Gas Consumption.

e) Maintenance free installation.

4.0 TECHNICAL SPECIFICATION FOR PIPING COMPONENTS

a) CODES AND STANDRDS:

EN 10217-7 (metric) ASTM A269 (imperial) AISI 304

ISO 1127

DIN VED 0207 ASTM D1248

b) HYDRAULIC ANALYSIS OF SS TUBES:

Stainless steel (SS 316L / SS 316 Ti) tube for compressor discharge/ storage bank/ priority panel/ dispenser inlet tube design conditions: 330 barg & (-) 100 / 85 deg C) and for daughter station inlet design conditions of 350 barg & 100 deg C.

Standard Tube Size (mm), (Note-2)	Tube OD (mm)	Tube Thickness (mm)	Remarks
6	6	1	Note -1
10	10	1.5	-
12	12	2	-
16	16	2.5	-
20	20	3	-
25	25	3	-
30	30	4	-
38	30	5	-

Note:

Multi flexible tube bundle containing SS tubes of 10 mm OD each shall be used for Underground portion of daughter station inlet and between priority panel & NGV- ½ Dispensers with deviation (if any) w.r.t. to maximum economic velocity limit for CNG application.

c) TUBE SIZING IN LINE WITH HYDRAULIC ANALYSIS:

As per hydraulics report, size of the compressor final discharge tubing, priority panel tubing and dispenser tubing including the controlling device in the line shall be minimum as shown below.

Station	Line Description	Flow rate (SCMH)	Operating Pressure (barg)	Operating Temp. (deg. C)	Minimum Recommended Line Size	Remark
Mother Station	Individual Compressor Discharge Line & Each Storage Bank (NGV-1) Inlet/Outlet Line	1500	300	40	16 mm OD - SS tube	-
	Storage Bank (NGV-2) Inlet/ Outlet Line	3000	300	40	25 mm OD - SS tube	-

	NGV-1 Dispenser each inlet tube	250	200	40	10 mm OD - SS tube	-
	NGV-2 Dispenser inlet tube	3000	250	40	25 mm OD - SS tube	Note-2
Online station	Compressor Discharge Line and Each Storage Bank Inlet/ Outlet Line	1000	300	40	16 mm OD-SS tube	-
	NGV-1 Dispenser each inlet tube	250	200	40	10 mm OD-SS tube	-
Daughter Station (Option-1)	Station Inlet Line	4200	200	10-60	38 mm OD-SS tube	Note-3
	Direct Filling Line to Priority Panel	1000	250	10-60	30 mm OD-SS tube	-
	Compressor Discharge Line and Each Storage Bank Inlet / Outlet line	4200	300	40	25 mm OD- SS tube	-
	NGV-1 Dispenser each inlet tube	250	200	40	10 mm OD –SS tube	-
Daughter Station option-2)	Station Inlet Line & Direct Filling Line to Priority Panel from Trailer	1000	200-250	10-60	30 mm OD-SS tube	Note-4
	Compressor Discharge Line and Each Storage Bank Inlet/ Outlet Line	1000	300	40	16 mm OD – SS tube	-
	NGV-1 Dispenser each inlet tube	250	200	40	10 mm OD - SS tube	-

Notes:

1. Multi core flexible SS tubes of 10 mm OD each shall be used from sequential panel to dispensers in order to use existing provision to route via existing ducts to minimize excavation works. The deviation from economical maximum velocity limit is mutually

accepted for this case of CNG application.

2. Two nos. of multi core flexible SS tubes of 10 mm OD each shall be used for underground portion from decanting pillar to inlet system (up to 38 mm SS tube) inside the compressor enclosure. As maximum size available for the design conditions is 38mm SS tube, 38mm SS tube is considered for further station inlet system up to compressor. The deviation from economical maximum velocity limit is mutually agreed for this case of CNG application.
3. Two nos. of multi core flexible SS tubes of 10 mm OD each shall be used for underground portion from decanting pillar up to 30mm SS tube inside the compressor enclosure. The deviation from economical maximum velocity limit is mutually accepted for this case of CNG application.
4. Material grade for SS tube is SS 316L / SS 316Ti.
5. Line sizing shall be minimum as per specified in document.
6. The venting system shall be designed as per the design recommendation by Vendor. Vents from the compressor package shall be routed to the safe height.
7. Numbers of NGV-1 dispensers indicated are minimum. Actual number depends on company dispensing requirement. Accordingly, number of set of priority valves, tubes from priority valves to inlet of dispenser and valves/instrumentation inside the dispenser etc., shall be considered.

5.0 TUBING AND TUBE FITTINGS

I. Multi Tube Bundle (3 X 10 mm OD Stainless steel tubes) of following specifications shall be provided between dispensers and priority panel located near compressor enclosure.

II. Tube material shall be Stainless Steel series –316 L / Ti conforming to ASTM-A269.The process followed is longitudinal welded austenitic steel tubes to maintain the continues length of tube.

III. HP Bundle tubes are twisted stainless steel tubes which are coated with a plastic sheathing.

IV. **Brief Technical Specification of Multi tubes is as follows:**

- Design Pressure (@ 70 °C): 300 Bar
- Test Pressure (@ 20 °C): 430 Bar
- Burst Pressure under Hydraulic testing– 1100 Bar.
- Filler Sheath (EPDM) thickness: 1 mm Outer Jacket (PE-LD HM2) thickness: 1.8mm
- Min. bending radius with an automatic bending machine: 125 mm
- Flame behaviour of outer jacket: IEC 332/3 Cat. A/F
- Operating temperatures of outer jacket :-25°C / +80°C
- Natural Bending Radius – 10 X diameter of SS tube
- Multi Core Bundle Tubes will be supplied in coil form packed within Drums as per customer requirement.

V. Delivery Line: Multi-tube bundle (10 mm OD x 1.2 mm WT, 3 Core), coated with a plastic sheathing.

VI. Return Line: Single tube (10 mm OD x 1.2 mm WT, 1 Core), coated with a plastic sheathing. (If required)

VII. All tubes are 100% Eddy current tested acc. to DIN EN 10246 3 after the welding process at the production. The orbital welding is carried out at every 300-meter length to maintain the continuity of tube length as per client requirement.

VIII. All high-pressure double ferrule fitting & 2 / 3-way ball valves shall be from company approved makes & shall be SS 316L / Ti material.

IX. All, multi-tube bundles, shall be suitably identified as per applicable codes and practices.

X. Actual numbers of dispensers depend on the number of dispensers for CNG NGV-1/ cars filling in each station.

6.0 BUNDLE TUBE / MULTI TUBES INSTALLATION PHILOSOPHY

As a minimum, 2 nos. of NGV-1 type dispensers (2 filling hoses / dispenser) and 4 nos. of NGV-2 type dispensers (2 filling hoses / dispenser) have been considered for arriving at the quantity. In short 1 number of Multi tube (3 X 10mm OD tubes) to be proposed to carry gas from Priority panel to each hose of dispenser. The High bank, Medium bank and low bank connection from priority panel will be directly connected inside the dispenser of High, medium and low bank connection of each bank.

Bundle Tube (3 nos. tube, 1 no. from each high, medium and low bank) from Cascade to dispenser shall be used. The Multi tubes can be laid underneath the paved surface in depth of 60-80 cm without using a conduit or also at the outside of buildings. The additional and suitable fittings may be used at priority panel and inside dispenser to make the provision of Multi tube connection.

All tubes are 100% Eddy – current tested acc. To DIN EN 10246-3 after the welding process at the production.

7.0 STORAGE TO DISPENSER TUBING

Storage to dispenser tubing shall mainly comprise of bundled SS tubes (3 nos. tube, 1 no. from each high, medium and low bank), from cascade banks to the dispenser. The Multi tubes can be laid underneath the paved surface outside of buildings.

SS tubes shall be covered with protective sheath for underground application.

8.0 TRAINING

Training for COMPANY personnel shall be planned just before CNG station start-up or commissioning by competent trainers from MANUFACTURER/ VENDOR'S office. The awareness shall be provided to company officers to understand the concept of Multi tube connections.

9.0 APPROVALS

Inspection certificate acc. DIN EN 10204 3.1 issued by TUV Nord – Germany.

10.0 ADDITIONAL CERTIFICATES OF TUBE BUNDLES

1. LRS Type Approval Certificate Extension 98/200 23 (E1).
2. Det Norske Veritas Schweisszulassung ESN-06-5970 Rev 1.
3. Schweißzulassung RW TÜV gemäß AD-2000 Merkblatt HP2/1, EN 288-3.
4. ABS Product Design Assessment Certificate 01-HG2 42690/1-PDA.
5. CCS Certificate of works approval BJW-95010006.
6. DNV Manufacturing survey arrangement R1747.
7. Bureau Veritas SMS.W. II/3567/A.O.
8. Attachments: Typical CNG Station layout for installation of SS Bundle tubes.

ENERGISING QUALITY

VCS QUALITY SERVICES PRIVATE LIMITED

STANDARD SPECIFICATION

FOR

STAINLESS STEEL TUBE LAYING AND TESTING

VCS – SS – PI - 0015

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
00	10.07.2019	ISSUED AS STANDARD	AK	DG	AD

TABLE OF CONTENTS

1.0 SCOPE OF WORK AND TECHNICAL SPECIFICATION

This specification covers the minimum requirements for design, manufacture and supply of Stainless-steel tube laying and testing for city gas distribution.

1.1 Laying of SS Tube

Laying, testing and commissioning of SS tubes and fittings complete with all supports. The MS Angle and U-clamps (galvanised) / other fixing arrangement shall be procured and installed by the contractor. Payment shall be at the rate for the work set out in the agreed Schedule of Rates.

Contractor shall engage approved subcontractor for this specialized work.

1.2 Scope of Works: For Laying, Testing & Commissioning of SS Tubing

Generally, the following shall constitute the Contractor's scope of work but not limited to as given herein:

1.2.1 SS tubes shall be clamped to the MS Angle at every 1000 mm using P clamps of SWAGELOK make / any other approved make / SS – 308 clamps with EPDM cushion. The practice of flattening tubes for clamping purposes shall not be permitted.

1.2.2 MS Angle and U-clamps (galvanised) shall be procured from approved manufacturers and through a QAP including stage inspection and pre dispatch inspection of the materials By VCS (To be isolated by rubber gaskets).

1.2.3 Tubes shall be bend using tube benders only and any hot bending will be totally rejected. Tubes shall be cut using pipe cutting device. Hot cutting is not allowed.

1.2.4 Carrying out pneumatic testing and purging with nitrogen as per approved procedures; providing all tools, tackles, instruments, manpower and other related accessories for carrying out the testing of tubes.

1.2.5 Start-up and commissioning assistance.

1.2.6 Handing over the completed works to Client for their operation/ use purposes.

1.2.7 Any other work not specifically mentioned herein, but required for the satisfactory completion/ operation/ safety/ statutory/ maintenance of the works shall also be covered under the scope of work and has to be completed by the Contractor within specified schedule at no extra cost to Client.

2.0 INSTALLATION PROCEDURE

2.1 TUBE END PREPARATION

2.1.1 Cut the ends square with a hacksaw and a suitable guide. Tube cutters are satisfactory for most tube materials but tend to work harden stainless steel. As such proper care shall be exercised while cutting the SS tubes to avoid the hardening.

2.1.2 Burrs must be removed inside and outside for proper entry into fitting to prevent contamination and/ or restricted flow. 'Swagelok' de burring tool shall be used.

2.1.3 Remove all fittings, chips, and grit before attachment of fittings.

2.2 ASSEMBLY

2.2.1 Tube line fabrication must be accurate so that the tube end easily enters the fitting in proper alignment. Do not force an improperly fitted tube line into the fittings.

2.2.2 Ensure that the tube end is bottomed against the shoulder in the fitting body. This is necessary to prevent movement of the tube while the nut forces the ferrule to grip the tube and to seal through any imperfections that may exist on the outside tube surface.

2.2.3 Never permit the fitting body to rotate during tube end make-up, use two wrenches. Assemble port connectors to components first and hold with a wrench while making up the tube joint. All types of union bodies must be held while each of the tube ends is made up.

2.2.4 Never attempt to make up by torque.

2.2.5 Always turn the nut the prescribed amount regardless of torque required. Fitting end plugs required only 1- ¼ turn from finger tight make up in all sizes.

3.0 REMAKE OF FITTINGS

A disassembled joint can be remade, simply by retightening the nut to the position of the original make up. For maximum number of remakes, mark the fitting and nut before disassembly. Before retightening, make sure the assembly has been inserted into the fitting until the ferrule(s) seats in the fitting. Retighten the nut by hand. Rotate the nut with a wrench to the original position as indicated by the previous marks lining up. (A noticeable increase in mechanical resistance will be felt indicating the ferrule is being re-sprung into sealing position.) Then snug the nut 1/12 turn (1/2 hex flat) past the original position.

4.0 REFERENCE SPECIFICATION, CODES AND STANDARDS

The Contractor shall carry out the work in accordance with this specification, VCS'S Engineering Standards, ASME B 31.8 - Gas Transmission and Distribution Piping Systems, Oil Industry Safety Directorate (OISD) norms. Should the Contractor find any discrepancy, ambiguity or conflict in or between any of the Standards and the contract documents, then this should be promptly referred to the Engineer-in- Charge (EIC) for his decision, which shall be considered binding on the contractor.

5.0 SCOPE OF SUPPLY

In general, the following tubes & fittings shall be supplied:

i) ¾" OD SS Tube of 0.095 wall thick min.

ii) ½" OD SS Tube of 0.083 wall thick min.

iii) Double Compression Ferrule Fittings of sizes ¾", ½", 3/8" & ¼". iv SS Valves of suitable sizes.

1.1.1 Supply by The Contractor at His Own Cost As Part Of This Specification:

The procurement and supply of MS Angle with U- clamps at the appropriate time of all the materials and consumables except for the materials specifically enlisted under Owner's scope of supply, shall be entirely the Contractor's responsibility and its rates of execution shall be inclusive for all these items, as follows but not limited to these:

i) Bolts and nuts for supports, U-bolts with nuts, P-clamps for tubes, anchor bolts of various sizes for fixing to concrete structure.

ii) Bitumen paints primer and solvents.

iii) All material for minor civil works like grouting etc.,

iv) Minor structural steel for fabrication of tube/ tray supports like MS plates, GI plates, flats, pipe etc., v Pumps, compressor, Corrosion Inhibitor for water used for hydrostatic

testing, including water for testing, inert gas for purging. vi All items not expressly mentioned in the Contract but which are necessary for the satisfactory completion and performance of the Work under this Contract.

Note: Samples of all the consumables items / test certificates required to be approved by EIC.

ENERGISING QUALITY

VCS QUALITY SERVICES PRIVATE LIMITED

STANDARD SPECIFICATION

FOR

SEAMLESS FITTINGS AND FLANGES

{SIZE UPTO DN 400MM (16")}

VCS – SS – PL - 0025

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
00	23.06.2017	ISSUED AS STANDARD	AS	SM	AD

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.

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

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 beveled 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.

ENERGISING QUALITY

VCS QUALITY SERVICES PRIVATE LIMITED

STANDARD SPECIFICATION

FOR

SS FITTINGS

VCS – SS – PI – 0014

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
00	10.07.2019	ISSUED AS STANDARD	AK	DG	AD

CONTENTS

1.0 GENERAL

M/s. BHARAT GAS RESOURCES LIMITED (BGRL) has been authorized by PNGRB for developing City Gas Distribution Infrastructure in Chatra & Palamu GA, Jharkhand to meet the projected gas demand of it and lay pipeline network into these GA from the Tap off station/ city gas station (CGS) to cater residential, commercial, industrial (PNG) and automobile consumers (CNG) in the city vide authorization letter no. PNGRB/CGD/BID/10/2018/GA/10.13/Schedule-D dated 29.03.2019.

VCS Quality Services Pvt. Ltd. (VCS) has been appointed as Project Management Consultant for providing consultancy services for CGD Expansion Project for PNG & CNG in Chatra & Palamu GA, Jharkhand (hereinafter referred as Consultant), by BGRL

2.0 SCOPE OF SUPPLY

2.1 The scope of this specification covers the requirement of design, manufacture, inspection, testing at works/ marking/ packaging/ and supply of high-pressure SS Ferrule Fittings.

2.2 All codes & Standards for manufacturing, testing, inspection etc. shall be of latest edition.

3.0 CODES & STANDARDS

Applicable Codes and Standards to be followed are as under but not limited to the following:

Bar Stock : ASME SA-479-316 or DIN 4401 or BS:970-316-S31

Forging : ASME SA-182-316 or DIN 4401 or BS:970- 316-S31

Thread : NPT ANSI B 1.20.1

In case of any conflict between this job specification and other document, the following order of precedence shall apply:

- Job Specification
- International Standards/ Codes Applicable.

Any discrepancy, ambiguity or conflict in or between any of the standards, specifications codes and the contract documents should be promptly referred to Owner / Owner's Representative for his decision, which shall be binding on the bidder.

4.0 TECHNICAL SPECIFICATION

All the items shall be suitable for compressed Natural Gas service and meet following specifications:

Testing shall be as per ASTM F 1387

4.1 Materials

4.1.1 Fittings shall be manufactured from the following materials:

i) Bar stock shall be as per BS: 970-316-S31, EIN 1.4401 or ASME 479-316.

ii) Forgings shall be as per BS: 970-316-S31, EIN 1.4401 or ASME SA- 182-316

4.1.2 The fittings end connections shall be compatible to tube of hardness ≤Rb80

4.1.3 All component parts of the fittings shall be of the same material.

4.1.4 The ferrule material shall be able to withstand an atmosphere of Natural Gas, oil and moisture without rusting.

4.2 Design & Manufacture

4.2.1 All fittings shall be designed in conformance with the requirements of ASME B31.3 and applicable standards. Area classification applicable for all items shall be Class-1, Division-1, Group-D as per NEC or Zone-1 Group- IIA/ IIB as per IS/ IEC specification or equivalent specification. Fittings shall be designed so that all parts/ components meet the requirements for the specified area classification.

4.2.2 The SS fittings shall be of flareless design and four-piece construction, consisting of front and rear ferrules, nut and body suitable for use on SS tubes conforming to ASTM A269 TP316.

4.2.3 Fittings shall be rated for at least the design pressure as stipulated in the material requisition. The design of fittings shall ensure that they shall be capable of holding full tube burst pressure after only one and a quarter turn pulls up of the nut

4.2.4 The threaded ends of fittings shall be NPT as per ANSI B1.20.1. Especially male threads are to be made by

Cold rolling method & shall be protected by plastic end caps.

4.2.5 The fittings shall hold the tube with collecting action producing a firm grip on the tube without substantially

reducing the tube wall thickness.

4.2.6 Fittings shall not torque the tubing during original or subsequent make-up of the connection and should use

geometry for inspection before and after make up the fittings shall not require disassembly for inspection

before or after makeup.

4.2.7 All tube fittings shall be guageable for sufficient pull up after one and a quarter turn. All tube fittings shall have a guageable shoulder and there will be no radius at the point where the shoulder meets the neck of the fitting body.

4.2.8 The gap inspection gauge shall be easily insertable at finger tight position of nut. The gap inspection gauge shall not be insertable between the nut and shoulder of the fitting after completing only one and a quarter turn pull up of the nut.

4.2.9 The tube seat counter bore in the body shall be faced flat 90° to the axis of the tubing to minimize tube expansion and subsequent galling.

4.2.10 The sealing and gripping power of the fitting shall be controlled such that the action between ferrules will overcome commercial variations in tubing wall thickness, hardness, diameter and installer skill.

4.2.11 The seal contact areas of the fittings body shall have a machined finish of 32 Ra or better.

4.2.12 The fittings body shall have no machined stop or shoulder to preclude additional tightening in subsequent make-up.

4.2.13 Front Ferrule

i) The front ferrule shall affect a long, smooth repeatable seal by contact with body and a grip hold

on the tube surface

ii) The front ferrule shall always remain in a sprung condition to compensate for thermal stresses and to

accomplish repeated make and break

iii) Front ferrule which is wetted part shall not be hardened by HT.

iv) The sealing cone of body where front ferrule sits shall be finished to remove tool marks & to give extra

smooth surface for proper seating.

4.2.14 Rear Ferrule

i) The rear ferrule shall collect the tubing surface, improving the performance of the tubing in systems of high impulse or vibration

ii) The rear ferrule shall have a machine recess on the inside diameter and shall have complete surface hardening so as to substantially reduce the required pull up torque. Both the requirements i.e. complete surface hardness and machined recess shall be met for all rear ferrules.

iii) Rear ferrule which grips the tubing & not typical wetted part shall be significantly Hardened than the tubing upto RC 60 Hardness.

iv) Rear ferrule shall not be hardened at the edge by HT and should be case hardened.

v) For hardening of back ferrule multiple process shall not be used.

4.2.15 Nuts shall have silver plated threads to act as a lubricating agent to avoid galling and to reduce

tightening torque.

5.0 INSPECTION AND TESTING

The manufacturer shall submit typical type test reports for the following test carrier out on random

samples of two ferrule fittings

i) Hydraulic burst pressure test

ii) Helium leak test under 0.0002 PSIA negative pressure, leaks into assembly greater than 4.0 x 10

-9

atm-cc/sec being unacceptable

iii) Gas pressure test for 25 Remakes at 5000 Psig. No leakage should be detectable even after 25

remakes.

iv) Impulse & vibration testing as per ASTM F1387.

6.0 TEST REPORTS AND CERTIFICATES

6.1 The manufacturer shall supply material compliance certificates conforming that the raw material for fittings

conforms to the requirements of ASME Section-II and ASME Section-III sub section NB, NC and ND.

6.2 The manufacturer shall furnish test procedure and typical test reports of all tests conducted on fittings as per the requirements of clause 5

7.0 MARKING, PACKING & SHIPMENT

7.1 Heat code traceability number shall be stamped or etched on both body and nut of each fitting

7.2 Replacement nuts and ferrules shall be packaged in a manner so as to allow safe and simple replacement.

7.3 All the items shall be suitably wrapped and packaged to with stand rough handling during ocean shipment

and inland journey.

7.4 Item shall be properly tagged and package separately to facilitate easy identification.

7.5 Items shall be wrapped and packaged in such-a-way that they can be preserved in original as new

condition.

8.0 DOCUMENTATION

Following test certificates shall be furnished along with shipment

- Test certificate of visual, chemical, mechanical testing (incl. tensile, hardness) and hydro test reports with 3.1 certificate as per EN10204.
- Manufacturers standard shop inspection & test report for all items.
- The test report for specified tests – type approval as per LR/ASTM F1387/PNV.
- Third party inspection report as applicable to meet the requirements of specified codes & standards as applicable.

ENERGISING QUALITY

VCS QUALITY SERVICES PRIVATE LIMITED

STANDARD SPECIFICATION

FOR
SS VALVES

VCS – SS – PI – 0016

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
00	10.07.2019	ISSUED AS STANDARD	AK	DG	AD

1. GENERAL

M/s. BHARAT GAS RESOURCES LIMITED (BGRL) has been authorized by PNGRB for developing City Gas Distribution Infrastructure in Chatra & Palamu GA, Jharkhand to meet the projected gas demand of it and lay pipeline network into these GA from the Tap off station/ city gas station (CGS) to cater residential, commercial, industrial (PNG) and automobile consumers (CNG) in the city vide authorization letter no. PNGRB/CGD/BID/10/2018/GA/10.13/Schedule-D dated 29.03.2019.

VCS Quality Services Pvt. Ltd. (VCS) has been appointed as Project Management Consultant for providing consultancy services for CGD Expansion Project for PNG & CNG in Chatra & Palamu GA, Jharkhand (hereinafter referred as Consultant), by BGRL

2. SCOPE

a) The scope of the bidder includes but not limited to manufacture, supply, inspection & testing at work shop marking, packing, handling and dispatch of SS Ball Valves, as per quantities given in SOR and complying all the specifications mentioned.
b) All codes and standards for manufacture, testing, inspection etc. shall be of latest edition.
c) Owner reserves the right to delete or order additional quantities during execution of order, based on unit rates and other terms & conditions in the original order.

3. CODES & STANDARDS

Applicable Codes and Standards to be followed are as under but not limited to the following:

1. MSS SP-99 : Instrument Valves
2. ASME/ASTM B 31.3 : Chemical Plant and Petroleum Refinery Piping

4. PRECEDENCE CONFLICT RESOLUTION

In case of any conflict between this specification, Codes & Standards and other document, the following order of precedence shall apply:-

1. Job Specification.
2. International Standards/ Codes Applicable.

5. DEVIATIONS

a) Technical deviations, if any, required by bidder shall be separately furnished again each clause giving reasoning for each deviation. Bidder to note that except the deviation furnished by them, Bidder's offer shall be deemed to be in total conformity with the enquiry / tender specifications.

6. SPECIFICATIONS OF 2 WAY SS BALL VALVES

a) Valves should be manufactured from following materials

i. The valve body will be made out of material conforming to ASTM A 479 Gr. SS 316/ASTM A351 CF3M.

ii. Material of construction of ball shall conform to ASTM A 276 Gr. SS 316.

b) All ball valves shall be designed in conformance with the requirements of ASME B31.3, MSS SP-99 and other applicable standards. Area classification applicable for all items shall be Class 1, Division 1, Group D asper NEC or Zone-1, Group IIA/IIB as per IS/IEC specification or equivalent specification. All parts components shall meet the requirements for the specified area classification.

c) Valves shall be rated for a maximum pressure rating of 6000 psig and shall be capable of operation between Design Temperature range of –400F to +2500F.

d) Valves shall have spring loaded PEEK seats allowing seal-ability over the full pressure range at any port and low operating torque over the full range of pressure and temperatures.

e) Valve shall have Nylon handle. Handle shall indicate the direction of flow.

f) All valves should be full bore to ensure no pressure drop.

7. DOCUMENTATION

a) The Valve Manufacturer shall submit factory test reports for the following tests carried out on each Valves.

i. Hydrostatic seat leak test shall be carried out with de-ionized water. There shall be no
ii. detectable seat leakage at 1.1 times the rated pressure of the valve.
iii. Gas pressure test for seat shall be carried out with nitrogen at 1000 psig. There shall be no detectable external leakage. Maximum allowable seat leakage shall be 0.1 std-cc/min.

8. OTHER REQUIREMENT

a) Manufacturer should conform that valves are approved by Rail Road Commission of Texas, LP Gas Division under regulation for compressed natural gas or ANSI / AGA NGV 3.1 1995, CAN / CGA-12-3- M95"Fuel Systems Components for Natural Gas Powered Vehicles" by "Canadian and Association" Spares and Accessories.

b) Manufacturer shall furnish a list of recommended spares and accessories for valves required during startup and commissioning.

9. MARKINGS, PACKING AND SHIPMENT

a) Heat code shall be marked on valve body to facilitate traceability.
b) All items shall be suitably wrapped and packaged to withstand rough handling during ocean shipment and inland journey.
c) Each item shall be properly tagged and packaged separately to facilitate easy identification.
d) All items shall be wrapped and packaged in such a way that they can be preserved in their original, as new condition.

VCS QUALITY SERVICES PVT. LTD.

STANDARD SPECIFICATION

FOR

PLUG VALVES

VCS – SS – PP - 2051

00	03.05.2022	SR	MC	HK	HK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY	:	If printed
CONTROLLED COPY	:	If in soft and signed

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

1.0 SCOPE

This Specification covers the minimum requirements for design, manufacture, testing and supply of carbon steel plug valves of size DN 50 mm (2") and above and ANSI 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).

2.0 REFERENCE DOCUMENTS

2.1 All valves shall be manufactured and supplied in accordance with the American Petroleum Institute (API) Specification 6D, Latest Edition with additions and modifications as indicated in the following sections of this specification.

2.2 Reference has also 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)

B31.3	:	Process Piping.
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 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.

AMERICAN PETROLEUM INSTITUTE (API)

1104	:	Specification for Welding Pipelines and Related Facilities.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A370	:	Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

B 733 : Auto catalytic (Electroless) Nickel - Phosphorus Coatings on Metal.

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.

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

VIS-I : Visual Standard.

2.3 In case of conflict between the requirements of this specification, API 6D and the Codes, Standards and Specifications referred in clause 2.2 above, the requirements of this specification shall govern.

Order of precedence shall be as follows:

- Data Sheets
- This Specification
- API 6D Specification
- Other Referred Codes & Standards
- Manufacturer's Standard

3.0 MATERIALS

3.1 The Material for Construction of major components of the Plug valves shall be as indicated in Valve Data Sheet. Other components shall be as per Manufacturer's standard (suitable for the service conditions indicated in the Valve Data Sheet) and shall be subject to approval by Company.

All process-wetted parts, metallic and non-metallic, 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.

3.2 Carbon steel used in the manufacture of valves shall be fully killed.

3.3 The carbon equivalent (CE) of valve end connections which are subject to further field welding by Company shall not exceed 0.45 on check analysis for each heat of steel used, as calculated by the following formula:

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

3.4 CHARPY V-NOTCH TEST REQUIREMENTS

3.4.1 For valves specified to be used for Gas service or LPG service, Charpy V-notch test, on each heat of base material shall be conducted as per API 6D, for all pressure containing parts such as body,

end flanges and welding ends as well as bolting material for pressure containing parts. Unless specified otherwise, the Charpy Impact test shall be conducted at 0^0C or minimum design temperature indicated in valve data sheet / MR, whichever is lower. Test procedure shall conform to ASTM A 370. The average absorbed energy value of three full sized specimens shall be 27 J. The minimum impact energy value of any one specimen of the three specimens analyzed as above shall not be less than 22 J.

3.4.2 When Low Temperature Carbon Steel (LTCS) materials are specified in Valve Data Sheet or offered by Manufacturer, the Charpy V-notch test requirements of applicable material standard shall be complied with.

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 A 370 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 such as base material of body and principal parts of the valve such as plug, stem, etc shall not exceed 248 HV_{10}.

3.6 ELECTROLESS PLATING REQUIREMENTS

For all such valves where Carbon Steel is used as plug material, the plug shall have 75 micrometers (0.003 inches) thick Electroless 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.

Manufacturer shall ensure that the adhesive strength of plating is sufficient so as to prevent peeling of plating during operation of the valve.

4.0 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 valve body and other pressure containing parts shall be designed in compliance with ASME Boiler & Pressure Vessel Code, Section VIII, Div1. Allowable stress requirements shall comply the provisions of ASME B31.3. 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.

All process-wetted parts, metallic and non-metallic, shall be suitable for the fluids and service specified by the Purchaser

4.2 VALVE PATTERN

Valve pattern area shall be as specified in the following table:-

ANSI Pressure Rating	SIZE RANGE, DN MM (INCH)	PATTERN
Class 150 #	50-100 (2- 4)	Short
	150-300 (6 – 12)	Regular
	350(14) & above	Venturi
Class 300 #	50 -100(2 – 4)	Short
	150 - 250 (6 -10)	Regular
	300 (12) & above	Venturi
Class 600 #	50 - 250 (2 – 10)	Regular
	300 (12) & above	Venturi
Class 900 #	50 - 250 (2 – 10)	Regular
	300 (12) & above	Venturi

4.3 PLUG DESIGN

The valves shall have an inherent feature to ensure that under line pressure cannot cause taper locking of plug/ plug movement in to the taper, i.e. valves shall be of “Pressure-Balanced” design type.

4.4 Cover shall be bolted to the valve body and screwed connections are not acceptable.

4.5 Soft seats to achieve a seal between plug and body are not permitted.

4.6 SEALANT INJECTION REQUIREMENT

All valves shall have the provision for secondary sealant injection under full line pressure for seat and stem seals. All sealant injection connection shall be provided with an internal non-return valve. Valve design shall have a provision (e.g. Ball Type Check Valve/ Needle Valve) to replace the sealant injector fitting under full line pressure. Location and arrangement of sealant injection points shall be as per Fig - 4.6. Valves shall have vent and drain connections as per API 6D.

4.7 Valves shall be designed to withstand a sustained internal vacuum of at least 1 (one) milli-bar in both open and closed positions.

4.8 Valve design shall ensure repair of gland packing under full line pressure.

4.9 VALVE ENDS

a. 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.

b. 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") and as per MSS-SP-44/ ASME B 16.47 Series A for valve sizes DN 550 mm (22") and for DN 650 mm (26") 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.

c. 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. Valves shall be without transition pups. 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.

4.10 POSITION INDICATORS

Valve shall be provided with Plug position indicator and stops of rugged construction at the fully open and fully closed positions.

4.11 VALVE INSTALLATION

Valves shall be suitable for either buried or above ground installation as indicated in Valve Data Sheet, material Requisition & P&IDs

4.12 LOCKING DEVICES

When indicated in Material Requisition, 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.

4.13 Valves of size NPS 8” and larger shall be equipped with lifting lugs. Tapped holes and eye bolts shall not be used for lifting lugs.

4.14 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. Seat sealant injection lines shall be extended and terminated adjacent to the valve operator by means of suitable piping anchored to the valve body/ stem housing. The pipe used shall be API 5L Gr. B/ ASTM A 106 Gr. B, with Sch 160. Fittings shall be ASTM A105/ ASTM A 234 Gr. WPB, Socket welded ANSI class 6000.

c. Sealant injection lines shall be extended and terminated adjacent to the valve operator in manner as indicated in (b) above

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.

4.15 The valve stem shall be capable of withstanding the maximum operating torque required to operate the valve against the maximum differential pressure as per the appropriate class. The combined stress shall not exceed the maximum allowable stresses specified in the ASME Section VIII Div 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 the valves stem

The valve stem shall have anti-blowout feature with antistatic device. The valve stem may be integral with plug or be a separate component.

4.16 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. 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 at least 1.25 times the break torque required to operate the 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. Manufacturer shall also indicate the number of turns of hand wheel (In case of gear operators) required for operating the valve from full open to full close position. Operating device shall be designed for easy operation of valve under maximum differential pressure corresponding to the valve rating

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.

4.17 WELDING

All welds shall be made by welders and welding procedures qualified in accordance with the provisions of ASME Section IX, except that only positions 5G and 2G shall qualify all-positional welding. The procedure qualification shall also include impact test and hardness test when

required as per Clause 3.4 and 3.5 of this specification and shall meet the requirements as specified therein.

4.18 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 and 3.5 of this specification and shall meet the requirements as specified therein.

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

5.0 INSPECTION AND 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. Valve castings of all valves shall be radiographically examined at the cover and body portion, seat location, flanged body ends and circumference of ends to be field welded as per ASME B 16.34. 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	All Sizes	Nil
ANSI 300 # Class	≤ DN 400 mm (16") ≤ DN 450 mm (18")	Nil 100%
ANSI 600 # Class above	All Sizes	100%

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 forgings shall be by ultrasonic method. Inspection procedure and acceptance shall comply with Annexure E of ASME B16.34.

5.6 Areas, 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 (2007 edition), Division 1, Appendix 12 and Appendix 6 respectively.

5.7 Weld ends of all cast valves subject to welding in field shall be 100% radiographically examined and acceptance criteria shall be as per ASME B16.34.

After final machining, all bevel surfaces shall be inspected by dye penetrate 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.

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.

5.8 All valves shall be tested in compliance with the requirements of API 6D. The drain, vent and sealant lines shall be either included in the hydrostatic shell test or tested independently. Test pressure shall be held for duration mentioned in API 6D. Hydrostatic shell testing shall ensure that the whole of the shell is subjected to the test pressure. If necessary, the empty shell shall be pressure tested prior to assembly of the plug. The drain, vent and sealant lines shall be either included in the hydrostatic shell test or tested independently

5.9 No leakage is permissible during hydrostatic testing. After pressure testing and acceptance, valves shall be thoroughly drained and dried. Drying of valves internal shall be with compressed air and lint free rags. The internal surfaces shall be coated with suitable water dispelling anti-corrosion fluid. To ensure total coverage, the valve shall be placed in the half open position, filled with the fluid and drained.

5.10 A supplementary air seat test as per API 6D shall be carried out for all valves. No leakage is allowed. Test pressure shall be held for at least 15 minutes.

5.11 Manufacturer who intends bidding must submit at bid stage, certificate and report for successful fire safe tests for all types of valves in accordance with BS:6755 (Part-II)/ API 6FA, as applicable in Valve Data Sheet. Failure to comply with the requirement shall be a cause of rejection of the offer

5.12 Valves shall be subjected to an Operational Torque Test as per API 6D under hydraulic pressure equal to maximum differential pressure corresponding to the applicable ANSI class rating of valve. For manually operated valves, testing shall confirm that the torque required to operate the valve does not exceed 4.16 (c) of this specification.

5.13 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 cyclic 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.

5.14 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.

6.0 TEST CERTIFICATES

Manufacturer shall submit the following certificates in accordance with EN10204 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 5.0 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.

7.0 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 SP-6 in accordance with "Steel Structures Painting Council - Visual Standard SSPC-VIS-1". 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 three coats of suitable coal tar epoxy resin with a minimum dry film thickness of 300 microns.

Manufacturer shall indicate the type of corrosion resistant paint used, in the drawings submitted for approval

8.0 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. Marking shall be done by die-stamping on the bonnet or on the housing. However, for buried valves the marking shall be done on the above ground portion of the stem housing only.

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 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

9.0 SPARES AND 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.

10.0 DOCUMENTATION

10.1. The Manufacturer shall supply documentation in accordance with the Vendor Data Requirements List (VDRL) as attached with Purchase Order/ Material requisition. If not mentioned below minimum documentation shall be followed.

At the time of bidding, the bidder shall submit the following documents:

a) General arrangement/ assembly drawings showing all features and relative positions & sizes of vents, drains, gear box & other external parts together with overall dimensions.

b) Sectional drawing showing major parts with reference numbers and material specification.

c) Reference list of similar plug valves manufactured and supplied in last five years, indicating all relevant details including project, year, client, location, size rating, service, etc.

d) Torque curves for the power actuated valves along with break torque and maximum allowable stem torque. In addition, sizing criteria and torque calculations shall also be submitted for power actuated valves.

e) Descriptive technical catalogues of the Manufacturer.

f) Copy of valid API 6D certificate, wherever applicable.

g) Details of support foot, including dimensions and distance from valve centre line to bottom of support foot.

h) Quality Assurance Plan enclosed with this tender duly signed, stamped and accepted.

The drawings to be submitted alongwith the bid shall be in total compliance with the requirement of technical specification and data sheets of the valves with no exception & deviation.

10.2. Within two weeks of placement of order, the manufacturer shall submit six copies of, but not limited to, the following drawings, documents and specifications for approval :

a) Design drawings and relevant calculations for pressure containing parts and other principle parts.

b) Detailed sectional arrangement drawing showing all parts with reference numbers and materials specification.

c) Assembly drawings with overall dimensions & clearances required and showing all features. Drawing shall also indicate the numbers of turns of handwheel (in case of gear operator) required for operating the valve from full open to full close position and the painting scheme.

d) Welding, heat treatment, testing and quality control procedures.

e) Details of corrosion resistant paint to be applied on the valves.

f) Design calculation for pressure containing parts.

Manufacture of valves shall commence only after approval of the above documents. Once approval has been given by Purchaser, any change in design, material and method of manufacture shall be notified to the Purchaser, whose approval in writing for all changes shall be obtained before the valves are manufactured.

10.3. Within 30 days from the approval date, Manufacturer shall submit one reproducible and six copies of the approved drawings, document s and specification as listed in clause 10.2 of this specification.

10.4. Prior to shipment, Manufacturer shall submit one reproducible and six copies of following

t certificates as listed in clause 7.0 of this specification.

b) Manual for installation, erection instructions, maintenance and operation instructions, including a list of recommended spares for the valves

10.5. All documents shall be in English Language.

11.0 GUARANTEE

11.1 Manufacturer shall guarantee that the materials and machining of valves and fittings comply with the requirements in this specification and in the Purchase Order.

11.2 Manufacturer is bound to replace or repair all valve parts which should result defective due to inadequate engineering or to the quality of materials and machining.

11.3 If valve defect or malfunctioning cannot be eliminated, Manufacturer shall replace the valve without delay.

11.4 Any defect occurring during the period of Guarantee shall be attended to by making all necessary modifications and repair of defective parts free of charge to the Purchaser as per the relevant clause of the bid document.

11.5 All expenses shall be to Manufacturer's account.

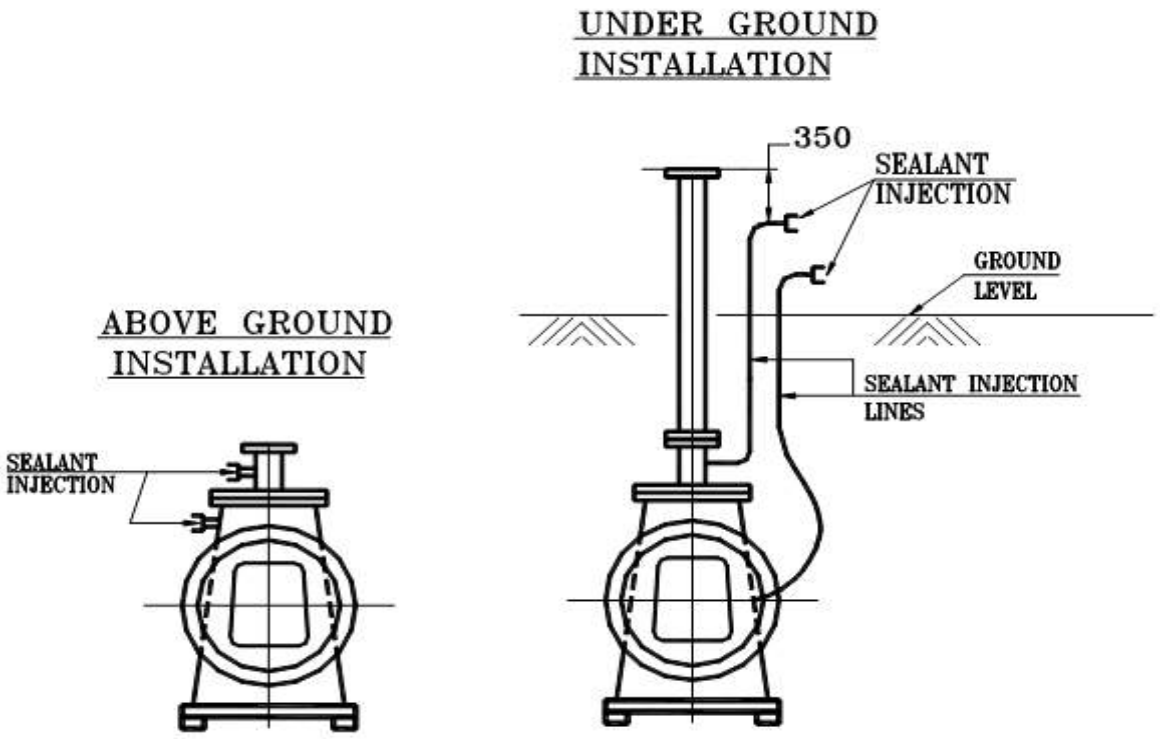

FIGURE- 4.6

ENERGISING QUALITY

VCS QUALITY SERVICES PRIVATE LIMITED

TECHNICAL SPECIFICATION

FOR
ASSORTED PIPES

VCS – SS – PI - 0001

REV. No	DATE	Purpose	Prepared By	Checked By	Approved By
00	13.05.2017	ISSUED AS STANDARD	AS	SM	AD

ABBREVIATIONS:

ASME	American Society of Mechanical Engineers.
ASTM	American Society for Testing and Materials.
API	American Petroleum Institute.
ISO	International Standards Organization.

CONTENTS

PART IV - ADDITIONAL REQUIREMENTS

GENERAL:

This scope of the specification covers pipe other than API 5L carbon steel pipe. This specification is organized into four sections plus an appendices section.

- Part I - Seamless Carbon Steel Pipe (ASTM A106 Grade B).
- Part II - Seamless Stainless Steel Pipe (ASTM A312M, Type 304L, 316L).
- Part III - Low Temperature Carbon Steel Pipe (ASTM A333M).
- Part IV - Additional Requirements.
- Appendices.

PART I - SEAMLESS CARBON STEEL PIPE (ASTM A106 GRADE B)

1.0 SCOPE

This Specification establishes the minimum requirements for the manufacture and supply of seamless carbon steel pipe. Pipe shall be supplied in accordance with ASTM Standard Specification A106-02a together with additional requirements detailed in this specification, and any other requirements specified in the Purchase Order.

For ease of reference, the sections, paragraphs and appendices contained herein have the same numbering as that of ASTM A106. Additional requirements, that are not specified in ASTM Specification A106 have also been numbered and marked as "(New)". Unless specifically amended and/or modified by requirements specified in this document, all requirements of ASTM A106 shall remain applicable.

2.0 REFERENCED DOCUMENTS

In addition to the standards listed in ASTM A106 the following standards shall also apply.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B36.10 Welded and Seamless Wrought Steel Pipe

INTERNATIONAL STANDARDS ORGANIZATION (ISO)

ISO 9712 Non-destructive Testing - Qualification and Certification of Personnel

In case of conflict between various requirements of this specification and reference standards mentioned above, the more stringent requirement shall apply unless otherwise approved by Purchaser.

3.0 PRODUCT ANALYSIS

Analysis of two pipes from each lot (Note 4) of 400 lengths or fraction thereof, of each size up to, but not including, DN150 (NPS 6), and from each lot of 200 lengths or fraction thereof of each size DN150 (NPS 6) and over, shall be made by the manufacturer from the finished pipe. The results of this analysis shall be reported to the purchaser or the purchaser's representative and shall conform to the requirements specified in Section 7.

4.0 BENDING REQUIREMENTS

For pipe whose diameter exceeds 254 mm (10 in.), it shall be permissible for the bend test to be substituted for the flattening test described in Section 12. The bend test specimens shall be bent at room temperature through 180° with the inside diameter of

the bend being 25.4 mm (1 in), without cracking on the outside portion of the bent portion.

5.0 NON DESTRUCTIVE ELECTRIC TEST

Non-destructive electric eddy-current (ET) testing is required in addition to hydrostatic testing requirements per Section 13. All Section 14 sub-sections regarding ET testing are applicable.

6.0 WORKMANSHIP, FINISH AND APPEARANCE

Weld repair is not permitted.

7.0 CERTIFICATION

Material test reports are required in addition to the requirements of ASTM Specification A530M. The producer or supplier shall furnish to the purchaser a chemical analysis report for the elements specified in Table 1.

8.0 PRODUCT MARKING

8.1 GENERAL

Marking shall be in English language and International System (SI) of units. Marking shall also include ASTM specification and grade designation, Buyer's purchase order number, item number, pipe number, heat number, wall thickness (mm) and weight. Marking shall be legible and of a size consistent with the available area and resistant to sunlight, heat, freezing and rain.

8.2 LOCATION OF MARKINGS

Regardless of size, marking shall be paint stenciled on the outer surface of each length of the pipe at each end and at mid-length. End marking shall begin approximately 300 mm from the end.

8.3 SPECIFIED DIMENSIONS

Diameter shall be marked in mm and the weight shall be marked in kg. Weight marked shall be actual weight of the pipe.

8.4 GRADES AND CLASS

A color code band shall be marked on the outside surface of finished pipe for identification of pipes of same diameter but different wall thickness, as indicated in the Purchase Order. The color code band shall be 50 mm wide and shall be marked at a distance of 150 mm from the pipe ends.

8.5 DIE STAMPING

Cold die stamping and low stress cold die stamping are not permitted on the pipe body or pipe end faces.

PART II - SEAMLESS STAINLESS STEEL PIPE (ASTM A312M TYPE 304L, 316L)

1.0 SCOPE

This Specification establishes the minimum requirements for the manufacture and supply of seamless austenitic stainless steel pipe. Pipe shall be supplied in accordance with ASTM

Standard Specification (metric) A312M-03 together with additional requirements detailed in this specification, and any other requirements specified in the Purchase Order.

For ease of reference, the sections, paragraphs and appendices contained herein have the same numbering as that of ASTM A312M. Additional requirements, that are not specified in ASTM Specification A312M have also been numbered and marked as "(New)". Unless specifically amended and/or modified by requirements specified in this document, all requirements of ASTM A 312M shall remain applicable.

2.0 REFERENCED DOCUMENTS

In addition to the standards listed in ASTM A312M the following standards shall also apply.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B36.10 Welded and Seamless Wrought Steel Pipe

B36.19 Stainless Steel Pipe

INTERNATIONAL STANDARDS ORGANIZATION (ISO)

ISO 9712 Non-destructive Testing - Qualification and Certification of Personnel

In case of conflict between various requirements of this specification and reference standards mentioned above, the more stringent requirement shall apply unless otherwise approved by Purchaser.

3.0 MATERIALS AND MANUFACTURE

The pipe shall be manufactured by the seamless process.

4.0 PRODUCT ANALYSIS

An analysis of one billet or one length of flat-rolled stock from each heat, or two pipes from each lot shall be made by the manufacturer. A lot of pipe shall consist of the following number of lengths of the same size and wall thickness from any one heat of steel:

NPS Designator	Lengths of pipe in Lot
Under 2	400 or fraction thereof
2 to 5	200 or fraction thereof
6 and over	100 or fraction thereof

5.0 LENGTHS

All pipe sizes from DN 3 (NPS 1/8) to and including DN200 (NPS 8) shall be provided in lengths up to 7.3 meters with a permissible range of 4.5 to 7.3 meters. Short lengths less than 4.5 meters are not acceptable.

6.0 WORKMANSHIP, FINISH AND APPEARANCE (NEW)

Repair by welding is not permitted.

7.0 MARKING

7.1 GENERAL

Marking shall be in English language and International System (SI) of units. Marking shall also include ASTM specification and grade designation, Buyer's purchase order number,

item number, pipe number, heat number, wall thickness (mm) and weight. Marking shall be legible and of a size consistent with the available area and resistant to sunlight, heat, freezing and rain.

7.2 LOCATION OF MARKINGS

Regardless of pipe size, marking shall be paint stenciled on the outer surface of each length of the pipe at each end and at mid-length. End marking shall begin approximately 300 mm from the end.

7.3 SPECIFIED DIMENSIONS

Diameter shall be marked in mm and the weight shall be marked in kg. Weight marked shall be actual weight of the pipe.

7.4 GRADES AND CLASS

A color code band shall be marked on the outside surface of finished pipe for identification of pipes of same diameter but different wall thickness, as indicated in the Purchase Order. The color code band shall be 50 mm wide and shall be marked at a distance of 150 mm from the pipe ends.

7.5 DIE STAMPING

Cold die stamping and low stress cold die stamping are not permitted on the pipe body or pipe end faces.

PART III - CARBON STEEL LOW TEMPERATURE PIPE (ASTM A333M)

1.0 SCOPE

1.1 PURPOSE AND COVERAGE

This Specification establishes the minimum requirements for the manufacture and supply of welded or seamless carbon steel pipe for use at low temperatures. Pipe shall be supplied in accordance with ASTM Standard Specification (metric) A333M-99 together with additional requirements detailed in this specification, and any other requirements specified in the Purchase Order.

For ease of reference, the sections, paragraphs and appendices contained herein have the same numbering as that of ASTM A333M. Additional requirements, that are not specified in ASTM Specification A333M have also been numbered and marked as "(New)". Unless specifically amended and/or modified by requirements specified in this document, all requirements of ASTM A333M shall remain applicable.

1.2 SUPPLEMENTARY REQUIREMENT S1

Supplementary Requirement S1 applies.

1.3 UNITS OF MEASUREMENT

SI (metric) units shall apply.

1.4 DIMENSIONS

This specification shall be applied to seamless pipe in sizes DN15 (1/2”) thru DN400 (16”) and to longitudinal welded or seamless pipe in sizes greater than DN400(16”).

Sizes and dimensions of steel pipe are in accordance with ASME B36.10.

2.0 REFERENCED DOCUMENTS

In addition to the standards listed in ASTM A333M the following standards shall also apply.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B36.10 Welded and Seamless Wrought Steel Pipe

INTERNATIONAL STANDARDS ORGANIZATION (ISO)

ISO 9712 Non-destructive Testing - Qualification and Certification of Personnel.

In case of conflict between various requirements of this specification and reference standards mentioned above, the more stringent requirement shall apply unless otherwise approved by Purchaser.

3.0 MATERIALS AND MANUFACTURE

Pipe in sizes DN15 (1/2”) thru DN400 (16”) shall be manufactured by the seamless process. Pipe in sizes greater than DN400 (16”) shall be manufactured by the seamless (preferred) or longitudinal welding process or as specified in the purchase order. The pipe material grade shall be as specified in the purchase order.

4.0 PRODUCT ANALYSIS

An analysis of one billet from each heat or of two pipes from each lot shall be made by the manufacturer. A lot of pipe shall consist of the following:

NPS PIPE SIZE	LENGTH OF PIPE IN LOT
Under 2	(400) or fraction thereof
2 to 6	(200) or fraction thereof
Over 6	(100) or fraction thereof

5.0 LENGTHS AND PIPE ENDS

Pipe lengths shall be provided in single random lengths of 4.75 meters to 6.74 meters with 5% 3.6 meters to 4.9 meters. Pipe ends shall be plain end (PE).

6.0 WORKMANSHIP, FINISH AND APPEARANCE

Repair welding is not permitted.

7. 0 HYDROSTATIC AND ULTRASONIC TESTING

Each pipe shall be subjected to the hydrostatic test in accordance with ASTM Specification A 530M and applicable paragraphs of ASTM A333M Section 15.

Each pipe shall be ultrasonically tested (UT) in accordance with applicable paragraphs of ASTM A333M, section 15.

Each pipe shall be eddy-current tested (ET) in accordance with applicable paragraphs of ASTM A333M Section 15.

8.0 PRODUCT MARKING

8.1 GENERAL

Marking shall be in English language and International System (SI) of units. Marking shall also include ASTM specification and grade designation, Buyer's purchase order number, item number, pipe number, heat number, wall thickness (mm) and weight. Marking shall be legible and of a size consistent with the available area and resistant to sunlight, heat, freezing and rain.

8.2 LOCATION OF MARKINGS

Regardless of pipe size, marking shall be paint stenciled on the outer surface of each length of the pipe at each end and at mid-length. End marking shall begin approximately 300 mm from the end.

8.3 SPECIFIED DIMENSIONS

Diameter shall be marked in mm and the weight shall be marked in kg. Weight marked shall be actual weight of the pipe.

8.4 GRADES AND CLASS

A color code band shall be marked on the outside surface of finished pipe for

identification of pipes of same diameter but different wall thickness, as indicated in the Purchase Order. The color code band shall be 50 mm wide and shall be marked at a distance of 150 mm from the pipe ends.

8.5 DIE STAMPING

Cold die stamping and low stress cold die stamping are not permitted on the pipe body or pipe end faces.

PART IV - ADDITIONAL REQUIREMENTS

1.0 COATING AND PROTECTION

Unless otherwise specified in the Purchase order, the pipes shall be delivered bare, free of any traces of oil, stain, grease and paint. Varnish coating shall be applied on the marking area only. Ends shall be free of any coating.

2.0 DOCUMENTS

2.1 RETENTION OF RECORDS

In addition to the records required by the applicable ASTM specification, the manufacturer shall retain the records of all additional tests mentioned in this specification including the hard copy records of ultrasonic testing carried out.

2.2 LINES-PIPE DATA

The manufacturer shall supply all the information required in the Mill Test Certificate and Pipe tally sheet in MS Excel format in CD ROM suitable for electronic data transfer to Purchaser's Pipe Tracking System. Extent of data to be supplied shall be agreed with the Purchaser prior to commencement of production.

3.0 PIPE LOADING

All relevant loading calculations shall be submitted to the Purchaser for approval prior to commencement of loading.

4.0 INSPECTION OF FIELD TEST AND WARRANTY

Manufacturer shall reimburse Purchaser 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, labor and equipment rental for finding, excavating, cutting out, installation of replaced pipe in position and retesting. The field hydro static 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 this 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. The Manufacturer shall express his desire in this regard at the time of bidding.

VCS QUALITY SERVICES PVT. LTD.

INSPECTION AND TEST PLAN
FOR
INSULATING JOINTS
VCS – ITP – PP – 2006

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
02	19/12/2021	SR	MC	HK	GW

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	06/06/2017					Issued as Standard
		GS	ADE	AD	SK	
01	22/04/2020					Document formatting, numbering updated from VCS-SD-ITP-006 to VCS-ITP-PP-2006 .
		MB	MC	AD	SK	
02	19/12/2021					Revised as Marked
		SR	MC	HK	GW	

ABBREVIATIONS:			
CE	Carbon Equivalent	PO	Purchase Order
DFT	Dry Film Thickness	PQR	Procedure Qualification Record
DPT	Dye Penetrant Testing	PR	Purchase Requisition
HT	Heat Treatment	RT	Radiography Testing
IC	Inspection Certificate	TC	Test Certificate
ITP	Inspection and Test Plan	TPI or TPIA	Third Party Inspection Agency
MPT/MT	Magnetic Particle Testing	UT	Ultrasonic Testing
MTC	Material Test Certificate	VDR	Vendor Data Requirement
NDT	Non-Destructive Testing	WPQ	Welders Performance Qualification
PMI	Positive Material Identification	WPS	Welding Procedure Specification

LEGENDS:
H - Hold (Do not proceed without approval)
W - Witness (Give due notice, work may proceed after scheduled date)
P - Perform
R - Review
RW - Random Witness [As specified or 10% (min.1 no. of each size and type of Bulk items)]

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Insulating Joints.

2.0 REFERENCE DOCUMENTS:

PO / PR / Standards referred there in / Job specifications / Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
1.0	**Procedure**						
1.1	Hydrostatic Test, NDT and other procedures	Documented Procedures	100%	Procedure Documents	-	H	R
1.2	WPS/ PQR /WPQ	Documented procedures	100%	Procedure Documents	-	H	R-Existing W-New
2.0	**Material Inspection**						

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
2.1	1) Forging 2) Pup Piece	Chemical / Mechanical Properties, NDT, HT and other requirement as per purchase specification.	100%	MTC & Inspection Record	H	W	W
2.2	Gasket, Insulating Ring, Filling Material, etc.	As per material spec./code	100%	MTC & Inspection Record	H	H	R
3.0	**In Process Inspection**						
3.1	Welding	Welding Parameters, NDT (as applicable)	100%	NDT Records/RT films	-	W	R
4.0	**Final Inspection**						
4.1	Hydro Testing, Air Leak test, Vacuum test (As applicable)	Leak Check	100%	Test Report	-	H	H

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
4.2	Visual and Dimension Check	Visual and Dimension Check	100%	Inspection Report	-	H	RW
4.3	Dielectric Test	Insulating Resistance	100%	Inspection Report	-	W	W
5.0	**Painting**						
5.1	Final painting (as applicable)	Paint Scheme, Visual & Paint thickness check	100%	Inspection Report	-	H	R
6.0	**Documentation & IC**						
6.1	Stamping and review of inspection documents, issue of IC	Review of documents for compliance as per PR.	100%	IC	-	-	H

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
7.0	**Review of final documentation**	Compilation of documents as per VDR attached with PR records for submission to customer	100%	Dossier/Completion Certificate (EN 10204 Type 3.2)	-	H	H

NOTES (As applicable):

1. Items shall be EN 10204 Type 3.2 Certified.

2. ITP shall be submitted including but not limited to the item/activity covered above. Any item/activity identified and required for the completeness shall also be covered in the ITP submitted by the manufacturers.

VCS QUALITY SERVICES PVT. LTD.

INSPECTION AND TEST PLAN
FOR
BALL VALVE
VCS – ITP – PP – 2007

					
04	27/05/2022	SR	MC	HK	GW
Rev. No	**Date**	**Prepared By**	**Checked By**	**Approved By**	**Authorized By**

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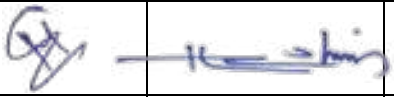
CONTROLLED COPY	:	**If in soft and signed**

REVISION RECORD						
Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
00	16/06/2017					
		GS	ADE	AD	SK	
01	20/01/2020					Formatting update, Doc Numbering change from VCS-SD-ITP-007 to VCS-ITP-PP-2007
		AG	MC	AD	SK	
02	19/05/2020					Revised as Marked
		AG	MC	AD	SK	
03	19/12/2021					Revised as Marked
		SR	MC	HK	HK	
04	27/05/2022					Revised as Marked
		SR	MC	HK	HK	

ABBREVIATIONS:			
CE	Carbon Equivalent	NDT	Non-Destructive Testing
DCN	Dispatch Clearance Note	PO	Purchase Order
DFT	Dry Film Thickness	PQR	Procedure Qualification Record
DPT	Dye Penetrant Testing	PR	Purchase Requisition
HT	Heat Treatment	RT	Radiography Testing
ITP	Inspection and Test Plan	TC	Test Certificate
IC	Inspection Certificate	TPI or TPIA	Third Party Inspection Agency
IGC	Inter Granular Corrosion	UT	Ultrasonic Testing
IR	Inspection Report	VDR	Vendor Data Requirement
IRC	Inspection Release Certificate	WPQ	Welders Performance Qualification
MPT / MT	Magnetic Particle Testing	WPS	Welding Procedure Specification
MTC	Material Test Certificate		

LEGENDS:
H - Hold (Do not proceed without approval)
W – Witness (Give due notice, work may proceed after scheduled date)
P - Perform
R - Review
RW - Random Witness [As specified or 10% (min.1 no. of each size and type of Bulk items)]

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Ball Valves.

2.0 REFERENCE DOCUMENTS:

PO / PR / Standards referred there in / Job specifications / Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT & ACCEPTENCE CRITERIA	FORMAT OF RECORD	SCOPE OF INSPECTION		
						SUB VENDOR	VENDOR	TPIA
1.0	**PROCEDURES**							
1.1	Hydrostatic Test, NDT and Other Procedures	Documented Procedures	100%		Procedure Documents	-	H	R
1.2	WPS,PQR & WPQ	Welding Parameters & Qualification Record	100%		WPS ,PQR & WPQ	-	H	W- New R- Existing
1.3	Pre-Qualification Tests	Fire safe, Cryogenic & Other Test as applicable	As per PR/Purchase Specification		Acceptance Report	-	H	H (If new)
2.0	**RAW MATERIAL**							
2.1	Forging / Casting: 1) Body 2) End Piece 3) Ball 4) Seat Ring 5) Pup Piece (as applicable)	Visual & Dimension	100%	Material & Technical Specification	Inspection Report	H	H	-
		Chemical: Chemical Analysis IGC (For SS component)	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Mechanical: Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	W (Note-1)

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT & ACCEPTENCE CRITERIA	FORMAT OF RECORD	SCOPE OF INSPECTION		
						SUB VENDOR	VENDOR	TPIA
		Impact Test (@ - 29°C): for CS Impact Test (@ - 45°C): for LTCS	All Heats	Material & Technical Specification / ASME B 16.34	Test Report	H	R	W (Note-1)
		Non-Destructive Examination (NDT): Radiography (100% Critical Area)	100%	Material & Technical Specification /ASME B 16.34	RT Report	H	R (RT-Film review)	R (RT-Film review)
		Non-Destructive Examination (NDT): Magnetic Particle Examination (100% exterior & accessible interior)	100%	Material & Technical Specification /ASME B 16.34	MPI Report	H	R	R
		ENP (For Ball): Visual, Thickness & Hardness	100%	25 microns (min) & 50 HRC (min)	Vendor Test Certificate	H	R	R
3.0	**INCOMING / BOF ITEMS**							
3.1	Stem	Chemical: Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Mechanical: Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
3.2	Fasteners	Chemical: Chemical Analysis	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Mechanical: Mechanical Test	All Heats	Material & Technical Specification	Vendor Test Certificate	H	R	R
		Impact Test (@ - 29°C): for CS Impact Test (@ - 45°C): for LTCS	All Heats	Material & Technical Specification /ASME B 16.34	Test Report	H	R	R
3.3	Gaskets, Gear units, Gland, Packings, etc.	Physical / Chemical Properties	100%	Material & Technical Specification	Test Certificates& Lab Report	H	R	R

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT & ACCEPTENCE CRITERIA	FORMAT OF RECORD	SCOPE OF INSPECTION		
						SUB VENDOR	VENDOR	TPIA
4.0	**MACHINED COMPONENTS**							
4.1	Body, Connector, Ball & Seat Ring	Surface examination & Dimension Inspection: Visual & Measurement	100%	Manufacturer's Drawing	Inspection Reports	100%	R	R
5.0	**IN-PROCESS**							
5.1	Body & Connector joint welding	Non-Destructive Examination (NDT): Magnetic Particle Examination (MPI)	100%	ASME Sec VIII - Appendix V & VI	MPI Report	100%	R	R
5.2	Valve & Pup Piece Bevel Ends joint welding	Non-Destructive Examination (NDT): Radiography (100% on weld joint)	100%	ASME B16.34	RT Report	100%	R (RT-Film review)	R (RT-Film review)
6.0	**FINAL INSPECTION**							
6.1	Finished Valve Assembly: Pressure Test & Final Inspection	Shell Test: Hydrostatic	100%	Testing Procedure as per Code	Test Record	-	H	RW
6.2		Seat Test: Hydrostatic				-	H	RW
6.3		Seat Test: Pneumatic				-	H	RW
6.4		Functional Test - Actuated Valve @ Atm. Pressure & Max. Diff. Pressure: Operation- Open / Close				-	H	RW
6.5		Double Block & Bleed: Hydrostatic				-	H	RW
6.6		Final Inspection: Visual, Dimension, TC Verification, Special Requirements & Marking as per sale order	100%	Approved GA Drawing (if applicable)	Test Report	-	H	RW
6.7		Anti-Static Test	100%	API 6D & Technical Specification	Test Record	-	H	RW

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT & ACCEPTENCE CRITERIA	FORMAT OF RECORD	SCOPE OF INSPECTION		
						SUB VENDOR	VENDOR	TPIA
6.8		Fire Safe Test	100%	API-6FA / ISO-10497	Fire safe type test report	-	H	R
6.9	Final Stamping	Stamping Of Accepted Valves	Stamping of Valves which are witnessed by VCS/TPIA	As per Tender Specification	Inspection Report	-	H	H
6.10	Strip Test	Component integrity, PMI of BOM	One per size per rating	-	Test report	H	H	H
7.0	**PAINTING & PACKING**	Surface examination & DFT Inspection: Visual & Measurement	100%	As per Tender Specification	Painting Record	-	H	R
8.0	**DOCUMENTATION & INSPECTION CERTIFICATE(IC)**	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	As per Tender Specification	Vendor TC & IC	-	H	H
9.0	**FINAL DOCUMENTATION & SUBMISSION OF REPORTS**	Compilation of IR/IRC/DCN/MTC/DRGS./VDR	100%	EN 10204 type 3.2/3.1 certification as specified in valve datasheet (Note-1)	Compliance Certificate	-	H	-

NOTES (As applicable):

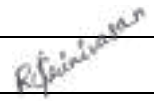
1. If the certification is specified as EN 10204 Type 3.1 in Data sheet / Material Requisition, then '**W**' may be replaced with '**R**' with Material Traceability.

2. ITP shall be submitted including but not limited to the item/activity covered above. Any item/activity identified and required for the completeness shall also be covered in the ITP submitted by the manufacturers.

VCS QUALITY SERVICES PVT. LTD.

INSPECTION AND TEST PLAN
FOR
SEAMLESS LINE PIPES UP TO 16”

VCS – ITP – PP – 2015

					
03	19/12/2021	SR	MC	HK	GW
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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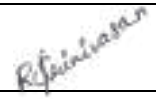
REVISION RECORD						
Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
0	14.05.2019					Issued as Standard
		BS	MV	AD	SK	
1	19.11.2019					Re-Issued as Standard
		SS	MC	AD	SK	
2	15.05.2020					Document formatting, Doc numbering updated from VPC-PL-ITP-025 to VCS-ITP-PP-2015 other detail update as marked
		SS	MC	AD	SK	
3	19.12.2021					Revised as Marked
		SR	MC	HK	HK	

ABBREVIATIONS:			
CE	Carbon Equivalent	MTC	Material Test Certificate
HT	Heat Treatment	NDT	Non-Destructive Testing
IC	Inspection Certificate	PO	Purchase Order
IGC	Inter Granular Corrosion	PMI	Positive Material Identification
ITP	Inspection and Test Plan	TC	Test Certificate
MPT/MT	Magnetic Particle Testing	TPI or TPIA	Third Party Inspection Agency
MPS	Manufacturing Process Specification	UT	Ultrasonic Testing
MR	Material Requisition	VDR	Vendor Data Requirement
LEGENDS:			
H - Hold (Do not proceed without approval)			
W - Witness (Give due notice, work may proceed after scheduled date)			
P - Perform			
R - Review			
RW - Random Witness (As specified or 10% [min.1 no. of each size and type of Bulk item])			

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Seamless Pipes up to 16" (Including 16")

2.0 REFERENCE DOCUMENTS:

PO/PR/ Standards referred there in/ Job specifications /Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
1.0	**Procedure**						
1.1	MPS	Documented Procedures	100%	Procedure Documents	-	H	R
2.0	**Raw Material Procurement**						
2.1	Raw Material Inspection	Chemical & Mechanical Properties, Method of manufacturing, Heat Treatment Condition etc.	100%	Mill Test Certificates (EN 10204-3.2)	H	H (Note-3)	R (Note-3)

SL. NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
3.0	**In Process Inspection**						
3.1	First Day Production test	All testing requirement as per PR/ MPS	As per PR/ MPS	Test Report	-	H	H
3.2	Raw material Inspection	Marking & Correlations with Test Certificates	100%	Inspection Reports	-	H	-
3.3	Heat Treatment	Heat Treatment time and temperature	100%	HT Graph / Record	-	H	R
4.0	**Final Inspection**						
4.1	Hydrostatic Testing	Leak & pressure Drop, Calibration of Gauges/ Recorder	100%	Inspection Report	-	H	RW (Min.5%)

SL. NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
4.2	Calibration of UT system	Run with calibration pipe	1) Beginning of each shift 2) After Breakdown /Maintenance	Inspection Report	-	H	W
4.3	Pipe UT	Lamination & other defects	100%	Inspection Report	-	H	RW (Min.5%)
4.4	Pipe End UT MPT as applicable	Lamination & other defects	100%	Inspection Report	-	W	RW (Min.1%)
4.5	Final visual and dimension	1. Visual Examination 2. Dimensional Check Surface Condition, Straightness, End Finish, Bevel Angle, Root Face, Outer Dia., Thickness, Length, End Finish, Marking etc.	100%	Inspection Report	-	H	RW (Min.5%)
4.6	Lot Testing	1. Chemical Analysis 2. Tensile Tests 3. Macro & Hardness Tests 4. Impact Tests and other applicable test	As per MPS/API 5L/Spec.	Inspection Report	-	H	W

SL. NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
4.7	Non-conforming product/stage	Repair / Retest /Reject	100%	Inspection Report	-	H	W
4.8	Marking/Stencilling	Pipe No, Acceptance No., Heat. No., Size, Weight, Grade, Thickness, Colour Code etc as per MPS	100%	Inspection Report	-	H	RW (Min.5%)
5.0	**PAINTING**						
5.1	Rust Preventive Coating & Colour Coding	Visual & Colour Coding as applicable	100%	Inspection Report	-	H	-
6.0	**Documentation & IC**						
6.1	Documentation & Inspection Certificate (IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Manufacturer TC & IC (Note-4)	-	H	H

SL. NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
6.2	Final documents as per PR/MR	Verification & compilation of inspection & test records for submission to customer	100%	Final dossier (Note-4)	-	H	H

NOTES (As applicable):

1. ITP shall be submitted including but not limited to the item/activity covered above. Any item/activity identified and required for the completeness shall also be covered in the ITP submitted by the manufacturers.

2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in /Job Specification /Approved Documents.

3. Raw Material shall be inspected at Mills (Sub vendors works) by TPIA appointed by Vendor.

4. Items shall be EN 10204 Type 3.2 Certified based on this ITP/MR/PR for the Pipe (Final product).

VCS QUALITY SERVICES PVT. LTD.

INSPECTION AND TEST PLAN
FOR
FORGED, SEAMLESS & WELDED FITTINGS (16” NB & BELOW)
VCS – ITP – PP – 2005

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
01	19/12/2021	SR	MC	HK	GW

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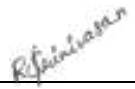
REVISION RECORD						
Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
00	22/04/2020					
		MB	MC	AD	SK	
01	19/12/2021					Revised as Marked
		SR	MC	HK	GW	

ABBREVIATIONS:			
CE	Carbon Equivalent	PMI	Positive Material Identification
DCN	Dispatch Clearance Note	PO	Purchase Order
DFT	Dry Film Thickness	PQR	Procedure Qualification Record
DPT	Dye Penetrant Testing	PR	Purchase Requisition
HT	Heat Treatment	RT	Radiography Testing
IC	Inspection Certificate	TC	Test Certificate
IR	Inspection Report	TPI or TPIA	Third Party Inspection Agency
IRC	Inspection Release Certificate	UT	Ultrasonic Testing
ITP	Inspection and Test Plan	VDR	Vendor Data Requirement
MPT/MT	Magnetic Particle Testing	WPQ	Welders Performance Qualification
MTC	Material Test Certificate	WPS	Welding Procedure Specification
NDT	Non-Destructive Testing		

LEGENDS:
H- Hold (Do not proceed without approval)
W-Witness (Give due notice, work may proceed after scheduled date)
P-Perform
R-Review
RW-Random Witness [As specified or 10% (min. 1 no. of each size and type of Bulk item)]

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Forged, Seamless & Welded Fittings.

2.0 REFERENCE DOCUMENTS:

PO / PR / Standards referred there in / Job specifications / Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
1.0	**Procedure**						
1.1	Heat Treatment / NDT	Documented Procedures	100%	Procedure Documents	-	H	R
1.2	WPS, PQR & WPQ	Welding Parameters & Qualification Record	100%	WPS, PQR & WPQ	-	H	W- New R- Existing
2.0	**Material Inspection**						
2.1	Raw Material Identification (Billets, Rounds, Pipes, Coil, Plates, etc.)	Chemical and Mechanical Properties, Size & Steel making practice etc	100%	Mill test certificate, Vendor's Inspection Report	-	H	R

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
3.0	**In Process Inspection**						
3.1	Welding	Welding Parameters as per WPS / PQR	100%	Inspection Reports	-	H	-
3.2	Heat Treatment	Stress Relieving, Normalising, Tempering, Solution Annealing, Stabilization Heat Treatment etc. as applicable	100%	HT chart	-	H	R
3.3	RT For Fittings As Applicable	Weld defects	PR / Purchase Specification	RT films & Reports	-	H	R (RT film review)
3.4	Identification of Test Samples	Product Chemical, Mechanical, Impact, Hardness and other test as applicable	One/Heat/Lot	Test Reports	-	H	H

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
3.5	Product Analysis	Chemical Composition	PR/ Purchase Specification	Test Reports	-	H	R
3.6	Destructive Testing	Mechanical, Impact, Hardness and Other test as applicable	One/Heat/Lot	Test Reports	-	H	H
3.7	MPT/LPT	Surface & Internal Imperfections	PR/ Purchase Specification	NDT Reports	-	H	R
4.0	**Final Inspection**						
4.1	Visual and Dimensional Inspection (VDI)	Surface finish, Dimensions, Marking etc	100%	Inspection report	-	H	RW
4.2	PMI Check	Chemical Check	As Per Spec./Code	Inspection report	-	H	RW

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
4.3	Final Stamping	Stamping of accepted Items	100%	Inspection report	-	H	H
5.0	**Painting**						
5.1	Rust Preventive Coating & Colour Coding	Visual Inspection & Colour Coding	100%	Inspection report	-	H	-
6.0	**Documentation & IC**						
6.1	Documentation & Inspection Certificate (IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Vendor TC & IC	-	H	H
7.0	**Final Documentation and Submission of Reports**	Compilation of IR/IRC/DCN/MTC/DRGS. /VDR	100%	Compliance Certificate (Note-1)	-	H	-

NOTES (As applicable):

1. If the certification is specified as EN 10204 Type 3.1 in Datasheet / Material Requisition, then '**W**' may be replaced with '**R**' with Material Traceability.

2. ITP shall be submitted including but not limited to the item/activity covered above. Any item/activity identified and required for the completeness shall also be covered in the ITP submitted by the manufacturers.

VCS QUALITY SERVICES PVT. LTD.

INSPECTION AND TEST PLAN
FOR
LONG RADIUS BENDS FOR ONSHORE PIPELINES
VCS –ITP –PP –2004

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
02	19/12/2021	SR	MC	HK	GW

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	05/06/2017					Issued as Standard ITP
		GS	ADE	AD	SK	
01	22/04/2020					Document formatting, Doc numbering updated from VCS-PL-ITP-004 to VCS-ITP-PP-2004 other detail update as marked
		MB	MC	AD	SK	
02	19/12/2021					Revised as Marked
		SR	MC	HK	GW	

ABBREVIATIONS:			
CE	Carbon Equivalent	PR	Purchase Requisition
IC	Inspection Certificate	RT	Radiography Testing
ITP	Inspection and Test Plan	TC	Test Certificate
MPT/MT	Magnetic Particle Testing	TPI or TPIA	Third Party Inspection Agency
MTC	Material Test Certificate	UT	Ultrasonic Testing
NDT	Non-Destructive Testing	VDR	Vendor Data Requirement
PO	Purchase Order		

LEGENDS:
H - Hold (Do not proceed without approval)
W - Witness (Give due notice, work may proceed after scheduled date)
P - Perform
R - Review
RW - Random Witness [As specified or 10% (min.1 no. of each size and type of Bulk items)]

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of long radius Bends for onshore Pipelines.

2.0 REFERENCE DOCUMENTS:

PO / PR / Standards referred there in / Job specifications / Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
1.0	**Procedure**						
1.1	Hydro Test, NDT, Bend Manufacturing, Heat treatment and Other Procedures	Documented Procedures	100%	Procedure Documents	-	H	R
2.0	**Material Inspection**						
2.1	Raw Material Inspection	Chemical, mechanical properties, method of manufacturing, Heat Treatment Condition, etc	100%	Mill Test Certificates (EN 10204 Type 3.2 certificate)	H	R	R

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
3.0	**In Process Inspection**						
3.1	Material Identification (In case of EN 10204 Type 3.1 certificate)	Review of Test Certificates, Markings, Visual and Dimensional inspection, identity co-relation & Transfer of identification marks	One/Heat	Material Clearance Record (3.2 certificate or check test [mechanical, chemical, impact, hardness])	-	H	H
3.2	Bend Manufacturing Procedure Qualification	Bend forming parameters, Mechanical, Impact, Micro and Hardness	100%	Test Report	-	H	H
3.3	Induction Bending (Production bends)	Bending temp Bending rate Power input As per qualified procedure of test bend	100%	Inspection Report	-	H	M

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
3.4	Heat Treatment (If Applicable)	Time / temp record	100%	HT Graph	-	H	R
4.0	**Final Inspection**						
4.1	NDT-RT, UT & MPT as applicable	Defects	100%	Films/Test Reports	-	H	R
4.2	Hydrostatic Test	Soundness / Leak check	100%	Test Report	-	H	W
4.3	Final visual and dimension	Visual and Dimension	100%	Inspection Report	-	H	W
4.4	Gauging Pig Passing (95% of ID)	Verification of ID / Profile	100%	Inspection Report	-	H	W
5.0	**Documentation & IC**						
5.1	Documentation & Inspection Certificate (IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Vendor TC & IC	-	H	H

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
5.2	Final documents as applicable	Verification & compilation of inspection & test records for submission to customer	100%	Final dossier	-	H	H

NOTES (As applicable):

1. ITP shall be submitted including but not limited to the item/activity covered above. Any item/activity identified and required for the completeness shall also be covered in the ITP submitted by the manufacturers.

VCS QUALITY SERVICES PVT. LTD.

INSPECTION AND TEST PLAN
FOR
FLANGES & SPECTACLE BLINDS
VCS – ITP – PP – 2003

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
01	19/12/2021	SR	MC	HK	GW

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REVISION RECORD						
Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
00	22/04/2020					
		MB	MC	AD	SK	
01	19/12/2021					Revised as Marked
		SR	MC	HK	GW	

ABBREVIATIONS:			
CE	Carbon Equivalent	NDT	Non-Destructive Testing
DCN	Dispatch Clearance Note	PO	Purchase Order
HT	Heat Treatment	PR	Purchase Requisition
IC	Inspection Certificate	RT	Radiography Testing
IR	Inspection Report	TC	Test Certificate
IRC	Inspection Release Certificate	TPI or TPIA	Third Party Inspection Agency
ITP	Inspection and Test Plan	UT	Ultrasonic Testing
MPT/MT	Magnetic Particle Testing	VDR	Vendor Data Requirement
MTC	Material Test Certificate		

LEGENDS:
H - Hold (Do not proceed without approval)
W - Witness (Give due notice, work may proceed after scheduled date)
P - Perform
R - Review
RW - Random Witness [As specified or 10% (min.1 no. of each size and type of Bulk items)]

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Flanges, Spectacle Blinds & Drip Rings.

2.0 REFERENCE DOCUMENTS:

PO / PR / Standards referred there in / Job specifications / Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
1.0	**Procedure**						
1.1	Heat Treatment, NDT and Other Procedures	Documented Procedures	100%	Procedure Documents	-	H	R
2.0	**Material Inspection**						
2.1.	Raw Material Inspection	Chemical, Mechanical, Properties	100%	Test Certificates	-	H	R
3.0	**In Process Inspection**						

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
3.1	Heat Treatment	Stress Relieving, Normalising, Tempering, Solution Annealing, Stabilization Heat Treatment etc. as applicable	100%	HT Chart	-	H	R
3.2	Identification of Test Samples	Product Chemical, Mechanical, Impact and Other test as applicable	One/Heat/Lot	Test Report	-	H	H
3.4	Product Analysis (As applicable)	Chemical Composition	As per PR/Purchase Specification	Test Reports	-	H	R
3.5	Destructive Testing	Mechanical, Impact and Other test as applicable	One/Heat/Lot	Test Reports	-	H	H
3.6	MPI	Surface & Internal Imperfections	As per PR/Purchase Specification	NDT Reports	-	H	R
4.0	**Final Inspection**						
4.1	Final Inspection	1. Visual 2 Dimensions 3. Hardness 4. Marking etc	100%	Inspection Report	-	H	W

SL.NO.	STAGE/ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB VENDOR	VENDOR	TPIA
4.2	PMI Check	Chemical	As per Spec.	Inspection Report	-	H	RW
4.3	Final Stamping	Stamping Of Accepted Flanges & Spectacle Blinds	Stamping of Valves which are witnessed by TPIA.	Inspection Report	-	H	H
5.0	**Painting**						
5.1	Rust Preventive Coating & Colour Coding	Visual & Colour Coding as applicable	100%	Inspection Report	-	H	-
6.0	**Documentation & IC**						
6.1	Documentation & Inspection Certificate (IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Vendor TC & IC	-	H	H
7.0	**Final Documentation & Submission of Reports**	Compilation of IR/IRC/DCN/MTC/DRGS./VDR	100%	Compliance Certificate (Note-1)	-	H	-

NOTES (As applicable):

1. If the certification is specified as EN 10204 Type 3.1 in Datasheet / Material Requisition, then '**W**' may be replaced with '**R**' with Material Traceability.
2. ITP shall be submitted including but not limited to the item/activity covered above. Any item/activity identified and required for the completeness shall also be covered in the ITP submitted by the manufacturers.

Energising Quality	LIST OF AUTHORIZED THIRD-PARTY INSPECTION AGENCY (TPIA)	DOC. NO.- VCS-C&P-TPIA-001

SL. NO.	NAME OF TPIA
1	Det Norske Veritas (DNV)
2	Germanischer Lloyd Industrial Services GmbH
3	Bureau Veritas (India) Pvt. Ltd.
4	Moody International (India) Pvt. Ltd. (Industry Services Division)
5	SGS India Pvt. Ltd.
6	Certification Engineer International Limited (CEIL)
7	TÜV SÜD South Asia Pvt. Ltd.
8	ABS Industrial Verification (India) Pvt. Ltd.
9	Lloyd Register of Industrial Services
10	IRCLASS Systems and Solutions Private Limited
11	Tata Projects Limited
12	International Certification Services Pvt. Ltd.
13	TUV India Pvt. Ltd., Industrial Services Division
14	Intertek India Pvt. Ltd. (Industry Services Division)
15	Quality Austria Central Asia Pvt. Ltd.
16	Edlipse Engineering Global Pvt. Ltd.

	LIST OF RECOMMENDED VENDORS FOR BOUGHT OUT ITEMS		
		TOTAL SHEETS	60
DOCUMENT NO	VCS-00-00-VL-0001		

LIST OF RECOMMENDED VENDORS FOR BOUGHT OUT ITEMS

06	21-12-2023	Issued for Vendor's	Ramveer Singh	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
k. IXAR
l. Aditya NDT Services

22.0 Tapes

22.1 Cold Applied Tapes

a. Denso GmBH
b. Polyken (Berry Plastics Corporation)

22.2 End Seal Tape-PVC

a. MAASH Industries

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

tt. Dawsons Tech Components LLP

uu. ASTEC Valves & Fittings Pvt Ltd.

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

d.

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

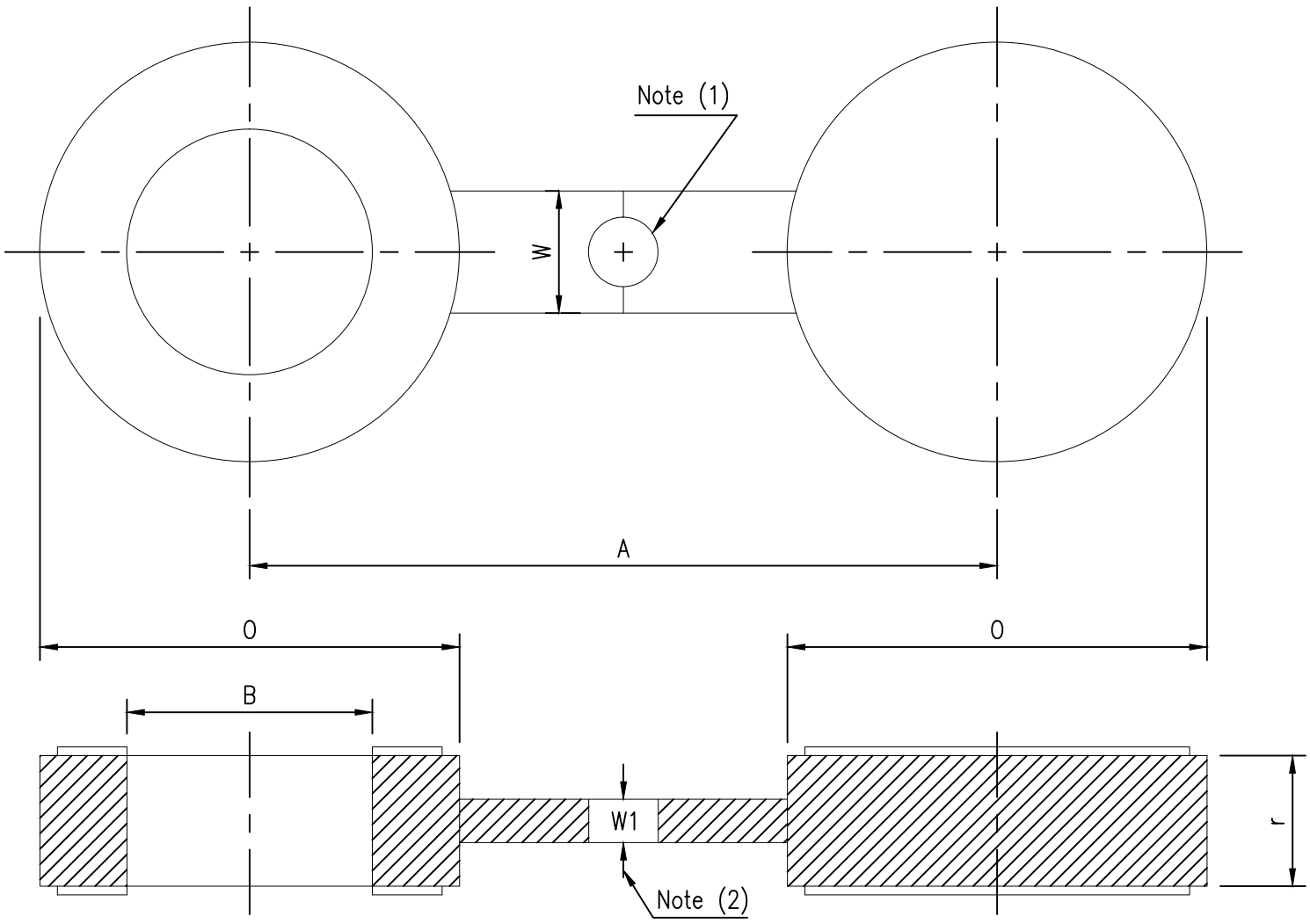
Note:

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.

STANDARD DRAWINGS

M/s. VCS QUALITY SERVICES PVT. LTD.	SPECTACLE BLIND FLANGE	DRAWING NO.
		SD–PI–001
		SHEET NO. 1 OF 1



TABLE–4 DIMENSIONS OF CLASS 600 RAISED FACE FIGURE 8 BLANKS

NPS	INSIDE DIAMETER B, in.	OUTSIDE DIAMETER O, in.	CENTERLINE DIMENSION A, In.	THICKNESS r, in.	WEB WIDTH W, In.
1/2	0.62	2.00	2.62	0.25	1.50
3/4	0.82	2.50	3.25	0.25	1.50
1	1.05	2.75	3.50	0.25	2.25
1¼	1.44	3.12	3.98	0.38	2.25
1½	1.68	3.62	4.50	0.38	2.62
2	2.16	4.25	5.00	0.38	2.25
2½	2.64	5.00	5.88	0.50	2.62
3	3.26	5.75	6.62	0.50	2.62
3½	3.76	6.25	7.25	0.62	3.00
4	4.26	7.50	8.50	0.62	3.00
5	5.30	9.38	10.50	0.75	3.38
6	6.36	10.38	11.50	0.88	3.38
8	8.33	12.50	13.75	1.12	3.75
10	10.42	15.62	17.00	1.38	4.12
12	12.39	17.88	19.25	1.62	4.12
14	13.62	19.25	20.75	1.75	4.50
16	16.62	22.12	23.75	2.00	4.88
18	17.62	24.00	25.75	2.12	5.25
20	19.58	26.75	28.50	2.50	5.25
24	23.50	31.00	33.00	2.88	6.00

NOTES:

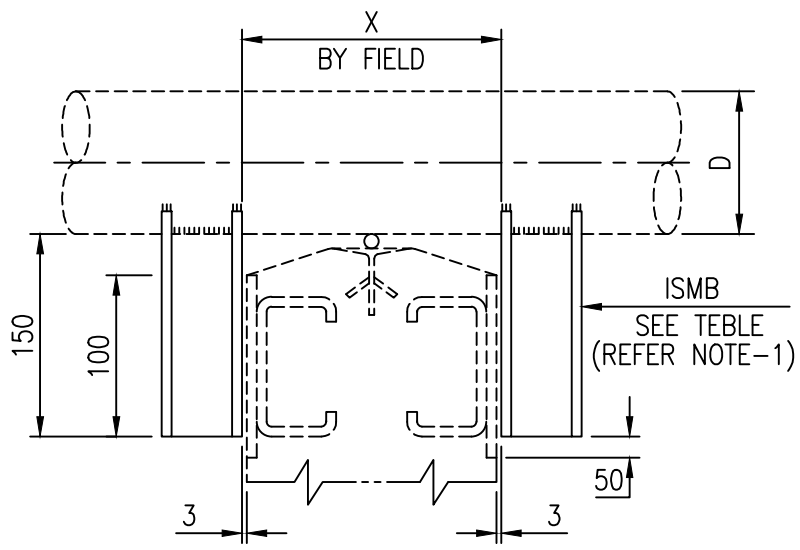
(1) Hole size (where required due to bolt spacing) shall be the same as the flange bolt hole. and located such that it will not interfere with bolting between two flanges.

(2) The thickness of the web (or tie bar) dimension W1 shall be 0.25 in. minimum.

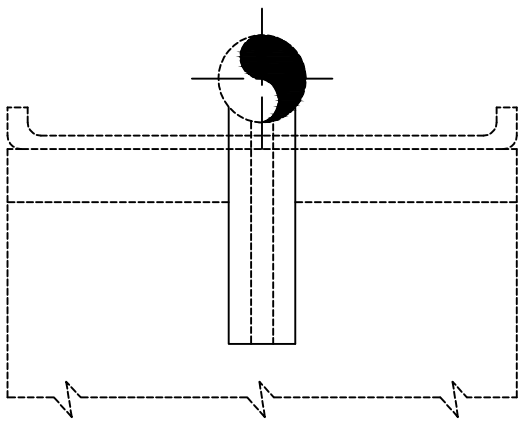
REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

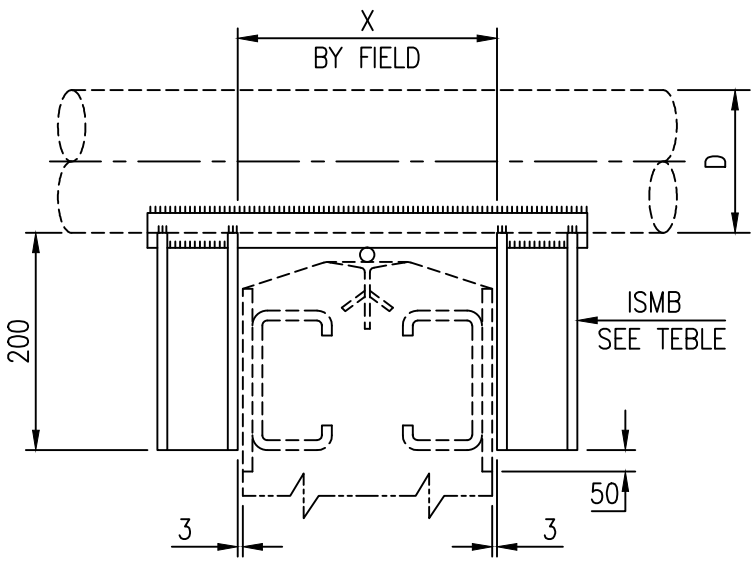
M/s. VCS QUALITY SERVICES PVT. LTD.	ANCHOR FOR BARE PIPE SIZE 2" THRU 24" TYPE–G5 (FOR OFFSITE)	DRAWING NO. SD–PI–002 SHEET NO. 1 OF 1

D	8	10	12	14	16	18	20	24
I BEAM	150				200		250	

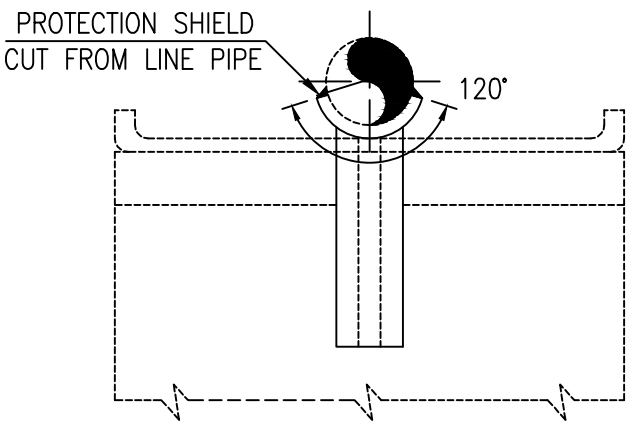


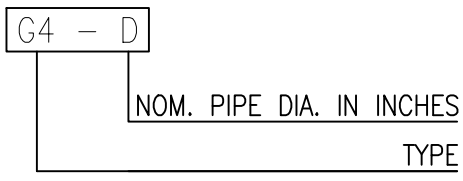
FOR PIPE 2" THRU 12"





FOR PIPE 14" THRU 24"





SYMBOL

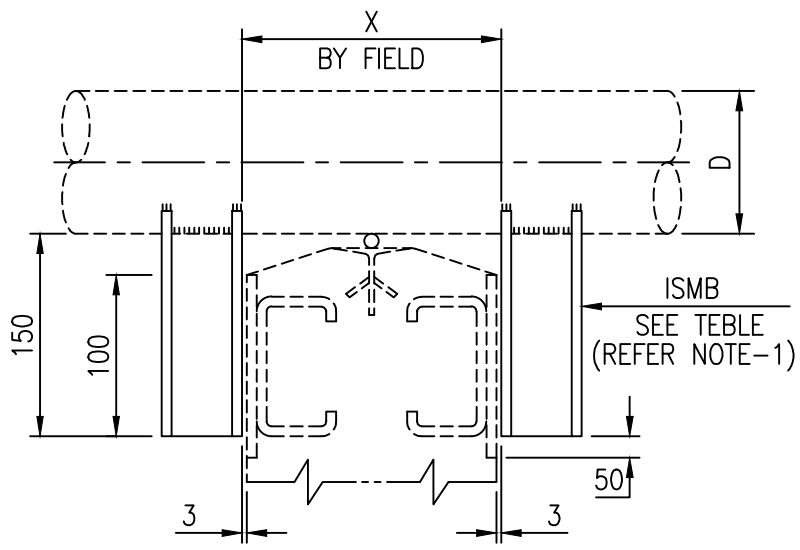
NOTE:–

1. FOR SUPPORTING DETAILS FOR PIPE SIZE 2" THRU 6", REFER STD. 00004–PL–PI–STD–009

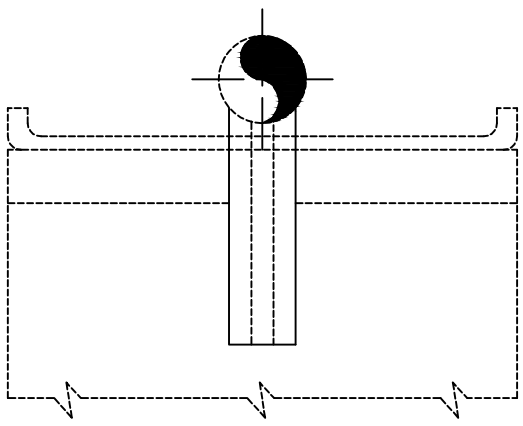
REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

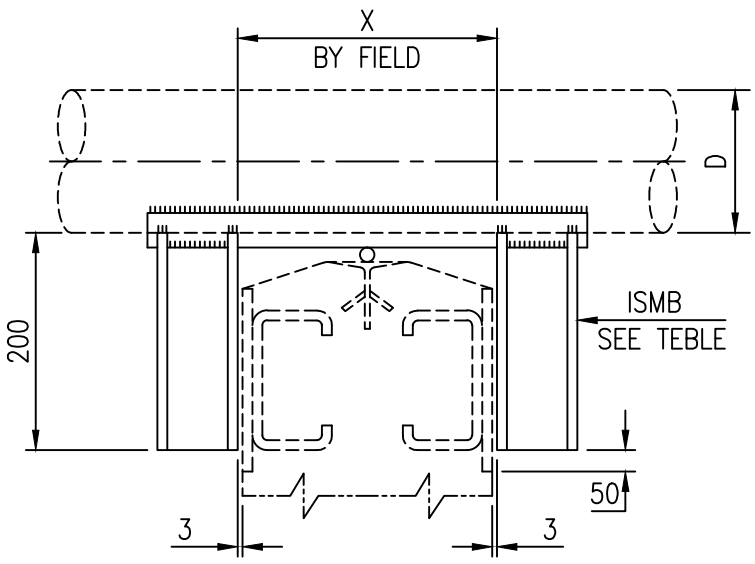
M/s. VCS QUALITY SERVICES PVT. LTD.	CROSS GUIDE FOR BARE PIPE SIZE 2" THRU 24" TYPE–G4 (OFFSITE)	DRAWING NO. SD–PI–003
		SHEET NO. 1 OF 1

D	8	10	12	14	16	18	20	24
I BEAM	150				200		250	

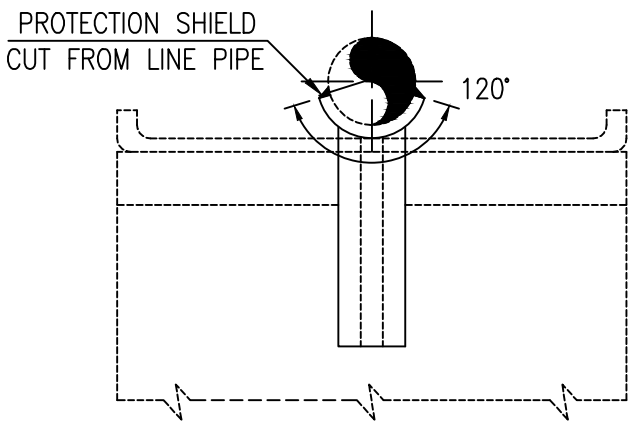


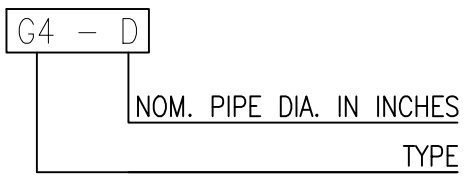
FOR PIPE 2" THRU 12"





FOR PIPE 14" THRU 24"





SYMBOL

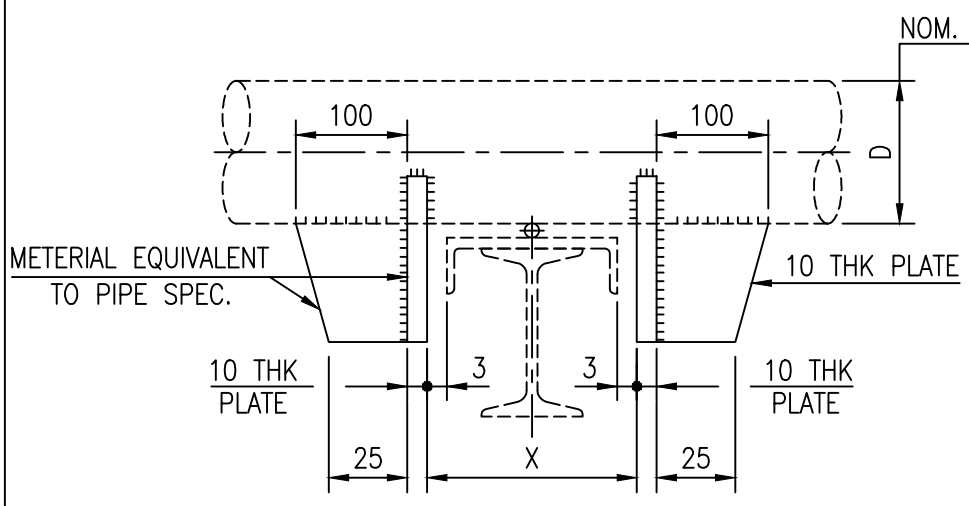
NOTE:–

1. FOR SUPPORTING DETAILS FOR PIPE SIZE 2" THRU 6", REFER STD. STD.00004–PL–PI–STD–009

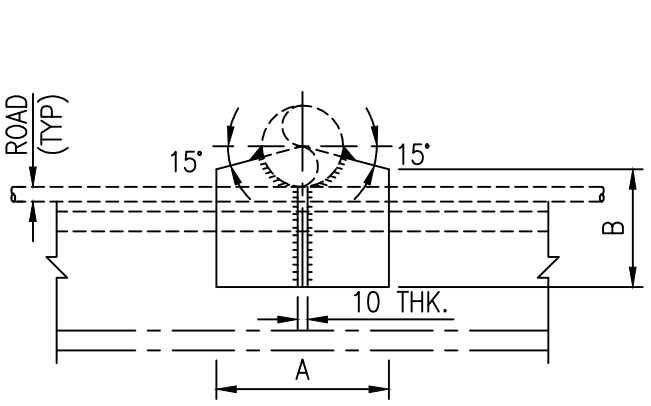
REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

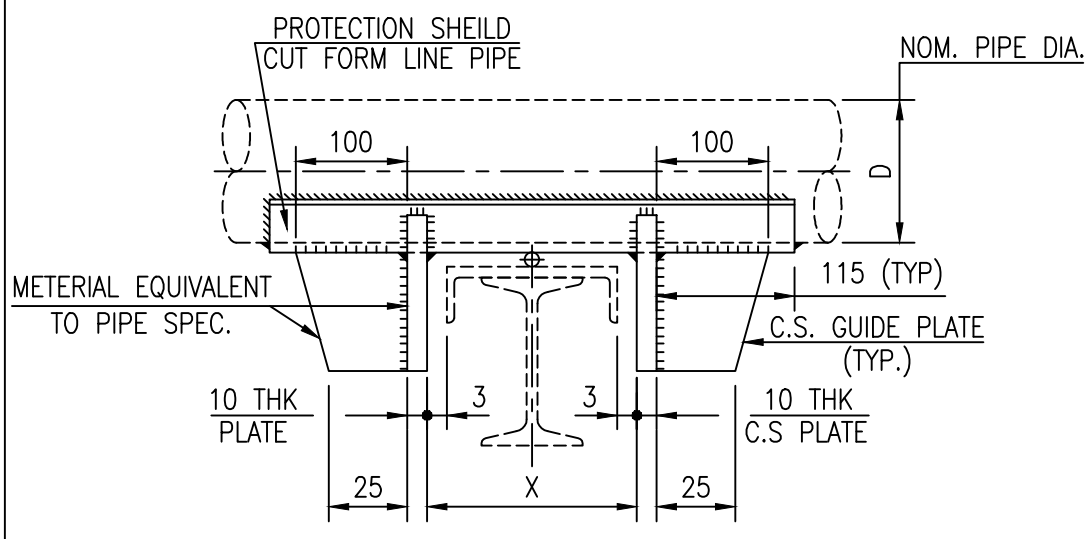
M/s. VCS QUALITY SERVICES PVT. LTD.	CROSS GUIDE FOR BARE PIPE SIZE 2" THRU 24" TYPE–G3	DRAWING NO.
		SD–PI–004
		SHEET NO. 1 OF 1

CROSS GUIDE													
D	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
A	100	130	154	208	280	314	364	396	446	498	548	598	650
B	67	78	86	106	131	145	163	175	193	212	231	248	268

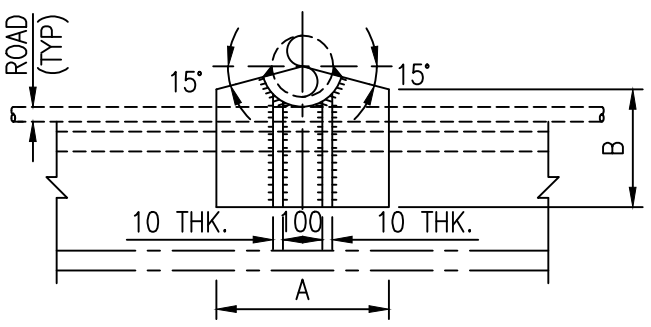


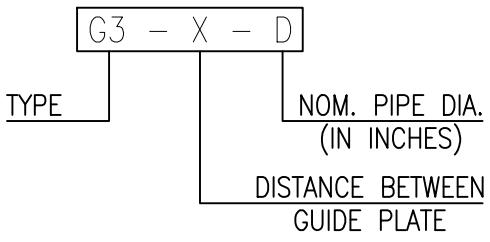
CROSS GUIDE 2" THRU 12"





CROSS GUIDE 14" THRU 24"





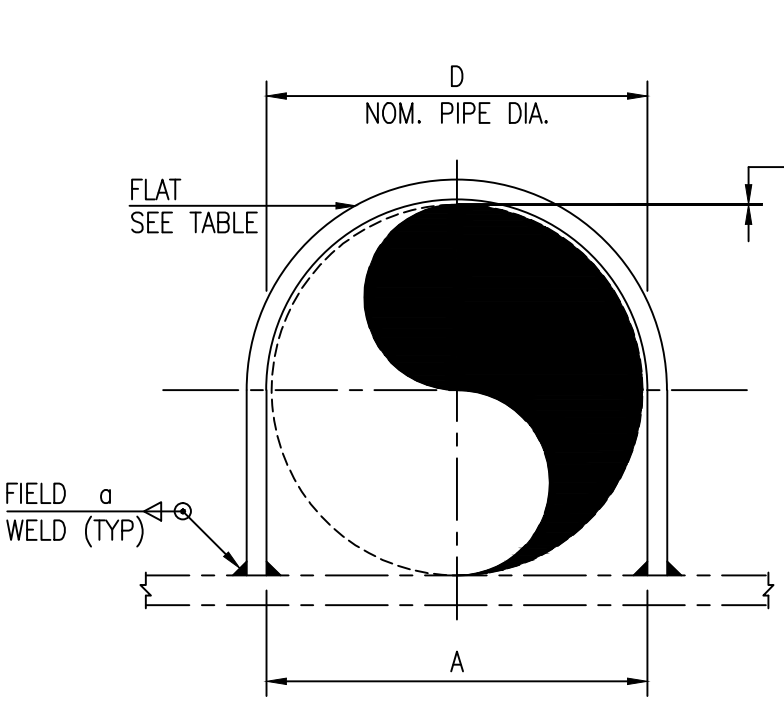
SYMBOL

NOTE:–

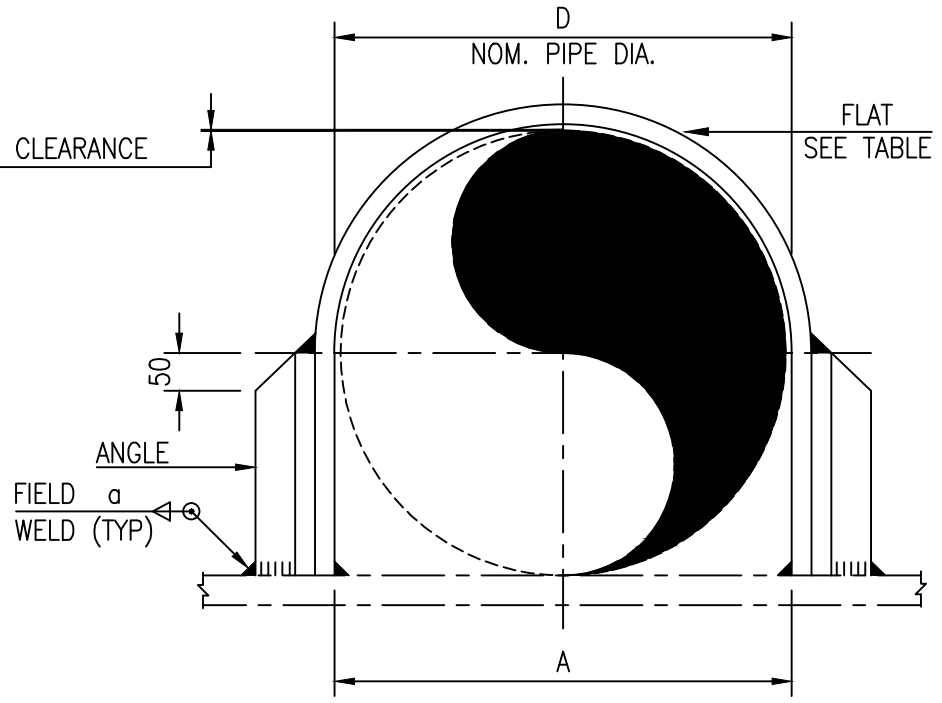
1. PROTECTION SHIELD SHALL BE CUT FROM LINE PIPE.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	GUIDE SUPPORT FOR BARE PIPE SIZE 1/2" THRU 24" TYPE-G1	DRAWING NO. SD-PI-005
		SHEET NO. 1 OF 1



FOR SIZE UPTO 10"



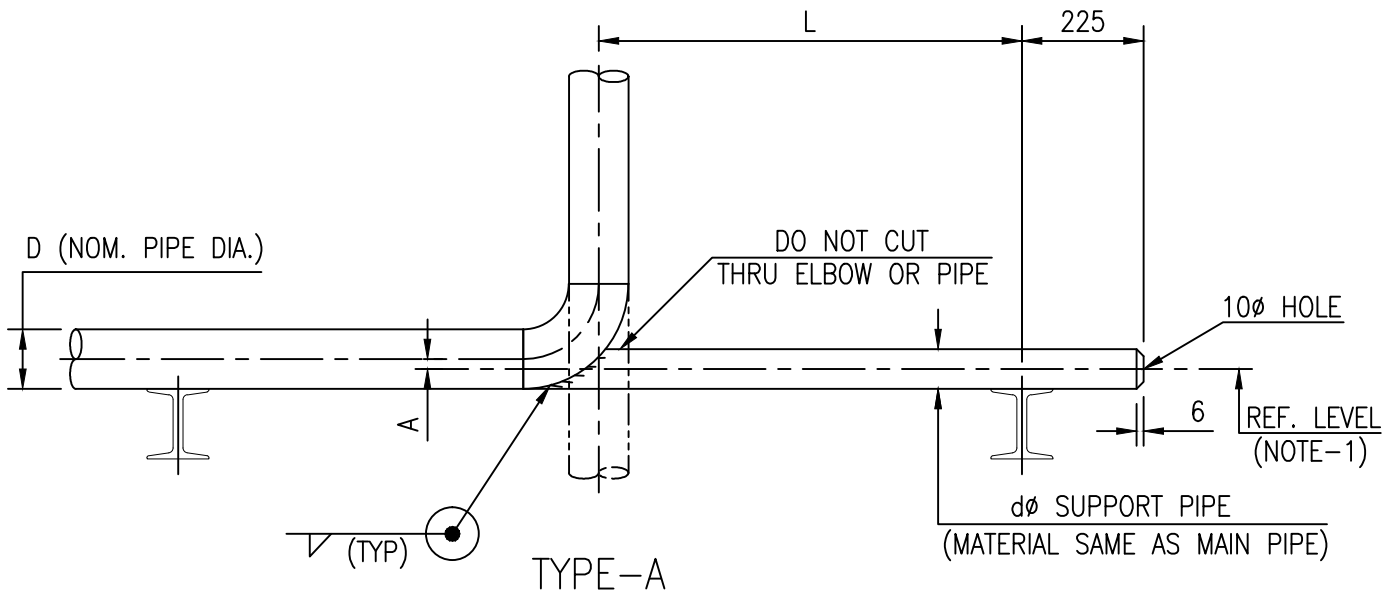
FOR SIZE 12" THRU 24"

D	A	a	FLAT SIZE	ANGLE SIZE
1/2"	26	6	40 x 6	–
3/4"	33			
1"	40			
1 1/4"	48			
1 1/2"	55			
2"	65			
2 1/2"	80			
3"	95			
3 1/2"	107	10	50 x 10	–
4"	120			
5"	146			
6"	174			
8"	225			
10"	278			
12"	328	10	65 x 12	75x75x10
14"	362			
16"	412			
18"	463	10	75 x 12	90x90x10
20"	515			
24"	616			

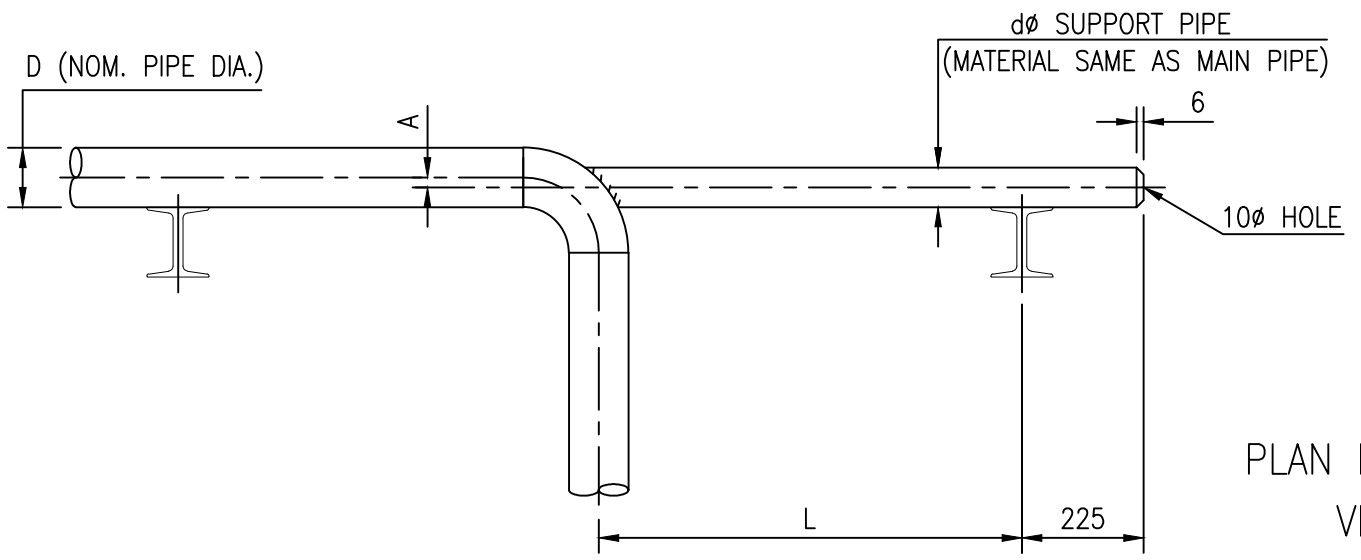
SYMBOL

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

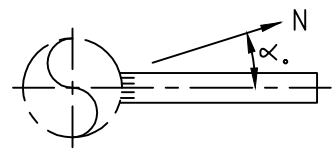
M/s. VCS QUALITY SERVICES PVT. LTD.	DUMMY PIPE SUPPORT FOR BARE PIPE SIZE 2" THRU 24" TYPE–B–39	DRAWING NO. SD–PI–006
		SHEET NO. 1 OF 1



TYPE–A



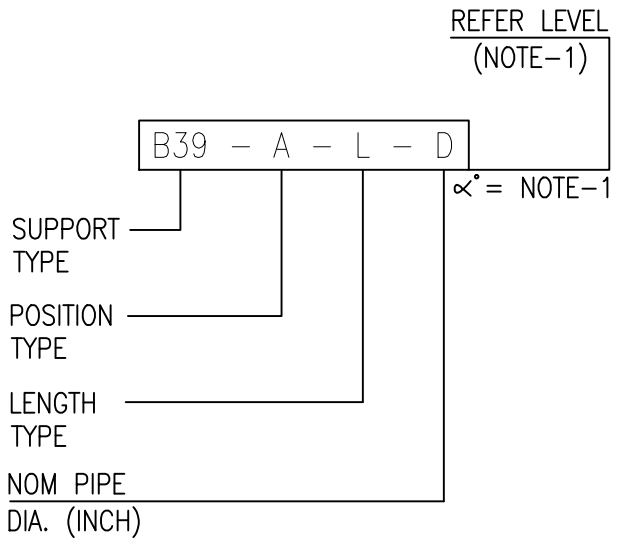
TYPE–B



PLAN FOR SUPPORT ON VERTICAL PIPE

FOR L, 1500 OR LESS		
D	d (NOTE 2)	A
2"	2"–SCH.40	–
3"	2"–SCH.40	15
4"	3"–SCH.40	13
6"	3"–SCH.40	40
8"	4"–SCH.40	52
10"	6"–SCH.40	52
12"	6"–SCH.40	78
14"	8"–SCH.40	68
16"	8"–SCH.40	94
18"	8"–SCH.40	119
20"	10"–SCH.40	118
24"	10"–SCH.40	168

FOR L, OVER 1500		
D	d (NOTE 2)	A
2"	2"–SCH.40	–
3"	2"–SCH.40	15
4"	3"–SCH.40	13
6"	4"–SCH.40	27
8"	6"–SCH.40	25
10"	8"–SCH.40	27
12"	8"–SCH.40	52
14"	10"–SCH.40	41
16"	10"–SCH.40	67
18"	10"–SCH.40	92
20"	12"–SCH.40	92
24"	12"–SCH.40	143



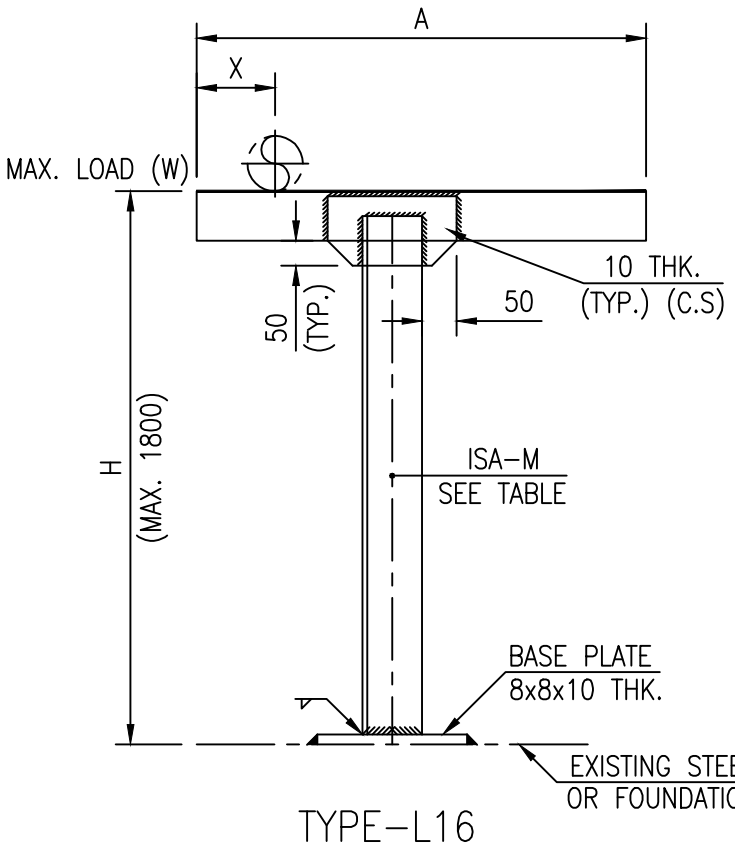
SYMBOL

NOTES:–

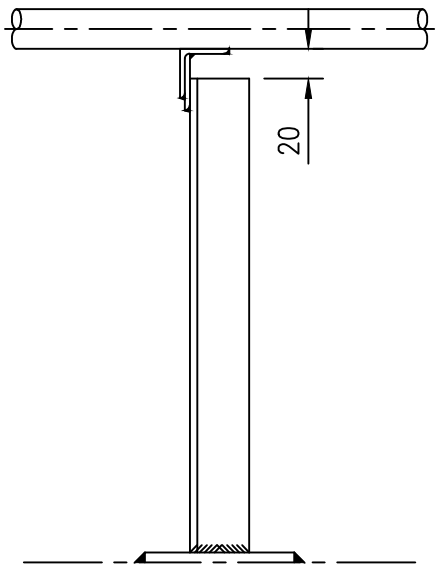
1. REF. LEVEL & ∝. TO BE GIVEN IN CASE SUPPORT IS WELDED TO VERTICAL PIPE.
2. IN CASE SIZE AND/OR SCH. OF SUPPORT PIPE (d) LISTED IN THE TABLE IS NOT AVAILABLE USE NEXT HIGHER SIZE AND/OR NEAREST EQUIVALENT THICKNESS AVAILABLE.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

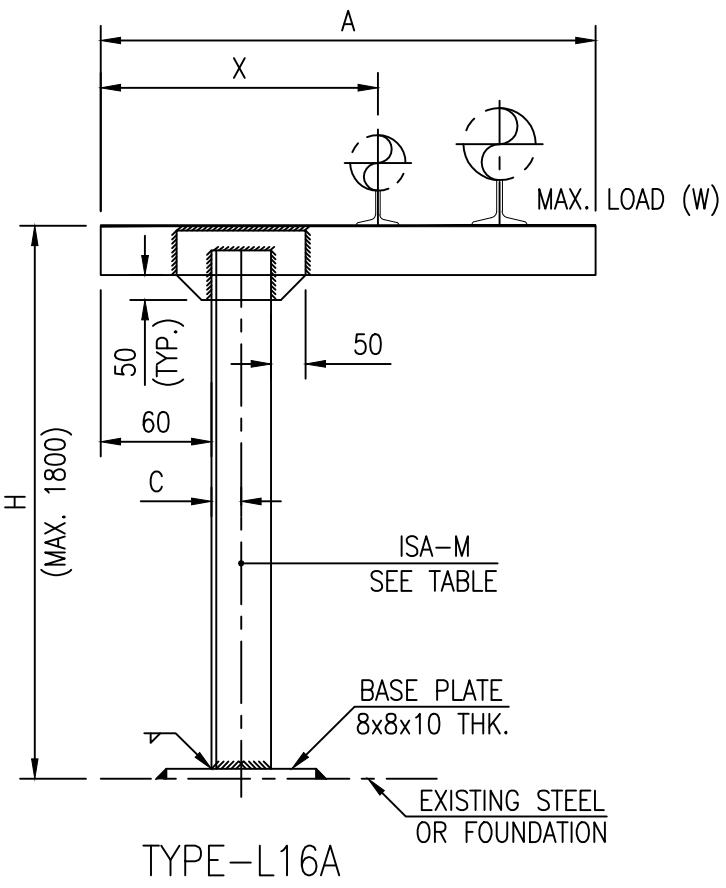
M/s. VCS QUALITY SERVICES PVT. LTD.	LOW SUPPORT STANCHION TYPE–L16 AND L–16A	DRAWING NO. SD–PI–007
		SHEET NO. 1 OF 1



TYPE–L16



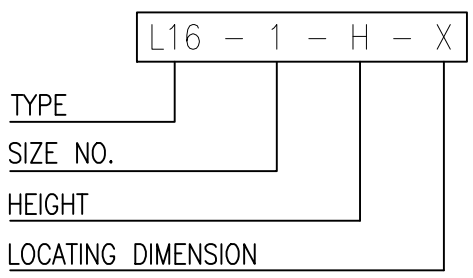
SIDE VIEW



TYPE–L16A

NOTE:–

1. DO NOT USE FOR ANCHORING THE PIPE.

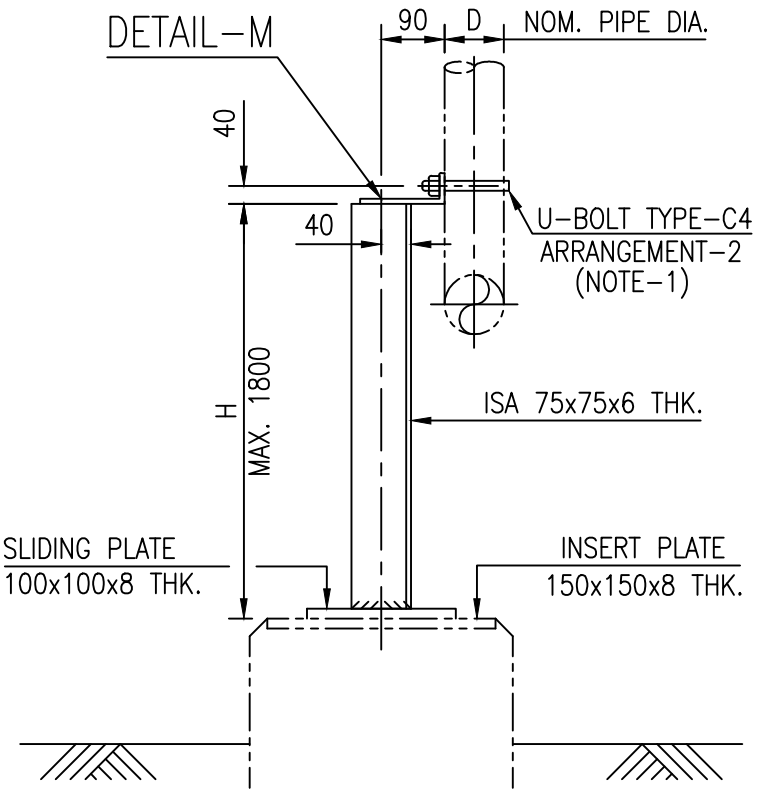


SYMBOL

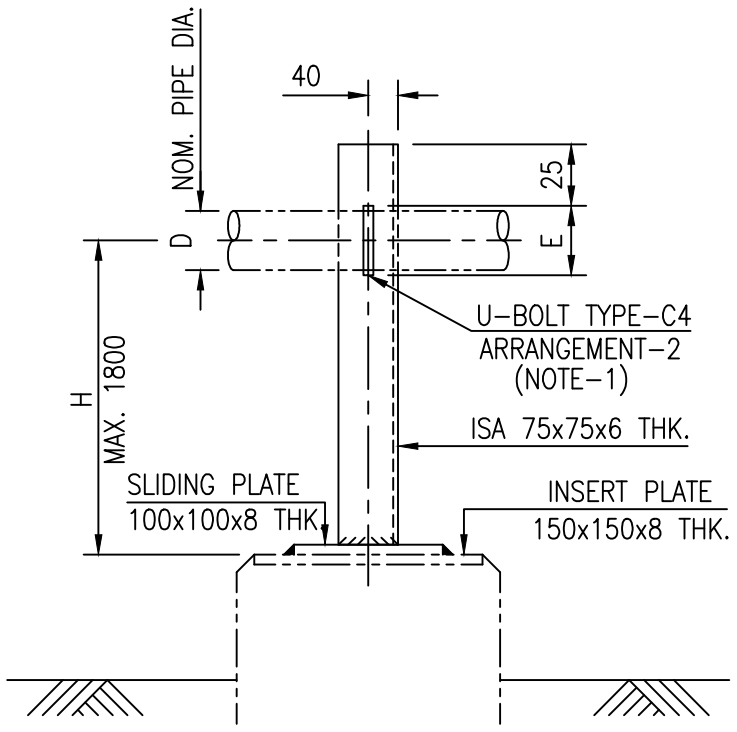
SIZE NO.	MAX. LOAD (W) Kg.	M	A	B	C
1	500	ISA 80x80x8	600	150	45
2	800	ISA 100x100x10	700	150	60
3	1500	ISA 130x130x12	800	150	80

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

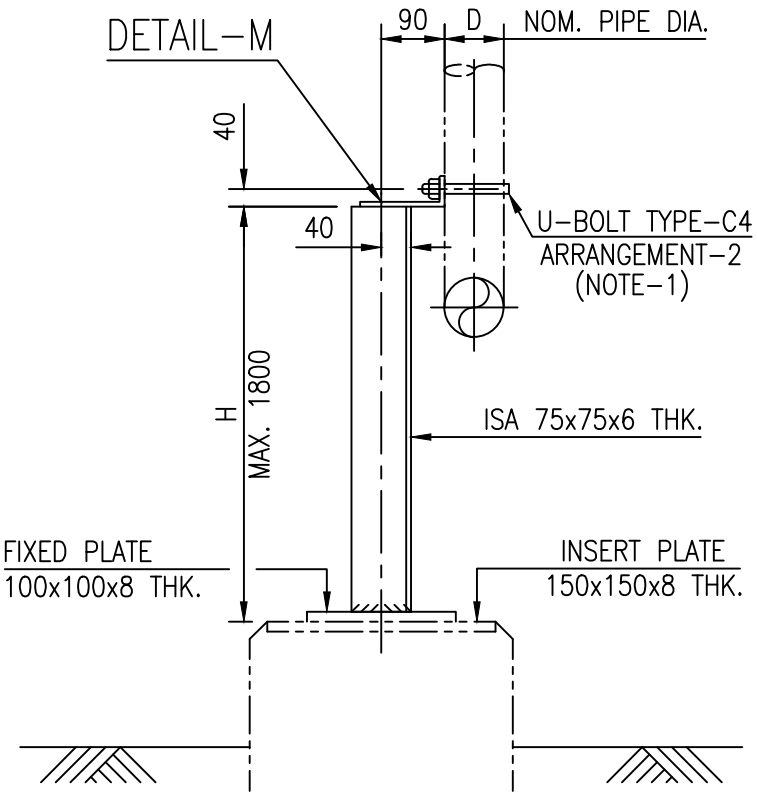
M/s. VCS QUALITY SERVICES PVT. LTD.	LOW SUPPORT SLIDING AND FIXED FOR PIPE SIZE 3/4" THRU 1.1/2"TYPE L-15	DRAWING NO. SD-PI-008
		SHEET NO. 1 OF 1



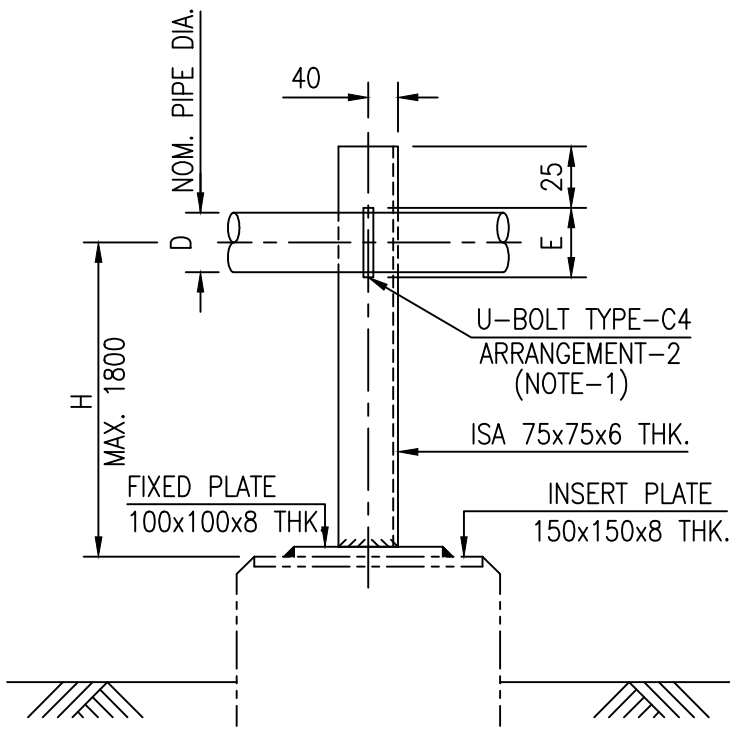
ARRANGEMENT TYPE-1
(SLIDING)



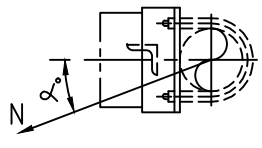
ARRANGEMENT TYPE-2
(SLIDING)



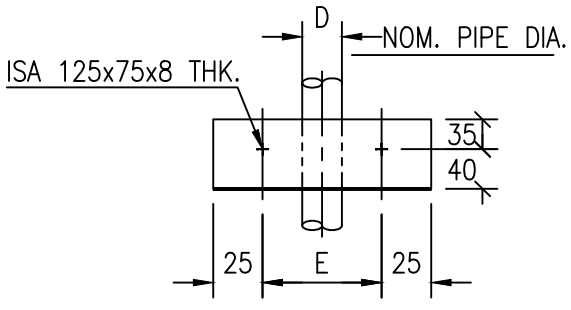
ARRANGEMENT TYPE-3
(FIXED)



ARRANGEMENT TYPE-4
(FIXED)



(FIXED)
(FOR TYPE-1 & 3)



DETAIL-M

D	E
3/4"	36
1"	45
1 1/2"	60

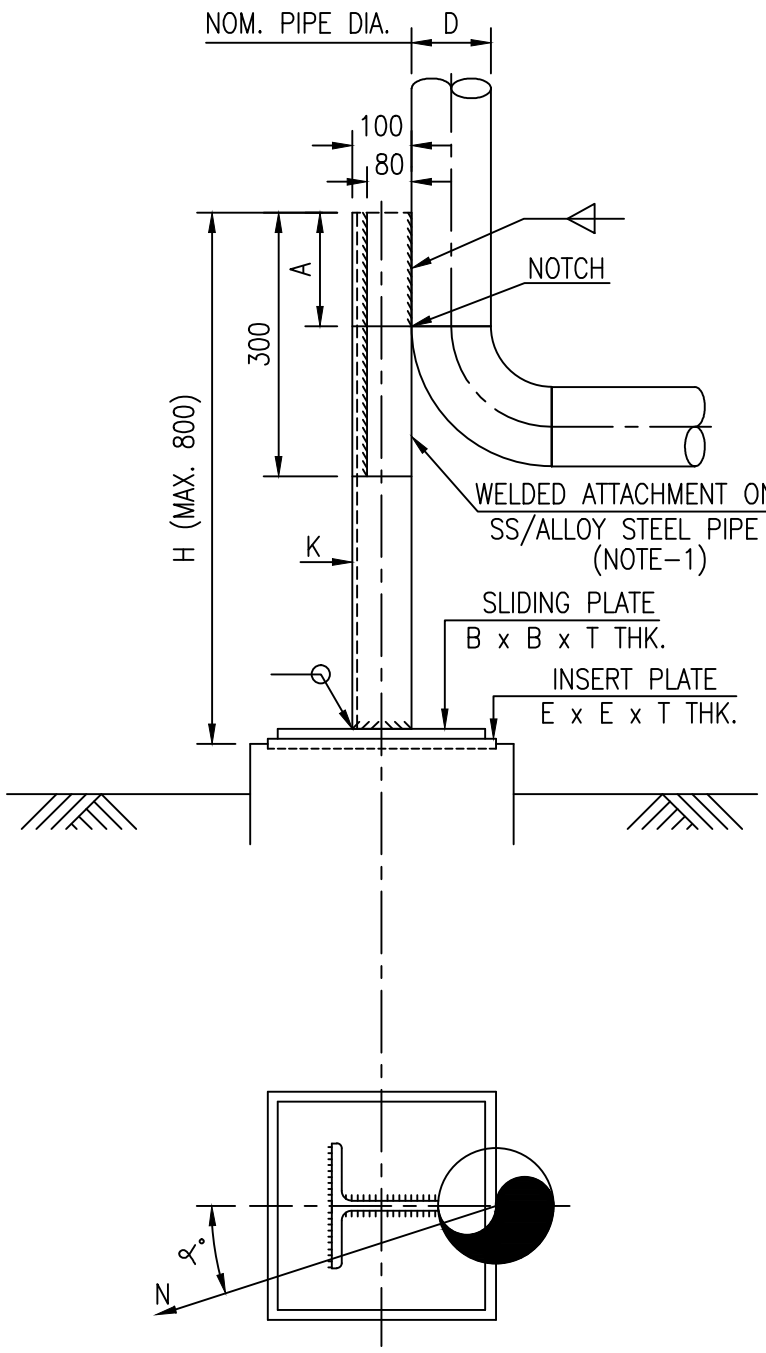
∝°= (FOR TYPE 1 & 3) L15 - 1 - H - D

- TYPE
- ARRANGEMENT TYPE
- HEIGHT
- NOM. PIPE DIA. (INCH)

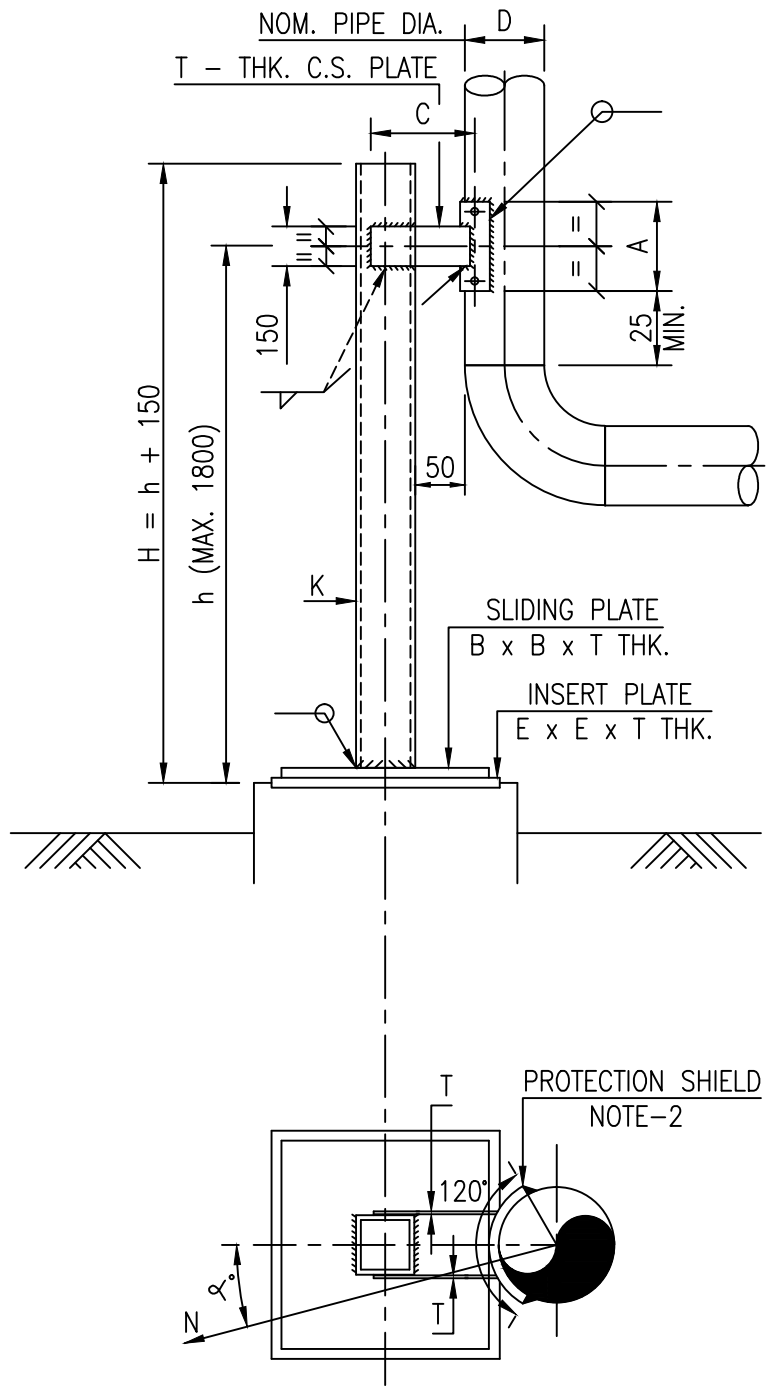
SYMBOL

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	LOW SUPPORT SLIDING FOR BARE & INSULATED PIPE SIZE 2" THRU 24" TYPE-L6	DRAWING NO. SD-PI-009
		SHEET NO. 1 OF 1



FOR PIPE SIZES 2" THRU 4"



FOR PIPE SIZES 6" THRU 24"

∝°=

L6 - 2 - H

TYPE

SIZE NO.

HEIGHT

SYMBOL

NOTES:-

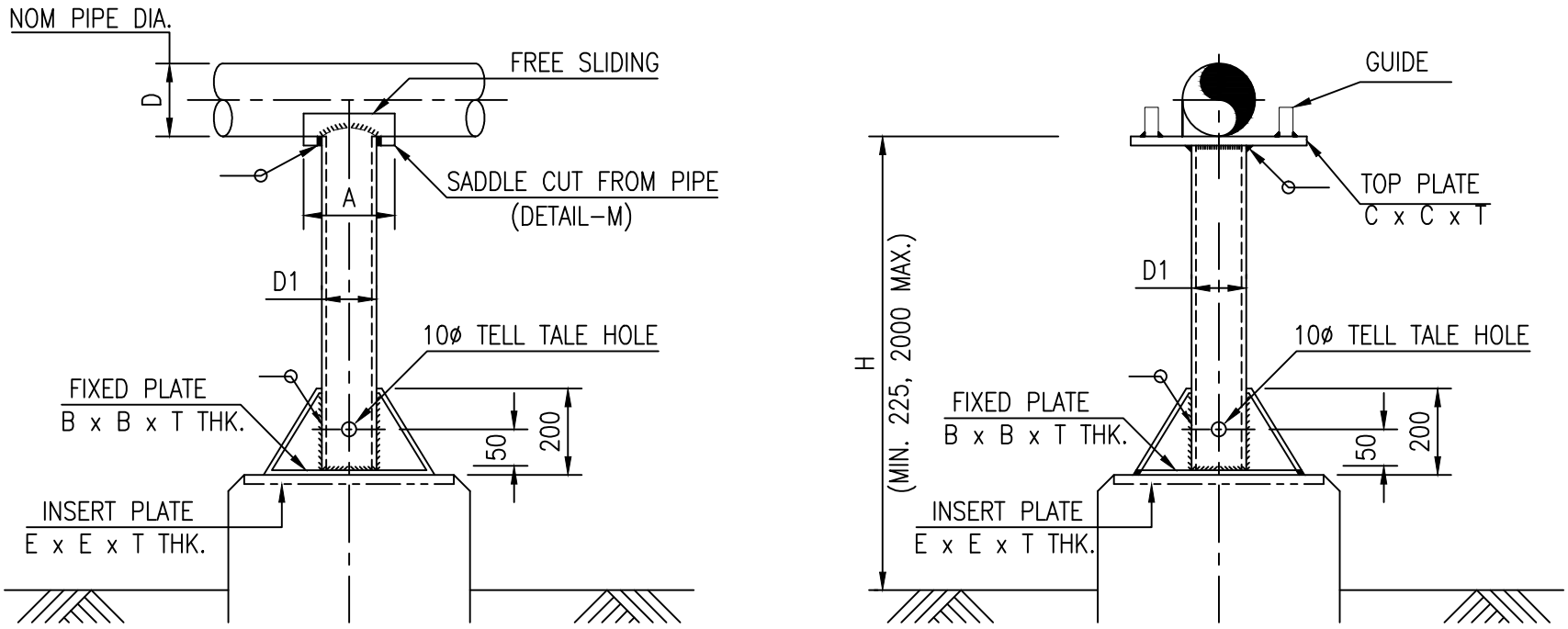
1. MATERIAL FOR WELDED ATTACHMENT SHALL BE EQUIVALENT TO PIPE MATERIAL.
2. PROTECTION SHIELD IS TO BE CUT FROM LINE PIPE.

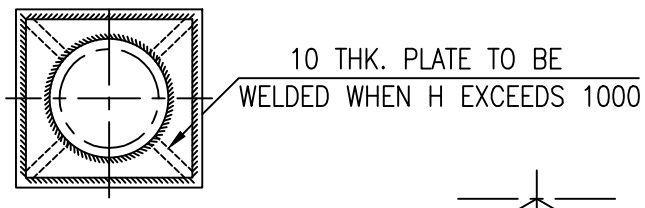
SIZE NO.	D	K	A	T	C	E	B
1	2" TO 4"	CUT FROM ISMB 200	200	10	-	250	150
2	6" TO 10"	ISMC-125 2 NOS.	200	12	150	300	200
3	12" TO 24"	ISMC-225 2 NOS.	300	12	230	400	300

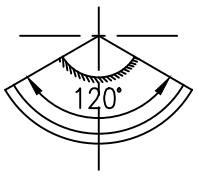
FOR TEMP. UP TO 400 °C ONLY

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

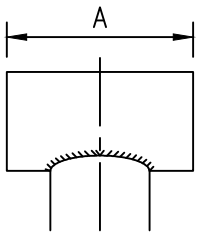
M/s. VCS QUALITY SERVICES PVT. LTD.	LOW SUPPORT SLIDING FOR BARE PIPE SIZE 3/4" THRU 36" TYPE–L5 & L5A	DRAWING NO. SD–PI–010
		SHEET NO. 1 OF 1

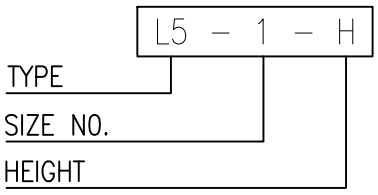




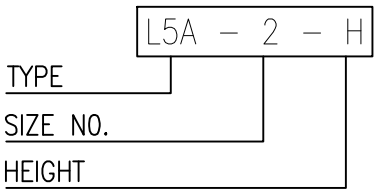


DETAIL–M





SYMBOL



SYMBOL

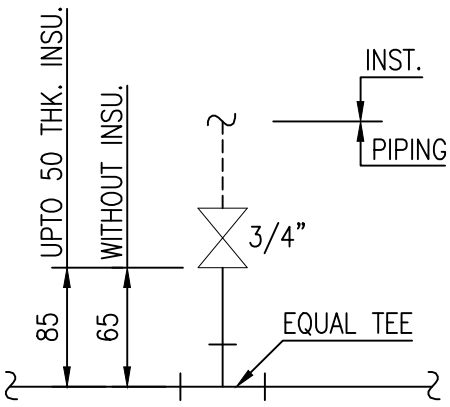
SIZE NO.	D	A	D1 (NOTE–1)	C	B	E	T
1	3/4"	2" NB x 100 Lg.	2" HEAVY IS :1239	150	150	200	12
	1"						
	1.1/2"	3" NB x 100 Lg.		200			
	2"						
2	3"	6" NB x 150 Lg.	2" HEAVY IS :1239	200	150	200	12
	4"						
3	6"	10" NB x 250 Lg.	3" HEAVY IS :1239	300	200	250	16
	8"						
4	10"	14" NB x 350 Lg.	4" HEAVY IS :1239	350	200	250	16
	12"						
5	14"	18" NB x 350 Lg.	6" HEAVY IS :1239	400	250	300	20
	16"						
6	18"	20" NB x 350 Lg.	8" SCH. 40	400	300	350	20
7	20"	24" NB x 350 Lg.	10" SCH. 40	450	350	400	20
	24"						
8	26"	30" NB x 350 Lg.	12" SCH. 40	550	400	500	20
	30"						
	36"	36" NB x 400 Lg.					

NOTES:–

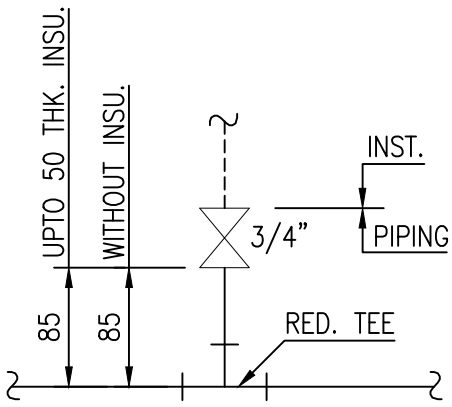
1. IN CASE SIZE AND/OR SCH. OF SUPPORT PIPE (D) LISTED IN THE TABLE IS NOT AVAILABLE, USE NEXT HIGHER SIZE AND/OR NEAREST EQUIVALENT THICKNESS AVAILABLE.
2. MATERIAL FOR SUPPORT PIPE & PLATE SHALL BE CARBON STEEL.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

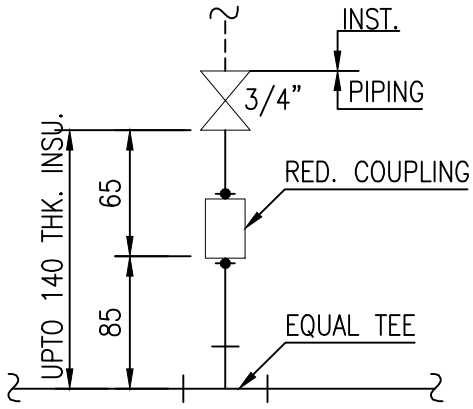
M/s. VCS QUALITY SERVICES PVT. LTD.	PRESSURE TAPPINGS (PA, PG, PC, PT, PIC ETC.)	DRAWING NO. SD–PI–011
		SHEET NO. 1 OF 1



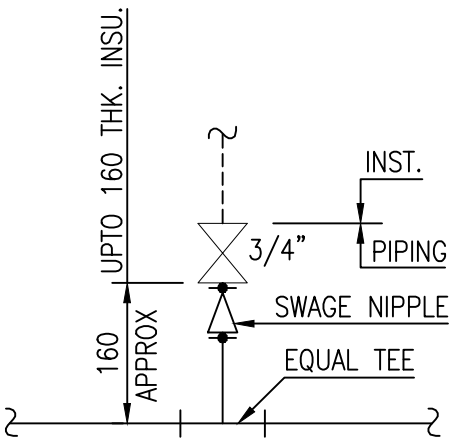
PC–1 ON LINE 3/4"



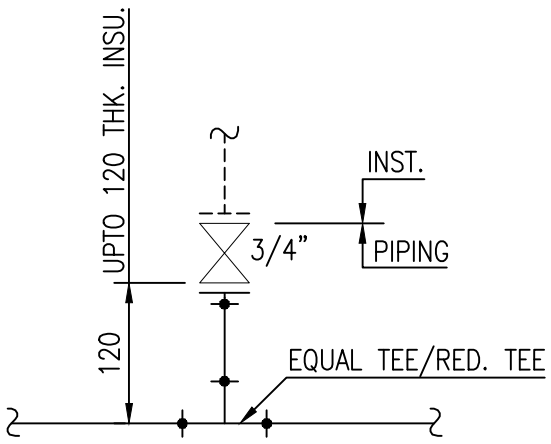
PC–2 ON LINE 1"–1 1/2"



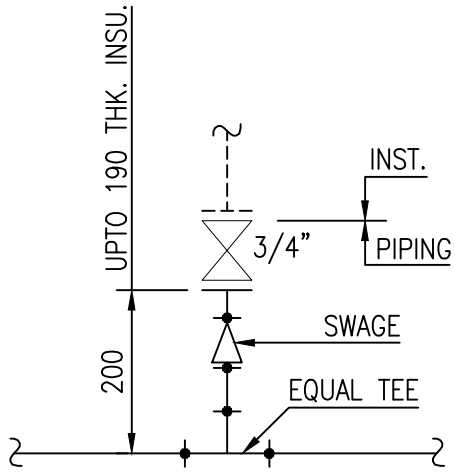
PC–3 ON LINE 1"–1 1/2"



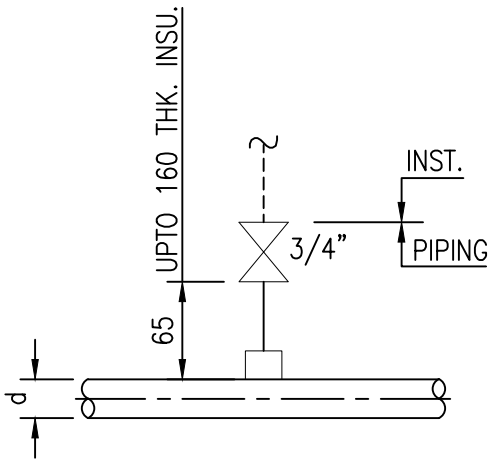
PC–4 ON LINE 1"–1 1/2"



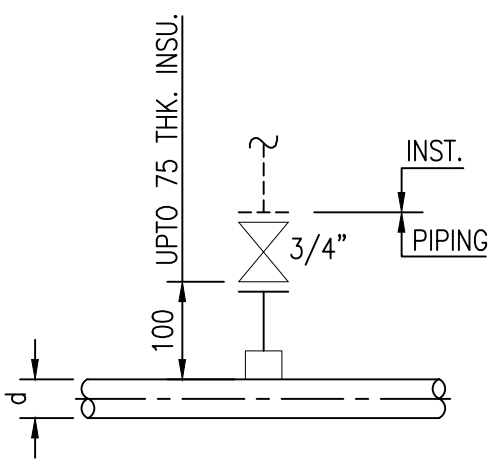
PC–5 ON LINE 3/4"–1 1/2"



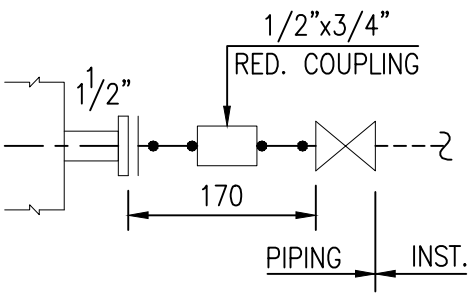
PC–6 ON LINE 1"–1 1/2"



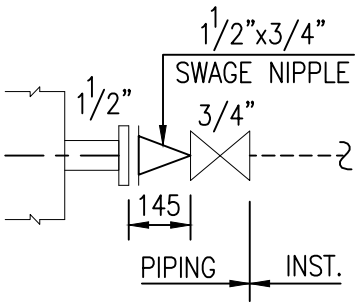
PC–10 ON LINE 2" & ABOVE



PC–11 ON LINE 2" & ABOVE

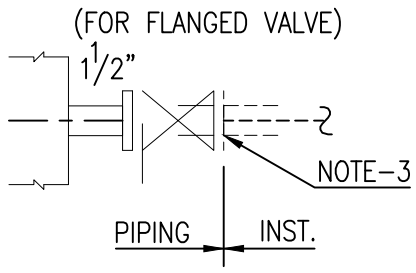


PC–12



PC–13

ON VESSELS / COLUMNS



PC–14

PC–15

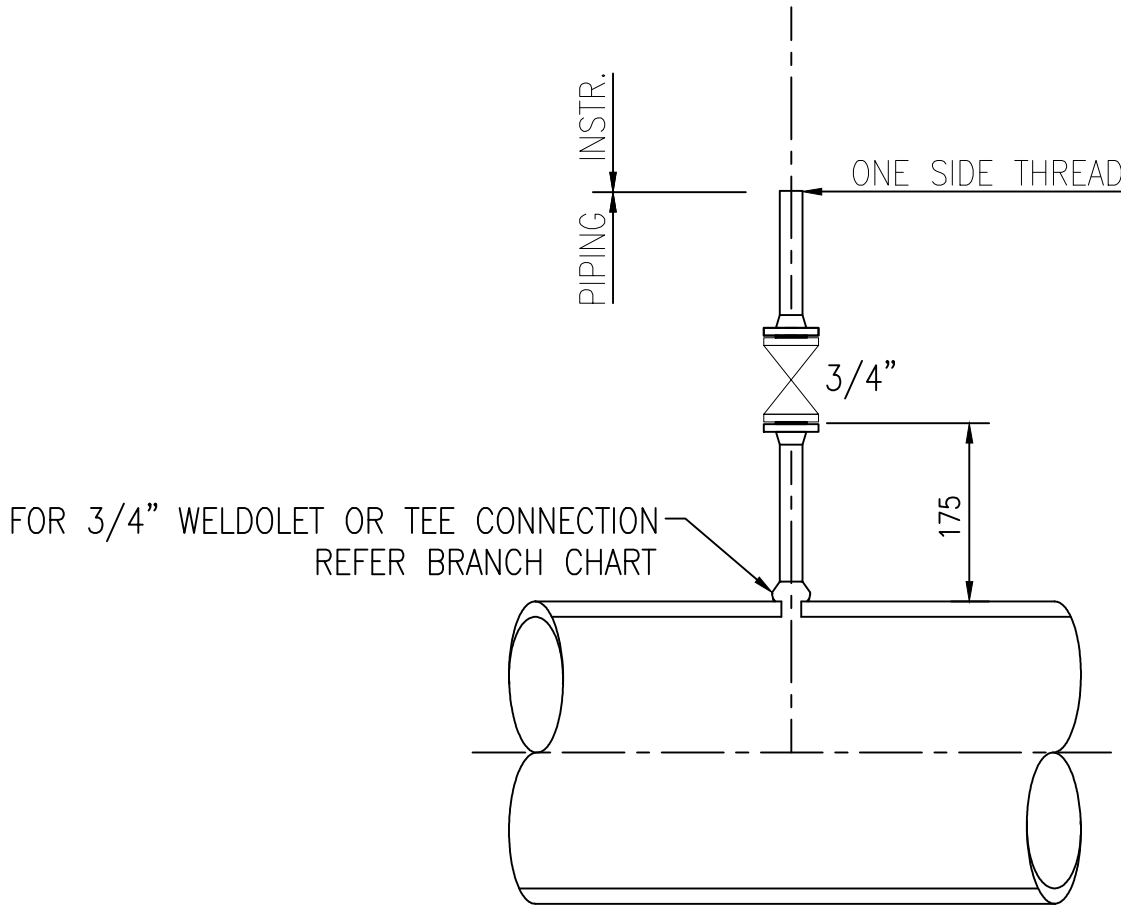
WITH 2" NO 220 E & 2" VALVE

NOTES:–

1. THE INDICATED DIMENSIONS ARE MINIMUM WHICH ALSO COVER INSULATION TO THE EXTENT SHOWN ABOVE IN HIGHER THICKNESS OF INSULATION THAN INDICATED, THE DIFFERENCE SHALL BE ADDED IN THE DIMENSIONS SHOWN ABOVE ACCORDINGLY.
2. PRESSURE TAPPING SHALL BE PROVIDED WITH GATE, GLOBE OR PLUG VALVE (FLGD. SW. OR SCR'D) WITH TEE (EQ. OR RED.) HALF COUPLING (.W. OR SCR'D) OR STUB–IN AS PER PIPING SPECIFICATION.
3. IN CASE OF FLGD. VALVES BOLTING & GASKET ON BOTH SIDES OF VALVE SHALL BE IN PIPING SCOPE.
4. IN CASE OF TAPPING PROVIDED OTHER THAN INDICATED IN THIS STD FOR LAYOUT REASONS DETAILED DIMENSIONS WILL BE CALLED FOR OR CARRIED OUT.

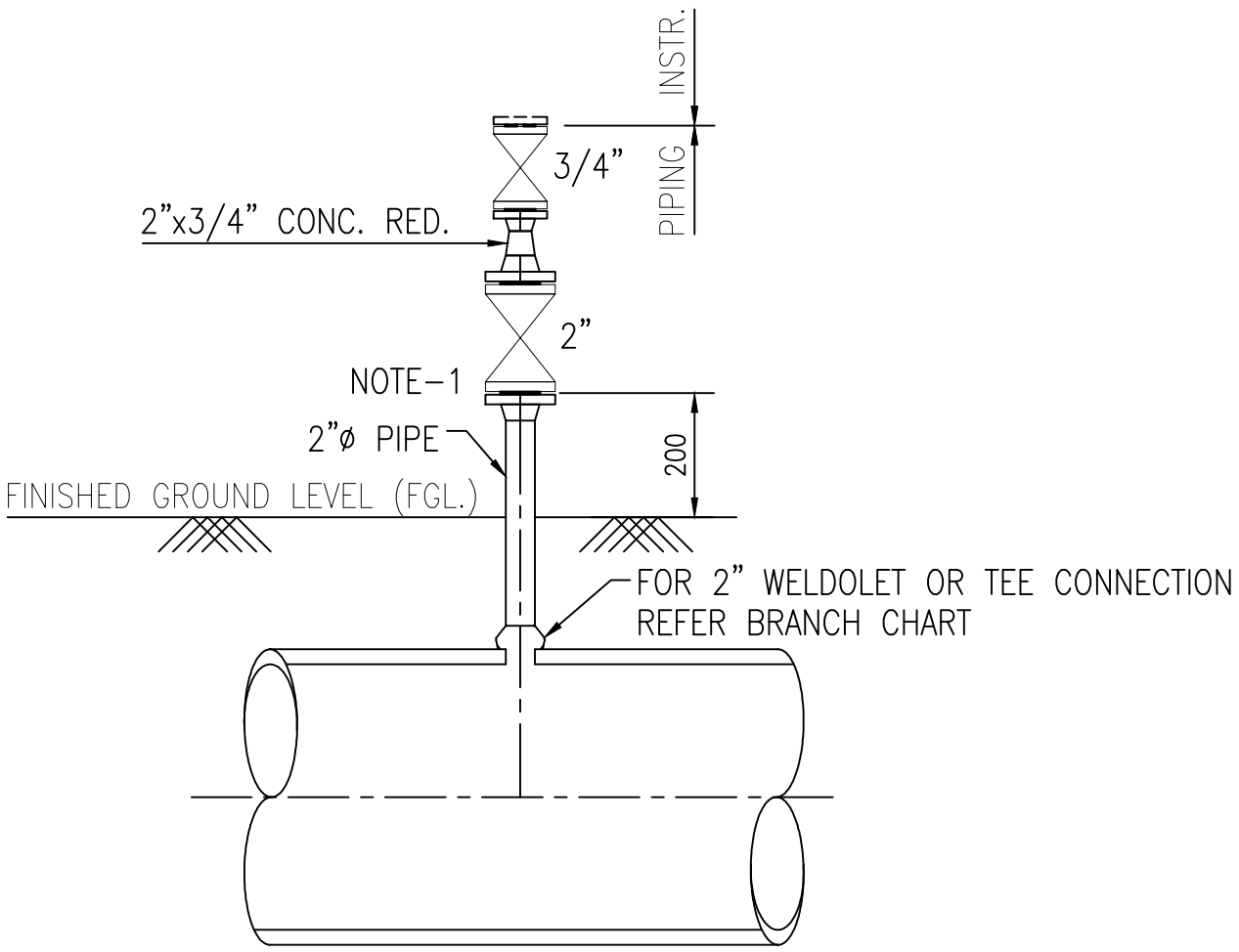
REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	DETAIL OF PRESSURE CONNECTIONS ABOVE GROUND PIPE	DRAWING NO.
		SD–PI–012
		SHEET NO. 1 OF 1



REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	DETAIL OF PRESSURE CONNECTIONS UNDER GROUND PIPE	DRAWING NO. SD-PI-013
		SHEET NO. 1 OF 1

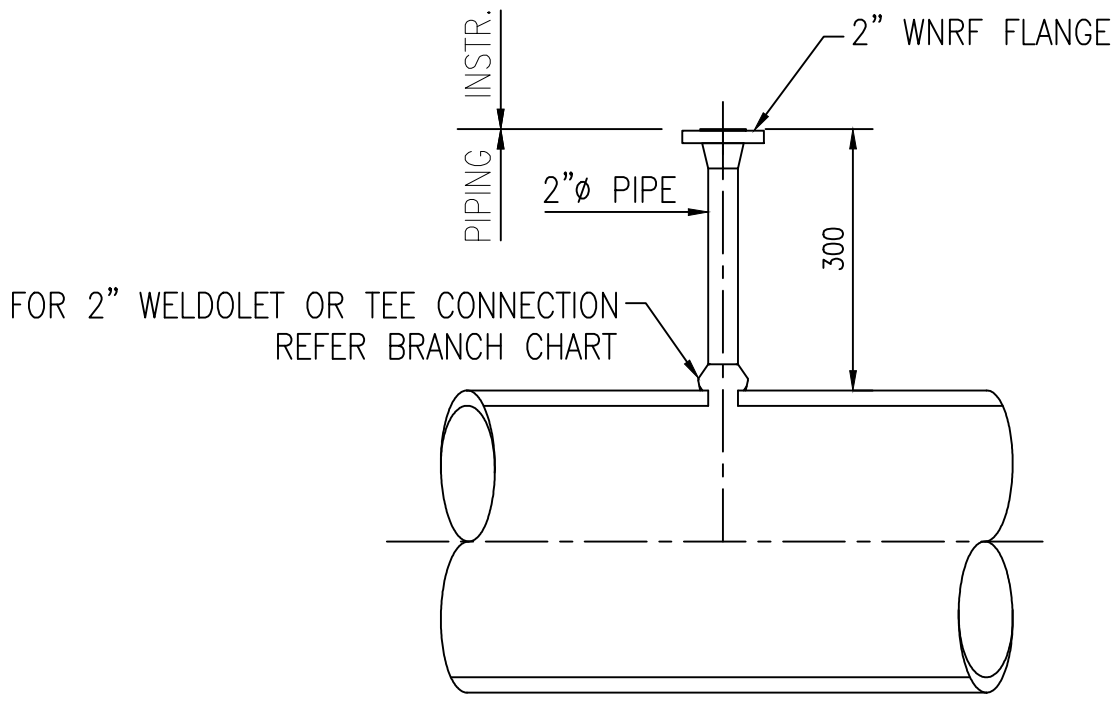


NOTE:

1 INSULATION GASKET SHALL BE INSTALLED.

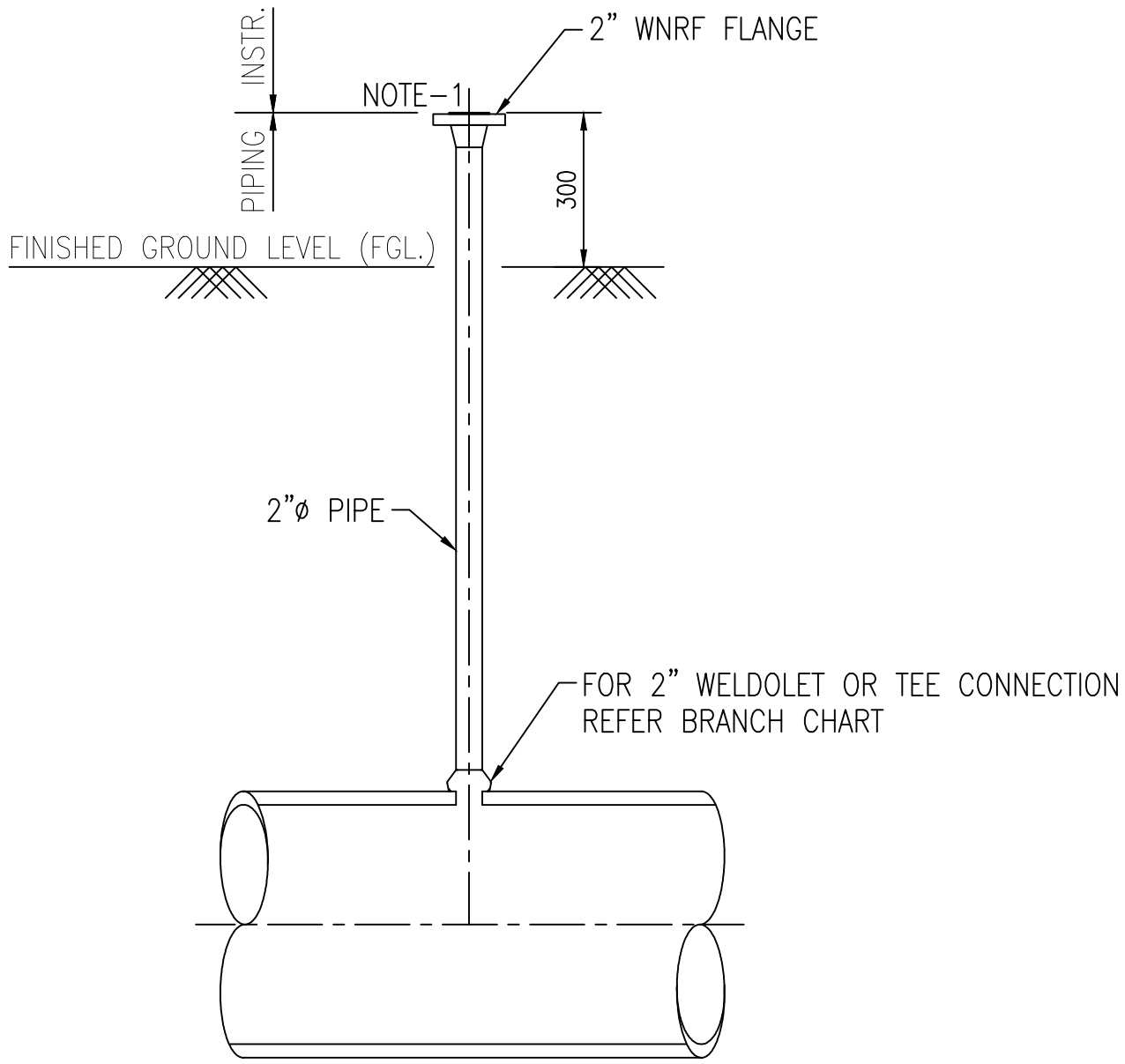
REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	DETAIL OF TEMPERATURE CONNECTIONS ABOVE GROUND PIPE	DRAWING NO. SD-PI-014
		SHEET NO. 1 OF 1



REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	DETAIL OF TEMPERATURE CONNECTIONS UNDER GROUND PIPE	DRAWING NO. SD–PI–015 SHEET NO. 1 OF 1

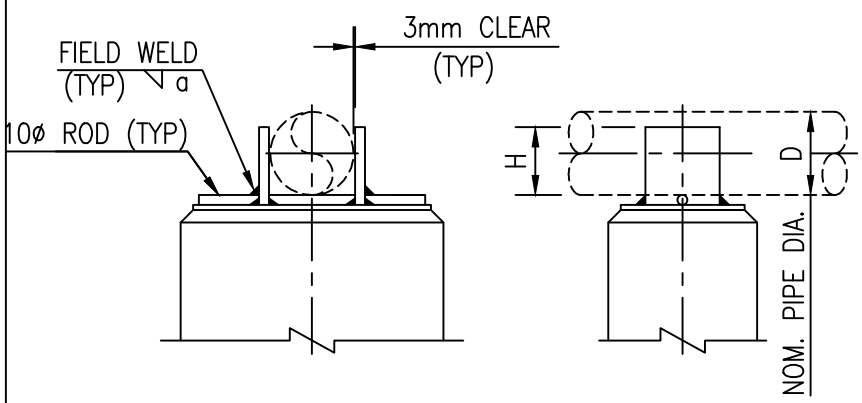


NOTE:

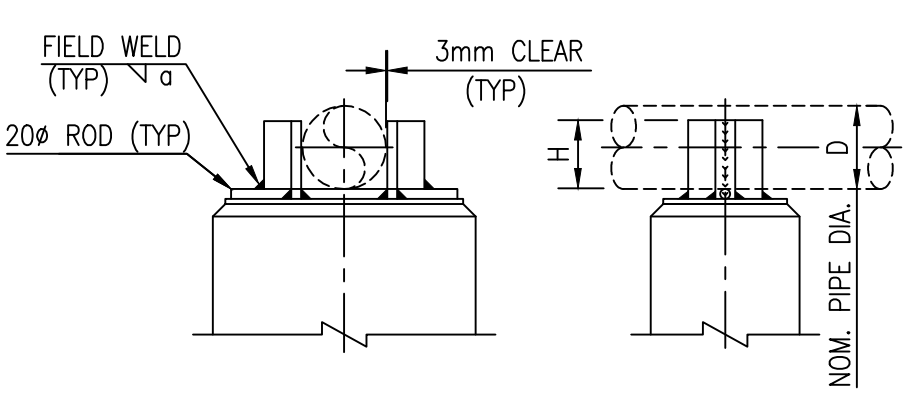
1 INSULATION GASKET SHALL BE INSTALLED.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

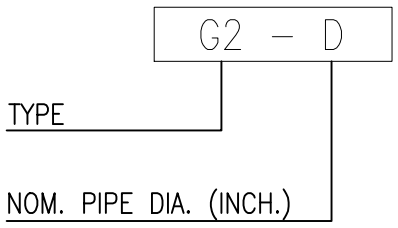
M/s. VCS QUALITY SERVICES PVT. LTD.	GUIDE SUPPORT FOR BARE PIPE (SIZE 1/2" TO 24") TYPE G2	DRAWING NO. SD-PI-016
		SHEET NO. 1 OF 1



FOR SIZES UPTO 4"



FOR SIZES 6" THRU 24"



SYMBOL

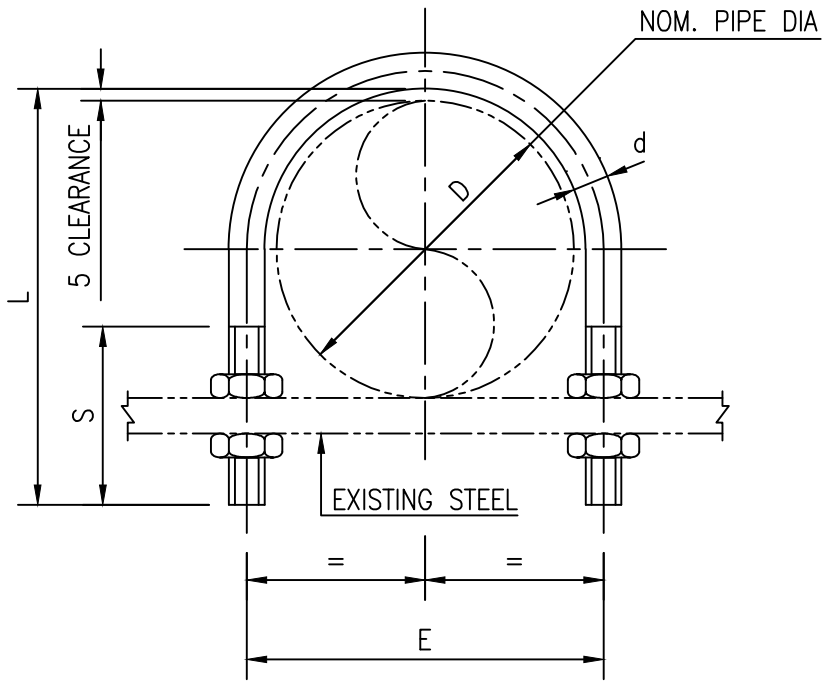
D	H	a	METERIAL
2" & SMALLER	40	6	FLAT 60 x 10
3" TO 4"	70	6	FLAT 75 x 10
6" TO 8"	130	6	2 NOS. ISA 50 x 50 x 6
10" TO 18"	230	10	2 NOS. ISA 75 x 75 x 10
20" TO 24"	350	10	2 NOS. ISA 90 x 90 x 10

NOTES:–

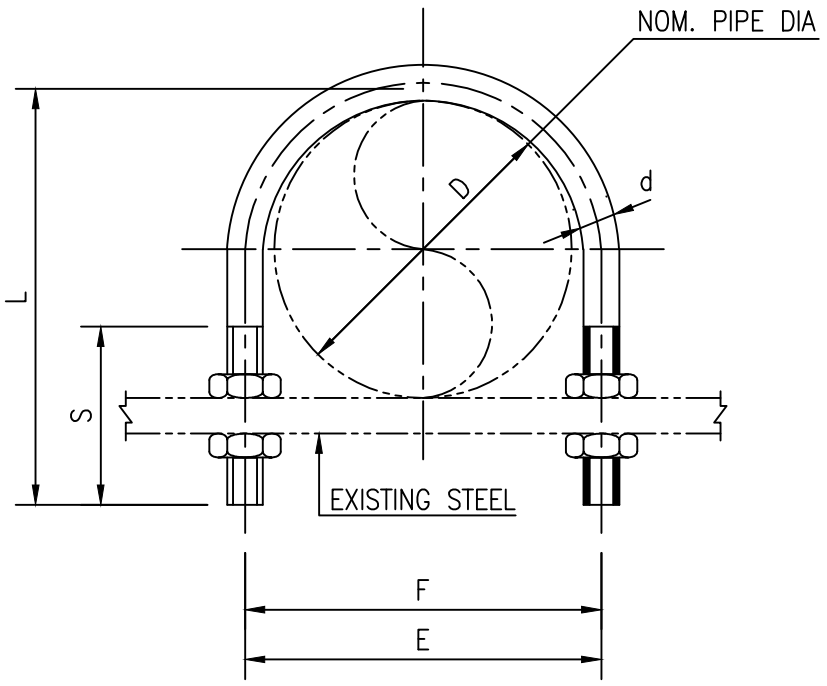
GUIDE ANGLES SHOULD BE SUITABLY TRIMMED WHEREVER THESE OBSTRUCT ADJOINING GUIDE ANGLES.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	U-BOLT FOR BARE PIPE (SIZE 1/2" TO 24")	DRAWING NO. SD-PI-017
		SHEET NO. 1 OF 1

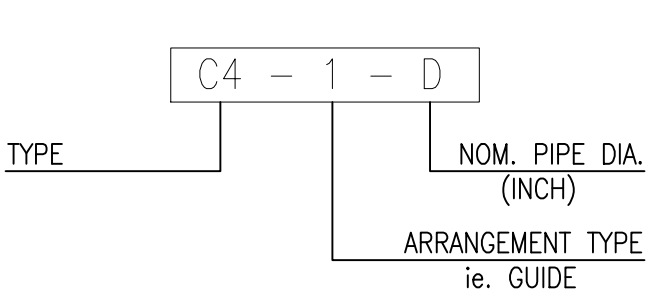


GUIDE
ARRANGEMENT TYPE-1
(1/2" TO 24")



FIXED
ARRANGEMENT TYPE-2
(1/2" TO 1 1/2")

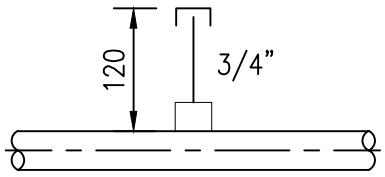
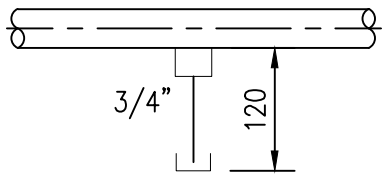
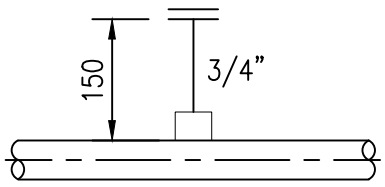
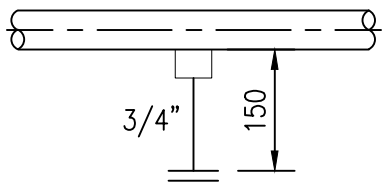
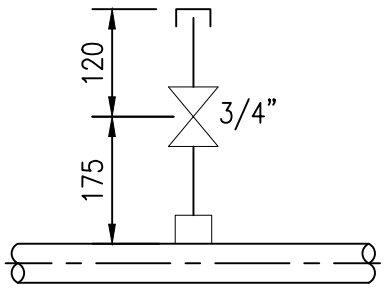
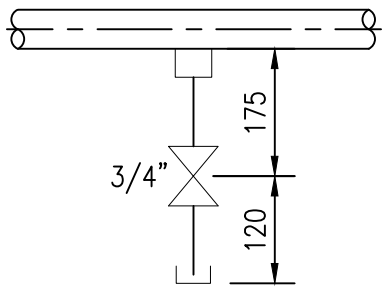
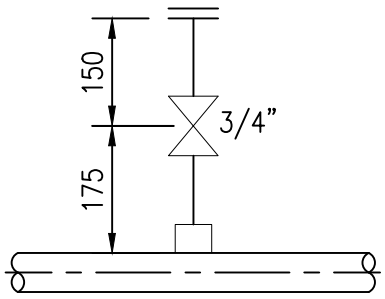
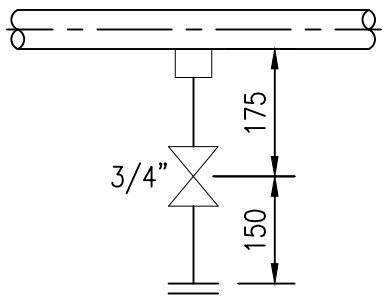
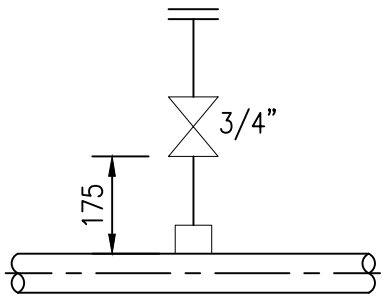
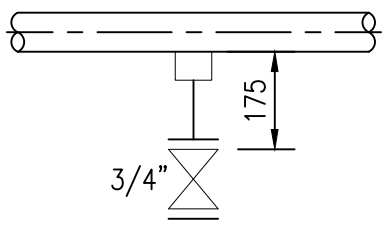
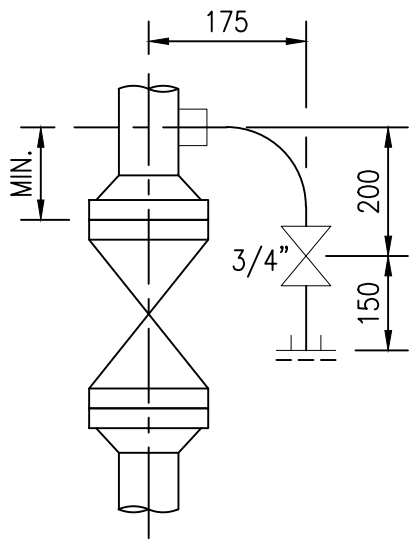
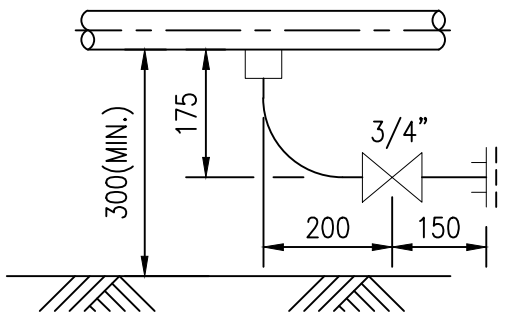
D	O.D. (mm)	'U' CLAMP				
		L	E	S	d	F
1/2"	21	65	30	50	6	24
3/4"	27	70	36	50	6	30
1"	33	75	45	55	8	37
1 1/2"	48	90	60	55	8	52
2"	60	105	72	60	8	64
3"	89	145	106	80	12	94
4"	114	170	130	80	12	119
6"	168	240	190	100	16	173
8"	219	290	242	100	16	226
10"	273	345	296	100	16	280
12"	324	420	351	130	20	331
14"	356	450	382	130	20	362
16"	408	500	435	130	20	414
18"	457	565	490	140	24	465
20"	508	620	540	140	24	515
24"	610	720	645	140	24	620



SYMBOL

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	VENTS AND DRAINS (ON LINES 2" AND ABOVE)	DRAWING NO. SD-PI-018
		SHEET NO. 1 OF 1

TYPE	VENT	DRAIN	TYPE
VP1 V1C			
			D1 D1C
V2F			
			D2F
V3 V3C			
			D3 D3C
V4F			
			D4F
V5F			
			D5F
		DC9 DF9	
			DC10 DF10

NOTES:-

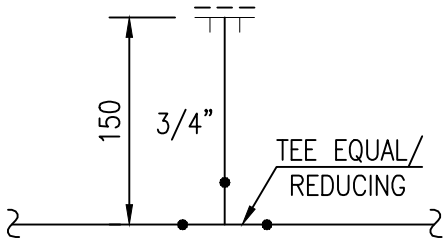
1. DELETED.
2. VENTS & DRAINS SHALL BE PROVIDED WITH GATE, GLOBE OR PLUG VALVE (FLG'D.) WITH HALF COUPLING. OR STUB IN, WITH CAP OR FLANGE & BLIND FLANGE AS PER PIPING SPECIFICATIONS.
3. DELETED.
4. LEGEND : V = VENT; D = DRAIN; C = CAP; F = FLANGE; P = PLUG.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	VENTS AND DRAINS (ON LINES 1 1/2" AND BELOW)	DRAWING NO. SD-PI-019
		SHEET NO. 1 OF 1

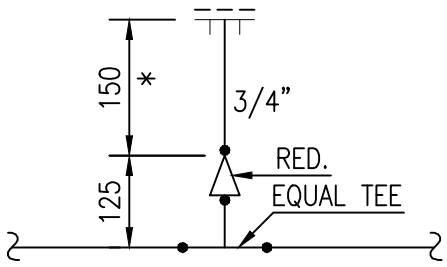
TYPE

VC1
VF1
VP1

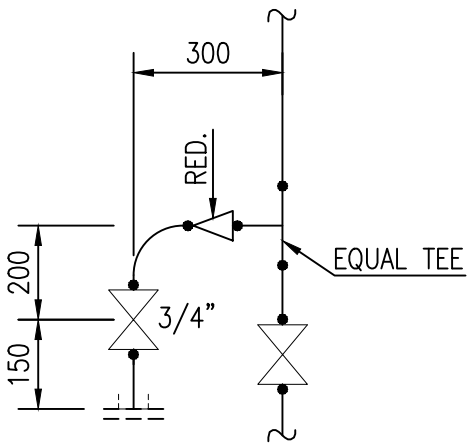


ON LINE 3/4"–1 1/2"

VC2
VF2
VP2



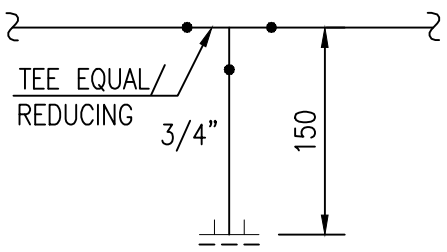
ON LINE 1"–1 1/2"



ON LINE 1"–1 1/2"

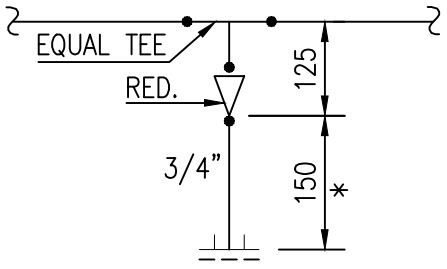
DC7
DF7
DP7

TYPE



DC1
DF1
DP1

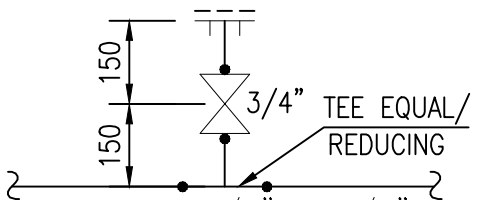
ON LINE 3/4"–1 1/2"



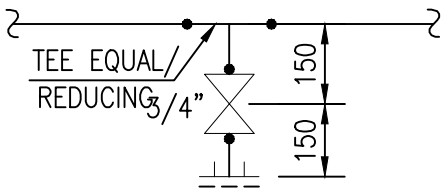
DC2
DF2
DP2

ON LINE 3/4"–1 1/2"

VC3
VF3
VP3



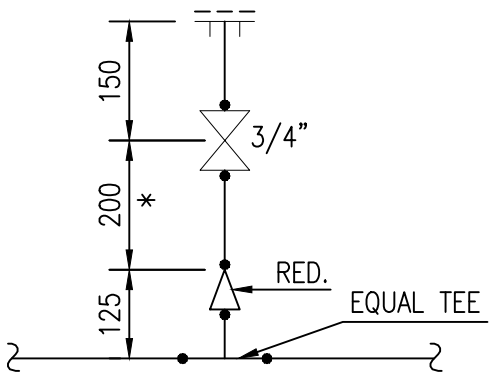
ON LINE 3/4"–1 1/2"



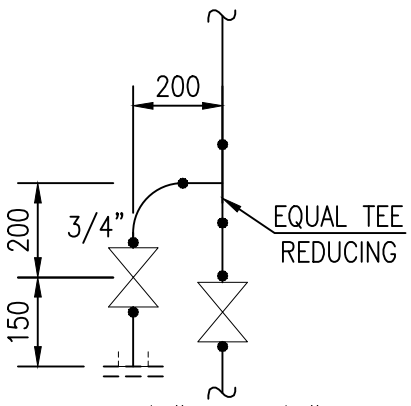
DC3
DF3
DP3

ON LINE 3/4"–1 1/2"

VC4
VF4
VP4

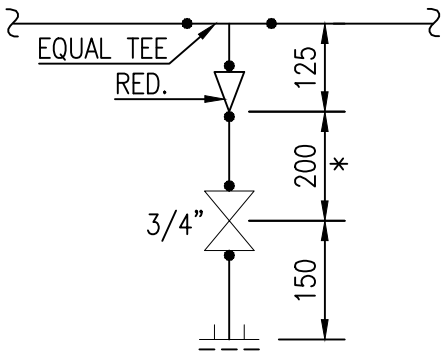


ON LINE 1"–1 1/2"



ON LINE 3/4"–1 1/2"

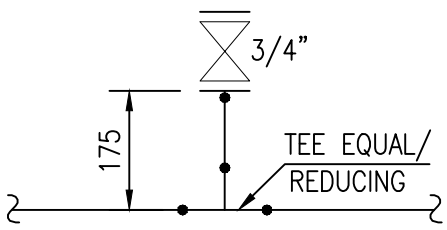
DC8
DF8
DP8



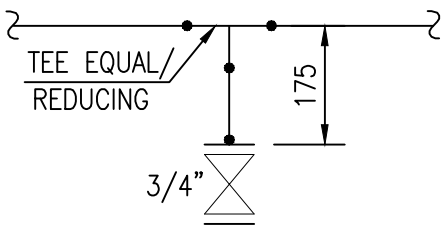
DC4
DF4
DP4

ON LINE 1"–1 1/2"

VF5
VP5



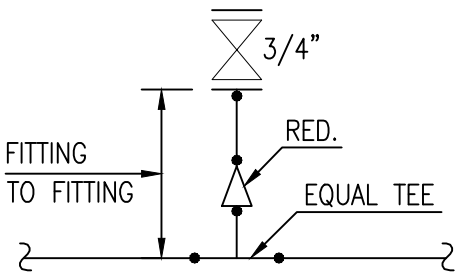
ON LINE 3/4"–1 1/2"



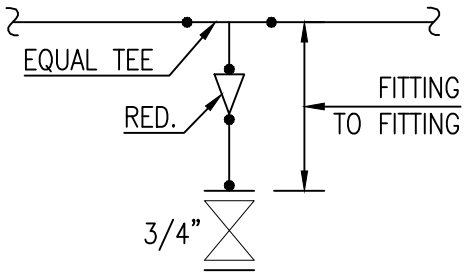
DC5
DF5

ON LINE 3/4"–1 1/2"

VF6
VP6



VENT ON LINE 1"–1 1/2"



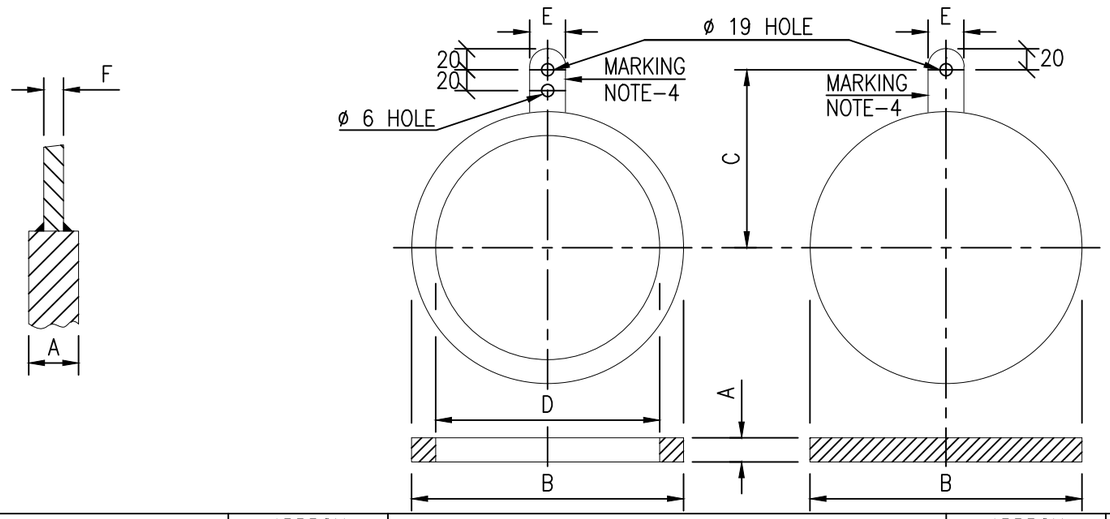
DC6
DF6

VENT ON LINE 1"–1 1/2"

NOTES:–

1. DIMENSIONS ARE VALID FOR 50mm(MAX) INSULATION THICKNESS, INCREASE DIMENSIONS AS REQUIRED, DIMENSIONS MARKED '*' ARE MAXIMUM AND MAY BE REDUCED TO SUIT.
2. VENTS & DRAINS SHALL BE PROVIDED WITH GATE, GLOBE OR PLUG VALVE (FLGD.) WITH TEE (EQUAL OR REDUCING), HALF COUPLING OR STUB IN, CAP OR PLUG FLANGE AND BLIND FLANGE AS PER PIPING SPECIFICATION.
   LEGEND : V = VENT; D = DRAIN; C = CAP; F = FLANGE; RED. = REDUCER, COUPLING OR SOCKET; P = PLUG.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD



NOTES:–

1. PROVIDE CONCENTRIC SERRATED FINISH ON BOTH SIDES WITH GROOVES 0.8 mm APART AND DEPTH APPROX 0.4 mm.
2. DIMENSIONS ARE FOR FLANGES TO ANSI B16.5 FOR SIZE UP TO 24" & MSS–SP–44 FOR SIZE ABOVE 24" FOR FLANGES TO API 605 CALCULATE DIMN.
3. THE DIA METER RATING AND MATERIAL SPECIFICATION SHALL BE MARKED ON WELDED FIXED PLATE.
4. MATERIAL AS PER PIPE CLASS.

PIPE SIZE INCH	150# FF							APPROX WT KGS		300# FF							APPROX WT KGS		600# FF							APPROX WT KGS		PIPE SIZE INCH
	A	B	C	D	E	F		BLIND	SPEC ER	A	B	C	D	E	F		BLIND	SPEC ER	A	B	C	D	E	F		BLIND	SPEC ER	
1"	5	62	105	29	25	4		0.2	0.1	5	70	115	29	25	4		0.2	0.1	5	70	125	29	25	4		0.28	0.15	1"
1½"	5	82	115	43	25	4		0.3	0.2	5	92	125	43	25	4		0.4	0.3	7	92	125	43	25	4		0.5	0.35	1½"
2"	7	102	125	55	25	4		0.4	0.3	7	108	130	55	25	4		0.6	0.4	10	108	130	55	25	4		0.75	0.5	2"
2½"	7	121	140	65	25	4		0.8	0.6	10	127	150	65	25	6		1.1	0.7	15	127	150	65	25	6		1.2	0.9	2½"
3"	7	134	150	80	40	4		0.9	0.7	10	146	155	80	40	6		1.7	1.0	15	146	155	80	40	6		2.0	1.2	3"
4"	8	170	165	106	40	6		1.8	1.0	13	178	180	106	40	6		2.1	1.2	18	190	180	106	40	6		3.7	2.4	4"
6"	11	218	190	157	40	6		3.7	1.5	18	248	210	157	40	6		7.2	3.8	24	263	225	157	40	8		11.0	6.2	6"
8"	15	275	220	207	40	6		7.5	2.7	21	305	240	207	40	8		13.5	6.3	30	314	260	207	40	10		19.5	10.0	8"
10"	18	335	250	260	40	8		13.0	4.3	26	358	270	260	40	10		22.5	8.8	37	397	300	260	40	10		37.0	19.0	10"
12"	19	405	290	312	40	8		22.0	8.0	30	418	310	312	40	10		35.0	13.8	43	454	325	312	40	15		57.0	27.5	12"
14"	22	445	320	342	40	10		28.0	12.5	34	480	340	342	40	15		52.0	23.5	48	448	350	342	40	15		71.0	33.0	14"
16"	26	510	350	393	40	10		42.0	15.0	38	536	375	393	40	15		70.0	30.0	54	560	390	393	40	20		110	55	16"
18"	29	545	370	445	40	10		53.0	17.0	43	592	400	445	40	20		100	42.0	62	608	415	445	40	20		140	65	18"
20"	30	600	400	496	40	15		70.0	20.0	48	650	440	496	40	20		128	49.0	67	678	450	496	40	20		190	83	20"
24"	37	710	450	597	50	15		120	52.0	57	772	510	597	50	20		210	74.0	81	785	515	597	50	25		307	125	24"
TOLERANCE	± 0.3	± 0.5		± 0.5	± 1.0					± 0.3	± 0.5		± 0.5	± 1.0					± 0.3	± 0.5		± 0.5	± 1.0					TOLERANCE

M/s. VCS QUALITY SERVICES PVT. LTD.

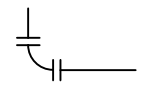
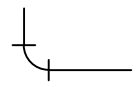
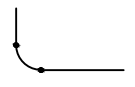
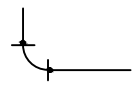
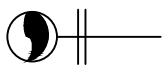
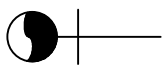
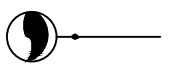
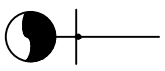
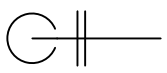
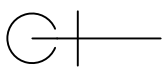
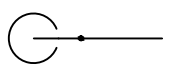
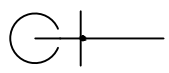
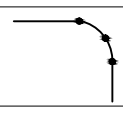
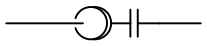
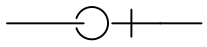
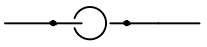
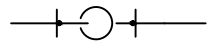
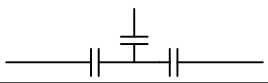
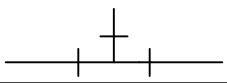
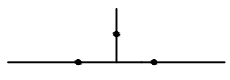
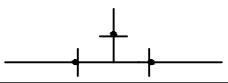
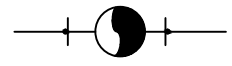
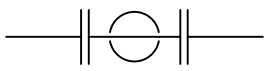
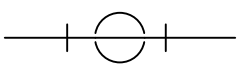
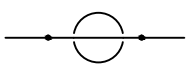
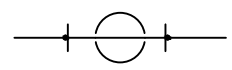
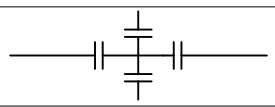
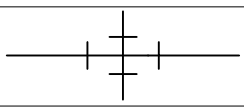
DWG. NO.	REF. DRAWING

NO.	DATE	REVISION	DRN	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

SPACERS BLINDS
150#,300# & 600# FF

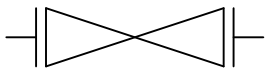
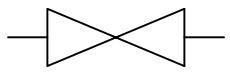
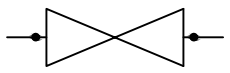
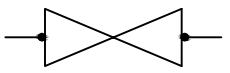
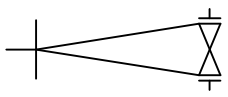
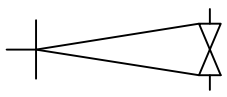
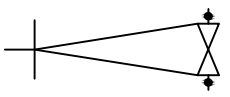
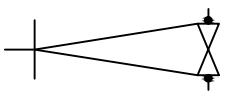
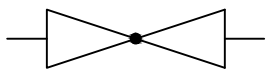
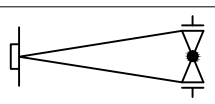
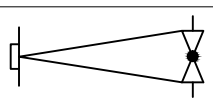
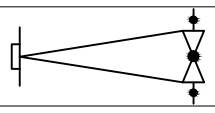
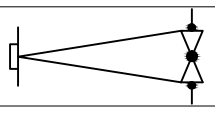
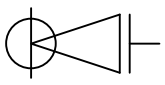
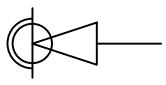
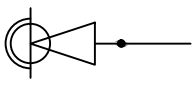
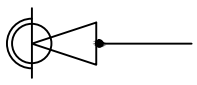
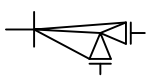
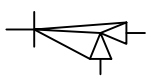
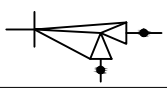
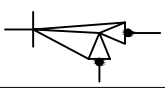
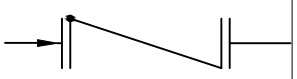
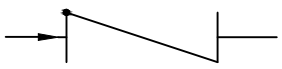
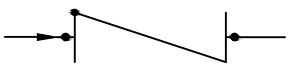
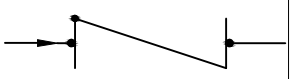
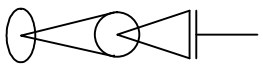
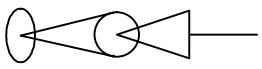
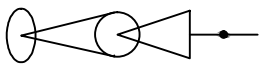
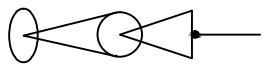
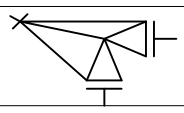
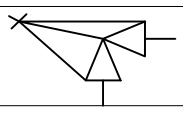
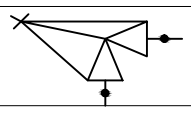
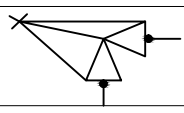
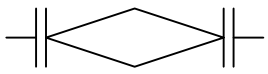
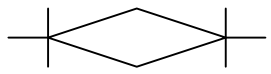
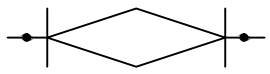
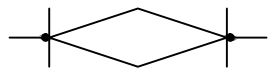
DRAWING NO.	REV.
SD–PI–021	0

M/s. VCS QUALITY SERVICES PVT. LTD.	SYMBOLS OF PIPING ELEMENTS ON DRAWINGS	DRAWING NO. SD–PI–023
		SHEET NO. 1 OF 4

DESCRIPTION	FLANGED	SCREWED	WELDED (NOTE–1)	SOCKET WELD
90° ELBOW				
ELBOW (TURNED UP)				
ELBOW (TURNED DOWN)				
MITERED BEND 90°				
MITERED BEND 45°				
45° ELBOW				
45° ELBOW (TURNED UP)				
45° ELBOW (TURNED DOWN)				
TEE EQUAL/UNEQUAL				
TEE (OUTLET UP)				
TEE (OUTLET DOWN)				
CROSS				
CONCENTRIC REDUCER				
ECCENTRIC REDUCER				
DEAD END				
LATERAL				
SIGHT GLASS				
UNION				
HALF COUPLING				
FULL COUPLING				
HOSE COUPLING				

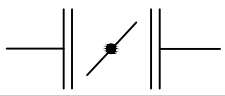
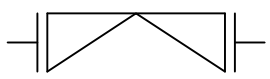
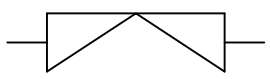
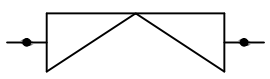
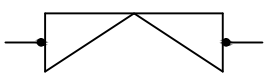
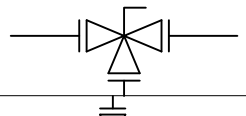
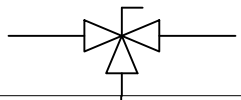
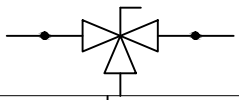
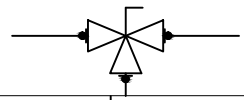
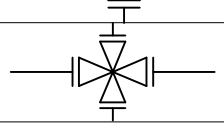
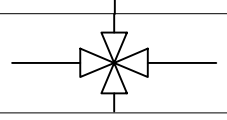
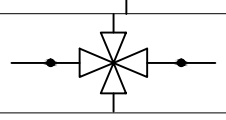
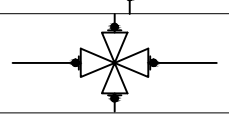
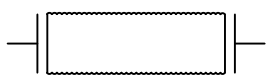
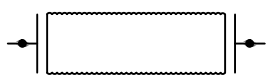
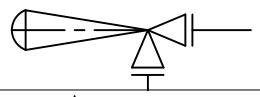
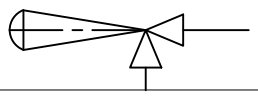
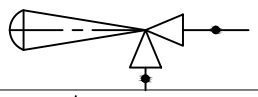
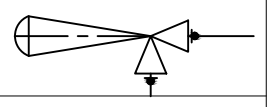
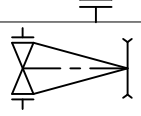
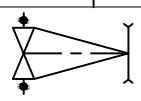
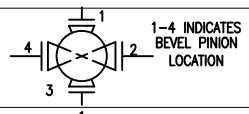
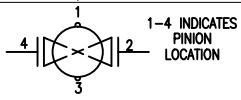
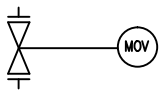
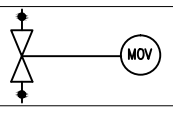
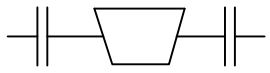
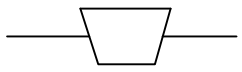
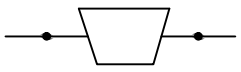
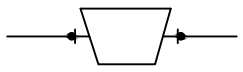
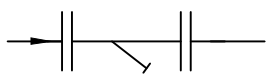
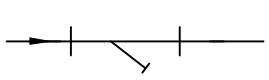
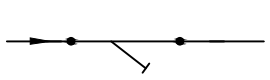
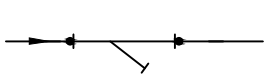
REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

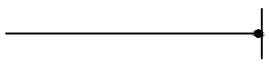
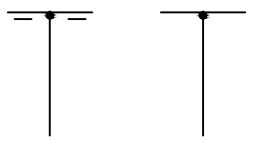
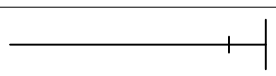
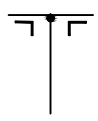
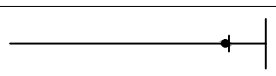
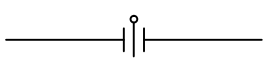
M/s. VCS QUALITY SERVICES PVT. LTD.	SYMBOLS OF PIPING ELEMENTS ON DRAWINGS	DRAWING NO. SD-PI-023 SHEET NO. 2 OF 4

DESCRIPTION	FLANGED	SCREWED	WELDED (NOTE-1)	SOCKET WELD
GATE VALVE (PLAN)				
GATE VALVE (ELEVATION)				
GLOBE VALVE (PLAN)				
GLOBE VALVE (ELEVATION)				
ANGLE VALVE (PLAN)				
ANGLE VALVE (ELEVATION)				
CHECK VALVE (PLAN OR ELEVATION)				
ANGLE STOP CHECK VALVE (PLAN)				
ANGLE STOP CHECK VALVE (ELEVATION)				
PLUG VALVE (PLAN)				
PLUG VALVE (ELEVATION)				
BALL VALVE (PLAN)				
BALL VALVE (ELEVATION)				
NEEDLE VALVE (PLAN OR ELEVATION)				
RELIEF VALVE (PLAN)				
RELIEF VALVE (ELEVATION)				
CONTROL VALVE GLOBE TYPE(PLAN)				
CONTROL VALVE GLOBE TYPE(ELEVATION)				
CONTROL VALVE BUTTERFLY TYPE(PLAN)				
CONTROL VALVE BUTTERFLY TYPE(ELEV.)				
SOLENOID OPERATED VALVE(PLAN OR ELEV.)				

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

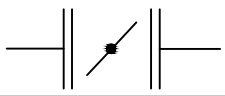
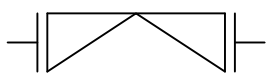
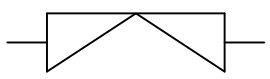
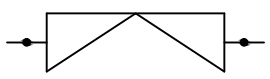
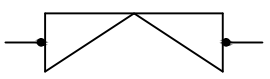
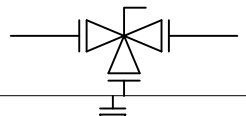
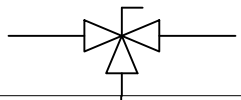
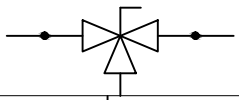
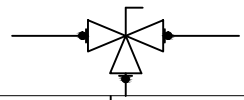
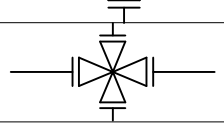
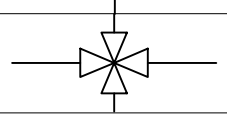
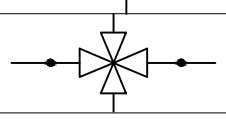
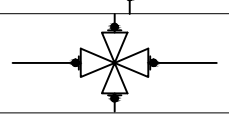
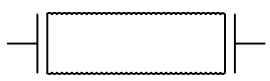
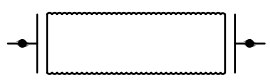
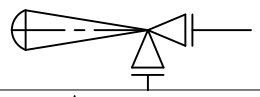
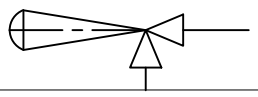
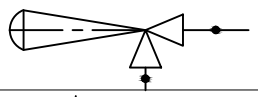
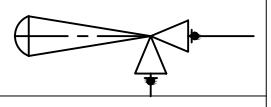
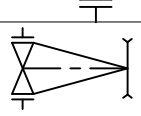
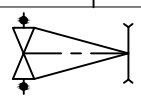
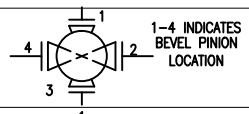
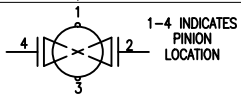
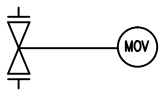
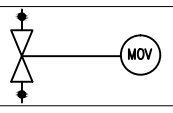
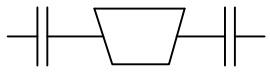
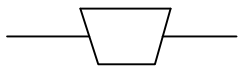
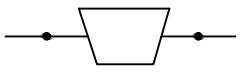
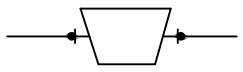
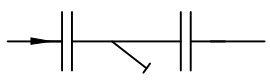
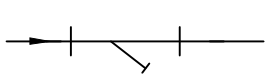
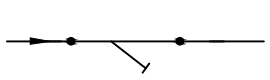
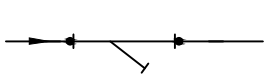
M/s. VCS QUALITY SERVICES PVT. LTD.	SYMBOLS OF PIPING ELEMENTS ON DRAWINGS	DRAWING NO. SD–PI–023
		SHEET NO. 3 OF 4

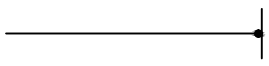
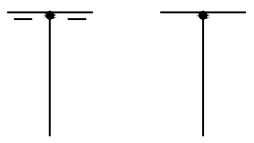
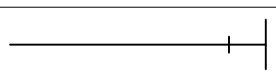
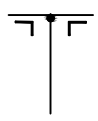
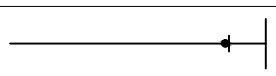
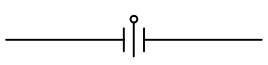
DESCRIPTION	FLANGED	SCREWED	WELDED (NOTE–1)	SOCKET WELD
BUTTERFLY VALVE (PLAN OR ELEVATION)				
DIAPHRAGM VALVE (PLAN OR ELEVATION)				
3–WAY PLUG VALVE (PLAN OR ELEVATION)				
4–WAY PLUG VALVE (PLAN OR ELEVATION)				
EXPANSION JOINT				
ANGLE CONTROL VALVE				
CHAIN OPERATING VALVE				
GEAR OPERATED VALVE (BEVEL GEAR)PLAN				
GEAR OPERATED VALVE (SPUR GEAR)PLAN				
MOTOR OPERATING VALVE				
STEAM TRAP				
Y–STRAINER				

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
SLIP ON FLANGE		STUB – IN (WITH OR WITHOUT RENIF)	
WELDNECK FLANGE			
SCREWED FLANGE		STUB – IN (SADDLE RENIF)	
SOCKET WELD FLANGE			
SPACER		STUB – IN WITH RENIF (IN PLAN)	
SPACER BLIND			
SPECTALE FIG. 8 (BLIND)		INSULATED (LINES 12" AND BELOW)	
SPECTALE FIG. 8 (OPEN)			

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

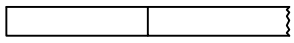
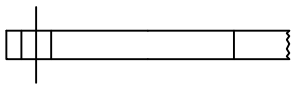
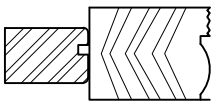
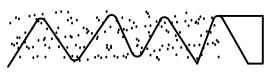
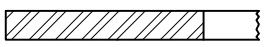
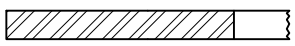
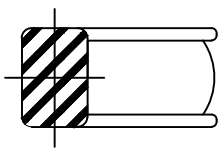
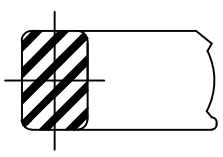
M/s. VCS QUALITY SERVICES PVT. LTD.	SYMBOLS OF PIPING ELEMENTS ON DRAWINGS	DRAWING NO. SD–PI–023
		SHEET NO. 3 OF 4

DESCRIPTION	FLANGED	SCREWED	WELDED (NOTE–1)	SOCKET WELD
BUTTERFLY VALVE (PLAN OR ELEVATION)				
DIAPHRAGM VALVE (PLAN OR ELEVATION)				
3–WAY PLUG VALVE (PLAN OR ELEVATION)				
4–WAY PLUG VALVE (PLAN OR ELEVATION)				
EXPANSION JOINT				
ANGLE CONTROL VALVE				
CHAIN OPERATING VALVE				
GEAR OPERATED VALVE (BEVEL GEAR)PLAN				
GEAR OPERATED VALVE (SPUR GEAR)PLAN				
MOTOR OPERATING VALVE				
STEAM TRAP				
Y–STRAINER				

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
SLIP ON FLANGE		STUB – IN (WITH OR WITHOUT RENIF)	
WELDNECK FLANGE			
SCREWED FLANGE		STUB – IN (SADDLE RENIF)	
SOCKET WELD FLANGE			
SPACER		STUB – IN WITH RENIF (IN PLAN)	
SPACER BLIND			
SPECTALE FIG. 8 (BLIND)		INSULATED (LINES 12" AND BELOW)	
SPECTALE FIG. 8 (OPEN)			

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	GASKET THICKNESS	DRAWING NO. SD–PI–024
		SHEET NO. 1 OF 1

TYPICAL CROSS SECTION	DESCRIPTION		THICKNESS OF GASKET	COMPRESSED THICKNESS (NOTE –1)
	FLAT RING FOR RAISED FACE FLANGE	COMPRESSED ASBESTOS FOR SYNTHETIC RUBBER	2.0	2.0
	FULL FACE FOR FLAT FACE FLANGES			
	SPIRAL WOUND METAL FLAT RING GASKET, NON METALLIC FILTER, AND A STEEL SOLID RING TYPE CENTERING DEVICE– FOR RAISED FACE FLANGES.		4.4	3.0
	FLAT METAL JACKETED GASKET, NON METALLIC FILTER COMPLETELY ENCLOSED WITHIN A FULLY ANNEALED DOUBLE METAL JACKET–FORRAISED FACE FLANGES		3.0	2.0
	CORRUGATED METAL JACKETED GASKET, NON METALLIC FILTER, COMPLETELY ENCLOSED WITHIN A FULLY ANNEALED DOUBLE METAL CORRUGATED JACKET– FOR RAISED FACE FLANGES.		3.2	1.0
	CORRUGATED METAL GASKET–FULLY ANNEALED CORRUGATED METAL WITH FILTER MATERIAL CEMENTED TO THE CORRUGATIONS ON BOTH FACES –FOR RAISED FACE FLANGES		3.2	1.0
	SOLID METAL FLAT RING FOR SMALL TONGUE AND GROOVE FLANGES.		AS SPECIFIED	
	SOLID METAL FLAT RING FOR LARGE TONGUE AND GROOVE FLANGES.		AS SPECIFIED	
	SOLID METAL OCTAGONAL RING FOR R.T.J FLANGES		DIMENSIONS SHALL BE AS PER ASME B 16.20(NOTE–2)	
	SOLID METAL OVAL RING FOR R.T.J FLANGES		DIMENSIONS SHALL BE AS PER ASME B 16.20(NOTE–2)	
	FULLY ANEALED CORRUGATED METAL FOR RAISED FACE FLANGES.		3.2	1.0

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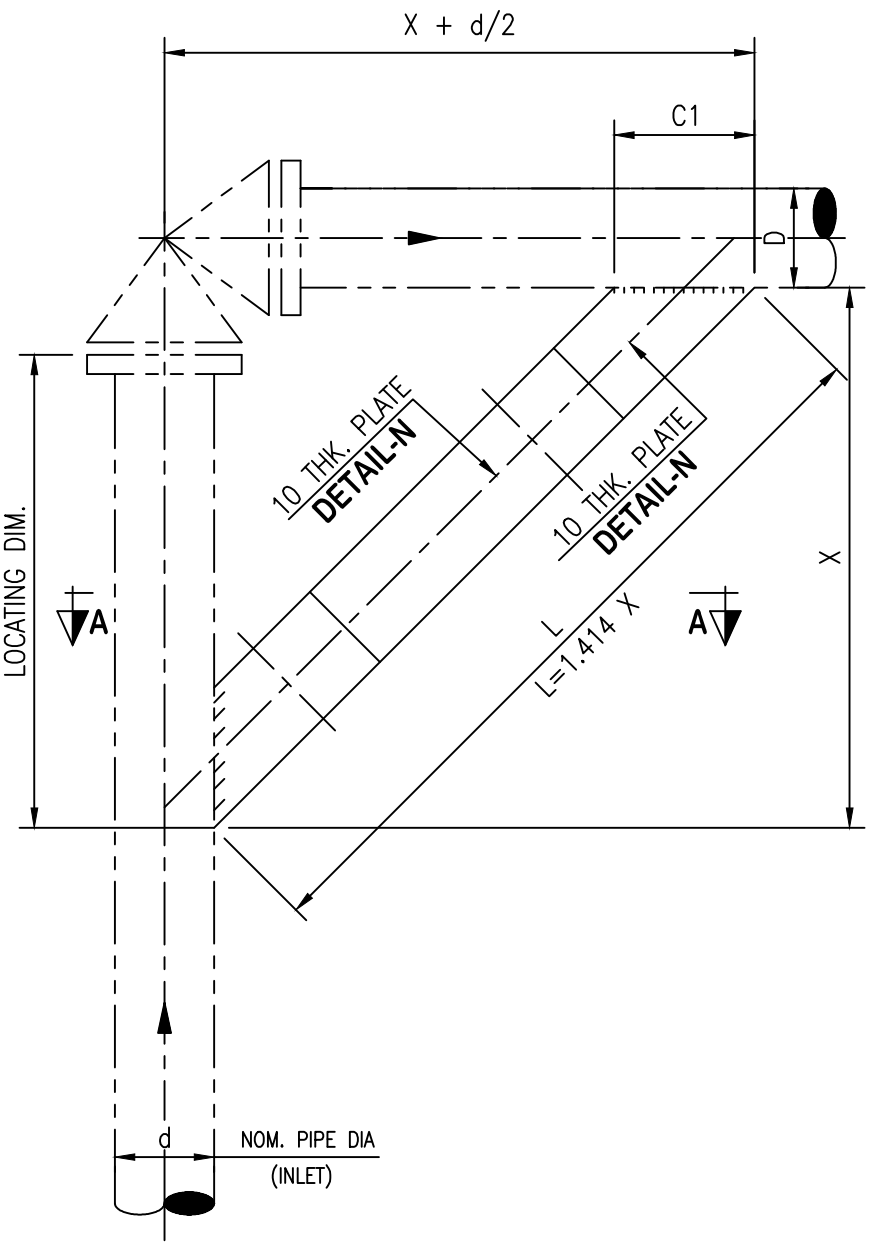
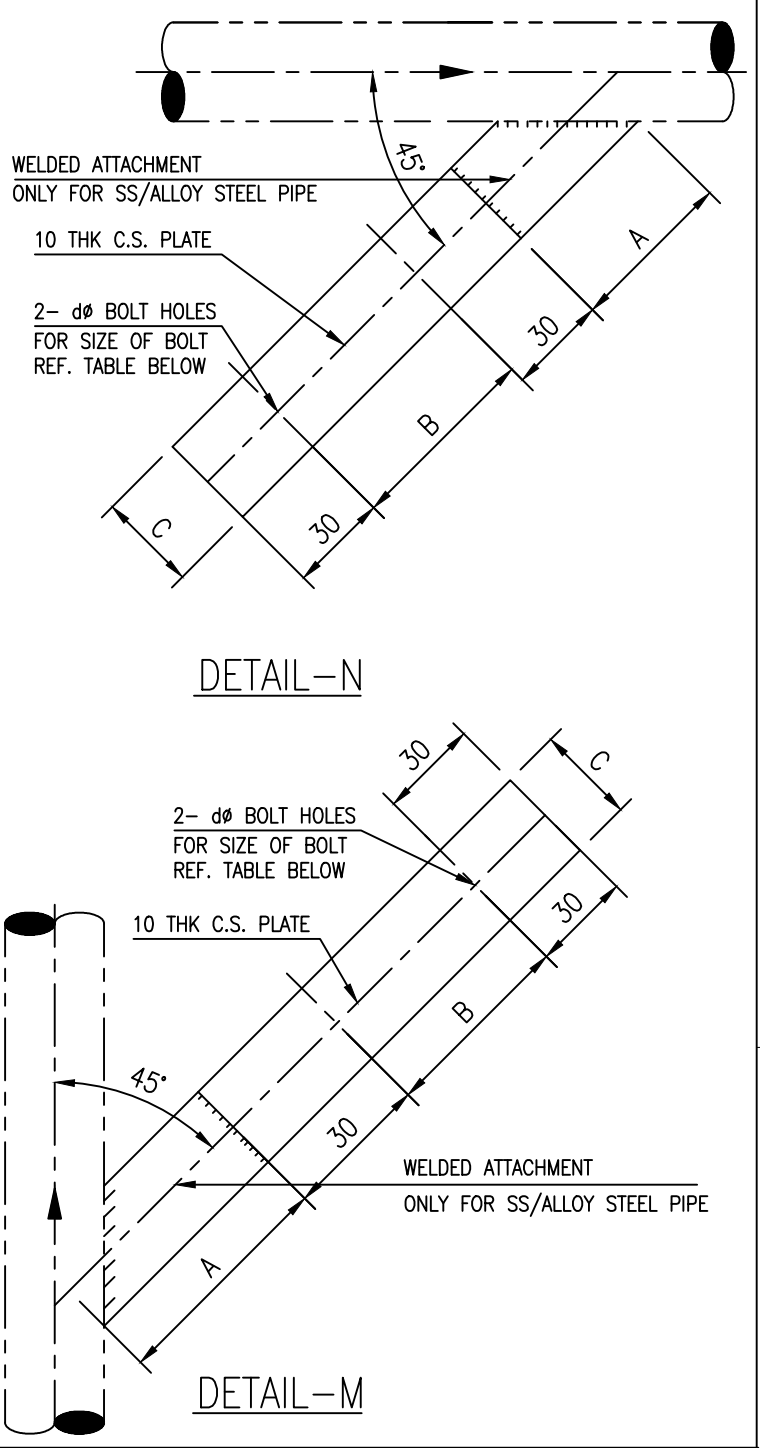
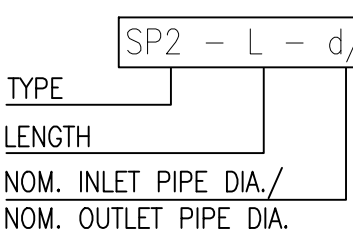
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	SUPPORTING ARRANGEMENT FOR ANGLE AND RELIEF VALVES TYPE–SP2	DRAWING NO. SD–PI–025 SHEET NO. 1 OF 1



SECTION A–A





SYMBOL

NOTES:–

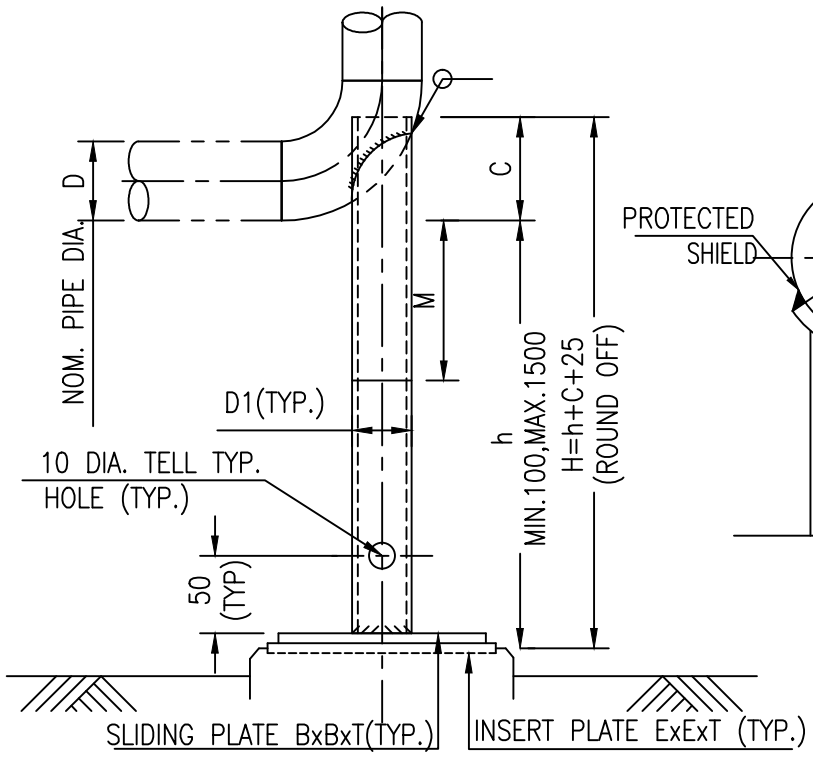
1. MATERIAL FOR WELDED ATTACHMENT SHALL BE EQUIVALENT TO PIPE MATERIAL.

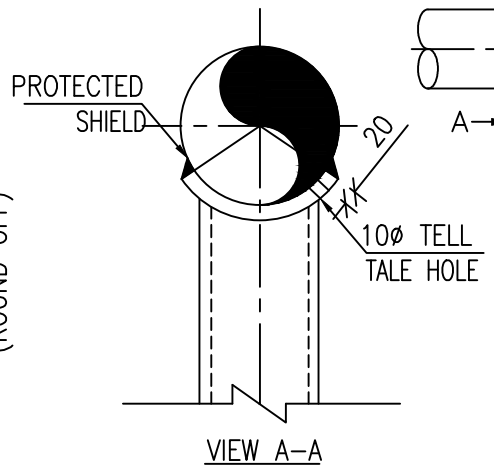
D	BOLT SIZE dø	A	C	B MIN.	C1	D1
1" TO 4"	M12 X 50	75	50	150	71	14
6" TO 12"	M16 X 50	100	75	200	106	18

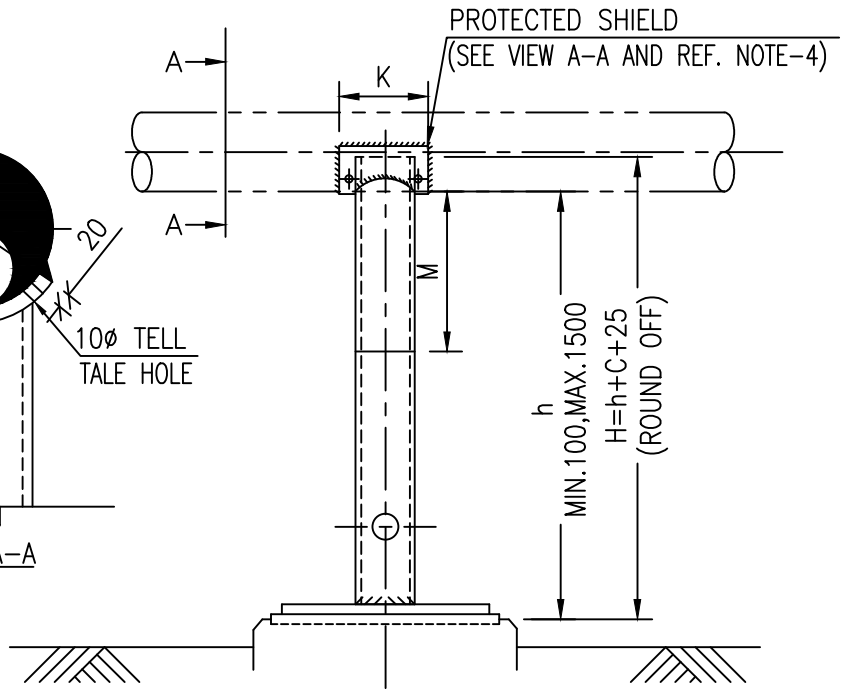
FOR TEMP. UP TO 400 °C ONLY

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	LOW SUPPORT SLIDING FOR BARE & INSULATED PIPE SIZE 2" THRU 36" TYPE–L1 AND L1A	DRAWING NO. SD–PI–026
		SHEET NO. 1 OF 1







L1 – 1 – H/M

TYPE

SIZE NO.

HEIGHT

LOCATION OF MATERIAL TRANSITION (NOTE–2)

SYMBOL

L1A – 2 – H/M

TYPE

SIZE NO.

HEIGHT

LOCATION OF MATERIAL TRANSITION (NOTE–2)

SYMBOL

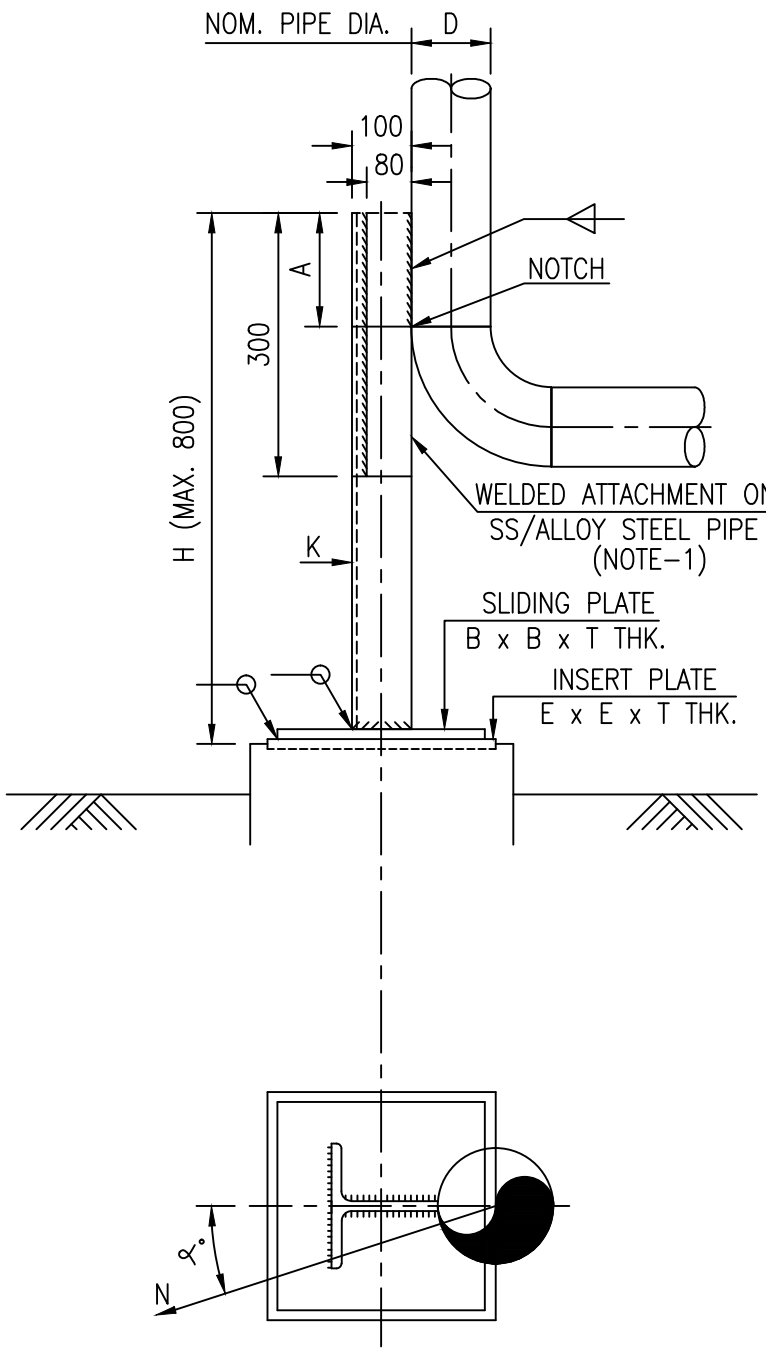
SIZE NO.	D	D1 (NOTE–3)	B	T	C (NOTE–5)	E	K (NOTE–4)
1	2"	2" S40/10S	150	10	70	250	160
	3"				115		
2	4"	3" S40/10S	200	10	137	300	190
	6"				174		
3	8"	4" S40/10S	200	12	205	300	215
	10"				262		
	12"				287		
4	14"	6" S40/10S	250	12	388	350	270
	16"				418		
5	18"	8" S40/10S	300	12	454	400	320
6	20"	10" S40/10S	350	12	554	450	375
	24"				615		
7	26"	12" S40/10S	400	16	675	500	425
	30"				800		
	36"				950		

NOTES:–

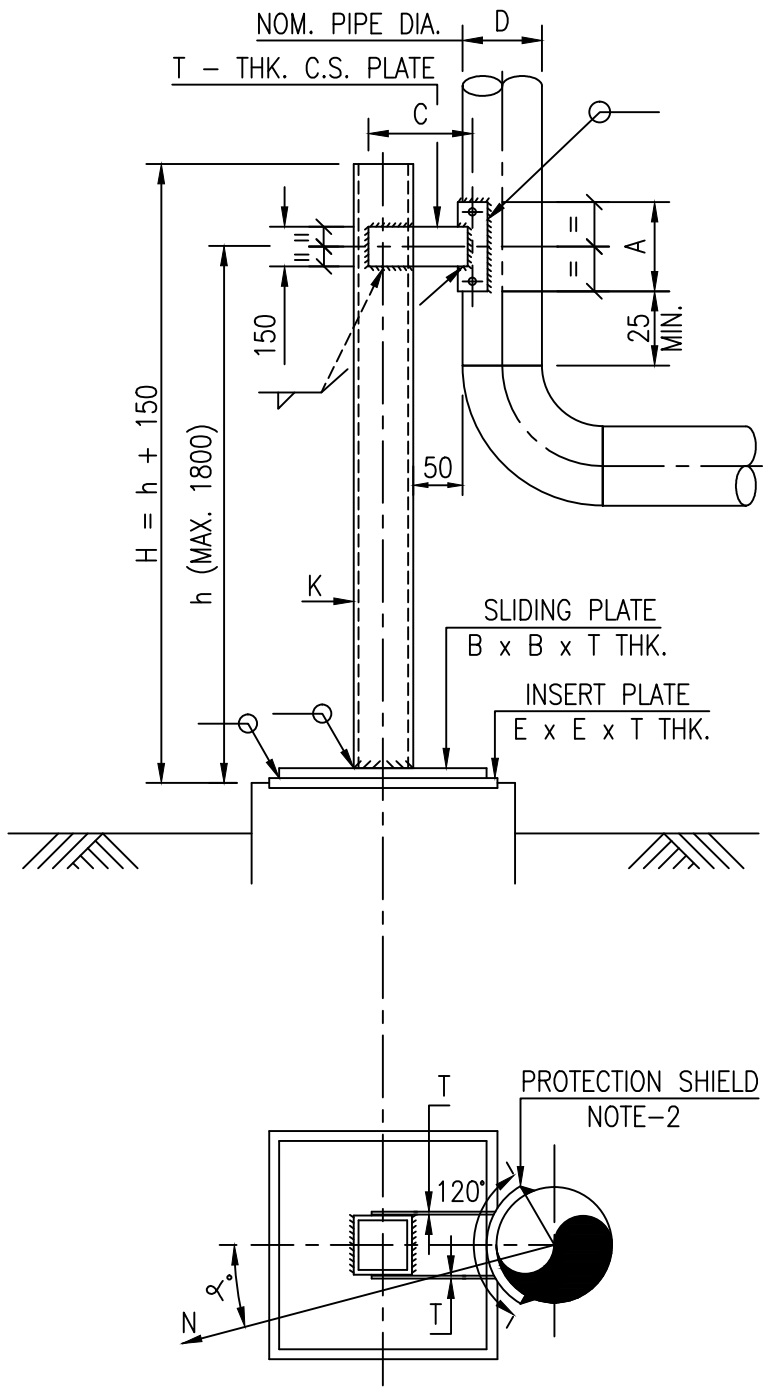
1. INSERT AND SLIDING PLATE MATERIAL SHALL BE CARBON STEEL WHERE DESIGN TEMP. IS >345°C WITH h < 200MM, SLIDING PLATE MATERIAL SHALL BE EUIVALENT TO PIPE MATERIAL.
2. DIMENSION "M" LOCATES THE POINT OF MATERIAL TRANSITION ON THE SUPPORT. THE STUB MATERIAL SHALL BE EQUIVALENT TO THAT OF LINE PIPE AND THE LOWER SUPPORT PIPE SHALL BE CARBON STEEL. MINIMUM VALUE OF M SHALL BE "INSULATION THICKNESS+25MM".
   A. FOR CARBON STEEL(CS) LINE PIPE, THE ENTIRE SUPPORT PIPE SHALL BE CS, THAT IS M=0.
   B. FOR ALLOY STEEL(AS) OR STAINLESS STEEL(SS) LINE –PIPE, SUPPORT PIPE SHALL CONSIST OF THE FOLLOWING–
   –FOR h LESS THAN OR EQUAL TO 500MM, ENTIRE SUPPORT PIPE MATERIAL SHALL BE EQUIVALENT TIO THAT OF LINE PIPE, THAT IS M=h.
   –FOR h GREATER THAN 500MM,SUPPORT PIPE SHALL BE COMPOSITE WITH M=INSULATION THK.+25MM OR 100MM, WHICHEVER IS GREATER.
3. IN CASE SIZE AND/OR SCH. OF SUPPORT PIPE (D1) LISTED IN THE TABLE IS NOT AVAILABE USE NEXT HIGHER SIZE AND/OR NEAREST HIGHER THICKNESS AVAILABLE.
4. PROTECTION SHIELD (LENGTH=KMM) CUT FROM LINE–PIPE OR EQUIVALANT PLATE SHALL BE PROVIDED ON HORIZONTAL LINE AS FOLLOWS–
   A. FOR 150# AND 300# CLASS PIPEING
      CS AND AS LINES – 10" AND ABOVE
      SS LINES – 2" AND ABOVE
   B. FOR 600# AND HIGHER CLASS PIPING
      CS, AS AND SS LINES – 10" AND ABOVE
5. DIMENSION "C" IS TO BE MODIFIED IF OTHER THAN 1.5 D RADIUS ELBOWS ARE USED.
6. IN CASE CALCULATED h EXCEEDS THE MAX. VALUE, PEDESTAL SHALL BE RAISED ACCORDINGLY.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

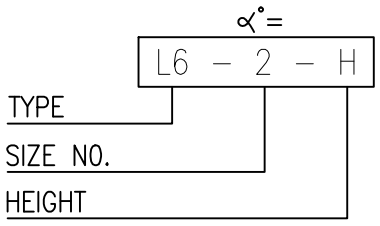
M/s. VCS QUALITY SERVICES PVT. LTD.	LOW SUPPORT FIXED FOR BARE & INSULATED PIPE SIZE 2" THRU 24"TYPE–L6	DRAWING NO. SD–PI–027
		SHEET NO. 1 OF 1



FOR PIPE SIZES 2" THRU 4"



FOR PIPE SIZES 6" THRU 24"



SYMBOL

NOTES:–

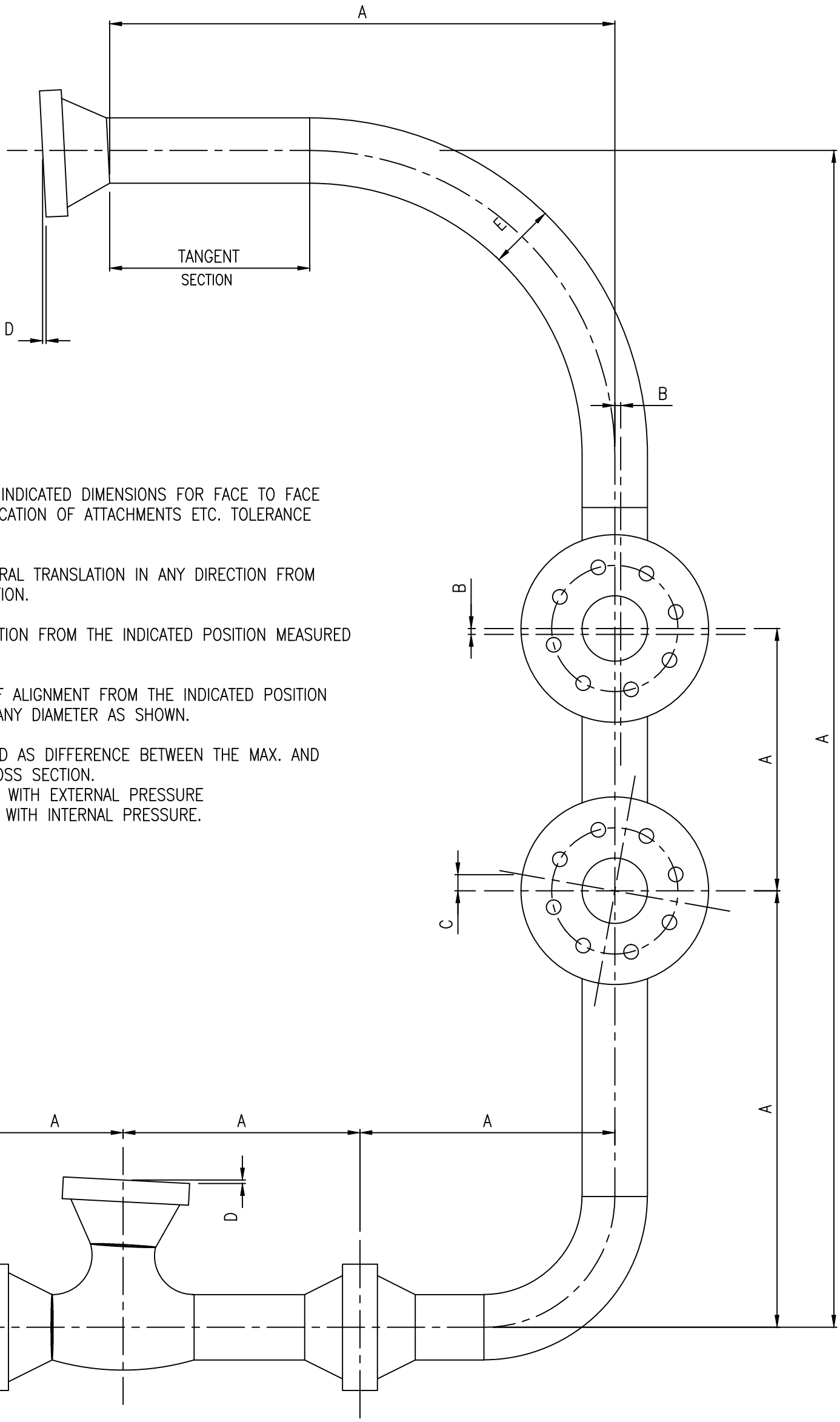
1. MATERIAL FOR WELDED ATTACHMENT SHALL BE EQUIVALENT TO PIPE MATERIAL.
2. PROTECTION SHIELD IS TO BE CUT FROM LINE PIPE.

SIZE NO.	D	K	A	T	C	E	B
1	2" TO 4"	CUT FROM ISMB 200	200	10	–	250	150
2	6" TO 10"	ISMC–125 2 NOS.	200	12	150	300	200
3	12" TO 24"	ISMC–225 2 NOS.	300	12	230	400	300

FOR TEMP. UP TO 400 °C ONLY

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	TOLERANCES FOR FABRICATION	DRAWING NO.
		SD–PI–028
		SHEET NO. 1 OF 1



A ±3 MM. MAX. FROM INDICATED DIMENSIONS FOR FACE TO FACE CENTRE TO FACE LOCATION OF ATTACHMENTS ETC. TOLERANCE CAN NOT BE ADDED.

B ±1.5 MM. MAX. LATERAL TRANSLATION IN ANY DIRECTION FROM THE INDICATED POSITION.

C ±1.5 MM. MAX ROTATION FROM THE INDICATED POSITION MEASURED AS SHOWN.

D ±1 MM MAX. OUT OF ALIGNMENT FROM THE INDICATED POSITION MEASURED ACROSS ANY DIAMETER AS SHOWN.

E FLATTENING MEASURED AS DIFFERENCE BETWEEN THE MAX. AND MIN. OD AT ANY CROSS SECTION.
−3% MAX. FOR PIPE WITH EXTERNAL PRESSURE
8% MAX. FOR PIPE WITH INTERNAL PRESSURE.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED FOR STANDARD	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	ABBREVIATIONS	DRAWING NO.
		SD–PI–029
		SHEET NO. 1 OF 1

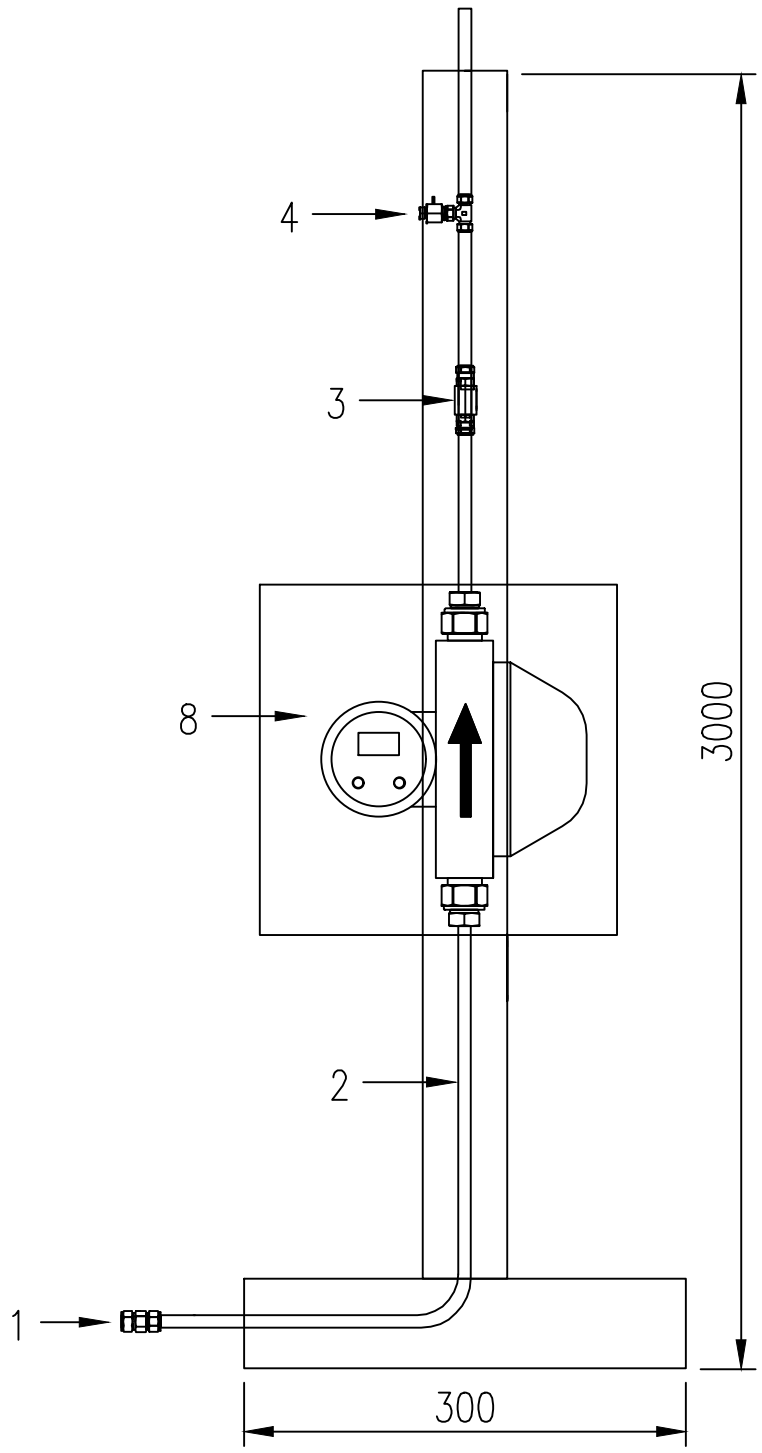
M&F	MALE & FEMALE	SO	SLIP ON
MI	MALLEABLE IRON	SOL	SOCKOLET
MOLY OR MO	MOLYBDENUM	SP. GR	SPECIFIC GRAVITY
MR	MATERIAL REQUISITION	SR	SHORT RADIUS
MTO	MATERIAL TAKE OFF	SS	STAINLESS STEEL
MS	MILD STEEL	ST	STEAM TRAP
MSS	MANUFACTURER'S STANDARD SOCIETY	STN	STATION
MH	MAN HLOE	STM	STEAM
NPT	NATIONAL PIPE THREAD	STD	STANDARD
NPSH	NET POSITIVE SUCTION HEAD	SW	SOCKET WELD
NIP	NIPPLE	SWG	SWAGE NIPPLE / STD WIRE GAGE
OD	OUTSIDE DIAMETER	STA	STEAM TRAP ASSEMBLY
PC.MK	PIECE MARK	TOG	TOP OF GRATING
PE	PLAIN END	TEMP.	TEMPERATURE
PL	PLATE	TOL	THREADOLET
PLTF	PLATFORM	T&C	THREADED & COUPLED
P.S	PIPE SUPPORT	THRD	THREADED
PSE	PLAIN SMALL END	T&G	TONGUE & GROOVE
PRESS.	PRESSURE	TBE	THREADED BOTH ENDS
PSI	POUNDS PER SQUARE INCH	TLE	THREADED LARGE END
POE	PLAIN ONE END	TSE	THREADED SMALL END
PSIG	POUNDS PER SQUARE INCH GAUGE	TOS	TOP OF STEEL
RAD OR R	RADIUS	TOE	THREADED ONE END
RED.	REDUCER	TYP	TYPICAL
RF	RAISED FACE	VC	VENT CONNECTION
R/L	RANDOM LENGTH	VERT.	VERTICAL
REF.	REFERENCE	WP	WORKING PRESSURE, WORKING POINT
RPM	REVOLUTIONS PER MINUTE	⍥	INVERT LEVEL OF PIPE
RTJ	RING TYPE JOINT	▽	BOTTOM LEVEL OF THE PIPE
SH	SPRING HANGER	▼	CENTRELINE ELEVATION OF PIPE
SHT	SHEET	WN	WELD NECK
SCH	SCHEDULE	WT	WEIGHT
SCRD	SCREWED	WOL	WELDOLET
S	SAMPLE CONNECTION	WLD	WELD
SG	SIGHT GLASS	XS	EXTRA STRONG
SC	SAMPLE COOLER	XXS	DOUBLE EXTRA STRONG
SMLS	SEAMLESS		

NOTE:

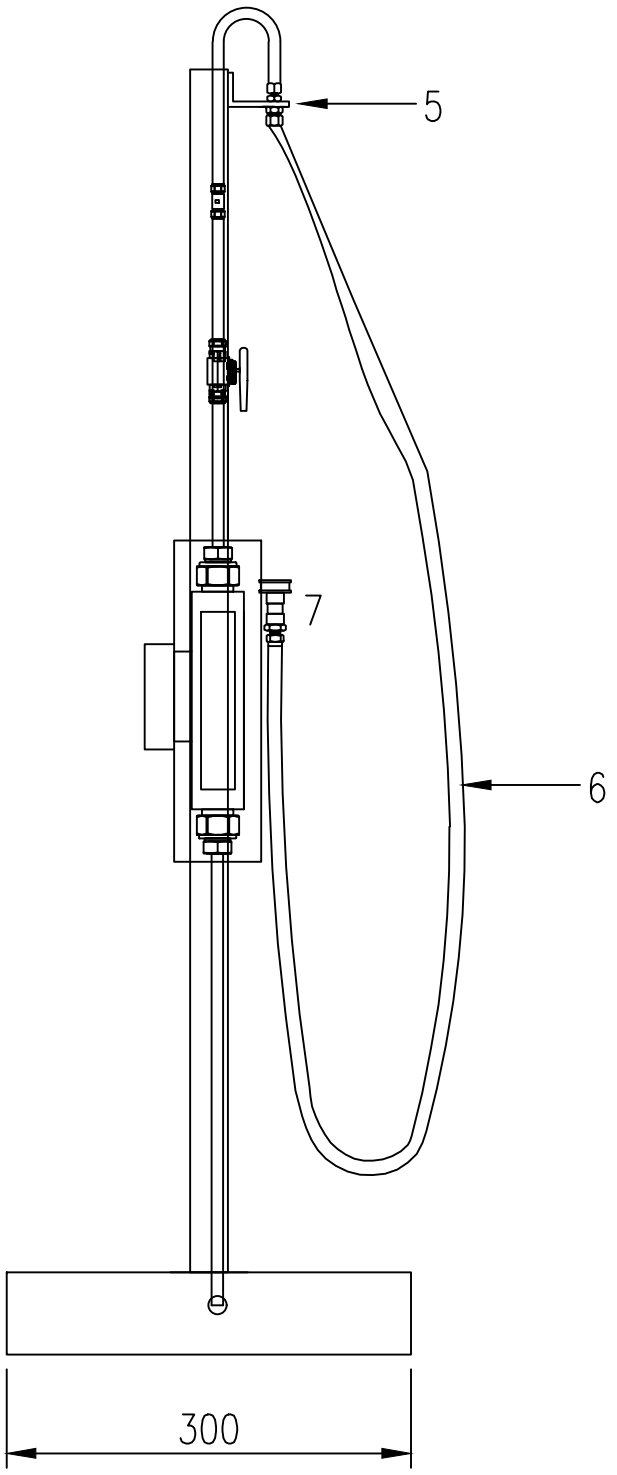
1. FOR ABBREVIATIONS RELATED TO CIVIL ENGINEERING/UNDERGROUND PIPING WORK, REFER CIVIL ENGINEERING STANDARD.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	10.05.17	ISSUED WITH TENDER	US	DK	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	LCV LOADING POST WITH FLOW METER	DRAWING NO. SD-ME-001
		SHEET NO. 1 OF 1



FRONT VIEW



SIDE VIEW

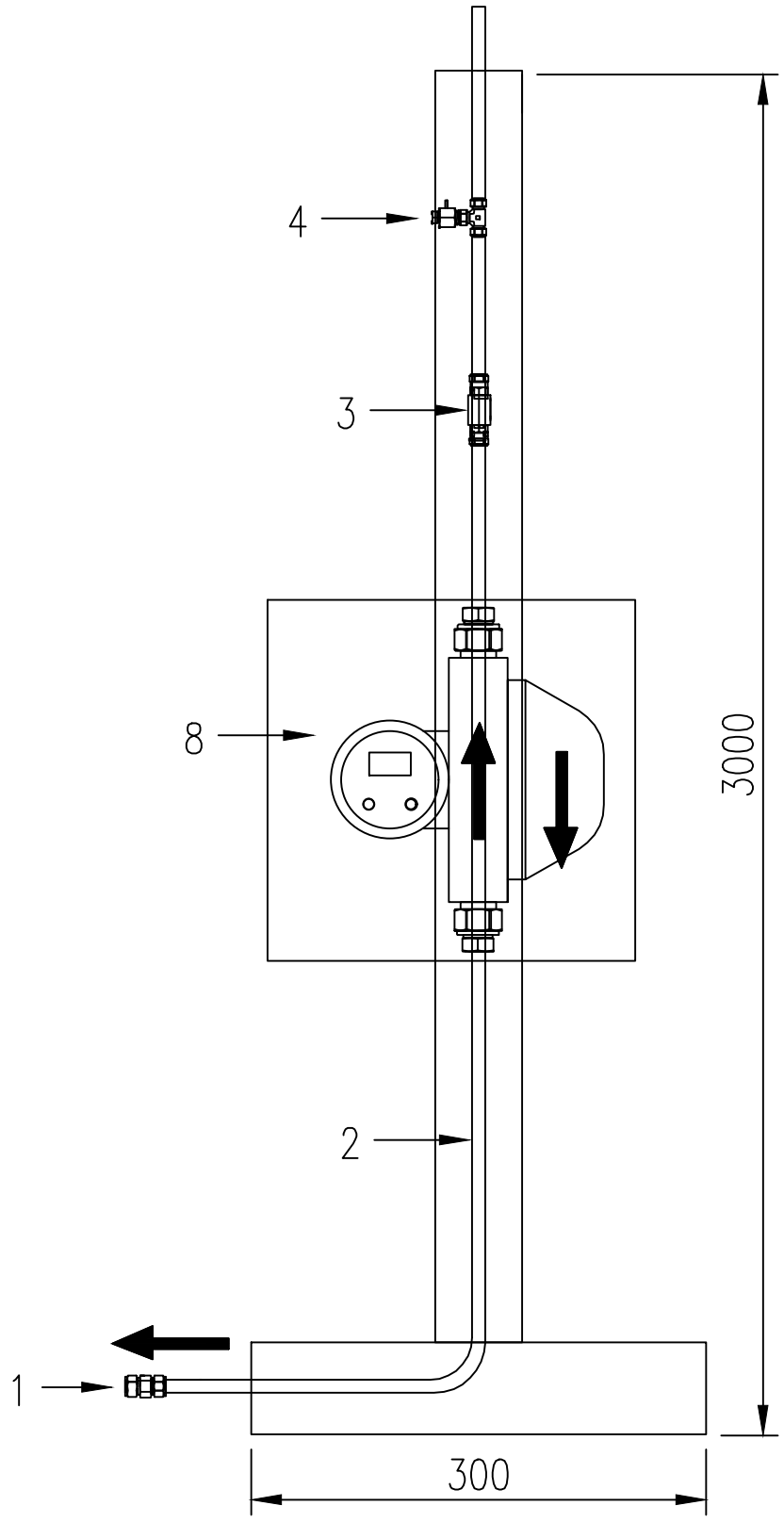
S.NO.	PART NAME	MATERIAL	MAKE/MODEL
1	UNION 3/4" OD	SS 316	SWAGELOK/PARKER/ DK LOK
2	TUBE 3/4" OD	A 269/213 TP316	SANDVIK/TUBACEX
3	TWO WAY BALL VALVE 3/4" OD	SS 316	SWAGELOK/PARKER/ DK LOK
4	BLEED VALVE 1/4" NPTM	SS 316	SWAGELOK/PARKER/ DK LOK
5	BULKHEAD UNION 3/4" OD	SS 316	SWAGELOK/PARKER/ DK LOK
6	FILL HOSE 1/2" ID, LENGTH-4Mtr. (SS BRAIDED STAINLESS STEEL)	5000 PSIG	SWAGELOK/TUBACEX/ETON
7	QRC 1/2" NPTF	SS 316	SWAGELOK/PARKER/ DK LOK
8	FLOW METER WITH INTEGRATED DISPLAY (COROLIS TYPE) 0-100 Kg/min.	-	MICRO MOTION / E&H

NOTES :

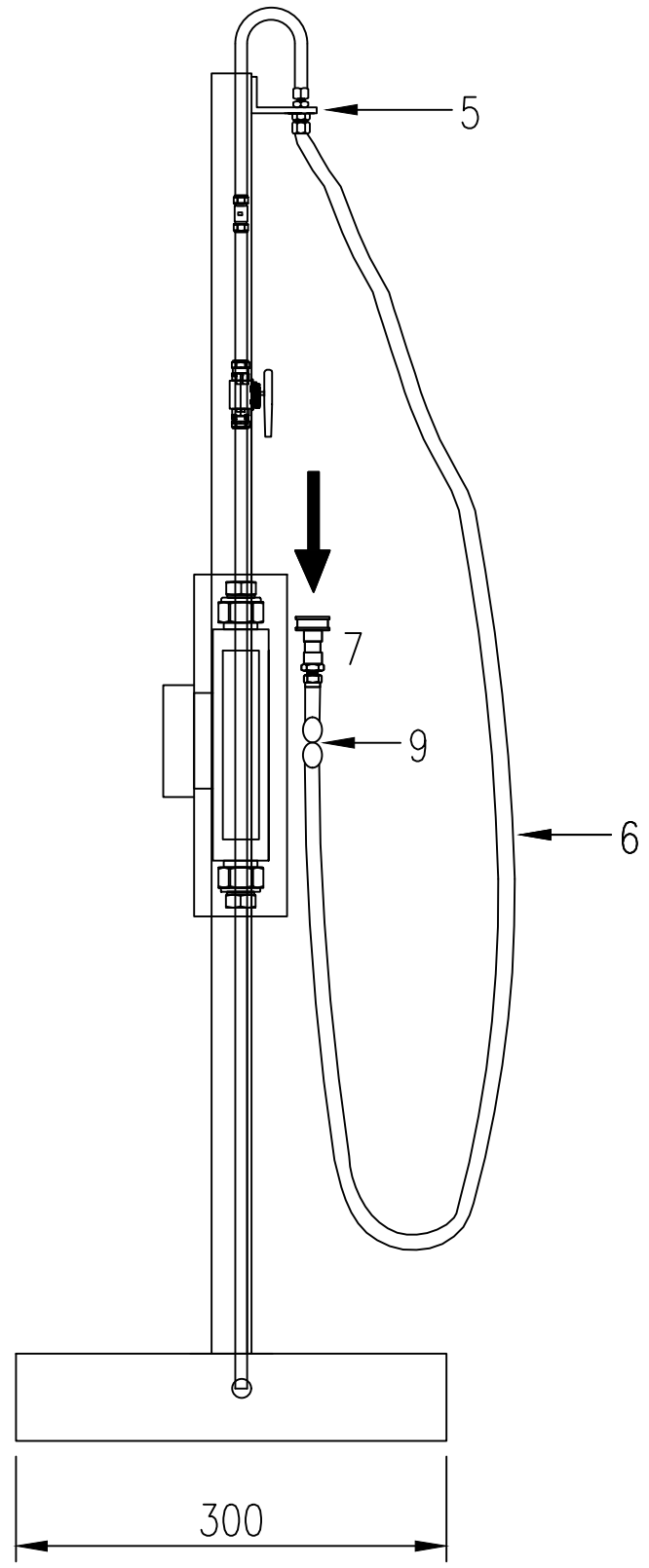
1. ALL DIMENSIONS IN MM.
2. THIS DWG. IS INDICATIVE ONLY, VENDOR TO FURNISH FINAL DWG. BASED ON ARRANGEMENT FOR CNG FILLING FOR APPROVAL POST ORDER.
3. HOSE SHOULD CONFIRM TO NFPA52/CSA NGV 4.2-2014/CSA12.52-2014.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	24.09.19	ISSUED FOR REVIEW	DK	RR	AD

M/s. VCS QUALITY SERVICES PVT. LTD.	LCV UNLOADING POST	DRAWING NO. SD-ME-002
		SHEET NO. 1 OF 1



FRONT VIEW



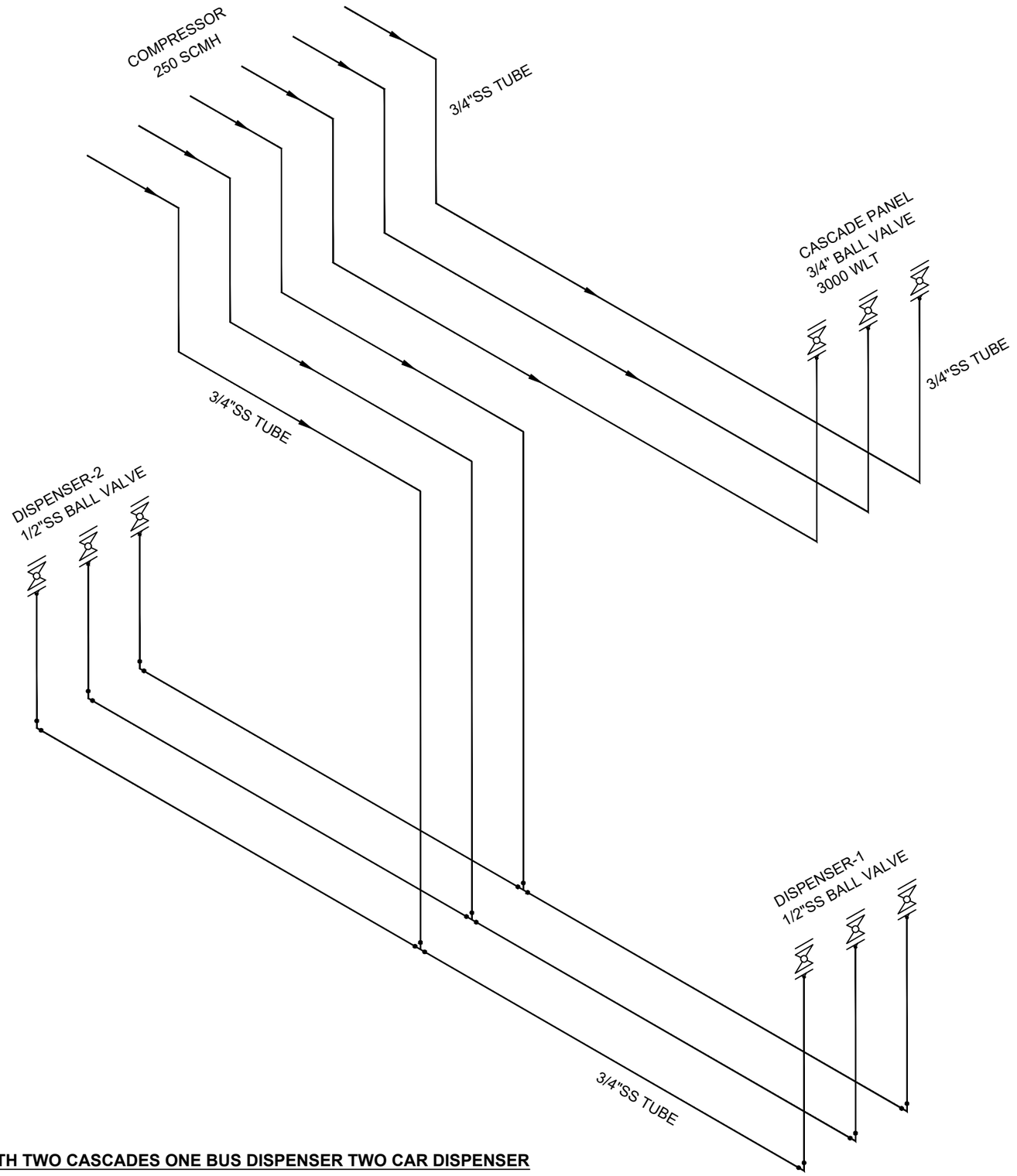
SIDE VIEW

S.NO.	PART NAME	MATERIAL	MAKE/MODEL
1	UNION 3/4" OD	SS 316	SWAGELOK/PARKER/ DK LOK
2	TUBE 3/4" OD	A 269/213 TP316	SANDVIK/TUBACEX
3	TWO WAY BALL VALVE 3/4" OD	SS 316	SWAGELOK/PARKER/ DK LOK
4	BLEED VALVE 1/4" NPTM	SS 316	SWAGELOK/PARKER/ DK LOK
5	BULKHEAD UNION 3/4" OD	SS 316	SWAGELOK/PARKER/ DK LOK
6	FILL HOSE 1/2" ID, LENGTH-4Mtr. (SS BRAIDED STAINLESS STEEL)	5000 PSIG	SWAGELOK/TUBACEX/ETON
7	QRC 1/2" NPTF	SS 316	SWAGELOK/PARKER/ DK LOK
8	FLOW METER WITH INTEGRATED DISPLAY (COROLIS TYPE) 0-100 Kg/min.	-	MICRO MOTION / E&H
9	BREAKAWAY COUPLING		

NOTES :

1. ALL DIMENSIONS IN MM.
2. THIS DWG. IS INDICATIVE ONLY, VENDOR TO FURNISH FINAL DWG. BASED ON ARRANGEMENT FOR CNG FILLING FOR APPROVAL POST ORDER.
3. HOSE SHOULD CONFIRM TO NFPA52/CSA NGV 4.2-2014/CSA12.52-2014.
4. BUSTING PRESSURE OF HOSE SHALL BE 20000 PSI.

REV. NO.	DATE	SUBJECT OF REVISION	PREP	CHKD	APPD
0	09.02.21	ISSUED FOR REVIEW	DK	RR	AD



MOTHER STATION WITH TWO CASCADES ONE BUS DISPENSER TWO CAR DISPENSER

NOTES:-

LEGEND:-

BUTTWELDED BALL VALVE

KEY PLAN:-

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	04/01/21	ISSUED FOR REVIEW	ANUJ	HS	HK

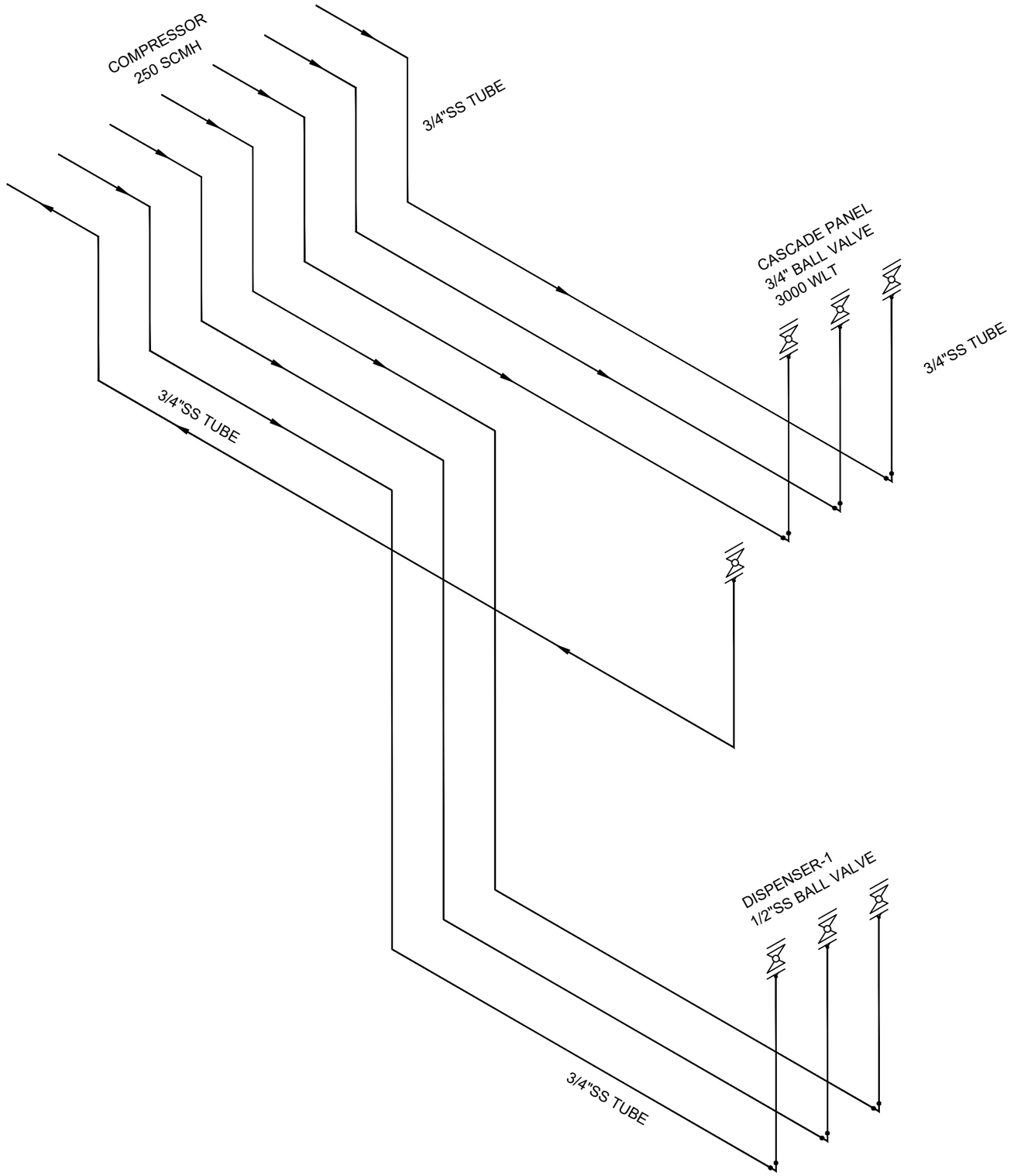
CLIENT: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION
BIHAR/JHARKHAND & RAJASTHAN

TITLE : TYPICAL ISOMETRIC FOR ONLINE STATION WITH TWO CAR DISPENSER

SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3	C221085	C221085-000-DR-1001	1 OF 1	0



MOTHER STATION WITH TWO CASCADES ONE BUS DISPENSER ONE CAR DISPENSER

NOTES:-

LEGEND:-

BUTTWELDED BALL VALVE

KEY PLAN:-

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	04/01/21	ISSUED FOR REVIEW	ANUJ	HS	HK

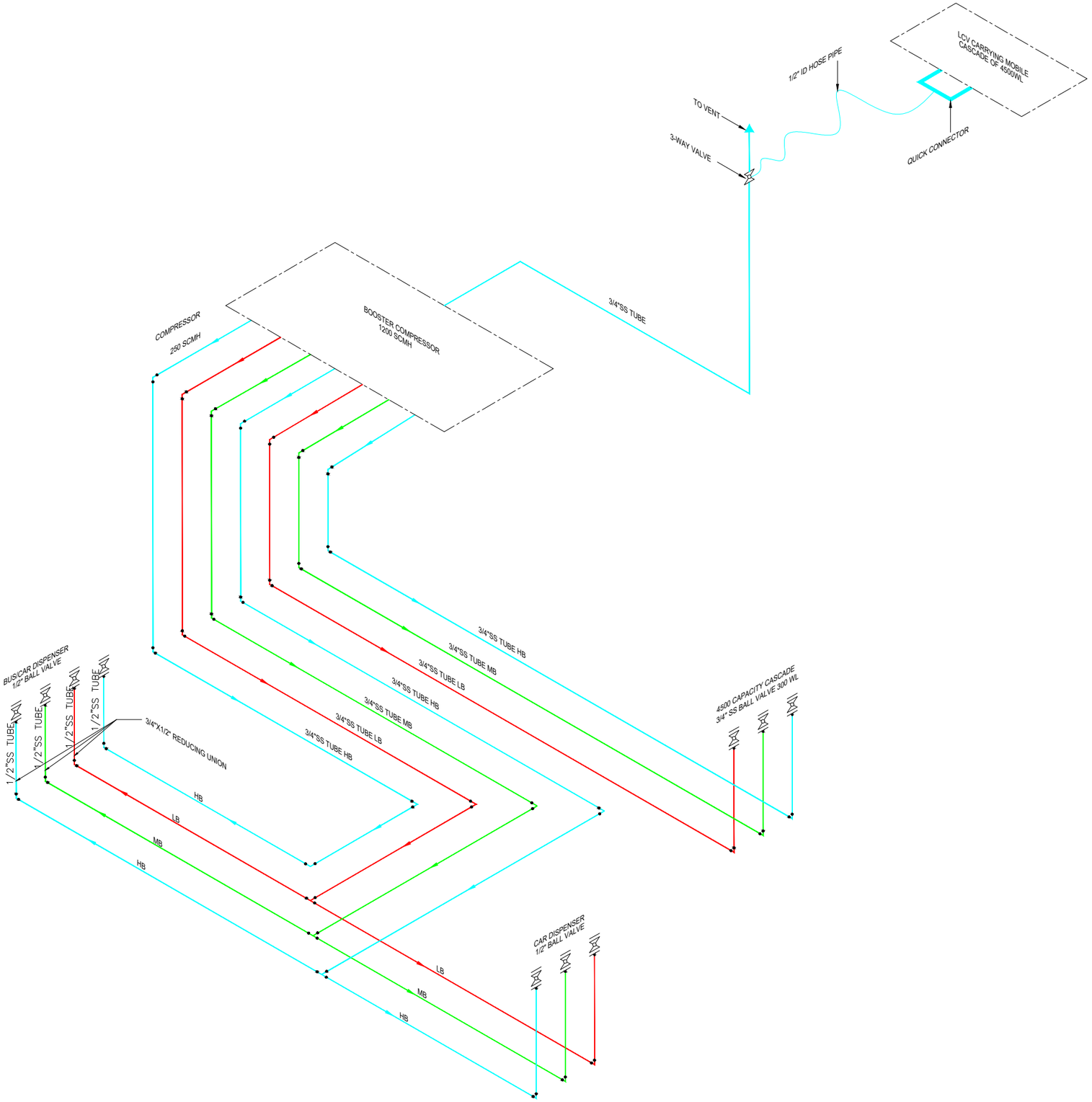
CLIENT:
HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC
VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION
BIHAR/JHARKHAND & RAJASTHAN

TITLE : TYPICAL ISOMETRIC FOR ONLINE STATION WITH ONE CAR DISPENSER

SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3	C221085	C221085-000-DR-1002	1 OF 1	0



SS TUBING FOR CNG STATION WITH TWO CAR DISPENSER

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	04/01/21	ISSUED FOR REVIEW	ANUJ	HS	HK

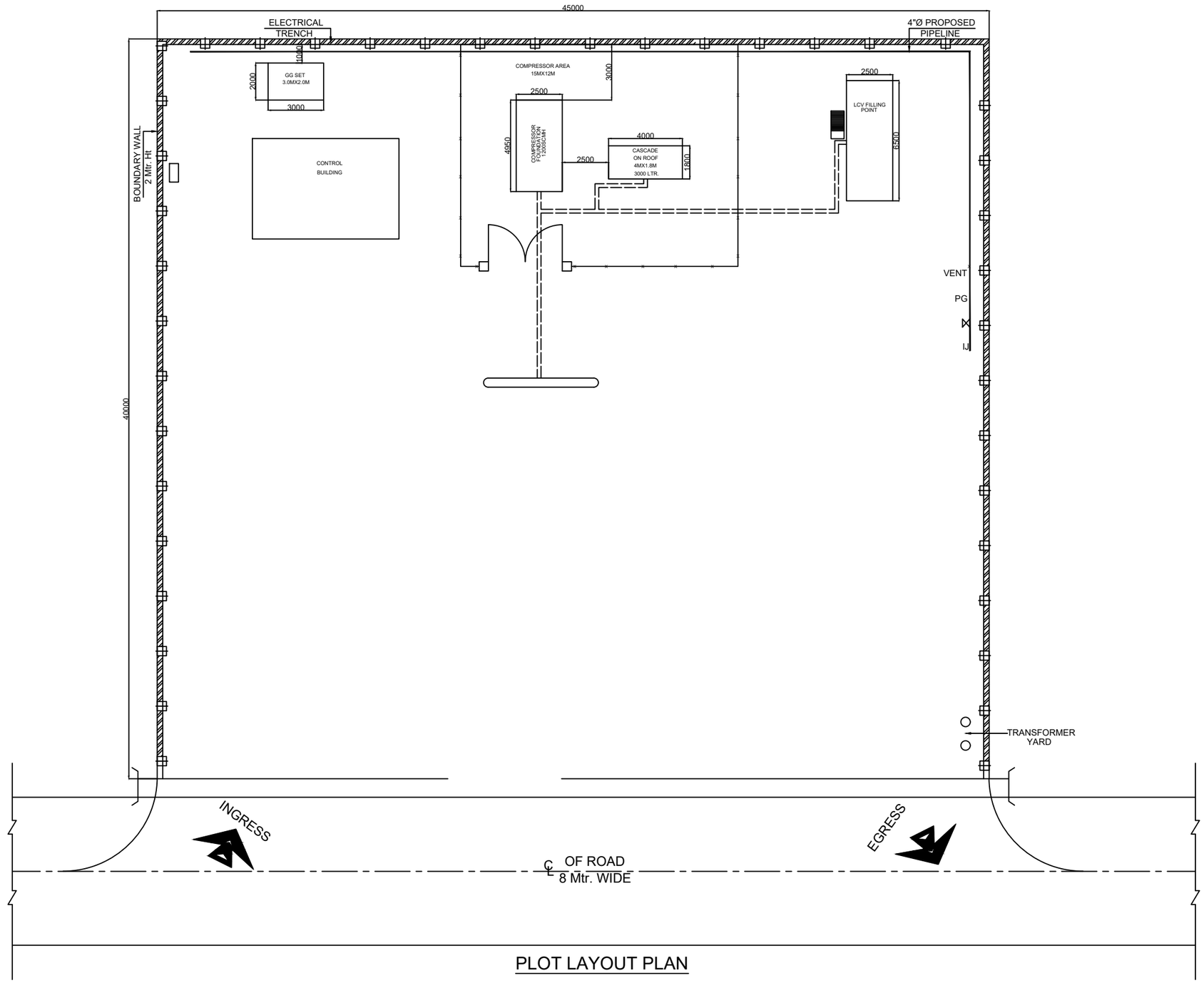
CLIENT: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION BIHAR/JHARKHAND & RAJASTHAN

TITLE : TYPICAL CNG TUBING WITH TWO CAR DISPENSER

SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3	C221085	C221085-000-DR-1003	1 OF 1	0



PLOT LAYOUT PLAN

NOTES:-

1. ALL DIMENSIONS ARE IN MM, LEVELS ARE IN METERS.
2. FOLLOW WRITTEN DIMENSIONS ONLY DO NOT SCALE DRAWING.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	04/01/21	ISSUED FOR REVIEW	ANUJ	HS	HK

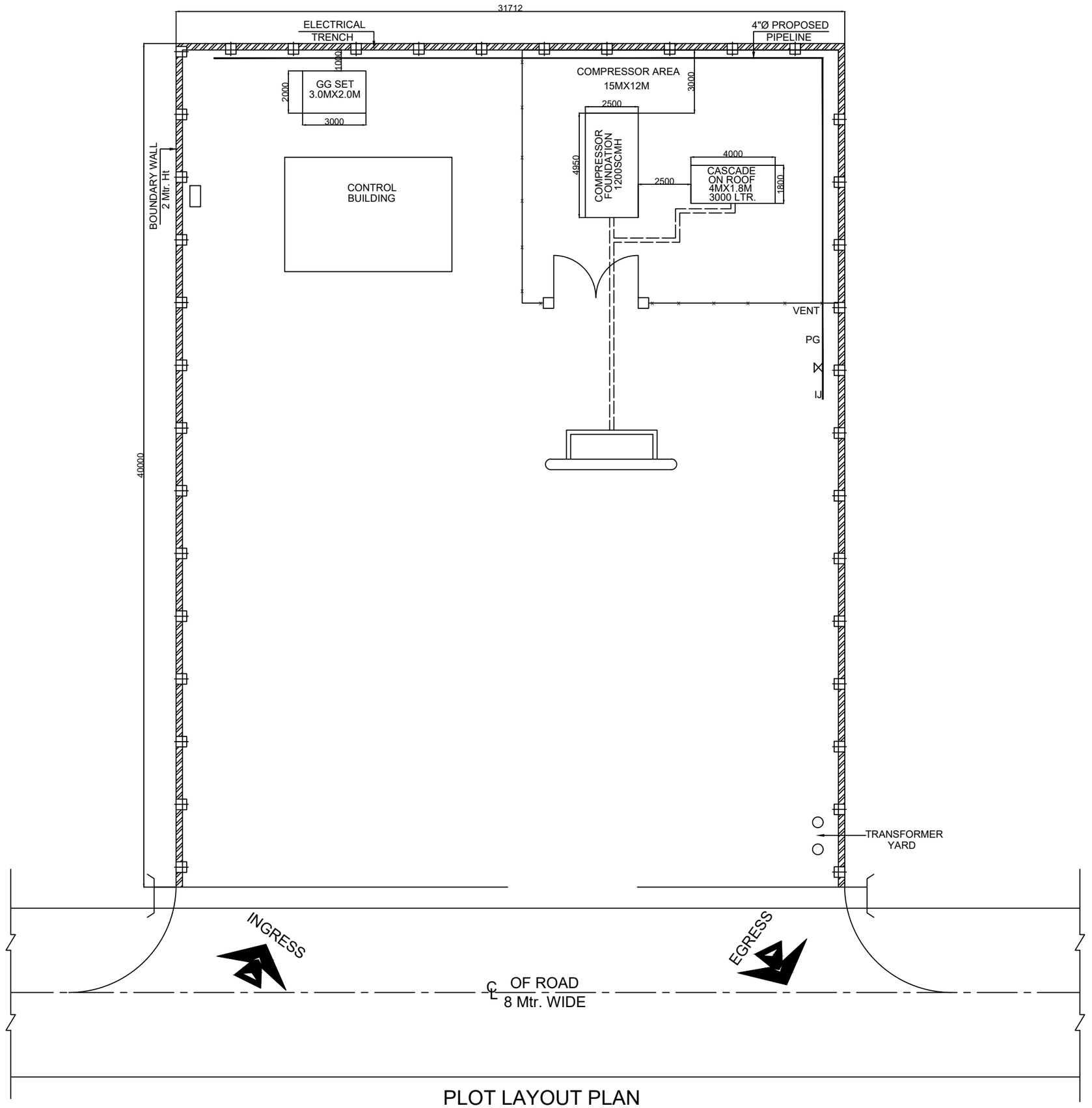
CLIENT: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION BIHAR/JHARKHAND & RAJASTHAN

TITLE : TYPICAL DAUGHTER STATION WITH ONE CAR DISPENSER

SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3	C221085	C221085-000-DR-1004	1 OF 1	0



PLOT LAYOUT PLAN

NOTES:-

1. ALL DIMENSIONS ARE IN MM, LEVELS ARE IN METERS.
1. FOLLOW WRITTEN DIMENSIONS ONLY DO NOT SCALE DRAWING.

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
0	04/01/21	ISSUED FOR REVIEW	ANUJ	HS	HK

CLIENT: HINDUSTAN PETROLEUM CORPORATION LIMITED

PMC: VCS QUALITY SERVICES PVT. LTD.

PROJECT: CITY GAS DISTRIBUTION BIHAR/JHARKHAND & RAJASTHAN

TITLE : TYPICAL CNG STATION WITH TWO CAR DISPENSER

SIZE	JOB NO.	DRAWING NUMBER	SHEET	REV.
A3	C221085	C221085-000-DR-1005	1 OF 1	0

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 listed separately in	
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

ENERGISING QUALITY	**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**