

Protocol # 63/14 МБрВ
dated from 30.09.2014

**National Company -
Certification Testing Center of Heating Equipment**

I HEREBY APPROVE

The Head of Testing Center of
NC CTCHE

Signed O.I. Tararin
September 30th, 2014

Round Seal:

Ukraine * Kyiv city * National Company - Certification Testing Center of Heating Equipment * Identification
number 14315701

PROTOCOL # 63/14 МБрВ

DETERMINATION TESTING

**Solid fuel formed from wood waste -
cylindrical briquettes**

A Testing Center of National Company - Certification Testing Center of Heating Equipment (03110, Kyiv-110 city, Mekhanizatory Street, building 9), is accredited for compliance with ISO 180/IEC 17025-2006 National Accreditation Agency of Ukraine (certificate accreditation number 2H122 on July 16, 2013) from September 22 to September 30, 2014 held a definitive test to determine the physical, chemical and technical characteristics of solid fuel formed from wood waste by application of 29.07.2014 g.

1. DESCRIPTION OF TESTING PRODUCTION

- 1.1 To test we received samples of solid fuel formed from wood waste - cylindrical briquettes - as a batch in amount of 4.0 kg, as per TU 16.2-36311007- 001: 2013 "Solid fuel from wood waste. Specifications" as amended under # 1:2014.
- 1.2 Applicant: CEO – V.V. Flud
- 1.3 Samples of solid fuel formed from wood waste - cylindrical briquettes - were submitted for testing.
- 1.4 Together with the samples of cylindrical briquettes we received:
 - TU 16.2-36311007- 001: 2013 "Solid fuel from wood waste. Specifications" as amended under # 1:2014.

2. DESCRIPTION OF TESTS

- 2.1. Type tests - determination.
- 2.2 Tests conducted under:

- Technical specifications TU 16.2-36311007- 001: 2013 "Solid fuel from wood waste. Specifications" as amended under # 1:2014;
- National Standard of Ukraine 3528 - 97 "Solid mineral fuel. Determination of total sulfur. Method of Eshko";
- National Standard of Ukraine-R SETI/TS 15289: 2009 "Biofuels firm. Determination of total sulfur and chlorine";
- GOST 11022 - 95 "Solid mineral fuel. Methods of determination of ashes";
- GOST 6382 - 91 "Solid mineral fuel. Methods of determination of extract of volatile substances";
- GOST 27314 - 91 "Solid mineral fuel. Method of determination of moisture content";
- National Standard of Ukraine 180 1928: 2006 "Mineral solid fuel. Definition highest combustion temperature by combustion in a bomb calorimeter and calculation of the lowest heat of combustion ";
- GOST 18132-72 "Peat Briquettes and Semi-finished products. Method for determining mechanical strength".

2.3 The work was performed on the testing equipment of Testing Center of National Company - Certification Testing Center of Heating Equipment.

3. MEANS OF MESURING MACHINE

The list of means of measuring machine, their characteristics and information on checking is given in table 1

Table 1

Measured parameter	Means of measuring machine				
	Name	Measuring range	Division value	Accuracy	Information on the next check (month, year)
Linear size	Calipers, PITSI, # 4129	(0-150) mm	0,02 mm	±0,03 mm	07.2015
Weight of briquettes and tare	Electronic weight SVP-30, # 742	(0-30) kg	-	III	06.2015
Time	Stopwatch SOS pr-2b-2-000, # 5489	(0-60) m	0,2 s	2,0	05.2015
Atmospheric pressure	Aneroid barometer MD-49-A, # 69	(300-810) mm Hg	1 mm Hg	±1 mm Hg	12.2014
Air temperature in testing premises	Laboratory mercury glass thermometer, TL-4, №13	(0-55) °C	0,1 °C	±0,2 °C	09.2015
Fuel burning heat	Calorimeter V-08-MA, # 478	(15000±150) J/°K	-	1	10.2014
Air speed	Air speedometer Testo 405-VI, # 0560.4051	(0-10) m/s	-	5 %	03.2015
Determination of ash and extraction of volatile substance	Analytical scales "WA-21, # 69703, stove SNOL 8.2/1100, # 06422 with an electronic	(0-200)g	0,02 mg	±0,1	06.2015

	temperature indicator	(0-1000) °C	1.0 °C	---	Not a subject of check
Determination of weight part of briquettes	Drying chamber SNOL-3.5 3.5 3.5/3.5-11, # 24373 with a thermoregulator and thermometer # 155	(100-150) °C	0.1 °C	±0,2 °C	Not a subject of check 12.2014
Relative humidity in tested premises	Hygrometer Psychometric VIT-2 # G137	(20-90)% Determination by psychometric graph	-	±6%	09.2015
Mechanical strength of briquettes	Measuring Strength Device	Diameter of sieve vault 3 mm	-	--	Not a subject of check
Determination of sulphur	Reaction agents and machines	-	-	--	Not a subject of check

4. DESCRIPTION OF PRODUCT

Solid fuel from waste wood – briquettes of cylindrical shape, which is presented for testing, made from waste wood (oak) of wood-processing industry (sawdust, shavings, wood chips) by pressing. As shown in Figure 1, the test briquettes are cylindrical shape, made from waste wood, beige color. The appearance of the briquette is brown (slightly charred). Length of 250 mm and a diameter - 96 mm. The surface of the briquette is equal and smooth, with surface cracks. Briquettes intended for burning in a fireplace in the boiler houses and public utilities.



Figure 1 - Solid fuel from waste wood – briquettes of cylindrical shape

5. RESULT

5.1 Testing of solid fuels formed from waste wood - cylindrical briquettes - were carried out under the following conditions in the test room:

- relative humidity - 66 %;
- atmospheric air pressure - 754 mm Hg;
- air temperature - 21,2 °C;
- air speed - 0,25 m/s.

5.2 Key testing indexes of solid fuel formed from wood waste - cylindrical pellets - are given in

Table 2

Table 2

Parameter	Unit	Unit	Result
Diameter	Mm	$D_{average}$	96
Length	Mm	$L_{average}$	245
Talus (small parts)	%	X	8,49
Mechanical strength	%	n	91,51
Total ash	%	W^r	7,2
Sulphur content	%	S	0,09
Ash	%	A^r	0,84
Extraction of volatile substances	%	V^r	81,6
Lowest calorific value of briquettes	MJ/kg	Q^{PH}	17,3

5.3 Test results of solid fuel formed from wood waste - cylindrical pellets - as required by TU 16.2-36311007-001: 2013 as amended by №1: 2014 are given in Table 3.

Table 3

Requirements of TU U 16.2-36311007-001:2013 as amended by №1:2014			Factual value	Conclusion on compliance
Number of TU clause	Technical requirements	Value		
3.2	Characteristics			
3.2.1	Organoleptic characteristics of the fuel shall meet the requirements given in Table 1.			
Table 1	Appearance	Form - cylindrical. Allowed thin charred layer and surface cracks	Cylindrical briquettes were submitted for testing. Surface cracks are present	Conforms
	Color	From yellow to dark brown	Beige, slightly charred on the outside	Conforms
	Odor	Conforms the used raw smell of burnt	Available	Conforms
	Nature of burning	Even without cod and odor	Available	Conforms
3.2.2	In terms of physical parameters, geometric dimensions of the fuel shall meet the requirements set out in the table 2.1 and 2.2.			
Table 2.2	The physical parameters and geometric dimensions of the solid fuel formed from wood waste			

	Sizes, mm, - length - diameter	From 50 to 350 from 40 to 120	L _{average} - 245 mm D _{average} = 96 mm	Conforms Conforms
	The presence of small parts (pieces smaller than 25 mm),%, not more than	10	8,49 %	Conforms
3.2.2 Table 2.2	Humidity, %, not more than	12	7,2 %	Conforms
	Burning heat, MJ/kg, not less than	13,0	17,3 MJ/kg	Conforms
	Ash, %, not more than	1,0	0,84 %	Conforms
	Mechanical strength when tested in the drum (remain whole and partly ruined pellets size pieces of more than 25 mm),%, not less than	90,0	91,51 %	Conforms
	Extraction of volatile substances, %, not less than	80	81,6%	Conforms
	Content of sulphur, %, not more than	0,5	0,09 %	Conforms

6. ВИСНОВКИ

As a result of testing solid fuel formed from wood waste - cylindrical briquettes, manufactured as per TU 16.2-36311007-001: 2013 as amended by №1:2014. By its basic physical, chemical and technical characteristics, namely size, moisture content, ash content, volatile matter yield, presence of fines, mechanical strength, sulfur content and calorific value, presented in percentage points in clauses 3.2.1 of Table 1, 3.2.2 Table 2.2 according to TU 16.2-36311007-001: 2013 "Solid fuel from waste wood. Specifications" as amended by №1:2014.

The test applies only to tested samples formed solid fuel from waste wood - cylindrical briquettes.

It is forbidden to fully or partially reprint this test report without the permission of the Testing Center of National Company - Certification Testing Center of Heating Equipment (Kyiv city).

Prepared by:

The Head of Laboratory

Signed

S.A. Bervytskyi

1st Category Engineer

Signed

V.D. Zvonarova

2nd Category Metrology Engineer

Signed

N.M. Parshenkova