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Specification for Porcelain Dinnerware

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1 Scope

This standard specifies the requirements for the materials, design performance and manufacture of porcelain dinnerware.

2 Definitions

For the purpose of this standard DPNS ASTM C 242, and following definitions shall apply:

2.1

absorption

the relationship of the weight of the water absorbed by a ceramic specimen, subjected to prescribed immersion procedure, to the weight of the dry specimen

The capacity of a substance to take up a substance, usually a liquid or gas, with the formation of an apparently homogeneous mixture.

2.2

blistering

the development during firing of enclosed or broken macroscopic vesicles or bubbles in a body, or in a glaze or other coating

2.3

body dirt

small grain of grit or other particle stuck on the ware

2.4

bottom shape

fired ceramic dinnerware defect characterized by convex or concave bottom shape

2.5

chips

any broken edges of a dinnerware

2.6

crawling or glaze jump

a parting and contraction of the glazed or engobed ceramic ware during firing resulting in exposed areas bordered by coalesced glaze

2.7

crazing

the hair line cracking which occurs in fired glaze or other ceramic coatings due to difference in coefficient of thermal expansion between body and glaze

**2.8
decoration**

**2.8.1
overglaze decoration**

a ceramic decoration applied on the surface of fired glaze then refired at a lower temperature

**2.8.2
in-glaze decoration**

a ceramic decoration applied on the glaze ware surface and fired at a temperature high enough to fuse the glaze and pigment together

**2.8.3
underglaze decoration**

a ceramic decoration applied directly on the surface of ceramic ware and subsequently covered with a transparent glaze

**2.9
dinnerware**

ceramic white porcelain ware

**2.10
dunting**

the cracking that occurs in fired ceramic wares as a result of thermally induced stresses

**2.11
engobe**

a slip coating applied to a ceramic body for imparting color, opacity, or other characteristics, and subsequently covered with a glaze

**2.12
firing**

the controlled heat treatment of the ceramic ware in kiln or furnace, during the process of manufacture, to develop the desired properties

**2.13
flux**

a substance that promotes fusion in a given ceramic mixture

**2.14
glaze**

a ceramic coating matured to the glassy state on a formed ceramic article, or the material or mixture from which the coating is made

**2.15
impervious**

the degree of vitrification of a ceramic ware evidenced by resistance to penetration of water

2.16

iron spot – Black or brown spot on the surface of fired ceramic due to iron

2.17

poor edge

fired ceramic ware generally characterized by rough edge

2.18

glost ware

fired ceramic porcelain ware covered with a glaze

2.19

decorated ware

fired ceramic porcelain ware with decoration

2.20

poor seam

glost ware defect usually occurring on cast wares caused by mold joints during casting

2.21

opacified glaze

fired ceramic glaze on ware with sufficiently low light transparency to effectively hide the body from view

2.22

wavy glaze

uneven fired glaze on ceramic surface

2.23

pitting

broken microscopic vesicle or bubble on glaze

2.24

pinhole

imperfections in the surface of a ceramic body or glaze resembling pin pricks

2.25

cast ware

ceramic ware formed by casting

2.26

heat resistance degree

the maximum temperature change (thermal shock) that the fired ceramic ware can be subjected to without incurring damage or cracks on both glaze and body

2.27

translucency

the ability of fired ceramic white porcelain ware to transmit scattered light

3 Types

Porcelain dinnerware shall be classified into two types:

3.1 Fine porcelain

3.2 Ordinary porcelain

4 General requirements

4.1 Fine porcelain dinnerware shall be a vitrified ceramic ware with a good degree of whiteness covered by non-opacified glaze properly matured and fitted to the body.

4.2 Ordinary porcelain ware shall be a vitrified ceramic ware with a good degree of whiteness which may or may not be covered by non-opacified glaze.

4.3 The body shall show upon fracture a dense, homogeneous and fine grained vitrified texture.

4.4 The dinnerware shall possess a good or high-pitched metallic ring whenever tapped with anything hard, of good workmanship, and free as possible from manufacturing defects mentioned in Tables 1 and 2.

4.5 Fine porcelain dinnerware shall be translucent when subjected to practical light test.

4.6 Ordinary porcelain dinnerware may not be translucent, but shall possess all the other properties of true porcelain.

4.7 The materials used for the body and glaze shall be of a true porcelain mix. These are feldspar, silica and kaolin.

4.8 The dinnerware shall be totally glazed except in areas which are for support during firing, but such unglazed surfaces shall be smooth and polished. The glaze shall be even, free from cracks, and shall possess an impervious surface. It shall be free as possible from pinholes, blisters, iron spots, glaze jumps, glaze runs, waxy glaze and pittings.

5 Workmanship and finish

5.1 The cup shall match the saucer in all respect. Each item of a set may or may not have a common distinctive portion in the design and / or decoration.

5.2 Whenever in use, lids shall fit properly and shall not fall off during ordinary use.

5.3 For a product with a lip and spout, it shall be of suitable design so that the liquid does not drip outside while pouring.

5.4 Any unglazed foot must be polished.

5.5 The handle when provided shall always be symmetrical.

6 Characteristics

Defects in respect to appearance, workmanship, finish and decoration shall be as classified in Tables 1 and 2.

Any ware having one major or three minor defects mentioned in Tables 1 and 2 shall be rejected.

Table 1 – Defects of dinnerware

| Defects | Minor | Major |
|----------------|---------------------------------|---|
| Warpage | Not more than 4 mm. | More than 4 mm. |
| Bottom up/down | Not more than 4 mm. | More than 4 mm. |
| Poor edge | Noticeable | Noticeable and can be felt by touching |
| Body dirt | 3 specks smaller than 0.5 mm | More than 3 specks or 1 speck larger than 0.5 mm |
| Iron spot | 3 specks smaller than 0.5 mm | More than 3 specks or 1 speck larger than 0.5 mm |
| Pinhole | 3 pinholes smaller than 0.5 mm. | More than 3 pinholes or 1 pinhole larger than 0.5 mm. |
| Wavy glaze | Noticeable | Very noticeable |
| Pitting | Noticeable | Very noticeable |
| Glaze jump | Not more than 1 mm. | More than 1 mm. |
| Handle crack | Not more than 1 mm. | More than 1 mm. |
| Seam | Noticeable | Very noticeable |

Table 2 – Defects on decoration of dinnerware

| Defects | Minor | Major |
|---------------------------------|-----------------------|---|
| Broken Line | | Broken lines visible form a distance of 300 mm. |
| Accumulated pigment | Not more than 0.5 mm. | More than 0.5 mm. |
| Discolored | | Gold/ Platinum lining easily removed by rubbing |
| Rippled lines | | Rippled lines visible from a distance of 300 mm. |
| Damaged or Erased decals | | Erased or damaged decals visible from a distance of 300 mm. |
| Color shade variation | Noticeable | Very noticeable |
| Scratch | Not more than 2.5 mm. | More than 2.5 mm. |
| Sand dust/ Rough surface | Noticeable | Can be felt by touching |
| Crawling of decoration | | Crawling decoration visible |
| Overfired/ Underfired pigment | | Noticeable |
| Decal stain | | Stain visible within 300 mm. |
| Gold/ Platinum stain | | Gold/ Platinum stain visible within 300 mm. |
| Color stain | | Other color stain visible within 300 mm. |
| Uneven distance between linings | Noticeable | Very noticeable |
| Peeling-off of pigment | | Peeled-off pigments |

6.1 Decoration

6.1.1 Types of decoration can either be overglaze, in-glaze, or underglaze.

6.1.2 The decoration can either be made of gold, platinum, or ceramic pigments and stains.

6.2 Translucency – Fine porcelain dinnerware shall show a good degree of translucency when tested in accordance with the method described in sub-clause 8.1.

6.3 Whiteness – The materials shall show the following degrees of whiteness when tested in accordance with sub-clause 8.2.

6.3.1 Fine porcelain shall have a whiteness of 86 percent minimum.

6.3.2 Ordinary porcelain shall have a whiteness of 55 percent minimum.

6.4 Heat resisting degree – The materials shall have a heat resisting degree of 120°C minimum when tested in accordance with sub-clause 8.3.

6.5 Water absorption – Water absorption of any porcelain ware shall be 0% when tested in accordance with sub-clause 8.4.

6.6 Acid proof – The decoration shall be highly resistant to acid with a maximum tolerance up to Grade No. 1 (see Table 3) when tested in accordance with sub-clause 8.5.

6.7 Alkali proof – The decoration on the surface of the ware shall be highly resistant to alkali to Grade No. 2 (see Table 3) when tested in accordance with sub-clause 8.6.

6.8 Boiling water proof – The decoration on the ware surface shall be highly resistant to boiling water with a maximum tolerance up to Grade No. 1 (see Table 3) when tested in accordance with sub-clause 8.7.

6.9 Detergent proof – The decoration on the ware surface shall be highly resistant to household detergent with a maximum tolerance up to Grade No. 1 (see Table 3) when tested in accordance with sub-clause 8.8.

6.10 Chipping resistance – The chipping resistance of the samples when tested in accordance with the method described in Annex B shall not be less than 0.140 N.m.

The ware shall be considered as having failed the test if the impact results in chipping of the edge.

6.11 Impact strength – The impact strength of the samples when tested in accordance with the method described in Annex B shall not be less than 0.267 N.m.

A ware such as plate, saucer or platter shall be considered as having failed the test if it develops a rupture which appears as a hole through the body or as a body crack extending through its rim. A cup or bowl shall be treated as having failed if it develops a body crack extending into any portion of the foot or if a portion of the body breaks away.

6.12 Craziing – The article shall show no crazing after undergoing three cycles of the test method described in sub-clause 8.11.

6.13 Dissolved lead – The lead solubility of the decoration on the ware surface shall not exceed to 3.0 ppm when tested in accordance with the test method described in DPNS ISO 6486-1.

6.14 Dissolved cadmium – When tested in accordance with the test method described in DPNS ISO 6486-1, the cadmium solubility shall not exceed 0.5 ppm.

Table 3 – Grades based on chemical test result

| Item | 0 | 1 | 2 | 3 |
|----------------|-----------|----------------|---------------------|----------------|
| Surface luster | Unchanged | Slightly matte | Considerably matte | No luster |
| Color fading | Unchanged | Slight fading | Considerably fading | Extreme fading |

7 Sampling

The method of sampling and the criteria for conformity shall be in accordance with Annex A.

8 Testing

8.1 Test of translucency – Place a porcelain ware against the light with the fingers touching the ware surface. There is translucency if the image of the hand or fingers are visible on the opposite side.

8.2 Test for whiteness – To measure the whiteness use the Hunter Whiteness or any suitable apparatus.

8.3 Test for heat resisting degree – This test determines the resistance of porcelain wares to thermal shock.

Put a porcelain ware inside the oven and heat to 150°C for one hour. Prepare the water vessel and measure the water temperature. Immediately plunge the heated porcelain ware into the water and allow to cool. Take the ware out from the water, wipe with damp cloth and apply Rhodamine dye on the surface. Observe for tiny glaze or body cracks. If no cracks appear, put sample again in the oven, heat at 10°C higher for one hour and repeat the whole process until cracks appear.

8.4 Test for water absorption (Test for vitrification) – Break a porcelain ware, pick up two pieces, weigh and boil for five hours with water. Wipe each piece with a damp cloth and weigh again.

8.5 Acid proof test – This test evaluates the quality of design or decoration (gold or platinum) on the ware surface and if fired pigments of gold on the ware is affected by acid.

Dip the test piece into a four percent solution of acetic acid. Soak at 25-55°C for 24 hours. Wash thoroughly with water, dry with cloth and observe for any change in luster, color and peeling-off of fired pigments or gold.

8.6 Alkali proof test – This test determines if fired pigment or luster is affected by alkali.

Dip the test piece into a 0.5% solution of sodium carbonate in a controlled water bath at 100°C for two hours. Wash, dry and observe for change in luster, color and peeling-off of pigments gold.

8.7 Boiling water proof test – This test determines if fired pigment or luster is affected by boiling water.

Leave the test piece at 100°C controlled water bath for 24 hours. Wash, dry and observe for changes in luster, color and peeling-off of pigments or gold.

8.8 Detergent proof test – This test determines if fired pigment or luster on the wares is affected by household detergents.

Dip the test piece into a 0.5% solution of ordinary household detergent. Place in a water bath and raise the temperature to 60°C and maintain the temperature for 96 hours. Wash thoroughly with water, and observe any change in color and peeling-off of fluid pigments or luster.

8.9 Dissolved lead test – Dissolved lead content shall be determined in accordance with the test method described in DPNS ISO 6486-1.

8.10 Dissolved cadmium test – Dissolved cadmium content shall be determined in accordance with the test method described in DPNS ISO 6486-1.

8.11 Crazing test

The wares are exposed to 5 kg/cm² of saturated steam for one hour and then cooled to room temperature. The glaze is tested for a maximum of three cycles.

Place fresh, whole wares in any suitable pressure vessel and subject to constant pressure of 5.0+/-0.2 kg/cm² in saturated steam. Allow 30 minutes for raising the steam pressure. Keep the wares under pressure for one hour, then release the pressure by opening the blow valve. Allow the wares to cool to room temperature in the pressure vessel. Examine them for cracking or crazing by applying Rhodamine dye solution to the surface. If no cracking and crazing appears, subject the test pieces to another cycle of the above test and observe for cracking or crazing.

9 Packing

The dinnerware shall be packed as agreed upon between the purchaser and the supplier.

10 Marking

Each article of the dinnerware shall be indelibly and legibly marked at the bottom surface with the following information:

10.1 Manufacturer's name and his trademark, if any.

10.2 The words "Made in PHILIPPINES" or country of origin.

Annex A

Sampling procedure

Table A1 – Sampling scheme

| Lot or Batch size, pieces | Sample size pieces | Acceptance quality level, (Normal inspection = 4.0) | |
|------------------------------|-----------------------|--|-----------|
| | | Acceptable | Rejection |
| 2-15 | 2 | 0 | 1 |
| 16-25 | 3 | 0 | 1 |
| 26-90 | 5 | 0 | 1 |
| 91-150 | 8 | 1 | 2 |
| 151-280 | 13 | 1 | 2 |
| 281-500 | 20 | 2 | 3 |
| 501-1200 | 32 | 3 | 4 |
| 1201-3200 | 50 | 5 | 6 |
| 3201-10000 | 80 | 7 | 8 |

A.1 Determine the size of the lot or batch to be inspected. The corresponding sample size can therefore be determined from Table A1.

A.2 After having determined the sample size, proceed to pick the sample at random as possible. Number all the samples with a marking pen (pentel pen)

A.3 Proceed with the visual inspection and check for various defects listed in Tables 1 and 2. Mark the defective dinnerware accordingly.

Annex B

Test for impact strength and chipping resistance

B.1 Purpose

This test is carried out to ensure that fine porcelain dinnerware will stand impact encounter in normal day to day use without breaking or chipping.

B.2 Apparatus

Impact tester – A suitable pendulum type impact tester as illustrated in Figure 1.

B.3 Method

B.3.1 Impact strength

When testing a plate, saucer or platter, support the ware against three equally spaced 3 mm diameter steel balls so that when the hammer is hanging vertically, the impact point of the hammer touches the center of the bottom of the test piece.

When testing a cup or bowl, place the ware on its foot between two cast iron blocks forming a 90° “V” block whose sides are sufficiently light to support the upper edge of the cup or bowl and adjust it in such a manner that when the hammer is hanging vertically. Its impact point touches the cup or bowl at its upper edge and in the plane of the bisector of the angle of “V” block. Strike the test piece with the spherical end of the hammer with an impact of 0.267 N.m (0.027 kgf.m.)

B.3.2 Chipping resistance – This test shall be conducted on flat wares only. Place the plate or saucer on its foot between two cast iron blocks forming a 90° “V” block and adjust it in such a manner that when the hammer is hanging vertically, the center of the impact face of the chipping hammer touches the edge of the test piece at the plane of the bisector of the angle of the “V” block. Strike the test piece at three equally spaced points on its periphery with the cylindrical end of the hammer with an impact of 0.14 N.m. (0.014 kgf.m.)

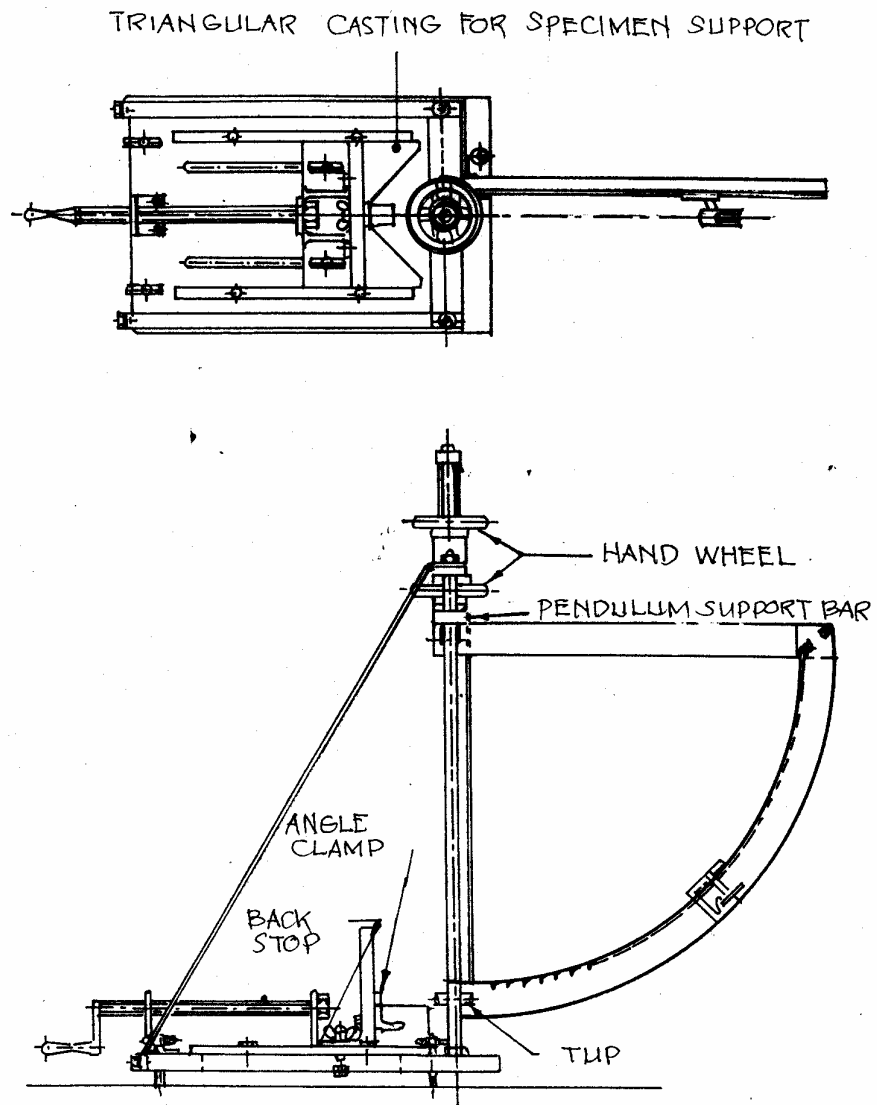


Figure 1 – Impact test apparatus

References:**DPNS 155:2005**

The following standards contain provisions, which through reference in the text form part of this national standard. At the time of publication of this PNS, the editions indicated were valid:

DPNS ASTM C 242:2005, Standard Terminology of Ceramic Whitewares and Related Products

DPNS ISO 6486-1:2005, Ceramic ware, glass-ceramic ware and glass dinnerware in contact with food -- Release of lead and cadmium -- Part 1: Test method