व्यापक परिचालन मसौदा

प्रलेख प्रेषण संज्ञापन	
संदर्भ	**दिनांक**
पी सी डी 12/टी (2577) सी	**30 11 2011**

तकनीक समीति पी सी डी 12

प्रेषिती

1 प्लास्टिक तकनीक समीति , पी सी डी 12 के समस्त सदस्य।

2 पैट्रोलियम, कोयला एवं संबंधित उत्पाद विभाग परिषद (पी सी डी सी) के सदस्य ।

3 रूचि रखने वाले सभी निकाय ।

महोदय/ महोदया,

आपके अवलोकन हेतु निम्नलिखित भारतीय मानक का मसौदा संलग्न हैं :

क.स.	मसोदा सख्या	विषय
1.	पीसीडी 12(2577)सी	जल में घुलनशील फिल्म – विशिष्टि

कृपया इस मसोदे का अवलोकन कर अपनी सम्मतियाँ यह बताते हुए भेजे कि यदि अंतत: यह मानक मसौदा राष्ट्रीय मानक के रूप में प्रकाशित हो जाए तो इन पर अमल करने में आपके व्यवसाय अथवा कारोबार में क्या कठिनाइयाँ आ सकती हैं ।

सम्मतियां भेजने की अंतिम तिथि : 29-02-2012

सम्मतियां कृपया संलग्न प्रारूप में अधो-हस्ताक्षरी को भेजें ।

धन्यवाद, ***भवदीया***

डा. (श्रीमति) विजय मलिक
वैज्ञानिक एफ एवं प्रमुख
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प्रति उपरिलिखित

DRAFTS IN WIDE CIRCULATION **Document Dispatch**
Advice

Ref.	Date
PCD 12/T(2577)C	**30-11-2011**

Technical Committee: Plastics Sectional Committee, PCD 12

Addressed to:

1) All interested Members of PCDC
2) All Members of Plastics Sectional Committee (PCD 12), its all Subcommittees; and
3) All others interested.

Dear Sir(s)/Madam(s),

Please find enclosed the following document.

Doc. No.	TITLE
PCD 12(2577)C	Water Soluble Film – Specification

Kindly examine the draft standard and forward your views stating any difficulties which you are likely to experience in your business or profession, if these are finally adopted as National Standard.

Last date for comments: 29-02-2012

Comments, if any, may please be made in the format as given overleaf and mailed to the undersigned at the above address. The document is also hosted on BIS website www.bis.org.in.

Thanking you, Yours faithfully,

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FORMAT FOR SENDING COMMENTS ON BIS DOCUMENTS

(Please use A4 size sheet of paper only and type within fields indicated. Comments on each clauses/sub-clauses/table/fig. etc to be started in a fresh box. Information in Column 5 should include reasons for the comments and suggestions for modified wording of the clauses should be typed in Column 6 when the existing text is found not acceptable. Adherence to this format facilitates Secretariat's work)

Doc. No.: **PCD 12(2577)C**, TITLE: **Water Soluble Film – Specification**

LAST DATE OF COMMENTS: **26-01-2012**

NAME OF THE COMMENTATOR/ORGANIZATION: _____

Sl. No. (1)	Clause/Sub-clause/ Para/Table/Fig. No. commented (2)	Commentator/ Organization/ Abbreviation (3)	Type of Comments (General/Editorial/ Technical) (4)	Justification (5)	Proposed Change (6)

For BIS Use Only

Doc: PCD 12(2577)C
November 2011

BUREAU OF INDIAN STNDARDS

Draft Indian Standard

WATER SOLUBLE FILM-SPECIFICATION

FOREWORD
(Formal clauses will be added later)

A water-soluble film (WSF) is made from water-soluble polymers, having the appearance of a common plastic film. It has unique characteristic of completely dissolving in water at room temperature. The dissolved film disappears in water like sugar and the ingredients of the film change their appearance but remain present as dissolved solids in water which are washed or flushed out after use. The rate of dissolution depends on agitation, water temperature, and amount of water and thickness of the film.

Water soluble film finds multiple uses which have not only satisfied users but also Environmental Agencies which strongly recommend it in packing agriculture chemicals and pesticides, chemical fertilizers, dyestuffs, detergents, water-sewer additives, mineral additives, concrete additives, chemicals for photography and gardening etc, but also for the packing of vegetable seeds, plant seeds, clothing, food and laundry bags in hospitals. In addition, it can be used for textile or embroidery underlay and water-transferred printing and mold release process as it is completely bio degradable and safe for environment. Bio-starch, polyvinyl alcohol etc are the raw material for WSF which decompose into water completely leaving no harmful sludge.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 `Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. Scope

The standard prescribes the requirements and methods of tests for water soluble films.

2. References

The following standards contain provisions which, through reference in this text, constitute the provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	Title
IS 2508: 1984	Specification for low density Polyethylene Films
IS 9833:1981	List of pigments and colorants for use in plastics in contact with foodstuffs, pharmaceuticals and drinking water.
IS 13360(Part 3/ Sec 1): 1995	Plastics – Method of testing: Part 3 physical and dimensional properties, Section 1 determination of density and relative density of non cellular plastics.
IS 13360 (Part 5/Sec 1): 1995	Plastics – Method of testing: Part 5 Mechanical properties, Section 1 determination of tensile properties general principles

3. TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Disintegration: Physical breakdown of water soluble film in water.

3.2 Dissolution: Dissolution is the process by which a water soluble film completely dissolves in water at given temperature without leaving any residue.

4. COMPOSITION

Water soluble film shall be made of polyvinyl alcohol or any other material having similar properties.

5. TYPES

Based on solubility in water, the water soluble film shall be of the following types:

5.1 Cold Water Soluble Film: Cold water soluble film shall dissolves in water having temperature ranging from 1^0C to 35^0C.

5.2 Warm Water Soluble Film: Warm water soluble film shall dissolves in water having temperature ranging from 35^0C to 55^0C.

5.3 Hot Water Soluble Film: Hot water soluble film shall dissolves in water having temperature ranging from 55^0C to 95^0C

6. REQUIREMENTS

6.1 Physical Appearance: The water soluble film shall be uniform and free from pinholes and non-dissolved particles and bubbles. The water soluble film may be transparent or opaque or translucent, with or without embossing as agreed to between the supplier and purchaser.

6.2. Colour: The water soluble film shall be supplied in colour as agreed to between the supplier and purchaser. Pigments and colorants used shall meet the requirements of IS 9833.

6.3. Film Form: The film shall be furnished in the form of flat sheet or rolls or in the form of flat tubing or any other form as agreed to between the supplier and purchaser.

6.4 Nominal Thickness: The nominal thickness of the film shall be as agreed between the manufacture and purchaser. When tested in accordance with the method given in **Annex A**, the nominal thickness shall be within ±25% for the films with nominal thickness up to and including 40 μm and ±20% for above 40 μm.

6.5 Nominal Grammage- The nominal grammage of the film shall be as agreed between the manufacture and purchaser. When tested in accordance with the method given in **Annex B**, the nominal thickness shall be within ±5 g/m^2 for the films with nominal thickness upto and including 40 μm and ±10 g/m^2 for above 40 μm.

6.6 Nominal Width- The nominal width of the film shall be as agreed between the manufacture and purchaser. The tolerance on the width shall be as given as in Table 1

Table 1-Tolerance on Width

SI No.	Nominal Width	Tolerance
i	Up to 500 mm	± 5 mm
ii	Above 500 mm and up to 1250 mm	± 10 mm
iii	Above 1250 mm and up to 2500 mm	± 20 mm
iv	Above 2500 mm and up to 3000 mm	± 40 mm

6.7 Yield Tolerance- The actual yield shall be determined in accordance with the method given in **Annex C** with following tolerance limits (Table 2) of the nominal yield (see IS 13360(Part 3/ Sec 1)).

Table 2- Yield Tolerance

SI No.	On Roll	Tolerance Percent
i	Lots of 100 kg	± 10
ii	Lots of 250 kg	± 10
iii	Lots over 250 kg and up to 1250 kg	± 5
iv	Lots over and up to 1500 kg	± 3

6.8 Water Solubility- Different types of water soluble films shall dissolves in water depending upon the temperature of water as well as the thickness of the film without leaving any trace or residue when determined in accordance with the method given in **Annex D.**

6.9 Tensile strength- The tensile strength at break tested is accordance with method prescribed in **Annex E** for all thickness of water soluble film shall be minimum 140 kgf/cm^2 in machine direction and 130 kgf/cm^2 in cross direction (see IS 13360 (Part 5 / Sec 1)).

6.10 Elongation at Break- The elongation at break when tested is accordance with method prescribed in **Annex E** for all thickness of water soluble film should be minimum 90 % in machine direction and 110 % in cross direction.

6.11 Moisture Content- The moisture content is the quantity of water contained in film. The moisture content expressed in percentage by weight of water in the water soluble film shall be maximum 10% when tested in accordance with the method given in **Annex F.**

6.12 Printability- Water soluble film shall be easily printable with the logos or any other design as agreed to between the supplier and purchaser.

6.13 Heat Sealabilty- Water soluble film shall be easily heat sealable. The temperature and dwell time of heat seal depends upon the thickness and the type of the water soluble film.

7. Packaging and Marking

7. 1 Packaging:

7.1.1 Each roll/folded roll shall be wrapped individually with inner HDPE film and outer corrugated box shrink wrapped.

NOTE: Water soluble film is made of hydrophilic material which can absorb and release moisture in response to relative humidity; therefore, prolonged exposure of film to moist conditions prior to packaging shall be avoided. The Film has the tendency to become more flexible as its moisture content increases.

7.2 Marking:

Each roll/folded film shall be marked legibly with the following information:

- **a.** Manufacturers name and recognized trade mark if any;
- **b.** Product code/ grade of the film;
- **c.** Thickness and Length of the film;
- **d.** Width of the roll / Folded film;
- **e.** Mass of the roll / folded film;
- **f.** Number of joints;
- **g.** Batch number and date of manufacture
- **h.** Additional information, if any.

ANNEX A
DETERMINATION OF THICKNESS
(Clause 6.4)

A-1 General
This method outlines the procedure for the determination of Thickness.

A-1.1 Apparatus
A deadweight dial micrometer with a flat anvil of 6 mm diameter or larger in area and 4.8 mm diameter flat surface on the head of spindle, or a spring micrometer which has been calibrated against a deadweight dial micrometer shall be used. In case of dispute, only deadweight dial micrometer shall be used and the reading shall be taken between 15 second and 2 minutes after load is applied.

A-1.1.1 This method is capable of producing measurement with a maximum error of ±0.000 25 cm**.**

A-1.2 Specimens
Test five specimens, Dimensions of the samples: 10 cm^2 (100 mm x 100 mm ± 0.5 mm).

A-1.3 Procedure

Dry and clean the surface of the anvil and spindle head, and of the specimen. Place the specimen on the anvil and lower the spindle head on it slowly. The total load applied by the spindle shall be 110g. Make one measurement on each specimen approximately at the centre of the specimen. Take mean of the measurements of all the specimens of a sample to obtain the average thickness of the sample.

ANNEX B
DETERMINATION OF GRAMMAGE
(Clause 6.5)

B-1 General
This method outlines the procedure for the determination of grammage.

B-1.1 Apparatus
Analytical Balance with an accuracy of 0.01 g.

B-1.2 Specimens
Dimensions of the samples: 10 cm^2 (100mm x 100mm ± 0.5mm).

B-1.3 Procedure
Samples with the defined area are weighed with an analytical balance, to determine their weight per square meter. Every sample is weighed. The mean value is expressed in g/m^2, using in the following formula:

$G = g \times 10^6 / a \times b$

Where:
G = Grammage (g/m^2)
g = weight of sample (g)
a = length of sample (mm)
b = sample width (mm)

ANNEX C
DETERMINATION OF YIELD TOLERANCE
(Clause 6.7)

C-1 GENERAL
Yield is the amount of area provided by a given mass of a film of specified thickness.

C-1.1 Calculation of Actual Yield
The actual yield γ_a shall be calculated as follows:

γ_a cm^2 / kg = A/M

Where

A = area in cm^2 calculated from the length and the width of roll/ folded film, and
M = mass in kg of the film on roll / folded film

C-1.2 Calculation of Nominal Yield
The Nominal yield γ_n shall be calculated as follows:

γ_n cm^2 / kg = 1000/ d *x* t

where,
d = density in g/ml.
t = nominal thickness in cm.

C-1.3 Calculation of Deviation of Actual Yield from the Nominal Yield
The deviation of actual yield from the nominal yield shall be calculated as follows

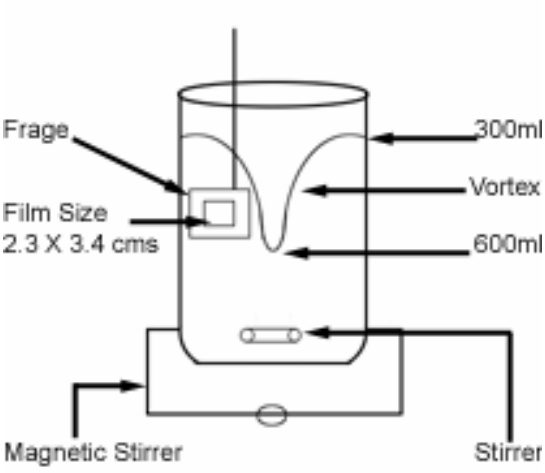
$D = (\gamma_n - \gamma_a)/\gamma_n \times 100$

Where,
D = deviation from the nominal yield in percent, and
γ_n, γ_a = nominal and actual yield respectively as determined in C-1.1 and C-1.2

ANNEX D
DETERMINATION OF SOLUBILITY
(Clause 6.8)

D-1 GENERAL
This method outlines the procedure for the determination of solubility in water.

D-1.1 Apparatus
Magnetic stirrer.



D-1.2 Specimens
Test five specimens, 20mm x 60mm in area, taken uniformly across the width of the test piece.

D-1.3 Procedure

D-1.3.1 For Cold Water Soluble Film
Cut a sample strip of 20 mm width and 60mm length and fix the strip in the slide frame and attach string [or a piece of thread] to one end of the frame. Fill 800ml of water in a 1000ml beaker 20-30^{0}C [use thermometer for verification] Drop the white magnetic capsule in the beaker. Place the beaker on the magnetic stirrer and adjust the vortex at 600ml.Suspend the frame containing the strip in the beaker with the help of the string. Start the stopwatch, moment the frame is suspended. Watch the strip carefully and continuously and note the time at which the strip is dissolved completely. For every fresh strip of material, the beaker should be filled with fresh water.

D-1.3.2 For Warm and Hot Water Soluble Films
Cut a sample test strip of 20 mm width and 60mm length. Fill a beaker with water at 40 - 50^{0}C for warm water soluble film and with 70-80^{0}C for hot water soluble film [use thermometer for verification]. Attach the sample strip to the bulldog clip. Suspend the bulldog clip to a rod having length of 150mm and suitable diameter. Use a marker pen to mark length of 30mm on the strip. Place the strip in the water and rest the rod on the edge of the beaker ensuring that the strip is submerged only to the marking. Start the stopwatch, moment the strip is suspended in the water.

Watch the strip carefully and continuously and note the time at which the strip is completely dissolved in water. For every fresh strip of material, the beaker should be filled with fresh water.

D-1.4 Solubility Test Chart

Sl.No.	**Grade of Film**	**Disintegration Time, Max**	**Dissolution, Time, Max**
i)	Cold Water Soluble Film	20 Seconds	35 Seconds
ii)	Warm Water Soluble Film	15 Seconds	35 Seconds
iii)	Hot Water Soluble Film	15 Seconds	35 Seconds

ANNEX E
DETERMINATION OF TENSILE STRENGTH AND ELONGATION AT BREAK
(Clause 6.10)

E-1 GENERAL
This method outlines the procedure for the determination of Tensile Strength and Elongation at break of Water Soluble Film.

E-1.1 Apparatus
Tensile Testing Machine – The tensile testing machine used shall maintain a rate of traverse of one grip as constant as possible. The mean value of speed of separation shall be such that the initial strain rate on the test specimen is 10 mm/ mm of the specimen per minute (for 50 mm specimen gauge length the speed should be 500 mm/min) the load scale shall be accurate to within one percent or 0.1 N whichever is less. The load range shall be such that the breaking load of the test pieces falls between 15 percent and 85 percent of full reading.

Note: It is recommended that the load scale be calibrated at least once every 12 months, using dead weights added successively.

E-1.2 Specimens
Gauge length of the specimen shall be 50 ± 1 mm and the width shall be 10 to 25 mm. Cut five test pieces from the sample in the lengthwise direction and further five in the crosswise direction. The total length of specimen should be at least 50 mm longer than the gauge length. Measure the thickness using a suitable micrometer.

E-1.3 Procedure
Condition the test pieces for not less than one hour at a temperature of 27 ± 2^{o}C and 65 ± 5 percent relative humidity and clamp their ends in the machine at the grips separated by 50 mm. start the machine at the pre-adjusted speed of 500 mm/min and note the load and elongation at break.

E-1.3 Calculation and Report

E-1.3.1 Tensile Strength at Break
The tensile strength at break shall be calculated in MN/ m2 (kg/cm2) from the original area of cross section. The mean of five results shall be expressed for the lengthwise and crosswise samples.

E-1.3.2 Elongation at Break
Elongation at break shall be expressed at percentage of the original length between the reference lines. The mean of five results shall be expressed for the lengthwise and crosswise samples.

ANNEX F
DETERMINATION OF MOISTURE CONTENT
(Clause 6.11)

F-1 GENERAL
This method outlines the procedure for the determination of Moisture Content in Water Soluble Film.

F-1.1 Apparatus
Hot Air Oven.

F-1.2 Specimens
Test five specimens, 100mm X 100mm in area, taken uniformly across the width of the test piece.

F-1.3 Procedure
Take the selected water-soluble film. Cut a 100mm X 100mm sample and weigh the sample and record the weight obtained. Place the sample in the oven at temperature of 100^0 C for 4 hours. On removal from the oven place sample in the Calcium Chloride desiccators to cool for approximately 15 minutes.

Re-weigh the sample on removal from the desiccator and record the weight. Calculate the weight lost and record the result.

F-1.4 Calculation
% Moisture Content = (a -b)/ a x 100

Where:
a = Weight Of The Sample Before Drying
b = Weight Of The Sample After Drying
(a - b) = Weight Loss

F-1.5 Moisture Content Test Chart

The values recorded during the test must be recorded as under:

Sr No	Grade Name	Weight Of The Sample Before Drying (a)	Weight Of The Sample After Drying (b)	Weight Loss (a-b)	% Moisture Content ((a-b)/a) * 100