



Hazen Research, Inc.
 4601 Indiana St. • Golden, CO 80403
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Date Mat 18 2001
 HRI Project 009-227
 HRI Series No. E102/01-2
 Date Rec'd. 05/08/01
 Cust. P.O.# 24777

Energy Products of Idaho
 Doug Krapas
 4006 Industrial Boulevard
 Coeur d'Alene ID 83814

Sample Identification
 University of ID Bluegrass
 Straw EPI REF #1350-24777

Reporting Basis > As Rec'd Dry Air Dry

Proximate (%)

Moisture	6.91	0.00	6.91
Ash	6.33	6.80	6.33
Volatile	69.47	74.63	69.47
Fixed C	<u>17.29</u>	<u>18.57</u>	<u>17.29</u>
Total	100.00	100.00	100.00

Sulfur	0.08	0.09	0.08
Btu/lb (HHV)	7238	7775	7238
MMF Btu/lb	7769	8391	
MAF Btu/lb		8343	
Air Dry Loss (%)			

Ultimate (%)

Moisture	6.91	0.00	6.91
Carbon	42.77	45.94	42.77
Hydrogen	5.52	5.93	5.52
Nitrogen	0.51	0.55	0.51
Sulfur	0.08	0.09	0.08
Ash	6.33	6.80	6.33
Oxygen*	<u>37.88</u>	<u>40.69</u>	<u>37.88</u>
Total	100.00	100.00	100.00

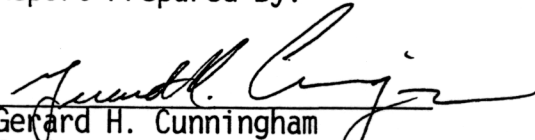
Chlorine** 0.04 0.04 0.04

Forms of Sulfur (as S,%)

Sulfate	_____	_____
Pyritic	_____	_____
Organic	_____	_____
Total	0.08	0.09

Lb. Alkali/MM Btu= 1.89
 Lb. Ash/MM Btu= 8.75
 Lb. SO₂/MM Btu= 0.22
 HGI= @ % Moisture
 As Rec'd. Sp.Gr.=
 Free Swelling Index=

Report Prepared By:


 Gerard H. Cunningham
 Fuels Laboratory Supervisor

Water Soluble Alkalies (%)

Na₂O
 K₂O

* Oxygen by Difference.

** Not usually reported as part of the ultimate analysis.



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Elemental Analysis of Ash (%)

SI02	56.12
AL2O3	0.41
TI02	0.21
FE2O3	0.54
CAO	3.04
MGO	1.39
NA2O	2.06
K2O	19.50
P2O5	3.98
SO3	1.79
CL	
CO2	
Total	89.04

Ash Fusion Temperatures (Deg F)

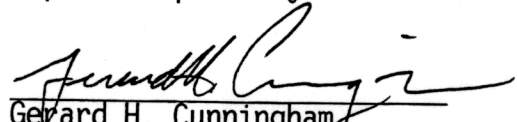
	Oxidizing Atmosphere	Reducing Atmosphere
Initial	1710	1615
Softening	1992	1761
Hemispherical	2063	2047
Fluid	2120	2144

Ash Viscosity Calculations *

Base Content (%)	31.86
Acid Content (%)	68.14
Dolomite Ratio	16.70
Base/Acid Ratio	0.47
Silica/Alumina Ratio	136.88
T(cv) (Deg F)	2247
T250 Temperature (Deg F)	2335
Equiv Silica Content (%)	91.86
Viscosity from equiv Silica @ 2600 F (Poise)	>999.99
Ash Type	LIGNITE

Slagging Type= HIGH
 Fouling Type= LOW

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 Gerard H. Cunningham
 Fuels Laboratory Supervisor

Note: The ash was calcined @ 1110 deg F (600 C) prior to analysis.

* 'Fusibility-Viscosity of Lignite-Type Ash'. A.F. Duzy, 1965.
 'Coal Ash Deposition Studies and Application to Boiler Design',
 R.C. Attig and A.F. Duzy, 1969.
 'Relationship of Coal-Ash Viscosity to Chemical Composition',
 W.L. Sage and J.B. McIlroy, 1960.
 'Fuel and Ash Characterization and its Effect on the Design
 of Industrial Boilers', Vecchi, et al, 1978.

** OTL=Outside Table Limits. ND=Not Determined.