

ULTIMATE AND MINERAL ANALYSIS STANDARDS

THE "ULTIMATES"

50 GRAMS/BOTTLE

The following ASTM procedures were employed in the analysis of all samples:

| | | | | | | | |
|-----------------|-------------|-----------|-------------|--------------|-------------|--------------|-------------|
| Preparation | ASTM D 2013 | Sulfur | ASTM D 3177 | Ash Analysis | ASTM D 3682 | BTU | ASTM D2015 |
| Carbon Hydrogen | ASTM D 3178 | Niitrogen | ASTM D 3179 | Chlorine | ASTM D 2361 | Sulfur Forms | ASTM D 2492 |
| Volatile Matter | ASTM D 3175 | ASH | ASTM D 3174 | Fusibilities | ASTM D 1857 | | |

| | Coke AR-2771 | Coke AR-2772 | Coal AR-2773 | Coal AR-2775 | Coal AR-2776 | Coal AR-2778 | Coal AR-2780 | Coal AR-2781 | Coal AR-2782 |
|----------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| PROXIMATE ANALYSIS | | | | | | | | | |
| % Ash | 8.35 | 6.72 | 7.40 | 5.898 | 21.46 | 9.72 | 7.55 | 18.12 | 13.13 |
| % Volatile Matter | 0.36 | 0.562 | 42.67 | 42.74 | 21.75 | 36.44 | 39.74 | 25.35 | 38.02 |
| % Fixed Carbon | 91.29 | 92.73 | 49.97 | 51.54 | 56.79 | 53.84 | 52.57 | 56.53 | 48.85 |
| BTU | 12,713 | 12,996 | 11,688 | 12,054 | 12,136 | 13,387 | 12,328 | 12,267 | 11,495 |
| % Sulfur | 0.65 | 0.81 | 0.46 | 0.29 | 0.86 | 0.64 | 3.48 | 1.89 | 4.70 |
| ULTIMATE ANALYSIS | | | | | | | | | |
| % Carbon | 89.23 | 89.42 | 69.96 | 69.71 | 69.69 | 75.29 | 69.77 | 69.55 | 64.95 |
| % Hydrogen | 0.13 | 0.11 | 4.83 | 4.26 | 4.09 | 5.02 | 4.84 | 4.17 | 4.57 |
| % Nitrogen | 1.11 | 1.28 | 0.92 | 0.84 | 1.21 | 1.54 | 1.31 | 1.29 | 1.28 |
| % Chlorine | 0.96 | 0.037 | 0.03 | | | 0.03 | 0.045 | 0.15 | 0.057 |
| % Ash | 11.36 | 6.728 | 7.14 | | | 9.72 | | | |
| % Sulfur | 0.65 | 0.81 | 0.46 | 0.29 | | 0.64 | 3.48 | 1.89 | |
| % Oxygen | | | | 17.22 | | | | | |
| SULFUR FORMS | | | | | | | | | |
| % Pyritic | 0.013 | 0.01 | 0.08 | 0.014 | 0.33 | 0.08 | 0.87 | 0.74 | 0.94 |
| %Sulfate | 0.01 | 0.00 | 0.00 | 0.01 | 0.02 | 0.00 | 1.15 | 0.18 | 1.59 |
| %Organic | 0.64 | 0.80 | 0.42 | 0.26 | 0.51 | 0.55 | 1.56 | 0.97 | 2.17 |
| %Total | 0.66 | 0.81 | 0.50 | 0.29 | 0.86 | 0.63 | 3.48 | 1.89 | 4.70 |
| MINERAL ANALYSIS | | | | | | | | | |
| Phosphorous Pentoxide | 0.19 | 0.20 | 0.88 | 1.03 | 0.14 | 0.14 | 0.19 | 0.45 | 0.18 |
| Silica | 37.63 | 49.36 | 36.02 | 32.93 | 61.36 | 58.79 | 40.96 | 50.12 | 44.24 |
| Ferric Oxide | 39.10 | 12.97 | 5.11 | 4.96 | 4.39 | 6.97 | 37.10 | 11.53 | 28.38 |
| Alumina | 16.62 | 27.75 | 17.11 | 17.78 | 26.26 | 24.94 | 13.29 | 26.71 | 18.18 |
| Titania | 0.82 | 1.51 | 1.29 | 1.39 | 1.47 | 1.74 | 0.82 | 1.24 | 0.92 |
| Sulfur Trioxide | 0.74 | 1.02 | 10.78 | 8.93 | 0.44 | 1.20 | 0.74 | 2.26 | 1.94 |
| Potassium Oxide | 1.22 | 1.93 | 0.57 | 0.39 | 3.04 | 2.56 | 1.22 | 2.64 | 2.18 |
| Sodium Oxide | 0.39 | 0.91 | 1.19 | 1.85 | 0.23 | 0.27 | 0.39 | 0.55 | 0.23 |
| Calcium Oxide | 1.76 | 1.87 | 21.06 | 23.95 | 0.59 | 1.43 | 1.76 | 2.84 | 2.22 |
| Magnesium Oxide | 0.56 | 0.94 | 4.55 | 5.56 | 0.96 | 1.06 | 0.56 | 1.02 | 0.81 |
| Strontium Oxide | 0.02 | 0.045 | 0.42 | 0.27 | 0.04 | 0.12 | 0.02 | 0.10 | 0.02 |
| Barium Oxide | 0.11 | 0.021 | 0.50 | 0.65 | 0.15 | 0.12 | 0.11 | 0.09 | 0.07 |
| Manganese Oxide | 0.025 | 0.085 | 0.03 | 0.07 | 0.02 | 0.05 | 0.03 | 0.03 | 0.04 |
| Undetermined | 0.007 | 0.21 | 0.000 | | 0.32 | 1.20 | 0.00 | 0.42 | 0.61 |
| ASH FUSION TEMPERATURE | | | | | | | | | |
| Initial Deformation Reducing | 2501 | 2172 | 2140 | 2107 | 2696 | 2575 | 1995 | 2500 | 1976 |
| Initial Deformation Oxidizing | 2575 | 2571 | 2183 | 2140 | 2700 | 2700 | 2528 | 2630 | 2458 |
| Softening - Reducing (H=W) | 2521 | 2407 | 2165 | 2126 | 2700 | 2700 | 2006 | 2515 | 1993 |
| Softening - Oxidizing (H=W) | 2632 | 2613 | 2186 | 2163 | 2700 | 2700 | 2544 | 2640 | 2475 |
| Softening - Reducing (H =1/2 W) | 2586 | 2435 | 2169 | | 2700 | 2700 | 2025 | 2530 | 2015 |
| Softening - Oxidizing (H = 1/2W) | 2556 | 2647 | 2191 | | 2700 | 2700 | 2544 | 2655 | 2500 |
| Fluid - Reducing | 2627 | 2541 | 2175 | 2164 | 2700 | 2700 | 2100 | 2545 | 2218 |
| Fluid - Oxidizing | 2697 | 2700 | 2196 | 2154 | 2700 | 2700 | 2566 | 2660 | 2542 |

H = Cone Height W = Cone Width

MINERAL ANALYSIS FOR COAL

MINERAL ANALYSIS - % WEIGHT IGNITED BASIS - 50 GRAMS/BOTTLE

Ash content is provided for those analysts who wish to convert the values to a whole coal basis.

| | AR-2751 | AR-2752A | AR-2753 | AR-2754 | AR-2755 | AR-2756 | AR-2758 | AR-2760 |
|---------------------------|---------|----------|---------|---------|---------|---------|---------|---------|
| Silicon Dioxide | 32.84 | 29.12 | 54.08 | 49.39 | 33.92 | 51.38 | 37.99 | 49.38 |
| Aluminium Dioxide | 18.04 | 14.67 | 34.47 | 27.73 | 14.29 | 32.11 | 17.90 | 27.36 |
| Titanium Dioxide | 1.42 | 0.51 | 1.15 | 1.47 | 0.73 | 2.09 | 0.75 | 1.33 |
| Ferric Oxide | 5.02 | 45.87 | 4.41 | 13.00 | 46.55 | 4.78 | 23.54 | 15.16 |
| Calcium Oxide | 23.85 | 4.50 | 1.44 | 1.92 | 0.54 | 2.19 | 8.87 | 1.07 |
| Magnesium Oxide | 5.64 | 0.54 | 0.57 | 0.96 | 0.53 | 1.04 | 0.77 | 0.77 |
| Potassium Oxide | 0.42 | 1.05 | 1.24 | 1.97 | 1.43 | 2.02 | 1.79 | 2.47 |
| Sodium Oxide | 1.80 | 0.54 | 0.29 | 0.89 | 0.17 | 0.84 | 0.66 | 0.16 |
| Sulfur Trioxide | 8.90 | 2.82 | 0.62 | 1.00 | 0.53 | 1.77 | 7.10 | 0.39 |
| Phosphorus Pentoxide | 1.01 | 0.26 | 0.59 | 0.23 | 0.11 | 0.68 | 0.50 | 0.30 |
| Strontium Oxide | 0.32 | 0.01 | 0.24 | 0.047 | 0.01 | 0.19 | 0.05 | 0.07 |
| Barium Oxide | 0.63 | 0.09 | 0.15 | 0.019 | 0.00 | 0.25 | 0.04 | 0.00 |
| Manganese Oxide | 0.09 | 0.02 | 0.14 | 0.088 | 0.29 | 0.00 | 0.04 | 0.11 |
| Undetermined | 0.00 | 0.00 | 0.00 | 0.17 | 0.90 | 0.66 | 0.00 | 1.33 |
| Ash Content of Whole Coal | 5.94% | 18.61% | 11.62% | 6.708% | 8.21% | 10.74% | 12.20% | 15.00% |



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