भारतीय मानक **IS 18725 : 2024**

Indian Standard

ठोस जैव ईंधन — ईंधन विशिष्टियाँ और श्रेणियाँ — कृषि और जड़ी-बूटियों के अवशेषों से प्राप्त ब्रिकेट

Solid Biofuels — Fuel Specifications and Classes — Briquettes from Agro and Herbaceous Residues

ICS 27.190; 75.160.40

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

July 2024 **Price Group 6**

Solid Mineral Fuels and Solid Biofuels Sectional Committee, PCD 07

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Solid Mineral Fuels and Solid Biofuels Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

Briquettes from agro and herbaceous residues are manufactured from biomass originating from agriculture, herbaceous, fruit, and other renewable organic matter derived from trees, plants, crops, animal, municipal, agro-residue and agro-industrial waste or aquatic biomass as well as blends or mixtures of woody and non-woody biomass.

This standard covers the use of biomass briquettes for domestic and industrial use. Thermally treated biomass briquettes (for example, torrefied briquettes) are not included in the scope of this standard.

In general, agro and herbaceous residues have higher content of ash forming elements and produce ashes with lower melting temperature compared to most woody biomass. Different growing and soil conditions of the herbaceous or fruit biomass may influence the fuel ash composition differently. This may result in fouling, slagging and corrosion inside boilers. These problems are especially related to materials that have high content of potassium (K) and silicon (Si) and low content of calcium (Ca). The content of chlorine (Cl), phosphorus (P) and potassium (K) in the material may form chlorides and phosphates and other chemical compounds resulting in high hydrochloric acid emissions and chemically active ash causing corrosion. Special attention should be paid to the risk of corrosion in boilers and flue gas systems. Blending of agro and herbaceous residues with woody biomass can improve combustion characteristics.

Considerable assistance has been derived from ISO 17225-7 ‘Solid biofuels — Fuel specifications and classes — Part 7: Graded non-woody briquettes’ in development of this standard. Since, only agro-residues and herbaceous residues are generally used non-woody biomass in India, the title, scope and the requirements have been modified when compared with ISO 17225-7. Terminology, few requirements and sampling are same as mentioned in ISO 17225-7. Assistance has also been derived from report “Development of standards and guidelines for densified biomass products in Indian context”, produced under Indo-German technical operation project.

The composition of the Committee, responsible for the formulation of this standard is given in Annex B.

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 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SOLID BIOFUELS — FUEL SPECIFICATIONS AND CLASSES — BRIQUETTES FROM AGRO AND HERBACEOUS RESIDUES

1 SCOPE

This standard prescribes the fuel quality classes and specifications of briquettes produced from agro residues and other herbaceous residues.

NOTES

1 Blends and mixtures include blends and mixtures from the main origin-based solid biofuel groups woody biomass, herbaceous biomass, fruit biomass and aquatic biomass. Blends are intentionally mixed biofuels, whereas mixtures are unintentionally mixed biofuels. The origin of the blend and mixture is to be described using ISO 17225-1, Table 1. If solid biofuel blend or mixture contains chemically treated material, it shall be reported.

2 Thermally treated biomass briquettes (for example, torrefied briquettes) are not included in the scope of this standard.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in the text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement, based on the standard, are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 18721 and in addition to, the following definitions shall apply.

3.1. Additive — Material which is intentionally introduced into the fuel feed stock to improve quality of fuel (for example, combustion properties), to reduce emissions or to make production more efficient.

NOTE — Trace amounts of grease or other lubricants that are introduced into the fuel processing stream as part of normal mill operations are not considered as additives.

3.2 Biofuel Briquette — Densified biofuel made with or without additives in pre-determined geometric form with at least two dimensions of more than 25 mm, produced by compressing biomass.

3.3 Chemical Treatment — Any treatment with chemicals other than air, water or heat (for example, glue and paints).

NOTE — Examples of chemical treatment are listed in ISO 17225-1.

3.4 Non-woody Biomass — Biomass originating from agriculture, herbaceous, fruit or aquatic biomass as well as blends or mixtures of woody and non-woody biomass.

3.5 Non-woody Briquette — Biofuel briquette (*see* **3.2**) made from non-woody biomass (*see* **3.4**)

4 REQUIREMENTS

4.1 The material shall comply with the requirements of briquettes given in Table 1 and Fig 1.

4.2 In general, chemical treatment of biomass before harvesting need not to be reported.

4.2.1 However, the process of chemical treatment before harvesting need to be mentioned in the following cases:

a) If any operator in the fuel supply chain has reason to suspect serious contamination of the biomass;

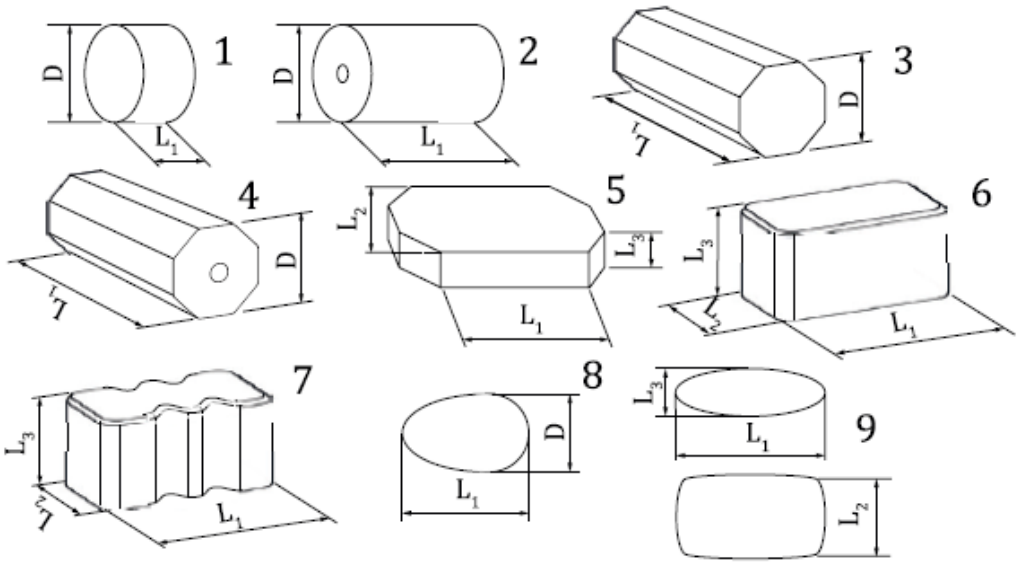
b) The soil (for example, coal slag heaps) or if planting has been done specifically for the chemical sequestration; and

c) Biomass has been fertilized by sewage sludge (originating from wastewater treatment or chemical process).

In such cases, fuel analysis shall be done to identify chemical impurities such as halogenated organic compounds or heavy metals.

4.2.2 In case of raw materials belonging to chemically treated herbaceous residue as per Table 1 of ISO 17225-1, the actual origin of the raw material shall be clearly reported.

4.3 Further analysis may not be required, if data for chemical or physical properties are available.



All dimensions in millimetres.

FIG. 1 DIMENSIONS OF BRIQUETTES

where

D = diameter;
L_1 = length;
L_2 = width; and
L_3 = height.

Table 1 Requirements of Biomass Briquettes Derived from Agro and Herbaceous Residues

(*Clauses* 4.1 *and* 7)

Sl No.	Characteristics	Requirements			Methods of test, Ref to	
		A	B	C	IS	ISO
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Origin and source[1)]	Agro residues and other herbaceous biomass			—	—
ii)	Diameter (D); length (L_1); width (L_2) and height (L_3), mm	Dimension and shape to be reported.			Dimension and shape to be specified as per Fig 1.	
iii)	Moisture (M), percent by mass, wet basis	≤ 15	≤ 15	≤ 15	IS 17655 (Part 1)/ IS 17655 (Part 2)	—

Table 1 (*Concluded*)

Sl No.	Characteristics	Requirements			Methods of test, Ref to	
		A	B	C	IS	ISO
(1)	(2)	(3)	(4)	(5)	(6)	(7)
iv)	Ash (A), percent in mass dry	≤ 20	≤ 20	≤ 20	IS 17653	
v)	Density of briquettes, g/cm^3	A1: ≥ 0.5 to < 0.7 A2: ≥ 0.7 to < 0.9 A3: ≥ 0.9	B1: ≥ 0.5 to < 0.7 B2: ≥ 0.7 to < 0.9 B3: ≥ 0.9	C1: ≥ 0.5 to < 0.7 C2: ≥ 0.7 to < 0.9 C3: ≥ 0.9	—	ISO 18847
vi)	Additives, percent by mass[2)]	Type and amount to be reported	Type and amount to be reported	Type and amount to be reported	—	—
vii)	Gross calorific value, kcal/kg	≥ 2 500 to < 3 000	≥ 3 000 to < 3 500	≥ 3 500	IS 17654	—
viii)	Nitrogen (N), percent by mass in dry		To be reported		IS 17832	—
ix)	Sulfur (S), percent by mass in dry		To be reported		IS 17833	—
x)	Chlorine (Cl), percent by mass in dry		To be reported		IS 17833	—
xi)	Arsenic (As), mg/kg, dry		To be reported		—	ISO 16968
xii)	Cadmium (Cd), mg/kg, dry		To be reported		—	ISO 16968
xiii)	Chromium (Cr), mg/kg, dry		To be reported		—	ISO 16968
xiv)	Copper (Cu), mg/kg, dry		To be reported		—	ISO 16968
xv)	Lead (Pb), mg/kg, dry		To be reported		—	ISO 16968
xvi)	Mercury (Hg), mg/kg, dry		To be reported		—	ISO 16968
xvii)	Nickel (Ni), mg/kg, dry		To be reported		—	ISO 16968
xviii)	Zinc (Zn), mg/kg, dry		To be reported		—	ISO 16968

[1)] Name and proportion (in percent) of the feedstock material or blend and mixtures used for preparation of the briquette shall be reported. Saw dust and other permitted woody biomass may be used in the blend to achieve the desired quality.

[2)] Type and amount of additive(s) to aid production, delivery or combustion (for example, pressing aids, slagging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil, and lignin) shall be reported.

5 PACKING AND MARKING

5.1 Packing

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

5.2 Marking

5.2.1 When the material is packed in packages, packages shall be marked with the following:

a) Name of the feedstock material or blend and mixtures;
b) Name of manufacturer and his recognized trade-mark, if any;
c) Month and year of manufacture;
d) Net mass of the material;
e) Dimensions of the briquette;
f) Lot number; and
g) Any other statutory requirements.

5.2.2 If briquettes are available in general market for sale, in addition to above information the following basic quality parameters shall be stated:

a) Gross calorific value;
b) Proximate analysis; and
c) Name and proportion (in percent) of the feedstock material or blend and mixtures used for preparation of the briquettes.

5.2.3 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the rules and regulations framed thereunder, and the products may be marked with the Standard Mark.

6 SAMPLING

The sampling and sample preparation shall be done as per ISO 18135 or ISO 21945 and IS 18640 respectively.

7 TEST METHODS

Tests shall be conducted according to the methods of test referred in col (6) and col (7) of Table 1.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No./Other Standards	*Title*
IS 17653 : 2021/ ISO 18122 : 2015	Solid biofuels — Determination of ash content
IS 17654 : 2021/ ISO 18125 : 2017	Solid biofuels — Determination of calorific value
IS 17655 (Part 1) : 2021/ ISO 18134-1 : 2015	Solid biofuels — Determination of moisture content — Oven dry method : Part 1 Total moisture — Reference method
IS 17655 (Part 2) : 2021/ISO 18134-2 : 2017	Solid biofuels — Determination of moisture content — Oven dry method : Part 2 Total moisture — Simplified method
IS 17832 : 2022/ ISO 16948 : 2015	Solid biofuels — Determination of total content of carbon, hydrogen and nitrogen
IS 17833 : 2022/ ISO 16994 : 2016	Solid biofuels — Determination of total content of sulfur and chlorine
IS 18640 : 2024	Solid biofuels — Sample preparation
IS 18721 : 2024	Solid biofuels — Vocabulary
ISO 16968 : 2015	Solid biofuels — Determination of minor elements
ISO 17225-1 : 2021	Solid biofuels — Fuel specifications and classes — Part 1: General requirements
ISO 18135 : 2017	Solid biofuels — Sampling
ISO 18847 : 2016	Solid biofuels — Determination of particle density of pellets and briquettes
ISO 21945 : 2020	Solid biofuels — Simplified sampling method for small scale applications

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Solid Mineral Fuels and Solid Biofuels Sectional Committee, PCD 07

Organization	*Representative(s)*
CSIR - Central Institute for Mining and Fuel Research, Dhanbad	PROF ARVIND KUMAR MISHRA **(*Chairperson*)**
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CSIR - Central Institute for Mining and Fuel Research, Dhanbad	DR ASHOK KUMAR SINGH DR SUJAN SAHA (*Alternate*)
CSIR - Institute of Minerals and Materials Technology, Bhubaneswar	DR SUDDHASATWA BASU DR D. S. RAO (*Alternate* I) DR MANISH KUMAR (*Alternate* II)
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Indian Council of Agricultural Research, New Delhi	DR PANNA LAL SINGH

Organization	*Representative(s)*
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Member Secretary
SHRIMATI ADITI CHOUDHARY
SCIENTIST 'B'/ASSISTANT DIRECTOR
(PETROLEUM, COAL AND RELATED PRODUCTS), BIS

Solid Biofuels Subcommittee, PCD 7 : 6

Organization	*Representative(s)*
CSIR - Central Institute for Mining and Fuel Research, Dhanbad	DR R. E. MASTO **(*Convenor*)**
Abellon Cleanenergy Limited, Ahmedabad	SHRI PANKAJ PATEL DR BEENA PATEL (*Alternate*)
Central Electricity Authority, New Delhi	SHRI JITESH SHRIVAS SHRI MD. ZUHAIB (*Alternate*)
Central Power Research Institute, Bengaluru	SHRI PRAFULCHANDRA R. DONGRE
CSIR - Central Institute for Mining and Fuel Research, Dhanbad	DR PINAKI SARKAR DR S. G. SAHU (*Alternate*)
CSIR - Central Mechanical Engineering Research Institute, Durgapur	DR KRISHENDU KUNDU
CSIR - Indian Institute of Petroleum, Dehradun	DR Y. SUDHAKAR REDDY DR GANESH NAIK (*Alternate*)
CSIR - Institute of Minerals and Materials Technology, Bhubaneswar	DR SUDDHASATWA BASU DR D. S. RAO (*Alternate* I) DR MANISH KUMAR (*Alternate* II)
Defence Research Development Organization, Ministry of Defence, New Delhi	DR PRAKASH
EID - Parry India Limited, Chennai	SHRIMATI SIVARANI. J. SHRI K. SENTHIL ENIYAN (*Alternate*)
ICAR - Central Institute of Agricultural Engineering, Bhopal	DR VINOD K. BHARGAVA DR SANDIP GANGIL (*Alternate*)
Indian Institute of Engineering Science and Technology, Shibpur	DR SUDIP GHOSH
Jadavpur University, Kolkata	PROF SUDIPTA DE
Kalpa Taru Power Transmission Limited, Biomass Power Plant, Padampur	SHRI HITESH GOYAL
Maharana Pratap University of Agricultural and Technology, Udaipur	DR SUDHIR JAIN DR N. L. PANWAR (*Alternate*)
Ministry of New and Renewable Energy, New Delhi	SHRI HIREN CHANDRA BORAH SHRI VIKRAM DHAKA (*Alternate*)
NTPC Limited, New Delhi	SHRI PIYUSH SRIVASTAVA
Orient Green Power Company Limited, Chennai	DR R. KULOTHUNGAN SHRI S. SUDARSAN (*Alternate*)

Organization	*Representative(s)*
Punjab Agricultural University, Ludhiana	DR SARBJIT SINGH SOOCH
Sardar Patel Institute of Technology, Petroleum, Coal and Related Products Department, Vadodara	DR MADHURI NARRA
Steel Authority of India Limited (SAIL), Research & Development Centre for Iron & Steel, Ranchi	SHRIMATI NEETA CHAKRAVARTY DR B. K. SAHOO (*Alternate*)
The Energy and Resources Institute, New Delhi	DR ASHVINI KUMAR SHRI N. K. RAM (*Alternate* I) VARUN GROVER (*Alternate* II)
In Person Capacity (*Prachi Apartment, Bl A, Fl 4 A , 127 Ho Chi Min Sarani. Behala, Near Bidya Bharati School - 700008*)	SHRI ASHIM KUMAR BHATTACHARYA
In Person Capacity (*B-178, Aakriti Garden, Nehru Nagar, Bhopal - 462003*)	DR ANIL KUMAR DUBEY

Panel for formulation of Indian standard on 'Solid Biofuels - Fuel Specification and Classes - Briquettes from Agro and Herbaceous Residues'

Organization	*Representative(s)*
CSIR - Central Institute for Mining And Fuel Research, Dhanbad	DR R. E. MASTO **(*Convener*)**
Abellon Cleanenergy Limited, Ahmedabad	DR BEENA PATEL
Biofuel circle Private Limited, Pune	SHRI SUHAS BAXI
Central Power Research Institute, Bengaluru (also Member of National Mission on use of biomass in Thermal Power Plants)	SHRI PRAFULCHANDRA R. DONGRE
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NTPC Limited, New Delhi	SHRI AMIT KULSHESTRA
Punjab Renewable Energy Systems Private Limited, Mumbai	LT COL MONISH AHUJA
Tamil Nadu Agricultural University, Coimbatore	DR P. SUBRAMANIAN
Tata Steel Limited, Jamshedpur	DR SANHCHIT KUMAR MAJHI
In Person Capacity (*B-178, Aakriti Garden, Nehru Nagar, Bhopal - 462003*)	DR ANIL KUMAR DUBEY

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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	2323 7617
Eastern	: 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	2367 0012 2320 9474
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019	265 9930
Southern	: C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	2254 1442 2254 1216
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