

(DZONGKHA TITLE)

BHUTAN STANDARD

Hand-made paper (Desho)



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(DZONGKHA TITLE)

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Contents

FOREWORD	iv
1 Scope	1
2 Normative References	1
3 Terms and Definition	1
4 Materials	2
4.1 Daphne	2
4.2 Vegetable Starch	2
4.3 Water	2
5 Manufacturing Process	3
5.1 Harvesting pulpwood	3
5.2 Preserving the Daphne bark	3
5.3 Soaking Daphne bark in water	3
5.4 Auxillary agents for boiling (wood ash and soda ash)	3
5.5 Boiling	3
5.6 Rinsing	3
5.7 Cleaning	3
5.8 Pulping	3
5.9 Screening	3
5.10 Compressing of Tsharsho Paper	4
5.11 Drying	4
5.12 Sorting	4
6 Requirements	4
7 Packing and Labeling	5
8 Sampling	5
ANNEX A	6
ANNEX B	7
BIBLIOGRAPHY	8

FDBTS 292: 2020

FOREWORD

This Bhutan Standard for Hand-made paper (Desho) was adopted by Bhutan Standards Bureau after the draft finalized by the Wood and Timber Product Standards Technical Committee TC 07 and approved by the Bhutan Standards Bureau Board (BSB Board) on xxxx 2020

This standard is subject to systematic review after five years to keep pace with the market trends, industrial and technological developments. Any suggestions and further information may be directed to the concerned Technical Committee.

(DZONGKHA)

BHUTAN STANDARD Hand-made paper (Desho)

1 Scope

This standard prescribes the materials, manufacturing processes and requirements of hand-made paper (desho).

2 Normative References

The following documents are indispensable for application of this document. For dated references, only the edition cited applies, for undated references, the latest edition of the latest document (including any amendments) applies.

BTS 293: 2020 ISO 187: 1990 Paper, Board and pulps – Standard atmosphere for conditioning and testing and procedure for conditioning the atmosphere and conditioning of samples

BTS 296: 2020 ISO 186: 2002 Paper and board – Sampling to determine average quality

BTS 297: 2020 ISO 536: 2019 Paper and board – Determination of grammage

BTS 298: 2020 ISO 287: 2017 Paper and board – Determination of moisture content of a lot – Oven-drying method

3 Terms and Definition

For the purpose of this standard, the following terms and definitions apply.

3.1 Ash – Ash collected from burning hard wood usually oak tree and rice straw

3.2 Bamboo screen – Screen made from bamboo used to separate desirable materials from undesirable materials by the principle of filtering through a perforated bamboo mesh.

3.3 Board – A long, thin, flat piece of wood or other hard materials used to compress the layers of wet paper sheets

3.4 Dekar – A flowering shrub used for paper making usually found at an altitude of 1200 -1800 meters above sea level.

3.5 Denag – A flowering shrub used for paper making usually found at an altitude above 2000 - 3500 meters above sea level.

3.6 Desho – Local term used to define hand-made paper; De means fiber, and Sho means paper

3.7 Beater - A machine consisting of a tank or 'tub' usually with a partition, and containing a heavy roll revolving against a bedplate. Both rolls and bedplate may contain horizontal metal bars set on edge. The primary function of the beater is to initiate the development of the fiber by cutting, bruising, fibrillating and hydrating action on the fibers.

FDBTS 292: 2020

3.7 Paper bed - A long, thin, flat piece of wood or other hard materials used to stack the layers of wet paper sheets.

3.8 Pulp - Fibrous material prepared from cellulosic raw material of daphne plants by mechanical processes for use in making paper

3.9 Resho – Hand-made paper screened on the cloth; Re means cloth, and Sho means paper

3.10 Tsharsho – Hand-made paper screened on bamboo screen; Tshar means bamboo and Sho means paper

3.11 Vegetable starch – Extracted from Malvaceae plant roots and used for evenly spreading of pulp and easy separation of paper sheets.

3.12 Wooden frame – Light wooden frame made from blue pine or cypress trees upon which the bamboo screens are placed. It has to be strong enough to withstand the intense swinging actions during the paper making process.

3.13 Wood slates – Two pieces of long and thin woods made from blue pine or cypress trees which are placed on two edges of the bamboo screens. It has to be strong enough to withstand the intense swinging actions during the paper making process.

3.14 Vat – The receptacle that holds pulp from which the hand-made sheets are formed.

4 Materials

4.1 Daphne

Desho shall be manufactured from locally available daphne plants like dekhar (*Edgeworthia gardneri*) and denag (*Daphne bholua*) plants. Dekhar are commonly found at an altitude of 1200 -1800 meters above sea level, and denag are generally found above 2000 - 3500 meters above sea level. To prevent rotting and molding, strips of daphne shall be placed on a raised floor.

4.2 Vegetable Starch

Vegetable starch shall be used for evenly spreading of pulp and easy separation of paper sheets. Vegetable starch is usually extracted from plants belonging to *Malvaceae* family. The most commonly used plants are *Abelmoschus manihot*, *Okra* and *Cotton Plants*.

4.3 Water

Water used for entire manufacturing process of hand-made paper (desho) shall be clean and without any contamination.

5 Manufacturing Process

5.1 Harvesting pulpwood

Daphne plant is harvested and the bark stripped off on-site during March to September. The branches and tips are not used.

5.2 Preserving the Daphne bark

Daphne strips are not placed directly on the ground. The use of a raised floor prevents molding and rotting.

5.3 Soaking Daphne bark in water

The daphne has to be thoroughly retted before boiling or boiling will not be effective, so it is soaked in water for a minimum of 12 hours.

5.4 Auxillary agents for boiling (wood ash and soda ash)

Water is poured on top of the ash and the part that filters through naturally is used. New ash and the ash that has been used several times differ in density. It is also necessary to mix in some soda ash.

5.5 Boiling

The filtered ash is used for boiling the daphne barks. Sometimes soda ash is also used but rarely. It should be boiled for a minimum of 6 hours. While cooking, the bark is turned every 30 minutes so that the bark can be boiled evenly.

5.6 Rinsing

Boiled bark is rinsed thoroughly with clean water until all alkaline content of the ash is removed. Clear water indicates the absence of alkaline content.

5.7 Cleaning

The rinsed barks are individually inspected and impurities like; uncooked parts, dark spots, bark remains and any other residues contained in the barks are carefully picked out by hand.

5.8 Pulping

Cleaned bark is made into a pulp either manually using wooden hammer or using Hollander beater machine. The pulp is blended sufficiently until a uniformly beaten pulp is obtained.

5.9 Screening

5.9.1 Tsharsho

Water and daphne pulp along with adequate quantity of vegetable starch is placed in the vat and stirred thoroughly with a pole. The bamboo screen is placed on the wooden frame and both ends fixed in place with wood slats. Holding both ends of the frame, the paper maker scoops it one time through the vat. Large pieces of debris are removed. When the water has drained, the slates at either end of the frame are removed. The screened paper is placed in layers on the paper bed. Two types of bamboo screens (thick and thin) are used for making thick and thin papers.

5.9.2 Resho

Water is filled in a wooden vat, and wooden frame is placed in the water. The daphne pulp is scooped with a ladle and poured into the wooden frame. The pulp on the wooden frame is spread out and mixed

FDBTS 292: 2020

evenly by hand from front to back and left to right. Then the wooden frame is lifted to allow the water to drain out. The paper is dried in the frame without transferring it to the paper bed. The frames are leaned against stakes and the paper is left to dry in the sun light.

5.10 Compressing of Tsharsho Paper

Board is placed on top of the layers of screened paper on the paper bed. The board is mechanically compressed to squeeze out approximately 80% of the remaining water content.

5.11 Drying

The compressed papers are separated individually from the paper bed and placed on the stainless steel heating board or can be air dried by placing on house walls or any other smooth surfaces.

5.12 Sorting

Dried papers are sorted into fine and reject papers. Fine papers are used to make other products like books, photo albums, stationeries...etc, and the reject papers are reprocessed into pulp.

6 Requirements

6.1 The hand-made paper (desho) shall comply with the requirements given in Table 1.

Table 1- Requirement for Hand-made Paper (Desho)

Sl.No	Characteristics	Requirements	Tolerance	Method of Test/Visual Examination
1	Fine Paper	Smooth and clean surface, free from hard spots and wrinkles	Not Applicable	ANNEX-B
2	Size	8 cm x 5 cm up to 300 cm x 300 cm	±3 mm	ANNEX-A
3	Substance	25 GSM up to 300 GSM	±5 percent	BTS 297: 2020 ISO 536: 2019
4	Moisture Content	6% to 9%	Not Applicable	BTS 298: 2020 ISO 287: 2017

7 Packing and Labeling

The hand-made paper shall be packed suitably as agreed between the buyer and the supplier.

Each package shall be labeled with the following information:

- a) Name of manufacturer and trade-mark;
- b) Description of the material including size of sheet;
- c) Substance, in g/m^2 ;
- d) Number of sheets (in the package) and net mass of the package;
- e) Batch number; and
- f) Month and year of manufacture.

8 Sampling

Sampling of hand-made paper (desho) shall be done as per TBS 296: 2020 ISO 186: 2002 – Paper and board – Sampling to determine average quality

ANNEX A

(Normative)

Visual Examination of Size of Hand-made Paper (Desho)

A-1. Materials

A-1.1 Calibrated meter rule

A-2 Procedure

Measure correct to 2 mm the size (length and width) of hand-made paper with the help of a calibrated meter rule, suitably sub-divided. The following tolerances shall be used;

Prescribed Length/Width (mm)	Tolerance (mm)
up to 150	± 1.5
Above 150 up to 600	± 2.0
Above 600	± 3.0

ANNEX B

(Normative)

Visual Examination for Identifying Fine Hand-made Paper (Desho)

B-1. Procedure

Visual examine the sheets for any defects, such as rough and coarse surface with hard spots, wrinkles and torn edges.

B-1.1 Fine paper shall have smooth and clean surface, free from hard spots and wrinkles

B-1.2 Reject all paper with rough and coarse surface, hard spots, wrinkles and torn edges

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FDBTS 292: 2020

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