Reason for review and the clarification is provided in the table below:

Reason for review	The fixed carbon percentage and NCV value have been sourced from SAP database of the plant. Further clarification is required on how these values were determined and how the DOE has justified that these values have been chosen in a conservative manner in accordance with the methodology.
Clarification from PP	Fixed Carbon: Fixed Carbon for a type of coal has been taken from coal test reports. PP has used "Weighted average of Fixed Carbon" for all coal types used during this monitoring period. NCV: Gross Calorific Values are taken from Coal test reports. NCV is calculated from GCV according to American Society for Testing and Materials standard ASTM - D 5865 (Annex-2**).** As per the standard the NCV is calculated as: Q_P (net) = Q_{var} (gross) – 215.5 j/g x H_{ar} .....*(1)* *where* Q_P (net) = Net calorific value Q_{var} (gross) = Gross calorific value H_{ar} = Total Hydrogen, %, as received basis (where hydrogen includes hydrogen in the sample moisture) In a month different kinds of coal are used, the quantity of each type of coal consumed is measured and their NCV is calculated based on the GCV test reports using above formula (1). Weighted average NCV of the coal consumed in a month are then reported in the monitoring period as NCV of coal consumed in that month. *Sample NCV calculation :* Coal type = MV NEW HARMONY Coal quantity = 3239 MT GCV value (Air Dried Basis) = 6005 kcal/ kg GCV value (As Received Basis) = 5515 kcal/ kg or 23088 j/ g Total H % (As Received Basis) = 5.14 So, NCV (As Received Basis) = 23088 – (215.5 x 5.14) = 21980 kJ/ kg or 5250 kcal/ kg These calculated NCV values are then fed into the SAP.

	A) NCV for the coal used in a month: It is a weighted average of NCV of all types of coal used in the month as described above. B) NCV for the coal used in the monitoring period: It is the weighted average of 'A' values as described above.

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INSPECTORATE

Certificate No : C/IGI/C&C0957/06-07/4038

January 22, 2007

CERTIFICATE OF INSPECTION

We hereby certify to have attended to the following consignment of **Steam Coal** at the request of **M/s. AGARWAL COAL CORPORATION LTD.** at **Kandla** Port, Gujarat, India during 14.01.2007 to 18.01.2007. We report as follows :

VESSEL	:	**mv NEW HARMONY**
COMMODITY	:	Steam Coal in Bulk
RECEIVERS	:	M/s. Hindustan Zinc Limited.
DISCHARGE PORT	:	Kandla port, Gujarat, India
QUANTITY DISCHARGED	:	**44,901.125 MT** (As per Draught Survey)
VESSEL ARRIVED	:	On 14.01.2007 at 0900 hrs.
DISCHARGE	:	Commenced on 14.01.2007 at 1100 hrs. Completed on 18.01.2007 at 0500 hrs.
DISCHARGE SUPERVISION & SAMPLING	:	Sampling of the cargo during the process of discharge was carried out by us. Samples were [illegible] composite sample was prepared for conducting chemical analysis.
TOTAL MOISTURE	:	Total Moisture test was conducted on individual samples drawn from every sub-lot during discharge. The weighted average percentage was determined to be **19.05 %.**

INSPECTORATE GRIFFITH INDIA P

Cont...2

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SIZE : Size analysis on sub-lot samples was carried out and the weighted average results are as follows :

Above 50 mm	:	8.68 %
50 mm to 25mm	:	19.97 %
25 mm to 15 mm	:	10.47 %
15 mm to 10 mm	:	12.50 %
10 mm to 5 mm	:	[illegible]
Below 5 mm	:	25.75%

ANALYSIS : Final composite sample was analyzed based on the standard method of analysis for the following constituents :

Analysis results (on Air Dried Basis)

Inherent Moisture	:	11.85 %
Volatile Matter	:	41.07 %
Ash	:	5.14 %
Fixed Carbon	:	41.94 %
Gross Calorific Value	:	6005 Kcal/Kg.
Sulphur	:	1.40 %

for INSPECTORATE GRIFFITH INDIA PVT. LTD.

(AUTHORISED SIGNATORY)

INSPECTORATE GRIFFITH INDIA PVT. LTD.

Sagar Sarkar
Verified by

Annex-2

Designation: D 5865 – 99a

Standard Test Method for Gross Calorific Value of Coal and Coke[1]

This standard is issued under the fixed designation D 5865; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method pertains to the determination of the gross calorific value of coal and coke by either an isoperibol or adiabatic bomb calorimeter.

1.2 The values stated in SI units are regarded as the standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in Section 8.

2. Referenced Documents

2.1 *ASTM Standards:*

D 121 Terminology of Coal and Coke[2]

D 346 Practice for Collection and Preparation of Coke Samples for Laboratory Analysis[2]

D 388 Classification of Coals by Rank[2]

D 1193 Specification for Reagent Water[3]

D 2013 Method of Preparing Coal Samples for Analysis[2]

D 3173 Test Method for Moisture in the Analysis Sample of Coal and Coke[2]

D 3177 Test Method for Total Sulfur in the Analysis Sample of Coal and Coke[2]

D 3180 Practice for Calculating Coal and Coke Analyses from As-Determined to Different Bases[2]

D 4239 Test Method for Sulfur in the Analysis Sample of Coal and Coke Using High Temperature Tube Furnace Combustion Methods[2]

D 5142 Test Methods for the Proximate Analysis of the Analysis Sample of Coal and Coke by Instrumental Procedures[2]

E 1 Specification for ASTM Thermometers[4]

E 144 Practice for Safe Use of Oxygen Combustion Bombs[5]

E 178 Practice for Dealing with Outlying Observations

3. Terminology

3.1 *Definitions:*

3.1.1 *calorific value*—the heat produced by combustion unit quantity of a substance under specified conditions.

3.1.2 *calorimeter*—a device for measuring calorific v consisting of a bomb, its contents, a vessel for holding bomb, temperature measuring devices, ignition leads, w stirrer, and a jacket maintained at specified temperature ditions.

3.1.3 *adiabatic calorimeter*—a calorimeter which ha jacket temperature adjusted to follow the calorimeter temp ture so as to maintain zero thermal head.

3.1.4 *isoperibol calorimeter*—a calorimeter which ha jacket of uniform and constant temperature.

3.1.5 *gross calorific value (gross heat of combustion constant volume), Q_v* (gross)—the heat produced by comp combustion of a substance at constant volume with all w formed condensed to a liquid.

3.1.6 *heat of formation*—the change in heat content res ing from the formation of 1 mole of a substance from elements at constant pressure.

3.1.7 *net calorific value (net heat of combustion at cons pressure), Q_p* (net)—the heat produced by combustion o substance at a constant pressure of 0.1 MPa (1 atm), with water formed remaining as vapor.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *corrected temperature rise*—the calorimeter temp ture change caused by the process that occurs inside the bo corrected for various effects.

3.2.2 *heat capacity*—the energy required to raise the te perature of the calorimeter one arbitrary unit.

NOTE 1—The heat capacity can also be referred to as the ene equivalent or water equivalent of the calorimeter.

4. Summary of Test Method

4.1 The heat capacity of the calorimeter is determined burning a specified mass of benzoic acid in oxygen. comparable amount of the analysis sample is burned under t same conditions in the calorimeter. The calorific value of t analysis sample is computed by multiplying the correct temperature rise, adjusted for extraneous heat effects, by t

[1] This test method is under the jurisdiction of ASTM Committee D-5 on Coal and Coke and is the direct responsibility of Subcommittee D05.21 on Methods of Analysis.

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[2] *Annual Book of ASTM Standards*, Vol 05.06.

[3] *Annual Book of ASTM Standards*, Vol 11.01.

[4] *Annual Book of ASTM Standards*, Vol 14.03.

[5] *Annual Book of ASTM Standards*, Vol 14.04.

[6] *Annual Book of ASTM Standards*, Vol 14.02.

$e1$ = acid correction according to 10.6.1, J;
$e2$ = fuse correction according to 10.6.2, J;
$e3$ = sulfur correction determined according to 12.4, J;
$e4$ = combustion aid correction determined according to 12.7, J; and
m = mass of the sample, g.

13.1.1 See X1.2.3 for an example calculation.

13.2 *Net Calorific Value*—Calculate the net calorific value Q_p(net) as follows:

$$Q_p\,(\text{net}) = Q_{var}(\text{gross}) - 215.5\ \text{J/g} \times H_{ar} \quad (11)$$

or:

$$(Q_p(\text{net})_{ar} = Q_{mr}(\text{gross}) - 92.67\ \text{Btu/lb} \times H_{ar}) \quad (12)$$

where:

Q_p (net) = net calorific value, at constant pressure;
Q_{var} (gross) = gross calorific value, at constant volume, as-received basis; and
H_{ar} = total hydrogen, %, as-received basis, where hydrogen includes hydrogen in the sample moisture.

Example:

Calorific value as determined Q_{vad}(gross) = 31 420 J/g
Moisture, as determined M_{ad} = 2.13 wt %
Moisture, as received M_{ar} = 8.00 wt %
Hydrogen, as determined H_{ad} = 5.00 wt %
Q_{var}(gross) = Q_{vad}(gross) × [(100 − M_{ar})/(100 − M_{ad})] = 31 420 J/g × [(100 − 8.00)/(100 − 2.13)] = 29 535 J/g
H_{ar} = [(H_{ad} − 0.1119 × M_{ad}) × [(100 − M_{ar})/(100 − M_{ad})]] + 0.1119 M_{ar} = [(5.00 − 0.1119 × 2.13) × [(100 − 8.00)/(100 − 2.13)]] + 0.1119 × 8.0 = 5.37
Q_p(net) = 29 535 J/g − (215.5 × 5.37) = 29 535 J/g − 1157 J/g = 28 388 J/g

14. Report

14.1 Report the calorific value as Q_{vad} (gross) along with the moisture of the sample as determined M_{ad} from 12.3.

14.2 The results of the calorific value can be reported in any of a number of bases differing in the manner the moisture is treated. Procedures for converting the value obtained on an analysis sample to other bases are described in Practice D 3180.

15. Precision and Bias

15.1 *Manual Calorimeters*:

15.1.1 *Repeatability*—The difference in absolute value between two test results calculated to a dry basis (Practice D 3180) performed on two separate test portions of the same analysis sample of 250-µm (No. 60) coal in the same laboratory, by the same operator, using the same equipment with the same heat capacity value shall not exceed the repeatability interval *I(r)* of 115 J/g (50 Btu/lb) more than 5 % of such paired values (95 % confidence level). When such a difference is found to exceed the repeatability interval, there is reason to question one or both of the test results.

15.1.2 *Reproducibility*—The difference in absolute value between test results calculated to a dry basis (Practice D 3180) performed in different laboratories on representative analysis samples of 250-µm (No. 60) coal shall not exceed the reproducibility interval *I(r)* of 250 J/g (100 Btu/lb) more than 5 % of such paired values (95 % confidence level). When such a difference is found to exceed the reproducibility interval there is reason to question one or both of the test results.

15.1.3 *Bias*—Bias in the determination of the gross calorific value is eliminated provided samples are treated identically to the benzoic acid used in the determination of the calorimeter heat capacity.

15.2 *Automated Calorimeters*:

15.2.1 *Repeatability*—The repeatability has not been determined.

15.2.2 *Reproducibility*—The reproducibility has not been determined.

15.2.3 *Bias*—Bias in the determination of the gross calorific value is eliminated provided samples are treated identically to the benzoic acid used in the determination of the calorimeter heat capacity.

16. Keywords

16.1 adiabatic calorimeter; bomb calorimeters; calorific value; calorimeter; coal; coke; isoperibol bomb calorimeter

ANNEX

(Mandatory Information)

A1. THERMOMETRIC CORRECTIONS