1.0 SCOPE

The scope of this document is to provide minimum requirements for design, selection, manufacture, inspection, testing and supply of MDPE Ball Valves and its component made from extruded or injected moulded polyethylene (PE) intended to be used for the Natural gas distribution systems.

It specifies some general properties of the materials from which these valves are made. It applies to bi-directional valves with spigot ends or electrofusion sockets intended to be fused with polyethylene pipes in accordance with the specification. This specification is limited to valves with a nominal diameter (dn) up to and including 225 mm.

2.0 APPLICABLE CODES, SPECIFICATIONS AND STANDARDS:

EN 1555-1: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 1: General

EN 1555-2 / ISO 4437-2 / IS-14885: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE)

EN 1555-3: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 3: Fittings

EN 1555-4: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 4: Valves

EN 1555-5: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 5: Fitness for purpose of the system

EN 1555-7: Plastics piping systems for the supply of gaseous fuels- Polyethylene (PE) - part 7: Guidance for assessment of conformity

ISO TR 13950:1997 or latest edition: Plastics pipes and fittings - Automatic recognition systems for Electro fusions

ISO/IEC 16390:1999 or latest edition: Information technology – Automatic identification and data capture techniques – Bar code symbology specification- Interleaved 2 of 5

ISO 12176-4: Plastics pipes and fittings - Equipment for fusion jointing polyethylene system - part 4: Traceability coding

ISO 17778: Plastics piping systems- Fittings, valves and ancillaries - Determination of gaseous flow rate/pressure drop relationships.

EN ISO 1133, Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics

ISO 3126: Plastics piping systems -- Plastics piping systems — Plastics piping components — Measurement and determination of dimensions

3.0 TERMINOLOGY

3.1. NOMINAL SIZE DN/OD
Nominal size, related to the outside diameter.

3.2. NOMINAL OUTSIDE DIAMETER (d_n)
Specified outside diameter, in millimetre, assigned to a nominal size DN/OD.

3.3. NOMINAL WALL THICKNESS (e_n)
Numerical designation of the wall thickness of a component, which is a convenient round number, approximately equal to the manufacturing dimension in millimetre (mm).

Note : For thermoplastics components conforming to prEN 1555, the value of the nominal wall thickness en is identical to the specified minimum wall thickness at any point, e_{min}.

3.4. COMPOUND
Homogenous mixture of base polymer (PE) and additives, i.e. anti-oxidants, pigments, UV-stabilisers and others, at a dosage level necessary for the processing and use of components conforming to the requirements of this standard.

3.5. MAXIMUM OPERATING PRESSURE (MOP)
Maximum effective pressure of the fluid in the piping system, expressed in bar, which is allowed in continuous use. It takes into account the physical and the mechanical characteristics of the components of a piping system.

Note : It is calculated using the following equation : $MOP = \frac{(20xMRS)}{Cx(SDR-1)}$

3.6. VALVES
An obturating device designed to stop or restore the gas flow by operating the opening and closing mechanisms.

3.7. BASE PLATE
The valves are split into two models.

MODEL 1	Valve supply without base plate
MODEL 2	Valve supply with a base plate fixed or integrated

3.8. SPINDLE PROTECTION SLEEVE
A sleeve tube that protect the valve spindle. The protection sleeve exists in two models

VENTILATED	The sleeve is provided with opening and wrapped with textile fabric in order to let the gas escape and prevent the soil to go in.
NON VENTILATED	A normal sleeve tube without textile fabric.

3.9. EXTERNAL LEAK-TIGHTNESS

The tightness of the body enveloping the space containing the gas, with respect to the atmosphere.

3.10. INTERNAL LEAK-TIGHTNESS

The tightness between the inlet and the outlet of the valve, obtained by closing the operating mechanism.

3.11. LEAK-TIGHTNESS TEST

Test to determine

- the internal leak-tightness of the valve's closing seat when closed and pressurised from either side;
- The external leak-tightness of the valve when half open.

3.12. INITIATING TORQUE

Torque required to initiate movement of the obturator.

3.13. RUNNING TORQUE

Torque required to achieve full opening or closing of the valve at maximum allowable operating pressure.

3.14. LEAKAGE

Emission of gas through the body, sealing membrane or any other component of the valve.

4.0 TECHNCIAL SPECIFICATION

4.1 Design of valve shall be as per European Standards EN 1555-4 and the complementary Particular requirement.

4.2 Valves shall be leak-proof and it is intended to be use in gas distribution networks made of PE pipes and accessories.

4.3 The valves are laid and to be welded by means of electro-fusion method.

4.4 The internal and external surfaces of valves shall be smooth, clean and free from scoring, Cavities or other surface defects to an extent that would prevent conformity to EN 1555-4.

4.5 No component of valve shall show any damage, scratches, pitting, bubbles, blisters, inclusions or crack.

4.6 Mechanical characteristics of assembled valves:

a. Valve shall have mechanical characteristics conforming to the requirements given in Table-1 of standard EN 1555-4.

b. Unless otherwise specified by the applicable test method, the test pieces shall be conditioned at (23 ± 2) °C before testing.
c. Testing of valve shall be in accordance with the test methods as specified in Table-1 of standard EN 1555-4 using the indicated parameters.
d. Hydrostatic test pressure and minimum test period shall be as per Table-2 of EN 1555-4.

4.7 Physical characteristics of assembled valves:

a. Valve shall have physical characteristics conforming to the requirements given in Table-3 of standard EN 1555-4.
b. Thermal stability test shall be done at 200 deg. C by means of differential scanning calorimetry (DSC), considering oxygen induction time (OIT) ≥ 20 min.
c. Melt mass flow rate shall be calculated at 190 deg. C by applying 5 Kg of load on test specimen. It shall be expressed in g/ 10min.
d. Unless otherwise specified by the applicable test method, the test pieces shall be conditioned at (23 ± 2) °C before testing.
e. Testing of valve shall be in accordance with the test methods as specified in Table-3 of standard EN 1555-4 using the indicated parameters.

4.8 Performance requirements:

When valves are assembled to each other or to components conforming to other parts of EN 1555, the joints shall conform to EN 1555-5.

4.9 Allowable pressure drop shall be as per the standard ISO 17778.

5.0 MATERIAL

5.1 GENERAL

- The PE compound from which the valve body, with spigot end or electrofusion socket is made out, shall conform to EN1555-1 and comply with the specification

- The PE valves bodies are PE 100 class made from approved material as specified in the Tender General requirements - appendix 1.

All parts of the valve in contact with the gas stream shall be resistant to the gas, its condensates and other occurring substances such as dust.

All metallic parts of the PE valve shall resist to both internal and external corrosion.

The PE valves bodies made from below listed material are forbidden:

- use of recycled materials,
- mixture of different materials,
- addition of complementary materials.

5.2. SEALS

- The seals shall be homogeneous, without any inner crack, inclusion or impurities and cannot contain any component that can alter the properties of the materials they are in contact with, and prevent the non-conformity of those materials with the present specification.
- additives shall be distributed evenly.
- The rubber seal rings shall comply with standard EN 682.
- Other seals shall comply with the relevant standard and be suitable for gas service.

5.3 Lubricants cannot have any adverse effects on the long-term performance of the valve parts.

5.4 **Operating cap** are in plastic material or in metal, protected against corrosion.

6.0 DESIGN

6.1 Valve will be designed for a maximum operating pressure (MOP) equal to 10 barg.

6.2 The wall thickness of the PE valve body shall be equal or greater than the minimum wall thickness of the corresponding SDR 11 series pipes.

6.3 Valve shall be bi-directional.

6.4 The design of valve shall be such that, when assembling the valve into the pipe or other components, the electrical coil and/ or seals or any other ancillary parts are not displaced.

6.5 Valve ends shall have extended pipes at both plain ends. Pressure rating and thickness of extended pipes shall be compatible with the pipe in the network.

6.6 Valve ends shall be welded to pipes or fittings by means of electrofusion jointing using coupler.

6.7 Electrofusion socket shall have sufficient fusion compatibility to the pipe to which it is fused to meet the requirement of standard EN 1555-4 and EN1555-5.

6.8 PE valves bodies and their PE electrofusion socket / ends shall have a pressure rating of at least that of the pipe to which they are assembled.

6.9 Valve body and valve ends shall not be bolted and screwed and shall also designed that it cannot be dismantled.

6.10 Operating Cap/ Head of valve shall be “non-blow out” type. Size of operating cap shall be 50 mm square socket and 40 mm height as per EN 1555-4.

6.11 The running torque of valve shall be as per standard EN 1555-4. Valve shall be designed in such a way that it cannot be easily operated by hand.

6.12 Operating Key or Extension spindle shall be provided for valve operation as per client requirement. Operating key or extended spindle shall be compatible with operating cap.

6.13 The valve should be equipped with a base plate. In order to achieve this, the valve body will be designed with a flat base or with an attached base plate or an integrated one.

6.14 The operating mechanism and the stop wedges will be protected against water intrusion.

6.15 The valve body is completely sealed except a passage for the spindle mechanism.

6.16 The internal and external surfaces of valves shall be smooth clean and shall have no scoring, cavities or other defects.

6.17 Colour of valve shall be black. If agreed previously, they can also be coloured yellow or orange.

7.0 DIMENSIONS & TOLERANCE:

i. The dimensions will be in conformity with the standard EN 1555-3 and EN 1555-4.
ii. Dimensions shall be measured in accordance with ISO 3126 at (23 ± 2) ^{O}C, after being conditioned for at least 4 hrs. The measurement shall not be made less than 24 hrs after manufacture.
iii. Each valve shall be characterized by its dimensions and associated end connections.
iv. Technical data given by the manufacture shall include at least following information:
   a. the dimensional characteristics, by working drawings
   b. the assembly instruction

1. The dimensions of electro-fusion socket shall conform to EN 1555-3, Table-1.
2. Pressure rating or thickness of ends shall confirm to interconnecting pipes specification.
3. Tolerance for operating cap of valve shall be (50+0.5) mm square for socket and (40 ± 2) mm for height.

8.0 INSPECTION/ DOCUMENTS:

Inspection shall be carried out as per BPCL /consultants approved Inspection Plan / QAP.
i) Third party inspection agency appointed by vendor on prior approval of owner shall carry out stage wise inspection during manufacturing / final inspection.
Vendor shall furnish all the material test certificates, proof of approval /licence from specified authority as per specified standard, if relevant, internal test / inspection reports as per BPCL Technical Specification and specified code for 100% material, at the time of final inspection of each supply lot of material.
The manufactures of the valves shall deliver documentation for each type of valve which includes:

- Raw material used,
- drawings, dimensions and tolerances, including for the accessories,
- application range (temperature and pressure limits),
- running torque and initiating torque,
- pressure drop and flow diagram,
- test results and data proving the conformity of the valve in accordance with prEN1555-4 and prEN1555-7,
- The pipe elements used during valves testing have to be conform to the specification attached in this document.
- The assembly pipes/valves realised during testing shall be in conformity with the manufacturer's instructions and the extreme installation conditions.
- For the test assembly due consideration should be taken regarding the fabrication tolerances and the variation of the outside ambient temperature.

9.0 MARKING

At least the information given below shall be printed or formed directly on the valve :

a. Manufacturer's name and/or trademark;
b. BPCL's name as client
c. Material and designation
d. Design application series

e. Nominal diameter
f. Direction of flow
g. Internal fluid "gas"
h. Traceability code (valve and component) as per standard ISO/FDIS 12176-4;
i. Number of the system standard (e.g. prEN 1555-4) this information can be printed/formed directly on the valve or on a label associated with the valve or on an individual bag.
j. Production period, year and month;

The marking shall stay legible during normal manipulation, storage and installation.
The marking shall not adversely influence the performance of the valve and prevent the non-conformity of the valve.
No marking will be accepted at the valve spigot ends.

The material and constituent elements used in marking of valve (including elastomers, greases and any metallic part, if used) shall be resistant to the external and internal corrosion and shall have life expectancy under following conditions at least equal to the PE pipes with which they are intended to be used.

a. During storage
b. Under the effect of the gas conveyed
c. With respect to the services environment and operating conditions

9.0 PACKAGING AND DELIVERY

The valve and its accessories shall be packaged individually in plastic bags in order to prevent them from deterioration. The valves ends shall be protected with external caps.

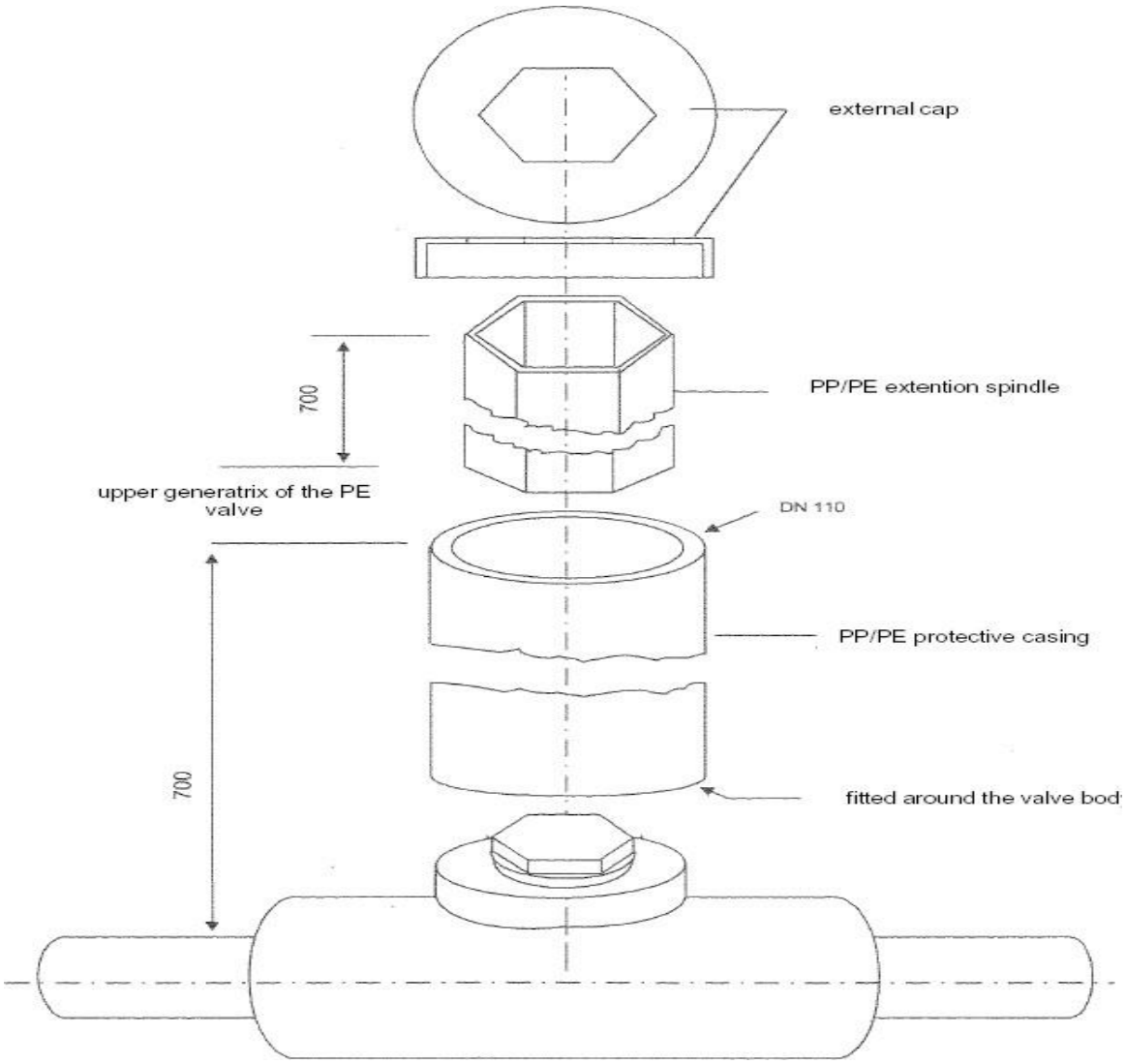
The cartons and/or individual bags shall bear at least one label with the manufacturer's name, type and dimensions of the part number, number of units in the box and, any special storage conditions and storage time limits.

10.0 GUARANTEE

The manufacturer will extend his guarantee for each part for 10 years after production.
This guarantee period is valid if the parts are kept in proper conditions and in the original packaging.
The valves equipped with electro-fusion sockets will be supply with a magnetic card and a code bar tag containing the welding parameters. The coding of the parameters shall be in conformity with the standard ISO TR 13950.
The operating manual (in English) will be inserted in the individual part package.

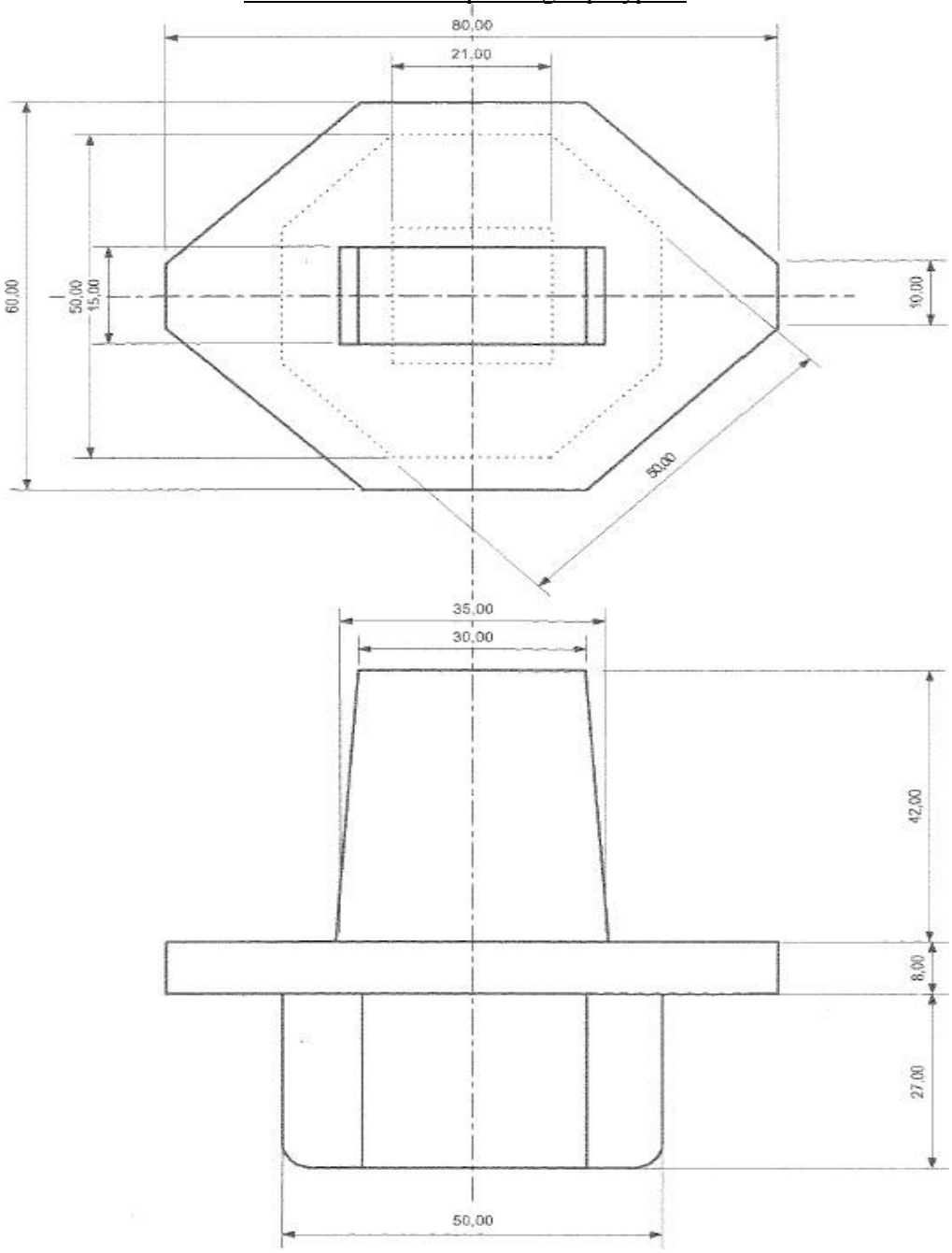
ANNEXURE A

Dimensions of the extension spindle

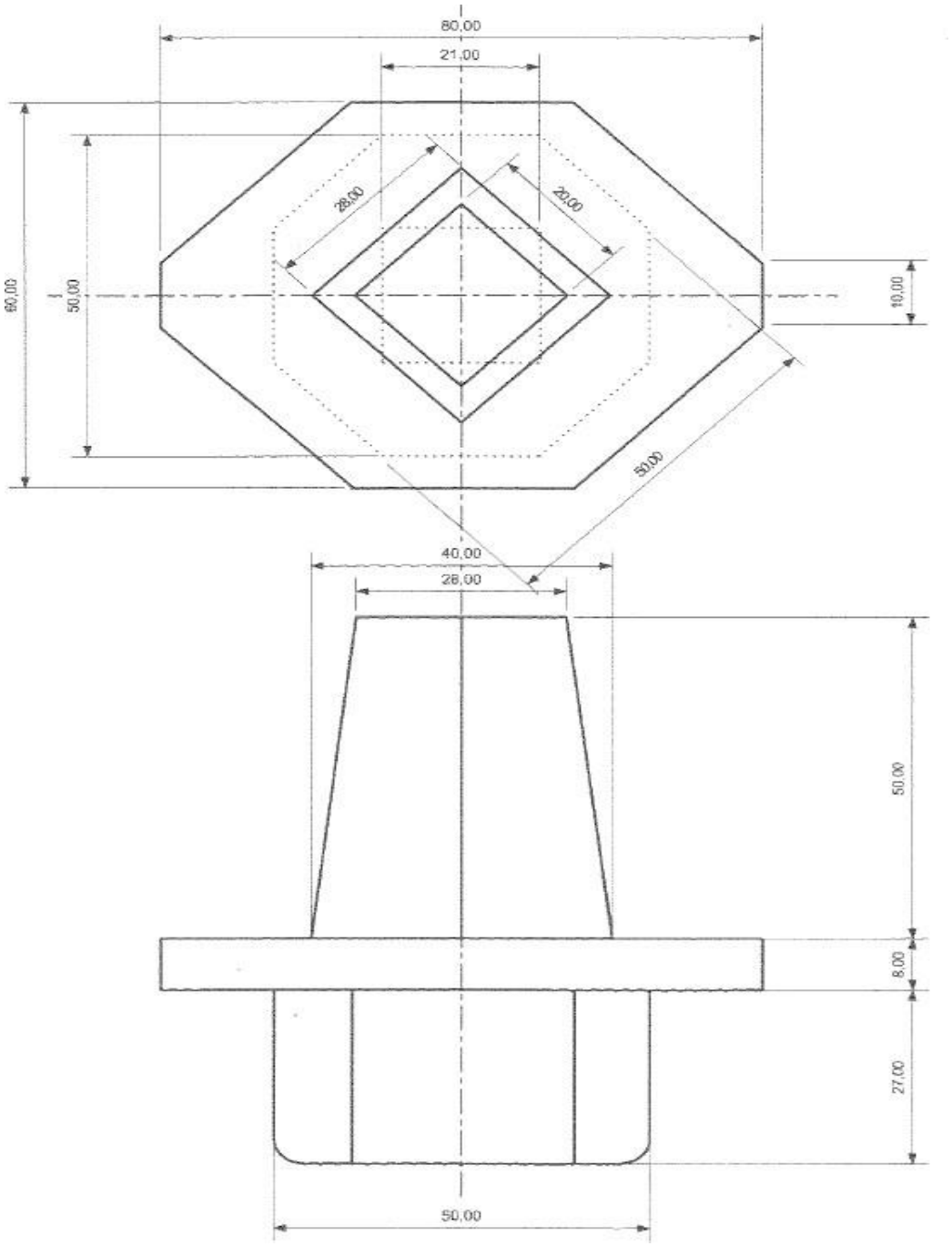


ANNEX B

Dimensions of the operating cap Type A



Dimensions of the operating cap Type B



Dimensions of the operating cap Type C

