SELF-SCRUBBING COAL™: AN INTEGRATED APPROACH TO CLEAN AIR

Final Report Volume 1: Public Design

CUSTOM COALS LAUREL
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ABSTRACT

Custom Coals Laurel has built a commercial demonstration plant to demonstrate an innovative, low risk, cost effective coal cleaning technology for meeting the requirements of the 1990 Clean Air Act. Self-Scrubbing Coal™ technology, segments of which have already been tested at commercial scale, offers many advantages. It can reduce total sulfur emissions 80-90 percent; it retains more than 90 percent of a coal's heating value; the coal is easy to handle; and the technology is capable of using any bituminous coal as a feed. Utilities can use their existing feedstock, averting potential boiler derating and economic dislocation caused by fuel switching. In brief, utilities using Self-Scrubbing Coal™ can achieve compliance without major capital expenditures, and there are no environmentally harmful waste products.

The demonstration project involves building a novel, 500-ton-per hour coal cleaning plant near Central City, Pennsylvania to produce Self-Scrubbing Coal™. First, run-of-mine coal is crushed, screened, and cleaned with innovative dense-media cyclones to remove non-combustible material, including 90 percent of the pyritic sulfur in the coal. Then limestone-based additives are mixed with the cleaned coal-additives that react during combustion to remove an additional 30-80 percent of the organic sulfur that remained with the clean coal. This achieves a total sulfur removal of 80-90 percent.

Two forms of coal produced during the demonstration will be field tested at commercial power plants: Self-Scrubbing Coal™ that has been aggressively cleaned but without the limestone-based additive (in this form called Carefree Coal™), and Self-Scrubbing Coal™ with the additive. Data collected during the field test burns will validate the performance and measure the emissions reduction of the innovative coal forms in utility boilers. Such data are critical to commercialization of Self-Scrubbing Coal™, which can bring into compliance about 164 million tons annually of bituminous coal that can not meet emissions limits through conventional coal cleaning. This represents over 38 percent of the bituminous coal burned in 50 MW or larger generating stations across the U.S.

Self-Scrubbing Coal™ depends mainly on conventional, proven technology. Its breakthrough comes from three innovative aspects of the cleaning process: Its unique magnetite recovery process; a new heavy-media cyclone design and separation circuit; and sorbent addition and agglomerization. Because Self-Scrubbing Coal™ is so firmly grounded in proven technology, it is an economical, low-risk, conservative approach to meeting emissions limits that should appeal to the utility industry.

Custom Coals is dedicated to providing Self-Scrubbing Coal™ as a pre-combustion alternative to U.S. utilities faced with emission reduction challenges. The full-scale demonstration will provide the opportunity to blend all of the innovative aspects of the technology and prove the effectiveness of Self-Scrubbing Coal™, which integrates pre-combustion and combustion sulfur reductions, in reducing emissions. The demonstration will also prove the cost effectiveness of the technology, paving the way to full commercialization of the project technology.

POINT OF CONTACT

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LIST OF ABBREVIATIONS

DOE	-	Department of Energy
CCL	-	Custom Coals Laurel
RP&L	-	Richmond Power & Light
FGD	-	Flue Gas Desulfurization
CAAA	-	Clean Air Act Amendment
TPO	-	Technical Project Officer
ESP	-	Electrostatic Precipitator
EPA	-	Environmental Protection Agency
SO_2	-	Sulfur Dioxide
CCCC	-	Custom Coals Coal Cleaning

LIST OF UNITS

Acres

British Thermal Unit (Btu)

Gallons per minute (GPM)

Horsepower (hp)

Inch (in.)

Megawatt (MW)

Mesh (M)

Micron (um)

Millimeter (mm)

Percent (%)

Pound sulfur dioxide per million British Thermal Unit (#SO_2/MBtu)

Tons

Tons-per-hour (TPH) short tons (2,000 pounds)

GLOSSARY OF TERMS

Carefree Coal™ is Self-Scrubbing Coal™ without sorbent additives.

Self-Scrubbing Coal™ is a compliance (1.2 lbs SO_2/MBtu) coal produced by aggressive physical coal cleaning and in some cases with added SO_2 sorbents.

Dense-media and **heavy-media** are used interchangeably in the report to indicate a separating mixture of water and magnetite.

Demonstration plant is the Self-Scrubbing Coal™ production plant that is constructed on the Central City, Pennsylvania, site.

Dolomite is crushed limestone containing calcium/magnesium carbonate that absorbs sulfur dioxide in flue gas.

Beneficiation, **coal preparation**, and **coal cleaning** refer to the physical processes of separating coal from ash-forming and sulfur-bearing mineral impurities.

Compliance coal is any coal that, when burned, will produce SO_2 emissions at or below 1.2 lbs SO_2/MBtu.

Sorbent, as used in this report, is a sulfur capture agent such as limestone or dolomite.

Mesh is a size designation based on the number of openings per unit area of sieve screen surface. Mesh can be converted to any linear measurement system (inches, millimeter, microns, etc.).

Refuse is the waste from a coal cleaning operation.

Product is the clean coal from a coal cleaning operation.

Media is the parting fluid or suspension in a density-based coal cleaning process.

Froth flotation *is a cleaning process in which fine coal in a slurry is caused to attach to an air* bubble.

Run-of-Mine is the coal just as it is produced in the mine and, on which no additional processing has occurred.

EXECUTIVE SUMMARY

Custom Coals Laurel has built a commercial demonstration plant to demonstrate an innovative, energy efficient technology capable of reducing the emission of sulfur dioxide and providing for future energy needs in an environmentally acceptable manner.

This project will provide a commercial demonstration of the Custom Coal's Coal Cleaning (CCCC) process for producing Carefree Coal™and Self-Scrubbing Coal™, as well as full-scale burns of the products in coal-fired utility boilers.

The Self-Scrubbing Coal™ project involves the construction of a 500 tons/hr advanced coal cleaning plant that has been designed with a unique blend of existing and new process steps. In the cleaning plant, run-of-mine coal is crushed, screened, and cleaned in a proprietary dense-media cyclone circuit, using ultrafine magnetite slurries, to remove noncombustible material, including up to 90% of the pyritic sulfur in the coal. The Carefree Coal™ produced by this cleaning process will allow many utilities to achieve compliance with the Clean Air Act Amendments (CAAA) sulfur emissions requirements.

Deep cleaning alone, however, cannot produce a compliance fuel from coals with high organic sulfur contents. In these cases, Self-Scrubbing Coal™ will be produced. Self-Scrubbing Coal™ is produced in the same manner as Carefree Coal™ except that the finest fraction from the cleaning circuit is mixed with limestone-based additives and agglomerated. These additives react during combustion to remove an additional 30-80% of the sulfur remaining with the clean coal, thus achieving a total sulfur removal of 80-90%. Three U.S. coal seams (Sewickley, Lower Freeport, and Illinois No. 5), representing a range of raw coal qualities, will be the source of the feedstock for the Self-Scrubbing Coal™ demonstration.

The demonstration cleaning plant has been constructed at a site in Somerset County near Central City, Pennsylvania. The product from the demonstration plant will be test burned at three sites. Pennsylvania Power & Light's 150 MW Martins Creek Power Station near Allentown, Pennsylvania, will burn Carefree Coal™ produced from Lower Kittanning Seam coal. Richmond

Power & Light's (RP&L) 60 MW Whitewater Valley Station, Unit No. 2, in Richmond, Indiana, will burn Self-Scrubbing Coal™ produced from Illinois No. 5 coal, and Centerior Service Company's 200 MW Ashtabula C-Plant in Ashtabula, Ohio will burn Self-Scrubbing Coal™ produced from Lower Freeport Seam coal. Data collected during these test burns will be critical to commercialization of Carefree Coal™ and Self-Scrubbing Coal™. About 38% of the bituminous coal burned in 50-MW or lager generating stations in the U.S. cannot be sufficiently cleaned by conventional coal cleaning techniques to meet CAAA emissions limits, but this coal can be brought into compliance by the CCL technology.

This demonstration project will be performed over 56 months. Project activities include project definition, design and engineering, construction, start-up, operations, and test burns.

The total project cost if $87,386,102. DOE's share is $38,038,656. The co-funder is CCL, whose share is $49,347,446. Operations began in the spring of 1996. The project is scheduled for completion in the second quarter of 1997.

This report provides the detailed design information and costs for the technology as a result of the completion of the project definition, design and engineering phases of the project.

1. PROJECT OVERVIEW

1.1 Purpose of the Public Design Report

The purpose of this report is to consolidate all design and cost information on Custom Coals Laurel's Self-Scrubbing Coal™ Demonstration Project at the completion of construction. Operating and maintenance costs have been projected in this report. A Final Report will be prepared at the completion of the Demonstration phase and will contain operating and maintenance costs based on the experience gained.

1.2 Project Description

CCL will demonstrate the production and utilization of Carefree Coal™ and Self-Scrubbing Coal™ by constructing a processing plant and having the product clean coal test burned in utility burners. Figure 1.2-1 presents the concept of the project. Three U.S. coal seams (Lower Kittanning, Somerset County, Pennsylvania, Lower Freeport Seam, Belmont County, Ohio, and Illinois No. 5 Seam, Wabash County, Illinois), representing a range of raw coal properties, will be the source of the feedstock. Carefree Coal™ is coal cleaned in a proprietary dense-media cyclone circuit, using ultrafine magnetite slurries, to remove noncombustible material, including up to 90% of the pyritic sulfur. The Carefree Coal™ produced by this cleaning process will allow many utilities to achieve compliance with the CAAA sulfur emissions requirements without major power plant modifications or capital expenditures.

Figure 1.2-1

Deep cleaning alone, however, cannot produce a compliance fuel from coals with high organic sulfur contents. In these cases, Self-Scrubbing Coal™ will be produced. Self-Scrubbing Coal™ is the same as Carefree Coal™ except that the finest fraction from the cleaning circuit is mixed with limestone-based additives and agglomerated. The reduced ash content of the Self-Scrubbing Coal™ will permit the addition of relatively large amounts of sorbent without exceeding boiler ash specifications or overloading electrostatic precipitators. This additive reacts with sulfur dioxide (SO_2) during combustion of the coal to remove most of the remaining sulfur. Overall sulfur reductions in the range of 80-90% are achieved.

The CCL demonstration coal cleaning plant was constructed at a site near Central City, Pennsylvania. The general location is as shown in Figure 1.2-2. Affiliated Engineering Technologies, Inc. provided the construction design and engineering for the project. Test burns will be conducted by Pennsylvania Power & Light, RP&L, and Centerior Service Company. Pennsylvania Power & Light's 150 MW Martins Creek Power Station near Allentown will burn Carefree Coal™ produced from Lower Kittanning Seam coal. RP&L's 60 MW Whitewater Valley Power Station in Richmond, Indiana, will burn Self-Scrubbing Coal™ produced from Illinois No. 5 coal; and Centerior's 200 MW Ashtabula C-Plant in Ashtabula, Ohio, will burn Self-Scrubbing Coal™ produced from Lower Freeport Seam coal.

FIGURE 1.2-2

1.3 Project Objectives

The overall objectives of Custom Coals Laurel's Self-Scrubbing Coal™ Demonstration Project are:

- To produce a low-ash coal known as Carefree Coal™ that can be used as a replacement fuel in coal-fired boilers which will allow numerous utilities to comply with the new sulfur dioxide compliance laws.

- To produce a compliance fuel known as Self-Scrubbing Coal™ from coals that are relatively high in organic sulfur contents. This will be accomplished by deep cleaning the finest coal fractions to produce a low ash product which would then allow for varying amounts of sorbent additions to remove most of the remaining sulfur during combustion of the coal.

- To demonstrate, on a commercial scale, the production of the Carefree and Self-Scrubbing Coals™.

- To determine plant operability, product quality, and process costs for the production of Carefree and Self-Scrubbing Coals™.

- To test all aspects of the cleaning technology at commercial scale by burning the product in coal-fired utility boilers. Data from the test burn will include boiler efficiencies and SO_2 and particulate emission levels.

FIGURE 1.2-1

1.4 Project Significance

The significance of this project is it provides many U.S. electric utilities which are coal-fired with the most cost-effective strategy to meet the CAAA sulfur emission limitations. The project will demonstrate an ability to produce a low-sulfur, low-ash coal that can be used as a replacement fuel in existing coal-fired boilers. Because it uses gravimetric separation techniques, it has a number of advantages over froth flotation technologies - such as the ability to remove pyrite efficiently and the flexibility to handle lower rank and oxidized coals. Compared to all other gravimetric coal cleaning processes, this technology has the significance of being able to clean finer size coal effectively, resulting in a higher recovery efficiency at equivalent clean coal qualities.

The product coal offers the potential for use in coal-fired boilers to achieve CAAA SO_2 emission standards without derating the unit or producing hard-to-dispose-of by-products. Furthermore, few, if any, modifications to the boiler are required.

Economic evaluations indicate that the cost of producing electricity may be 5-15% lower when using Carefree Coal™ or Self-Scrubbing Coal™ than when using conventionally cleaned coal together with FGD.

1.5 DOE's Role

DOE's Clean Coal Technology program provides significant funding to allow the Self Scrubbing Coal technology to be demonstrated at commercial levels. DOE is responsible for monitoring all aspects of the project and granting or denying approvals required by the Cooperative Agreement. The DOE Contracting Officer represents DOE on all matters related to the Cooperative Agreement.

The DOE Contracting Officer has appointed a TPO who will be the authorized representative for all technical matters and will have the authority to issue "Technical Advice" which may:

- Suggest redirection of the Cooperative Agreement effort, recommend a shifting of work emphasis between work areas or tasks, or suggest pursuit of certain lines of inquiry which assist in accomplishing the Statement of Work.

- Approval all technical reports, plans, and items of technical information required to be delivered by the Participant to the DOE under the Cooperative Agreement.

Finally, DOE provides the conduit to flow all pertinent information about the technology to the public.

Figure A-2 (of Appendix A) provides an overall organization chart for the project team responsible for execution of the entire project. Appendix A also contains the overall Management Plan used by the project team.

2.0 TECHNOLOGY DESCRIPTION

Figure 2.0-1 presents a block flow diagram of the process. The raw coal is first sized into an intermediate size fraction (1.5 in x 1.0 mm), a fine size fraction (1.0 mm x 0.105 mm) and an ultrafine size fraction (0.105 mm x 15 microns) with each of the fractions being processed in separate heavy-media cyclone coal cleaning circuits. The intermediate cleaning circuit will be two-stage, with the capability of producing a low-gravity clean coal, a high-gravity refuse, and an intermediate-gravity middlings fraction. This middlings fraction contains coal particles with pyrite and other mineral matter locked in the coal matrix. The middlings fraction will be crushed to a finer size to liberate the sulfur-bearing mineral matter form the coal matrix. The crushed coal along with the natural fines will then be processed in either the fine or ultrafine coal cleaning circuits to separate clean coal from refuse.

The effect of the cleaning process is to maximize clean coal recovery while simultaneously maximizing pyritic sulfur and ash rejection. If the composite clean coal can meet overall SO_2 compliance levels, then the product is ready for shipment as Carefree Coal™. If the sulfur content of the composite clean coal is too high (primarily due to the organic sulfur content), then before being blended with the other fractions, the ultrafine clean coal fraction is agglomerated with enough sorbent to enable the clean coal to meet compliance levels. If this option is taken, then the coal product is called Self-Scrubbing Coal™. The reduced ash content of the clean coal allows the addition of relatively large amounts of sorbent without exceeding the ash specifications of the boiler or overloading the electrostatic precipitator (ESP).

FIGURE 2.0-1 - BLOCK DIAGRAM

3.0 PROCESS DESIGN CRITERIA

The following criteria was used to design CCL's Carefree/Self-Scrubbing Coal™ processing plant:

- Plant capacity of 500 tons of raw coal per hour

- Plant clean coal yield of no less than 90% of the energy content of the ROM nor less than 75% of the weight of the ROM.

- A final plant clean coal product quality of:

Ash	< 10%
Sulfur Emissions Potential	< 1.2 # SO_2/MBTU
Heat Content	> 12,000 BTU
Total Moisture	7%
Size	< 10% minus 100M

- Plant yearly operating hours of 5,100 minimum and 6,000 maximum

- Minimize downtime and start-up time

- Provide state-of-art control systems for monitoring and controlling process functions

In addition to the above design criteria the plant as constructed has the ability to:

- Recover an exceptionally low-ash, low-sulfur clean coal,

- Reject a high-ash, high-sulfur refuse,

- Crush or grind the middling material to smaller size fractions,
- Efficiently reject fine pyritic sulfur,
- Remove high ash fine clays which otherwise would retain moisture and cause handling problems,
- Incorporate a method of agglomerating the fine clean coal.

4.0 DETAILED PROCESS DESIGN

4.1 Plot Plan and Plant Layout Drawings

Contained in Appendix B is the plot plan, and plant layout drawings for Custom Coals Laurel's demonstration plant. The plant is located in Somerset County, Pennsylvania. This site previously was operated by Consolidation Coal for National Mines Corporation and was shut down in the early 1980's. The site was well designed, preserved, and protected since its shut down. CCL has used much of the existing coal storage and loadout facilities and on-site permitted refuse disposal area. The loadout is designed for high rate and a rail loop provides unit train loading on the Conrail System.

The 133 acre site provides sufficient space for truck deliveries of the raw coal and for additional truck loading of the clean coal for some local markets. The site also houses the 500 TPH demonstration plant. The refuse disposal area has 64 acres with the remaining capacity sufficient for 18 to 20 years of full commercial operation.

4.2 Major Plant Process Areas

Contained in Appendix C is the Process and Instrumentation Diagrams and the Process Flow Diagrams. The Process Flow Diagrams in conjunction with Table A, also contained in Appendix C, provide a complete material balance regarding the demonstration plant. Incorporated in the four Process Flow Diagrams are 193 different process streams. The stream numbers in Table A coincide with those in the Process Flow Diagrams. The following information is provided for each of the process streams:

- Tons Per Hour Coal
- Tons Per Hour Magnetite

- Tons Per Hour Water
- Tons Per Hour Total Slurry
- Gallons Per Minute Coal
- Gallons Per Minute Magnetite
- Gallons Per Minute Water
- Gallons Per Minute Total Slurry
- Percent Solids or Percent Surface Moisture

The plant flowsheet has been designed to maximize the recovery of energy from that brought in with the raw coal even while the sulfur and ash material is removed.

Table 4.2-1 below presents the energy balance for the demonstration plant.

Table 4.2-1: Demonstration Plant Energy Balance

	Source	Amount (MMBTU/HR)	% Energy
Energy Input	Raw Coal	12,313.8	100.0%
	Fuel Oil	29.2	
	Total	12,343.0	
Energy Output	Clean Coal	11,028.8	89.4%
	Total	11,028.8	
Energy Lost	Refuse	1,285.0	10.6%
	Evaporation	29.2	
	Total	1,314.2	

4.3 Waste Streams

The Self-Scrubbing Coal™ project permits two waste stream avenues: one at the site of the demonstration plant and the other at the power plants burning the Carefree Coal™ and Self-Scrubbing Coal™. The environmental impacts caused by operation of the demonstration plant fall into three categories: air emissions, water discharge, and solid waste disposal.

The demonstration plant will use indirect thermal dryers, which eliminate the direct burning of coal and minimize particulate or combustibles emissions. Water vapor and a very small quantity of coal dust is vented to the atmosphere from the process after the dryer exhaust gases are passed through the wet scrubber. Low-sulfur fuel oil will be burned to heat the thermal dryers; emissions from this source will meet regulations.

Briquetting of the dried, fine coal will prevent dusting during on-site storage activities and during transportation.

Process water from the plant will be clarified in thickeners and reused in the plant with no discharge of wastewater to the environment. The major environmental issue concerns solid waste disposal. Coal cleaning plant waste is classified nonhazardous by EPA. Plant solid waste will be trucked to a permitted disposal site. Disposed solids are compacted and covered by an inert material. Any leachate from the pile is treated before discharging to nearby Miller Run.

With regard to the power plant operations, due to the deep cleaning associated with Self-Scrubbing Coal™ and the minor addition of dolomite, SO_2 emissions are considerably reduced. No detrimental environmental impacts due to the use of Self-Scrubbing Coal ™ are anticipated from coal handling, storage, or transport. Since the Self-Scrubbing Coal™ fines are agglomerated, less fugitive dust will be generated at the power plant. There will be no need to increase coal stockpile requirements at the power plants; therefore, there will be no increase in surface water runoff or treatment.

The ash from Carefree Coal™is very similar to the ash from the base coal, except for a reduced iron content due to pyrite removal. In addition to a lower iron content, the ash from Self-Scrubbing Coal™ has higher calcium and magnesium contents, because of the added dolomite. These changes in ash composition should cause no significant change in handling or disposal practices. Most power plants will see a significant reduction in the quantity of ash which needs to be disposed of when burning Carefree Coal™ and a small decrease when burning Self-Scrubbing Coal™.

Advanced coal cleaning decreases the concentration of many trace elements of environmental concern, such as antimony, arsenic, chromium, lead, mercury, and nickel, resulting in reduced emissions of air toxics. The level of particulate emissions is not expected to change compared to burning the base coal, since there will be little impact on electrostatic precipitator performance. However, there is less ash overall in Carefree Coal than in a typical power plant coal feed.

4.4 Equipment List

Contained in Appendix D is the equipment list for CCL's demonstration plant. The list contains:

- The equipment's unit number
- A description of the equipment
- The vendor who supplied the equipment
- The number and horsepower of any motors associated with the equipment.

5.0 PROCESS CAPITAL COST

Table 5.0-1 below presents the process capital cost of CCL's demonstration plant.

Table 5.0-1: Process Capital Cost of Demonstration Plant

Task	Cost ($)	% of Total Cost
Site Acquisition	5,666,000	11.5
Engineering	1,762,206	3.6
Equipment & Materials	14,679,750	29.7
Construction & Start-Up	24,524,392	49.6
Project Management	2,172,710	4.4
Environmental Monitoring	667,948	1.2
Total	49,473,006	100.0

6.0 ESTIMATED OPERATING COST

Tables 6.0-1 and 6.0-2 present the estimated annual fixed operating cost and the annual variable operating cost of CCL's demonstration plant. These estimated costs were based on the following assumptions:

- Yearly Raw Ton Tonnage Production 2,600,000 tons
- Yearly Clean Coal Tonnage Production 1,950,000 tons
- Yearly Hours of Plant Operation - 6,048
- Yearly Hours of Plant Maintenance - 2,000
- A total of 11 hourly employees averaging between $10.00 and $11.75 per hour (does not include fringe benefits).
- A total of 9 management employees averaging between $16.00 and $42.31 per hour (does not include fringe benefits).

Table 6.0-1: Annual Estimated Fixed Operating Cost

Item	Cost/$Yr.
Total Annual Operating Labor	1,731,474
Total Annual Maintenance Labor	250,030
Total Annual Maintenance Material	642,600
Total Annual Administrative and Support	500,400
GRAND TOTAL FIXED O&M COST	3,124,504

Table 6.0-2: Annual Estimated Variable Operating Cost

Item	Cost/$Yr.
Mobil Equipment Costs	155,200
Laboratory Analysis	117,699
Electricity	1,536,000
Magnetite	365,911
Dryer Fuel	769,075
Chemicals & Flocculants	288,473
Operating Supplies	172,224
GRAND TOTAL VARIABLE OPERATING COST	3,404,582

7.0 COMMERCIAL APPLICATIONS

The demonstration project is crucial to achieving commercialization of the technology, as it will demonstrate, at full commercial scale, the integrated operating of the cleaning plant. This project will confirm plant operability, product quality, and process costs, providing information that is vital to the commercialization effort.

The demonstration project will test all aspects of the cleaning technology at commercial scale, and the product will be test-burned in commercial, coal-fired units. Data collection, analysis, and reporting will be performed during the operations phase and will include on-stream reliability, coal recovery efficiencies, and equipment performance. Data from the test burns will include boiler efficiencies and SO_2 and particulate emission levels. The data that will be generated will be applicable directly to the design of other facilities and will provide valuable information which will facilitate the commercialization effort. Environmental Monitoring Data will be collected and reported for the cleaning plant and for the power plant unit tested.

The 1990 Clean Air Act Amendments (CAAA) require existing coal-burning power plants to reduce SO_2 emissions. Of the options that exist for accomplishing this, one of the most acceptable to power plant operators is switching to low-sulfur coal, providing that this can be done without unit derating. The advantage of fuel switching is that it avoids the capital investment required for FGD processes, as well as the operating and waste or by-product disposal problems inherent in FGD. Because Carefree Coal™ and Self-Scrubbing™ have high Btu contents and can be burned with little or no equipment modifications, they should be able to achieve significant penetration of the low-sulfur coal market.

Features of the CCL's technology that improve its potential for commercialization are its high energy recovery efficiency, its ability to reject pyritic sulfur, and its ability to handle lower ranked and oxidized coals. The technology's high efficiency and flexibility should give it wide appeal and applicability.

Carefree Coal™ and Self-Scrubbing Coal™ should be well received in the marketplace because of favorable economics and high product quality.

APPENDIX A

PROJECT MANAGEMENT PLAN

CUSTOM COALS LAUREL
SELF-SCRUBBING COAL: An Integrated Approach to Clean Air
PROJECT MANAGEMENT PLAN

INTRODUCTION

CCL has entered into a Cooperative Agreement with the DOE. CCL has also entered into three host site agreements. The first is with Pennsylvania Power & Light Company to provide facilities at its Martins Creek Power Station for full-scale combustion testing of Carefree Coal™. The second is with Richmond Power & Light for combustion testing of Self-Scrubbing Coal™ at its Whitewater Valley No. 2. The third is with Centerior Energy for combustion testing of Self-Scrubbing Coal at its Ashtabula Plant. CCL will subcontract with Custom Coals Corporation to provide technical and management assistance in the conduct of the overall project.

FIGURE A-1 AND FIGURE A-2 BELONG HERE (SEE DRAFT)

CCL has organized a Project Management Committee to provide policy-level guidance and review throughout the life of the demonstration. This committee is comprised of senior management personnel from CCL as well as the subcontractor organizations. Mr. Sheldon Wool, CEO of CCL, will serve as Chairman of the Management Committee. Other members of the committee include Dr. Kelly Kindig, Mr. Ken Harrison and Ms. Robin Godfrey of CCC, Mr. Clark Harrison, President of CQ, Inc., and Mr. Sidney Riggs, President of Riggs Industries.

The Project Management Committee will establish the baseline scopes of work, baseline budgets and schedules for each of the team members that will best serve the overall needs of the Cooperative Agreement with DOE and the needs of CCL. The committee will continue to meet on a quarterly basis to review the progress (accomplishments, cost, schedule) of each team member and assess the overall progress of the demonstration project.

The demonstration project encompasses four distinct phases of execution. These phases include *project definition, design, construction and operations (including testing) with technical reporting* throughout each phase. CCL will maintain overall responsibility for project control through its project manager, Mr. Ken Harrison. CCL will organize and execute the project phases according to the Project Organization Chart shown in Figure A-2. This chart identifies the technical responsibilities of each manager and the functions assigned to the participating organizations. Figure A-3 shows the breakdown of the 56 month project schedule.

Self-Scrubbing Coal: An Integrated Approach to Clean Air
Project Schedule (November 1, 1992 Start Date)

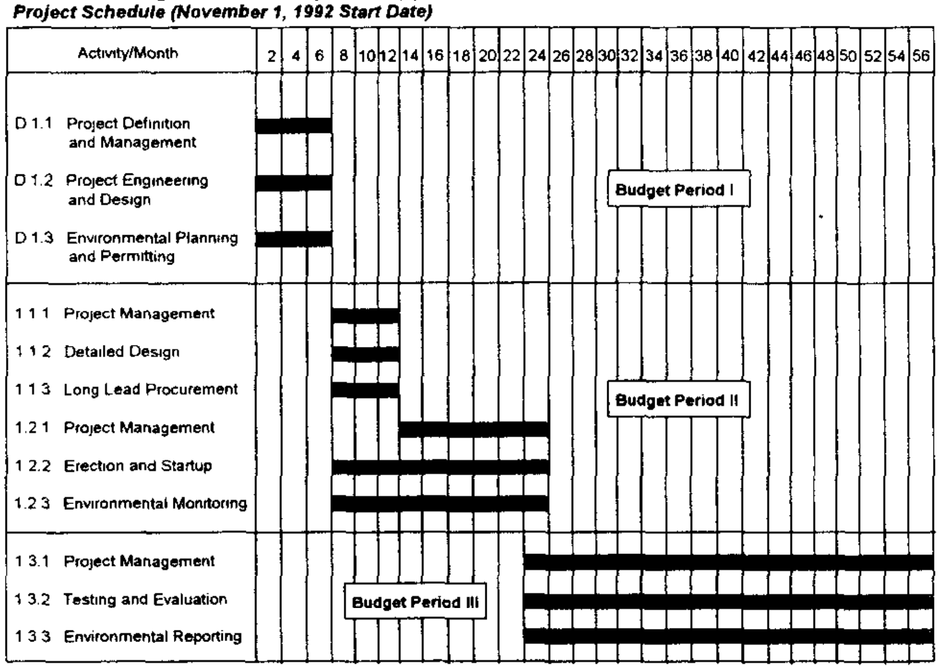
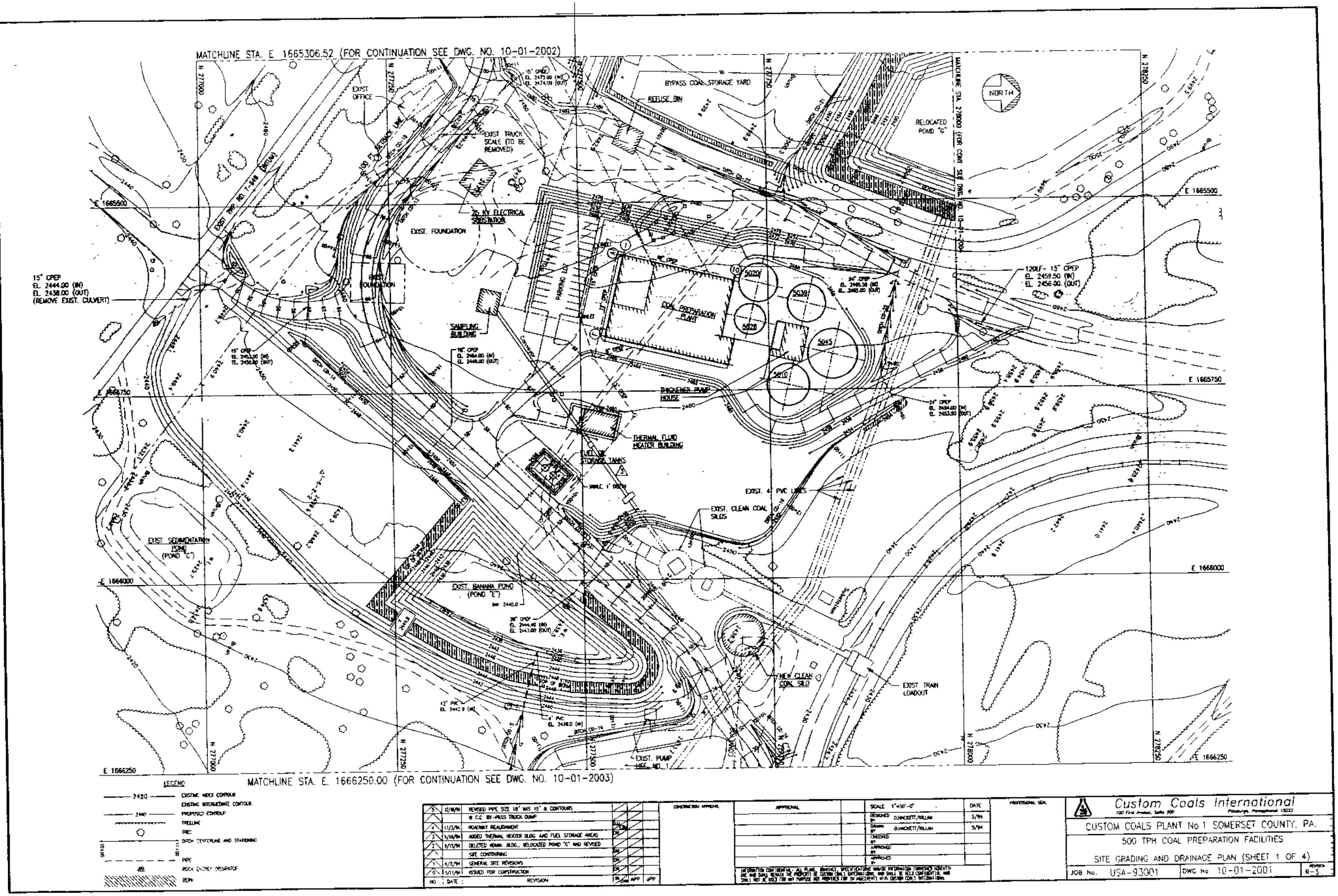


Figure A-3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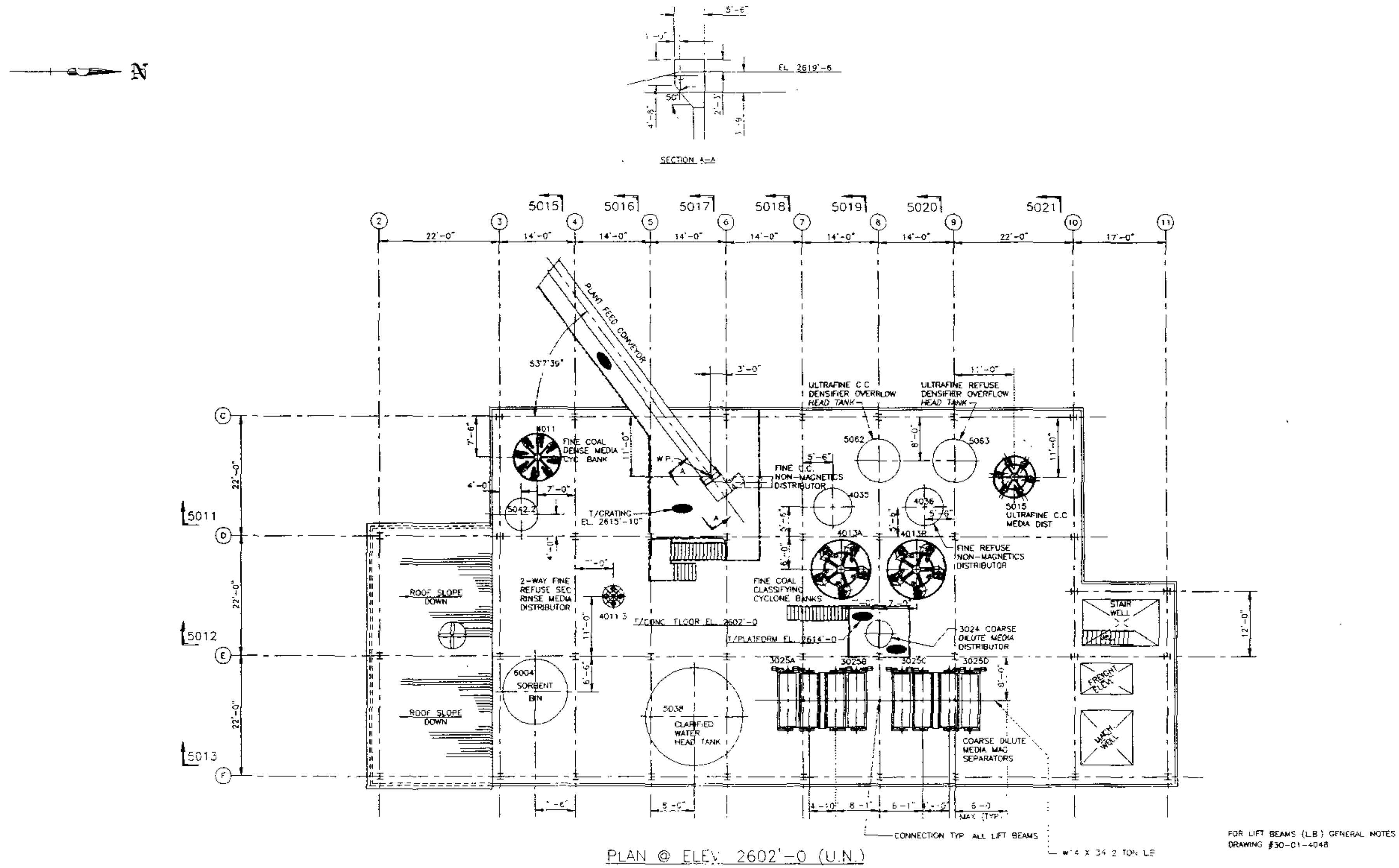
MATCHLINE STA. E. 1666250.00 (FOR CONTINUATION SEE DWG. NO. 10-01-2003)
MATCHLINE STA. 278000 (FOR CONT. SEE DWG. NO. 10-01-2004)
NORTH
BYPASS COAL STORAGE YARD
REFUSE BIN
RELOCATED POND "G"
EXIST. OFFICE
EXIST. TRUCK SCALE (TO BE REMOVED)
25 KV ELECTRICAL SUBSTATION
EXIST. FOUNDATION
PARKING LOT
COAL PREPARATION PLANT
SAMPLING BUILDING
THICKENER PUMP HOUSE
THERMAL FLUID HEATER BUILDING
FUEL OIL STORAGE TANKS
EXIST. 4" PVC LINES
EXIST. CLEAN COAL SILOS
EXIST. SEDIMENTATION POND (POND "C")
EXIST. BANANA POND (POND "E")
NEW CLEAN COAL SILO
EXIST. TRAIN LOADOUT
EXIST. PUMP
15" CPEP
EL. 2444.00 (IN)
EL. 2438.00 (OUT)
(REMOVE EXIST. CULVERT)
120LF- 15" CPEP
EL. 2459.50 (IN)
EL. 2456.00 (OUT)
LEGEND
EXISTING INDEX CONTOUR
EXISTING INTERMEDIATE CONTOUR
PROPOSED CONTOUR
TREELINE
TREE
DITCH CENTERLINE AND STATIONING
PIPE
ROCK ENERGY DISSIPATOR
BERM
5 12/8/94 REVISED PIPE SIZE 18" WAS 15" & CONTOURS @ C.C. BY-PASS TRUCK DUMP
4 11/3/94 ROADWAY REALIGNMENT
3 5/16/94 ADDED THERMAL HEATER BLDG AND FUEL STORAGE AREAS
2 5/15/94 DELETED ADMIN. BLDG., RELOCATED POND "G" AND REVISED SITE CONTOURING
1 5/2/94 GENERAL SITE REVISIONS
0 5/11/94 ISSUED FOR CONSTRUCTION
NO. DATE REVISION
SCALE 1"=50'-0"
DESIGNED BY D.HACKETT/KILLAM 5/94
DRAWN BY D.HACKETT/KILLAM 5/94
CHECKED BY
APPROVED BY
Custom Coals International
CUSTOM COALS PLANT No.1 SOMERSET COUNTY, PA.
500 TPH COAL PREPARATION FACILITIES
SITE GRADING AND DRAINAGE PLAN (SHEET 1 OF 4)
JOB No. USA-93001
DWG No. 10-01-2001
R-5



FILE C \002\5001

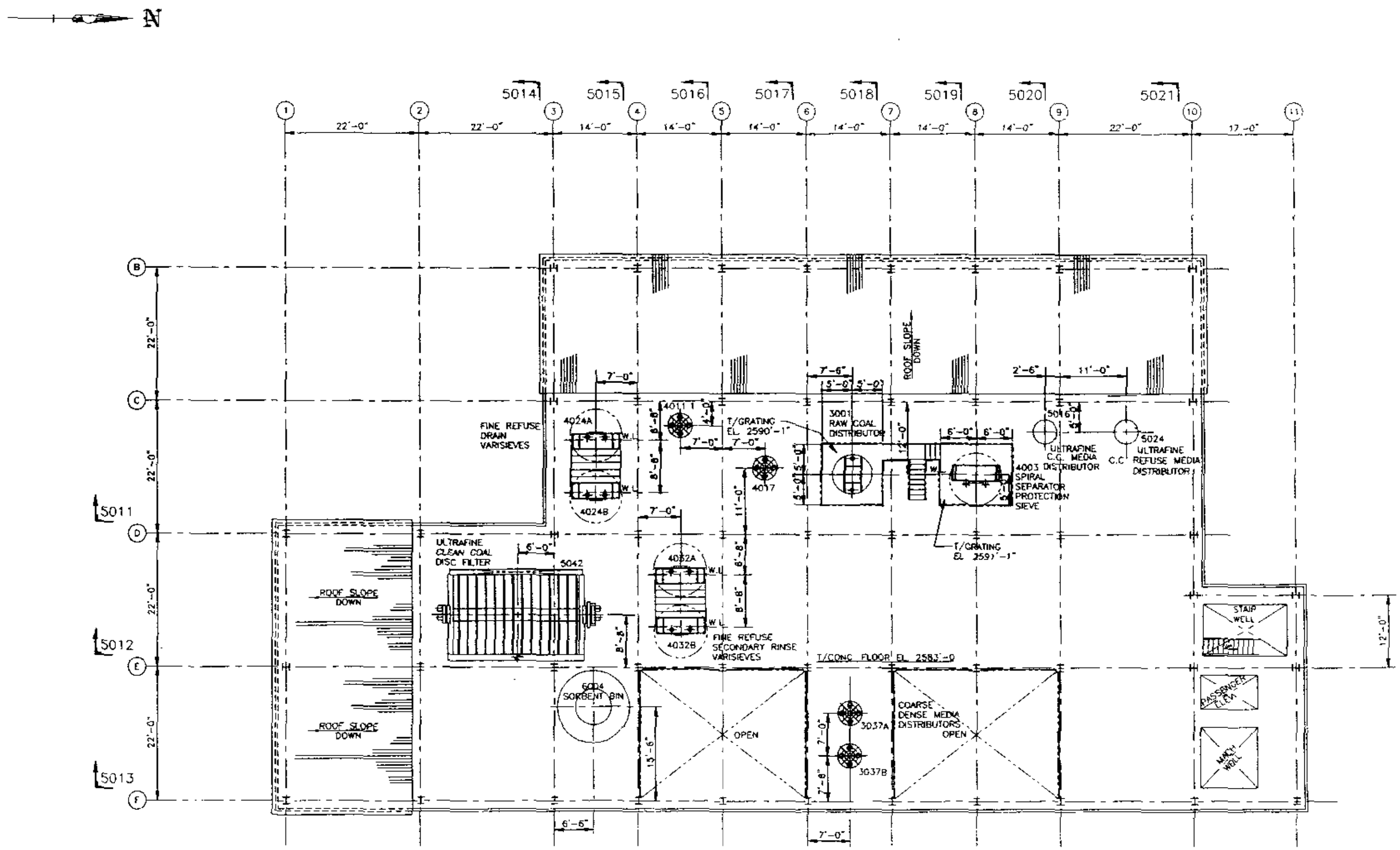
0 ISSUE FOR CONSTRUCTION

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - PLAN @ EL 2602'-0

JOB No USA-9300 | DWG No 30-01-5001 | R-0



PLAN @ ELEV 2583'-0

FILE C:\002\5002

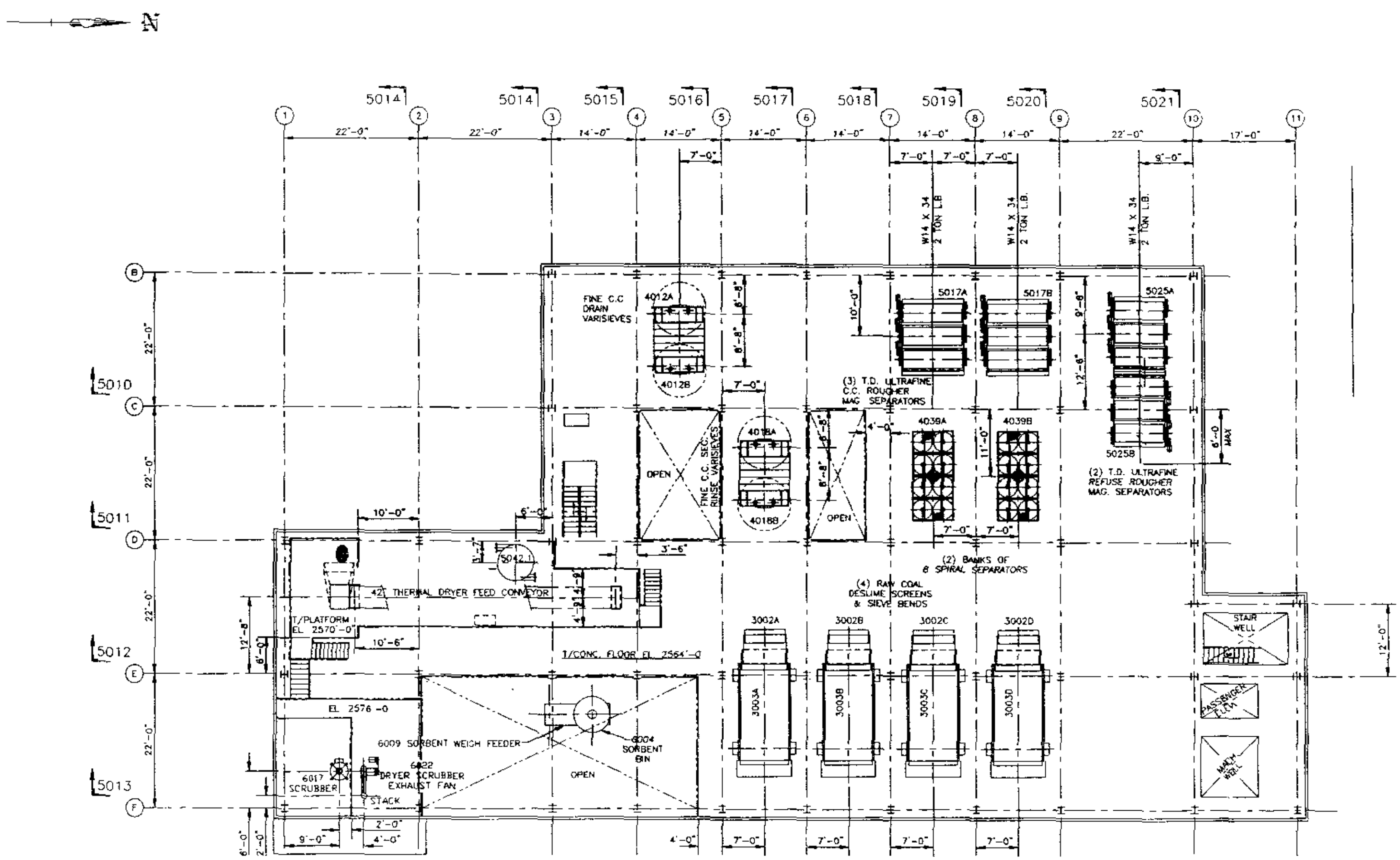
NO.	DATE	REVISION
0	7/20/94	ISSUE FOR CONSTRUCTION

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - PLAN @ EL 2583'-0

JOB No USA-9300 | DWG No. 30-01-5002



PLAN @ ELEV. 2564'-0

FOR LIFT BEAM (L.B.) GENERAL NOTES SEE DRAWING #30-01-4048

FILE C:\002\5003

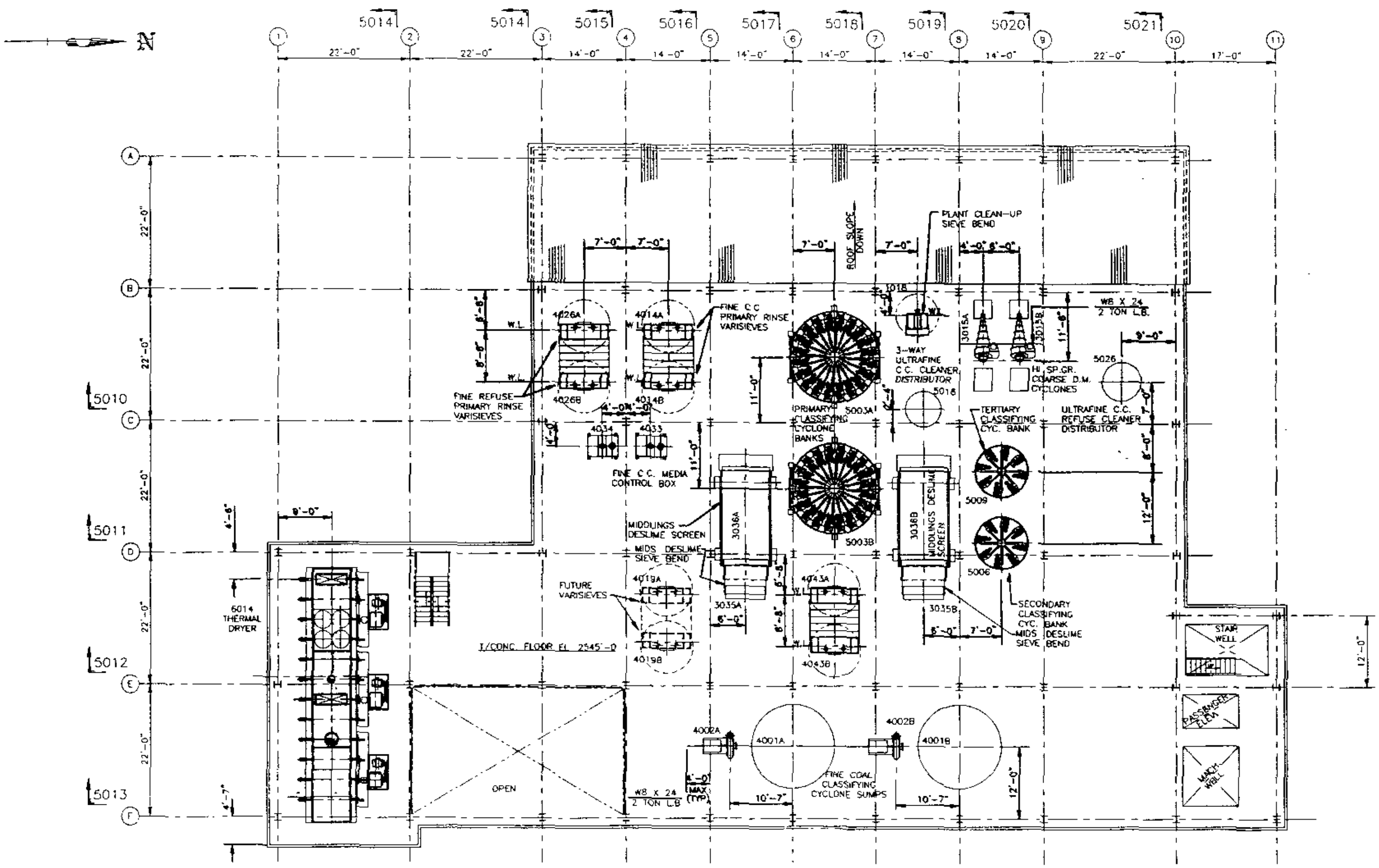
NO	DATE	REVISION
0	7/8/94	ISSUE FOR CONSTRUCTION

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - PLAN @ EL 2564'-0

JOB No. CSA-93001 DWG No. 30-01-5003 R-0



PLAN @ ELEV. 2545'-0

FOR LIFT BEAMS GENERAL NOTES SEE DRAWING #30-01-4048

FILE: C:\002\5004

NO.	DATE	REVISION
0	7/28/94	ISSUE FOR CONSTRUCTION

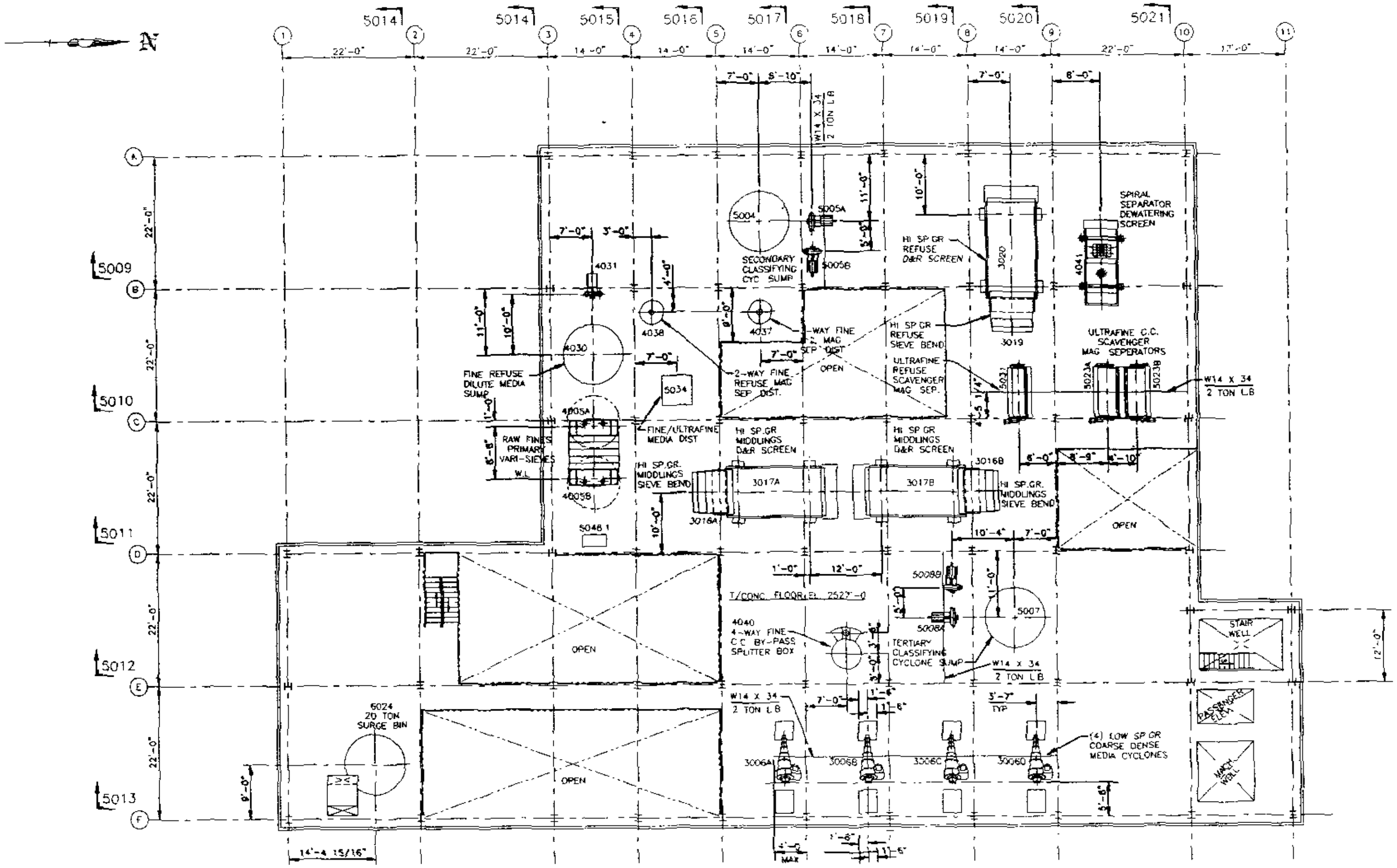
SCALE: 1/8"=1'-0 | DESIGNED BY: JRL 10-11-93 | DRAWN BY: C.KLUHEN 10-11-93

Custom Coals International

CUSTOM COALS PLANT No.1 SOMERSET COUNTY, PA.

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT – PLAN @ EL. 2545'-0

JOB No. US4-93001 | DWG No. 30-01-5004 | REVISION R-0



PLAN @ ELEV. 2527'-0

FOR LIFT BEAMS (L.B.) GENERAL NOTES
SEE DRAWING #30-01-4048

FILE C:\002\5005

NO.	DATE	REVISION	BY	APP
0	10/28/93	ISSUE FOR CONSTRUCTION		

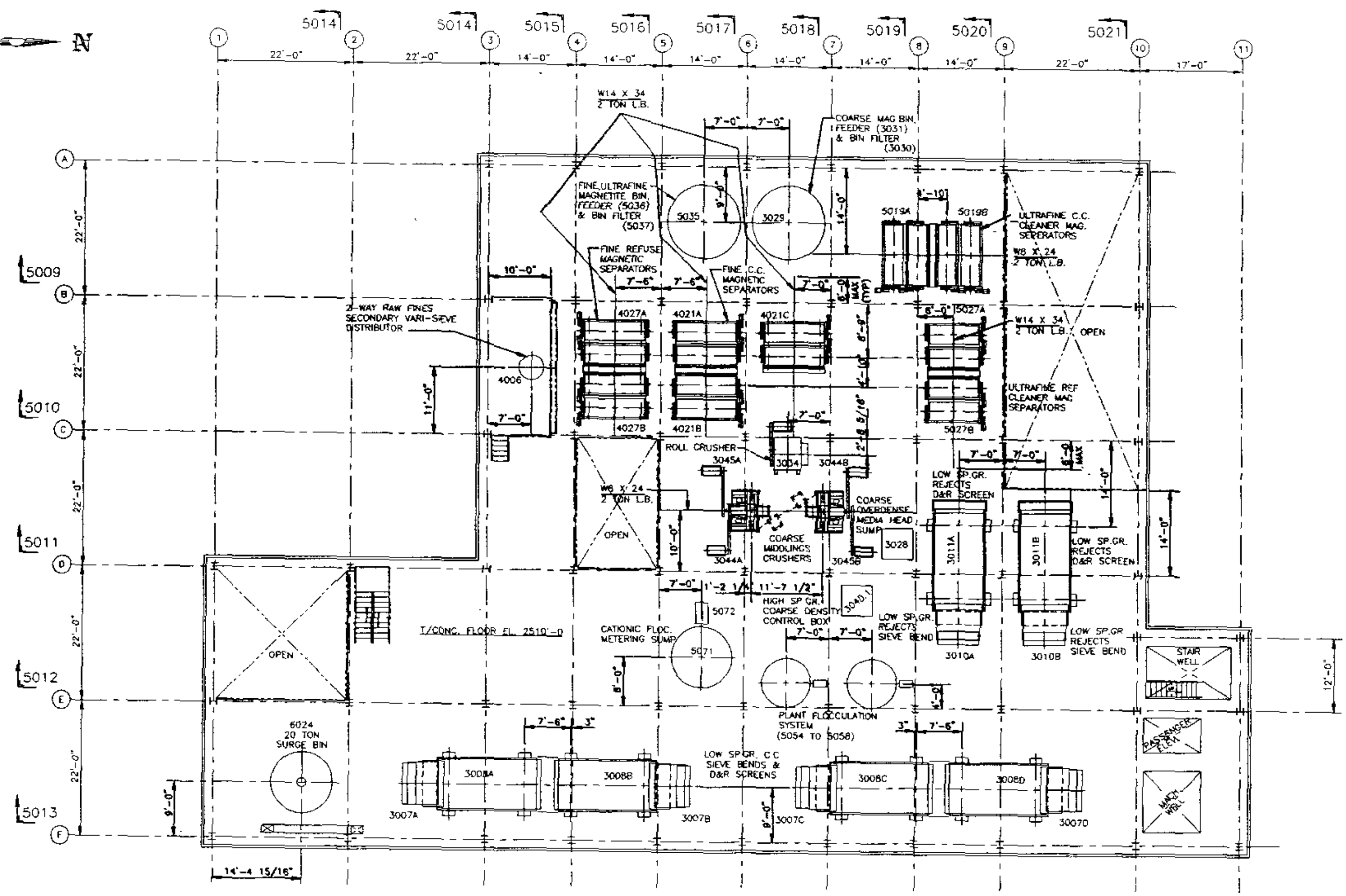
SCALE 1/8"=1'-0
DESIGNED BY JPL — DATE 10-11-93
DRAWN BY CHJUAN — DATE 10-11-93
CHECKED BY
APPROVED BY
APPROVED BY
CONSTRUCTION APPROVAL
APPROVAL
PITTSBURGH, PA

Custom Coals International

CUSTOM COALS PLANT No.1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT – PLAN @ EL 2527'-0

JOB No. USA-93001 | DWG No. 30-01-5005 | REVISION R-0



PLAN @ ELEV. 2510'-0 (UNLESS NOTED)

FOR LIFT BEAMS (L.B.) GENERAL NOTES
SEE DRAWING #30-01-4048

FILE C:\002\5006

NO.	DATE	REVISION	BY	APP.	APP.
0	7/20/94	ISSUED FOR CONSTRUCTION			

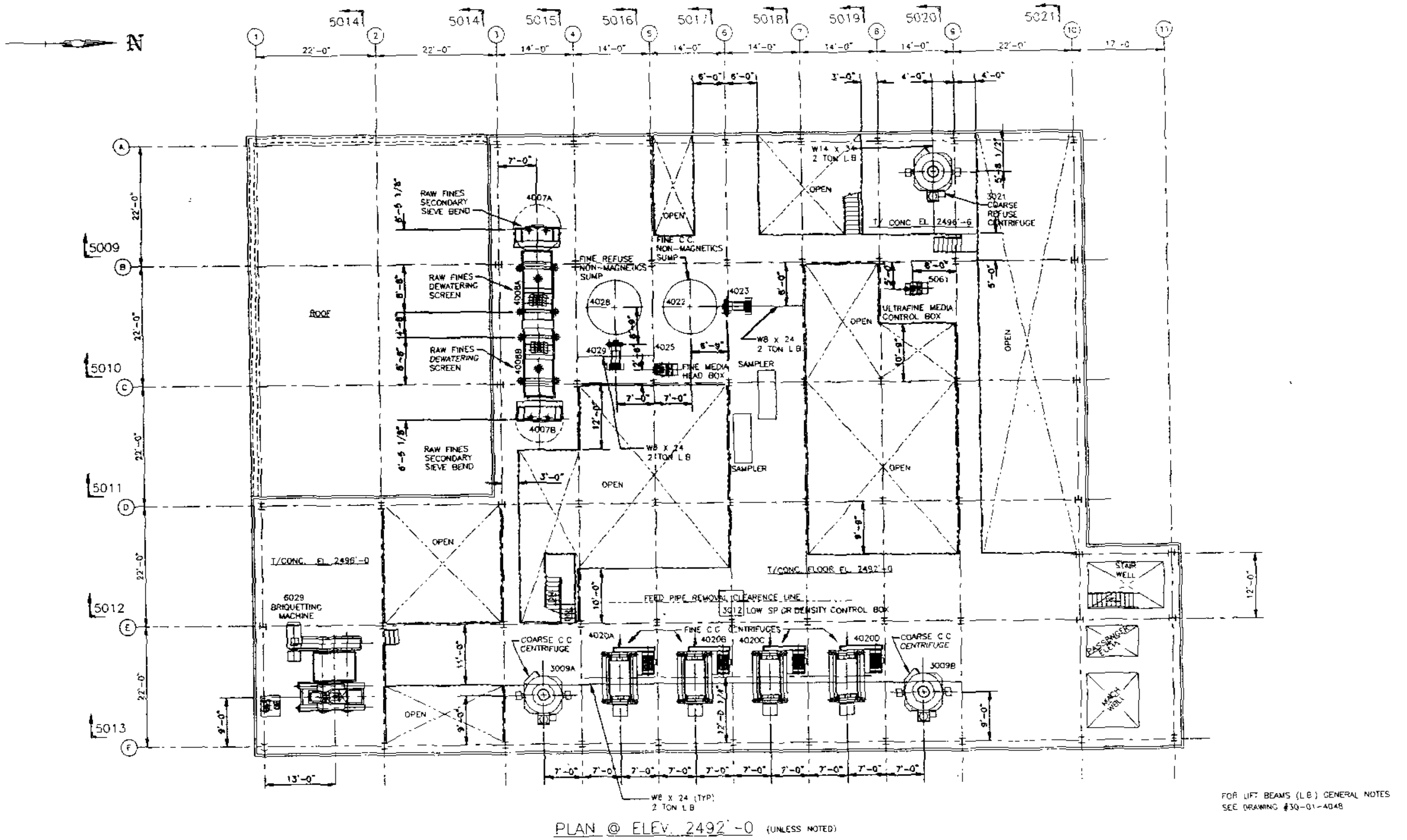
SCALE 1/8"=1'-0
DESIGNED BY J.P.L. 10-11-93
DRAWN BY G.M.LUNK 10-11-93

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA.

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRGEMENT – PLAN @ EL 2510'-0

JOB No USA-93001 | DWG No 30-01-5006 | REVISION R-0



PLAN @ ELEV. 2492'-0 (UNLESS NOTED)

FOR LIFT BEAMS (L.B.) GENERAL NOTES SEE DRAWING #30-01-4048

FILE C:\002\5007

NO.	DATE	REVISION
0	7/20/94	ISSUE FOR CONSTRUCTION

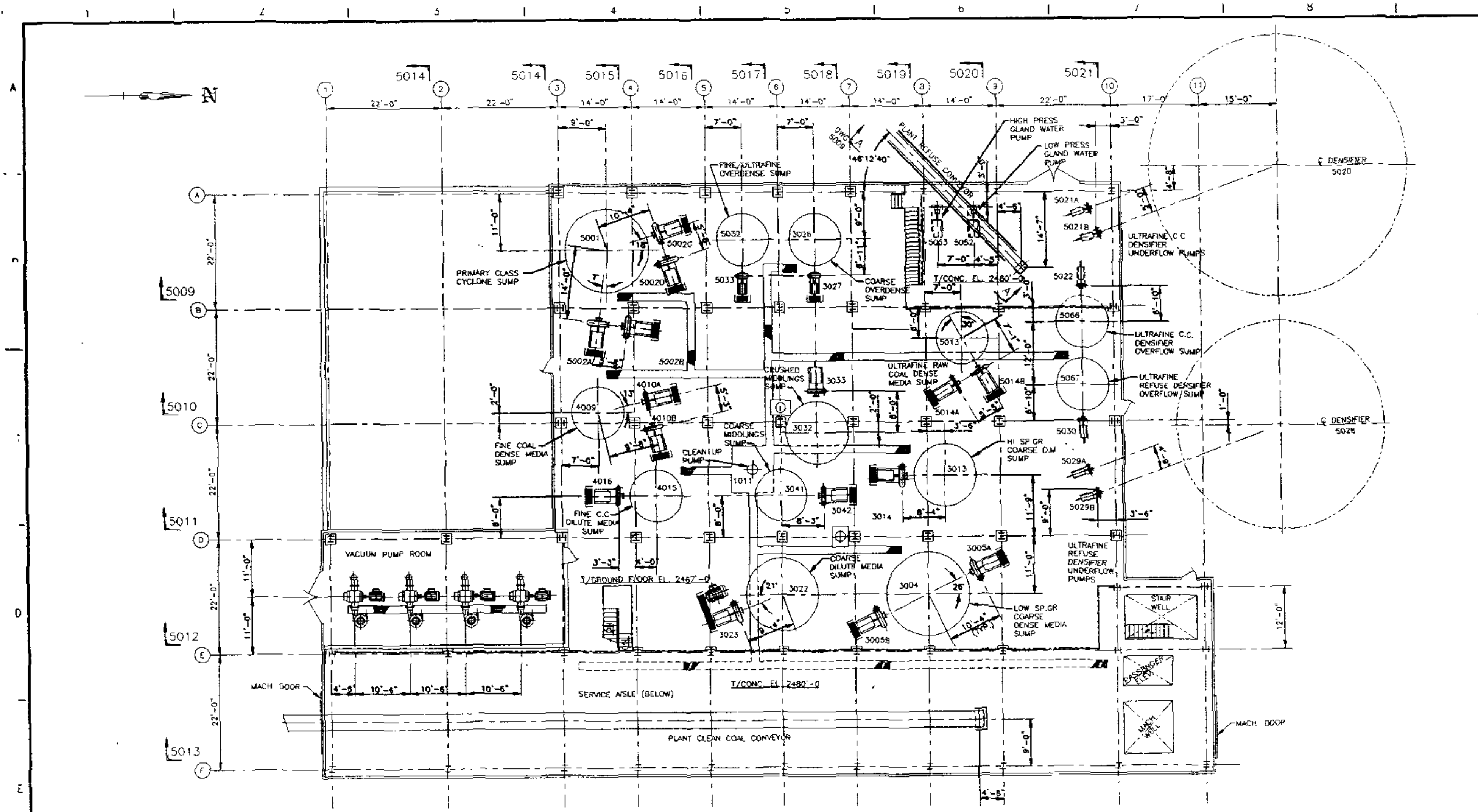
SCALE 1/8"=1'-0"

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - PLAN @ EL 2492'-0

JOB No USA-93001 | DWG No 30-01-5007 | REVISION R-0



PLAN @ GROUND FLOOR ELEV. 2467'-0 (UNLESS NOTED)

FOR LIFT BEAMS
SEE DRAWING #30-01-4048

FILE C:\002\5008

NO.	DATE	REVISION	BY	APP.	APP.
0	7/20/94	ISSUE FOR CONSTRUCTION			

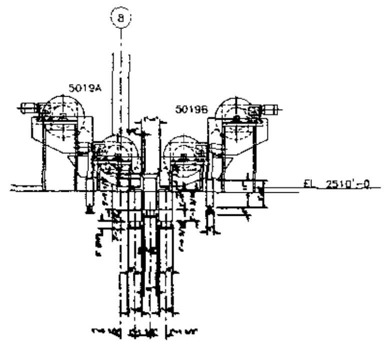
SCALE 1/8"=1'-0

Custom Coals International

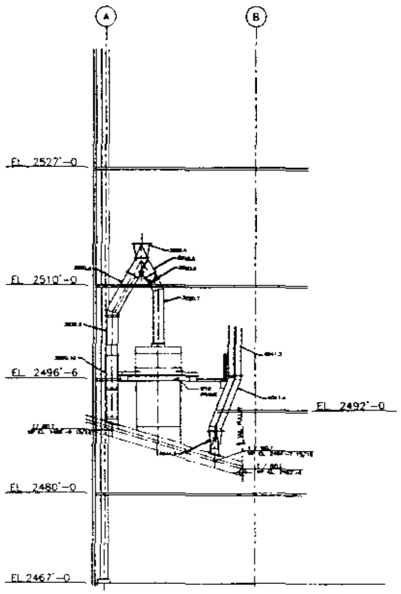
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - PLAN @ EL 2467'-0

JOB No USA-93001 DWG No 30-01-5008 REVISION R-0

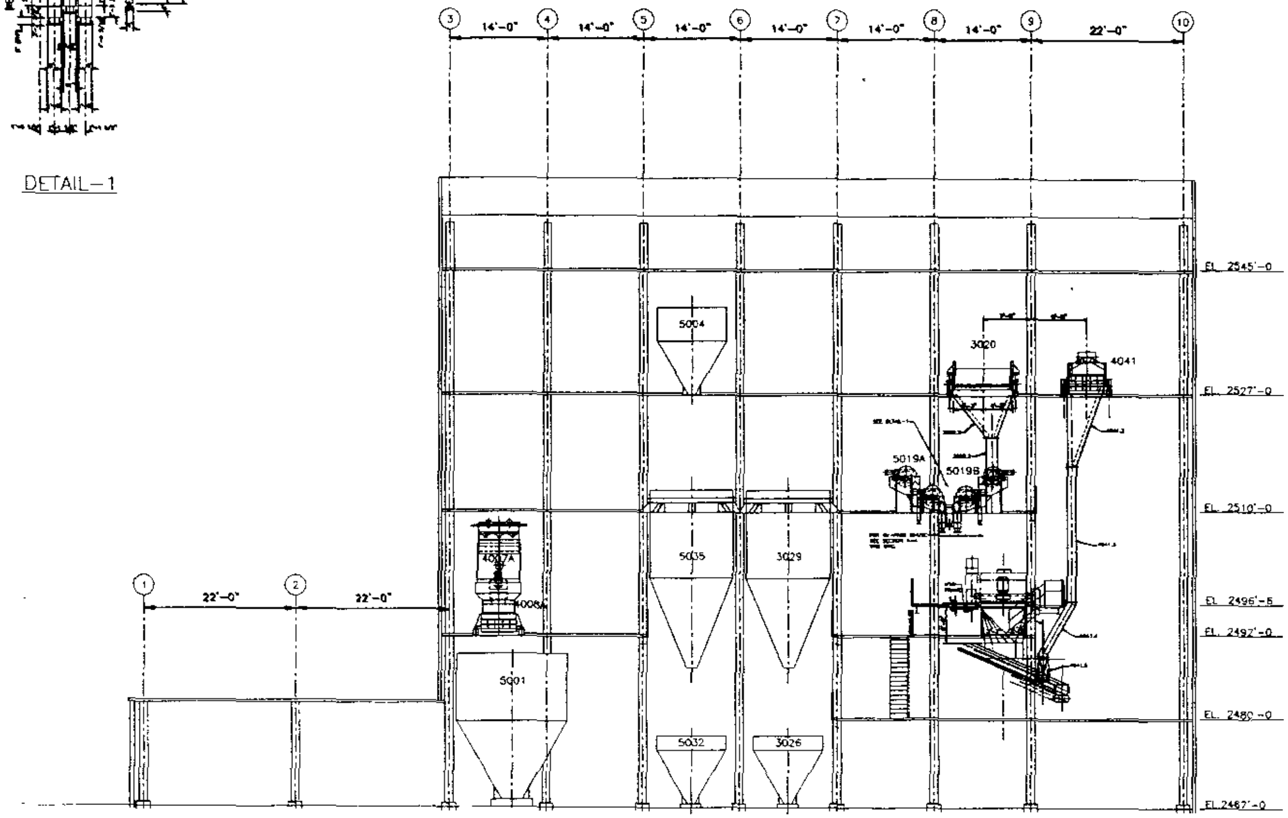


DETAIL-1



SECTION A-A

DWG 5008



SECTION @ COLUMN LINE B

FILE: C:\C\CCI\J93002\A\5009

NOTE
WORK THIS DWG WITH CHUTEWORK REFERENCE
DWG#'S 30-01-5515, 30-01-5536 & 30-01-5576

ISSUE FOR CONSTRUCTION

NO.	DATE	REVISION	BY	CHK.	APR.

CONSTRUCTION APPROVAL

APPROVAL

SCALE 1/8"=1'-0

DESIGNED BY J.R.L. 11-18-93

DRAWN BY J.R.LUNN 11-18-93

CHECKED BY

APPROVED BY

APPROVED BY

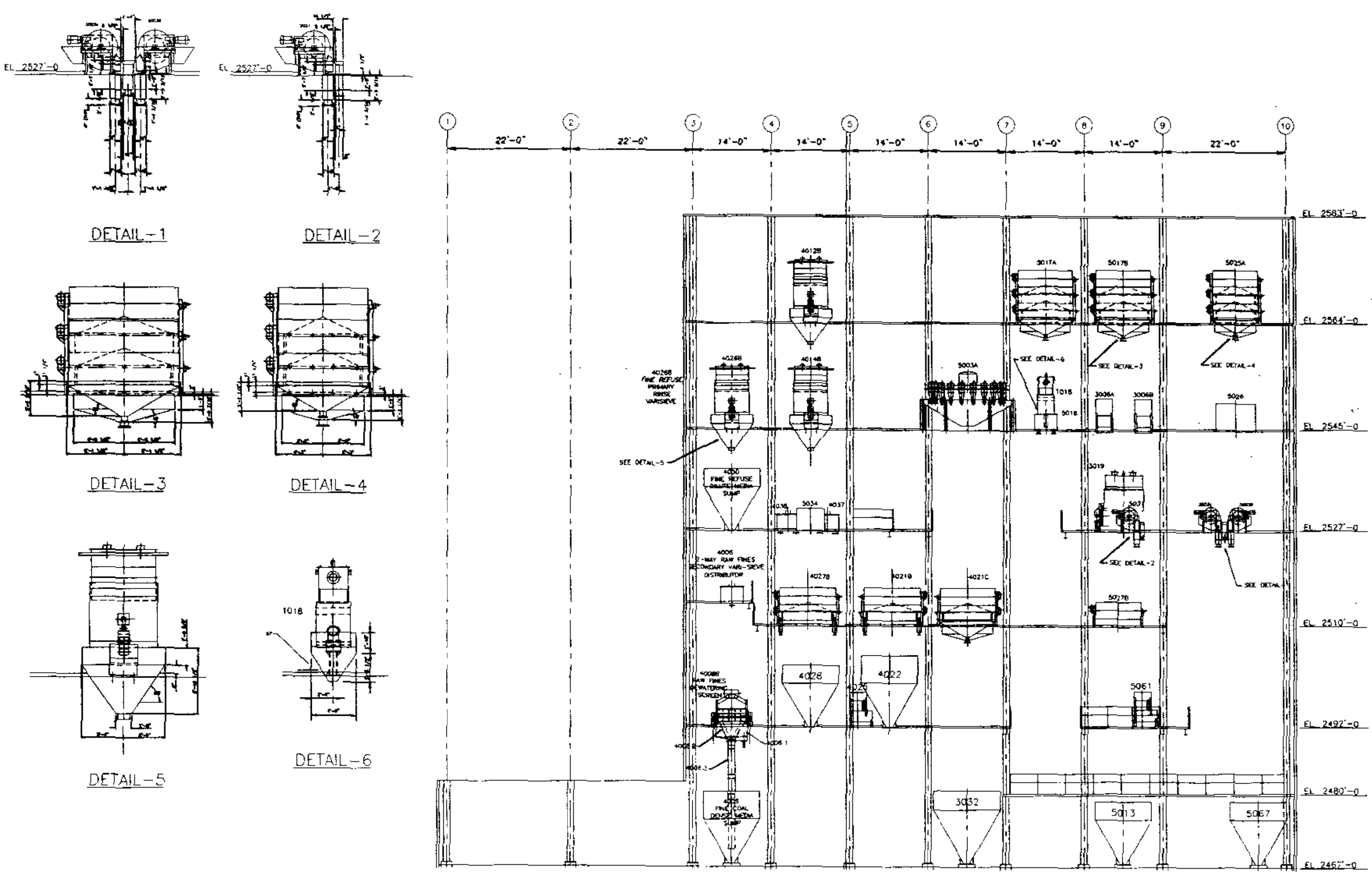
PROFESSIONAL SEAL

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - SECTION @ COLUMN LINE B

JOB No. USA-93001 DWG No. 30-01-5009 REVISION R-0



SECTION @ COLUMN LINE C

NOTE
WORK THIS DWG WITH CHUTEWORK REFERENCE
DWG # 30-01-5514

FILE C:\C\CCI\J93002\A\5010

NO.	DATE	REVISION
0	7/28/94	ISSUE FOR CONSTRUCTION

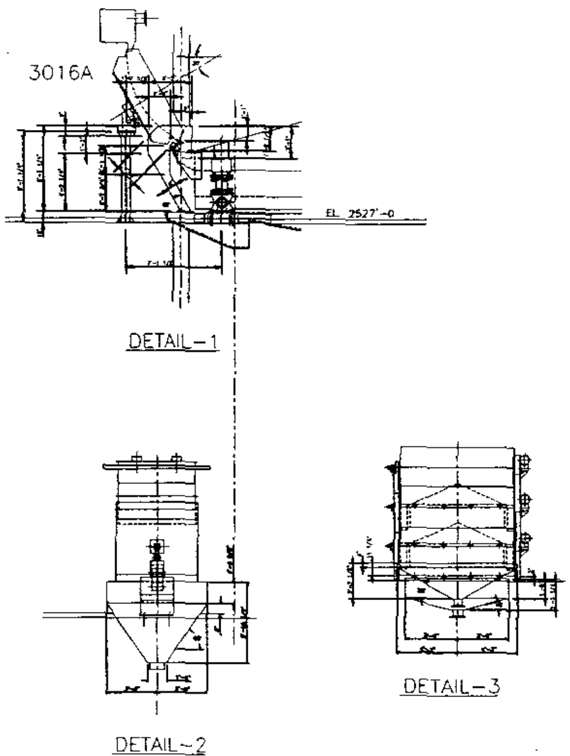
SCALE 1/8"=1'-0
DESIGNED BY J.R.L. 11-8-93
DRAWN BY C.H.LUNN 11-8-93

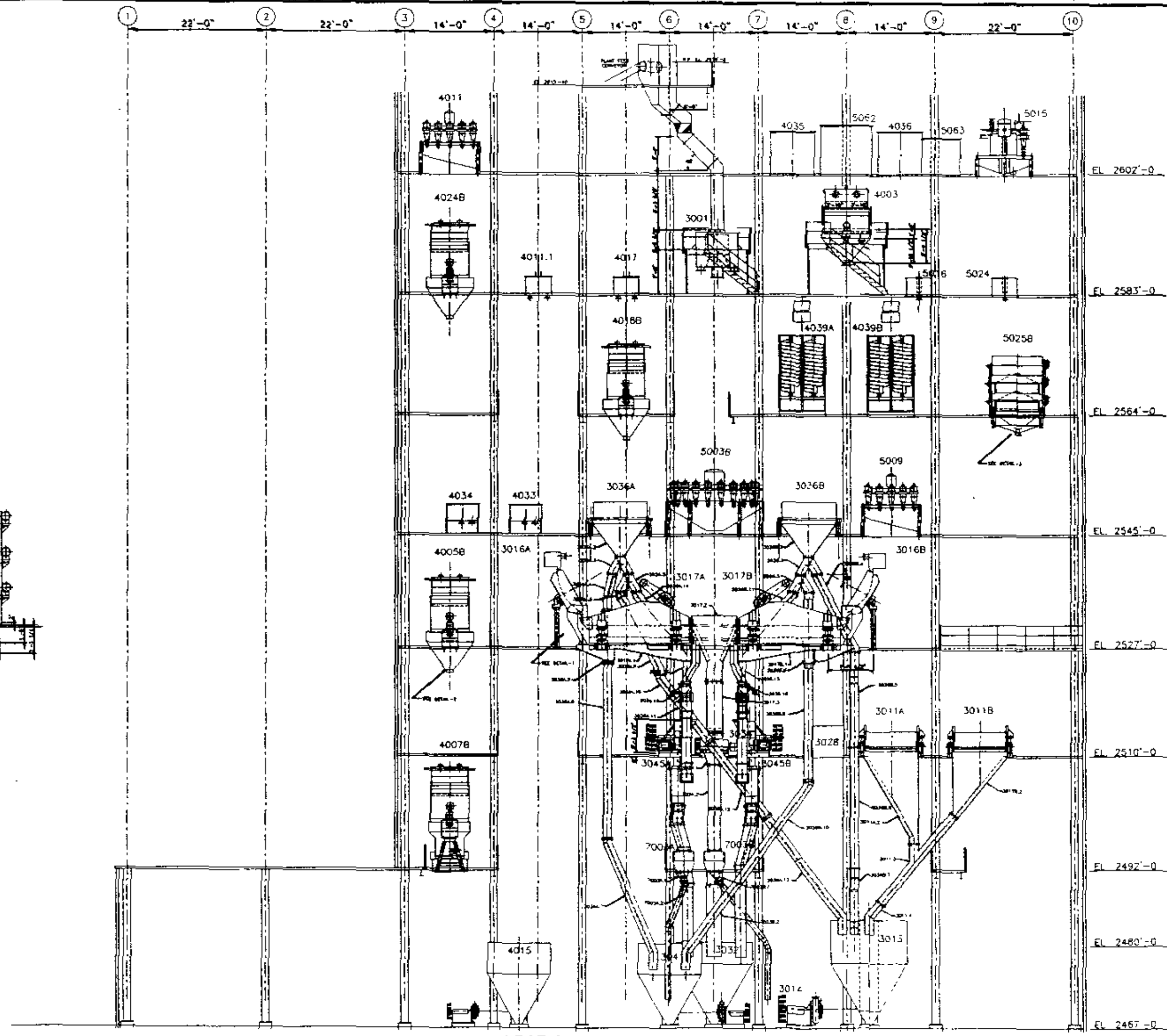
Custom Coals International

CUSTOM COALS PLANT No.1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - SECTION @ COLUMN LINE C

JOB No USA-93001 | DWG No 30-01-5010 | REVISION R-0





SECTION @ COLUMN LINE D

NOTE:
WORK THIS DWG. WITH CHUTEWORK REFERENCE
DWG.#'S 30-01-5510, 30-01-5511, 30-01-5512,
30-01-5534, 30-01-5535, 30-01-5579,
30-01-5580, 30-01-558L, 30-01-5582,
30-01-5583 & 30-01-5584

NO.	DATE	REVISION	BY	CHK	APP.	APP.
0	7/20/94	ISSUE FOR CONSTRUCTION				

CONSTRUCTION APPROVAL

APPROVAL

SCALE	1/8"=1'-0	DATE
DESIGNED BY	JRL	11-18-93
DRAWN BY	APAUM	11-18-93
CHECKED BY		
APPROVED BY		
APPROVED BY		

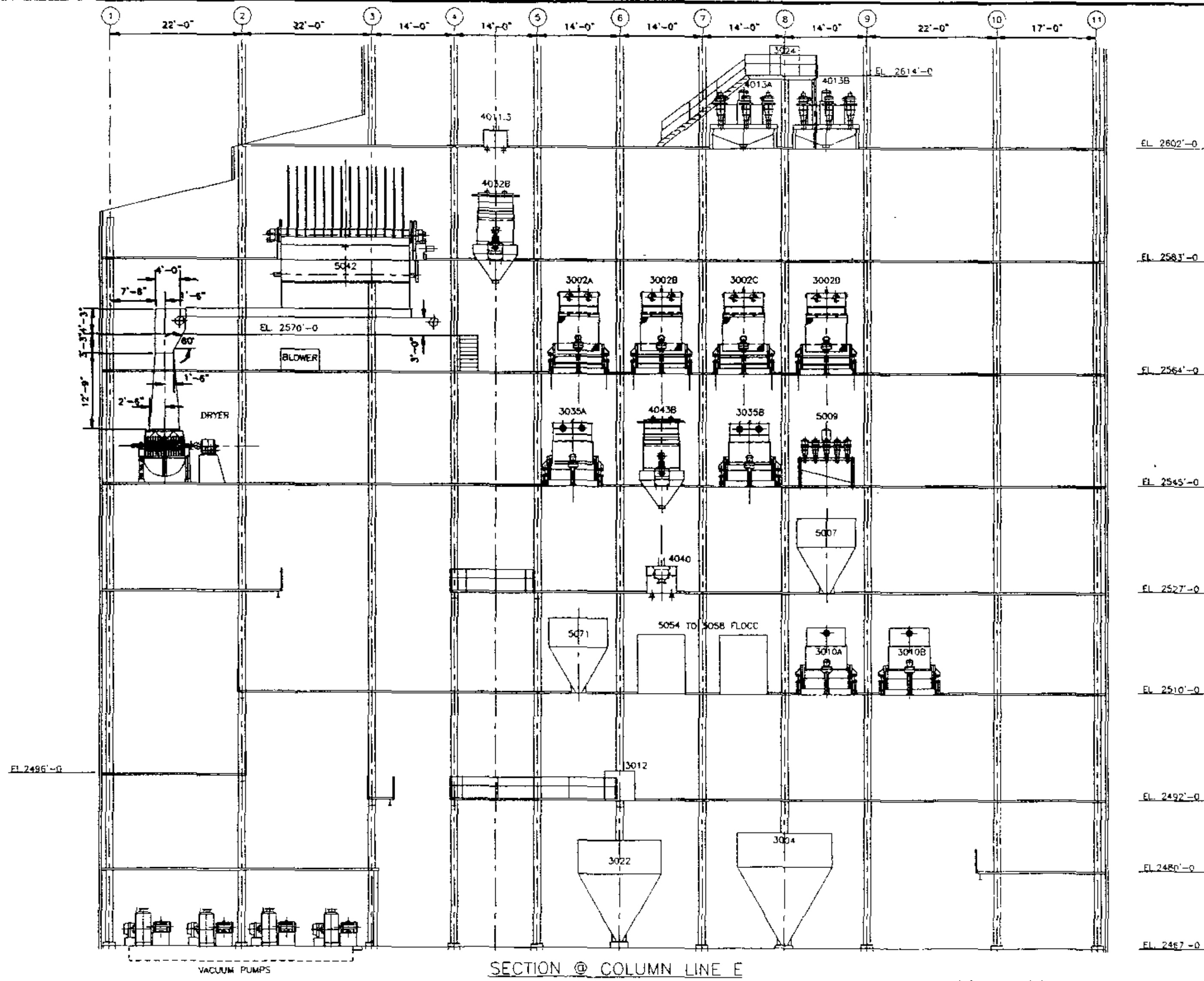
PROFESSIONAL SEAL

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - SECTION @ COLUMN LINE D

JOB No. USA-93001 | DWG No. 30-01-501 | REVISION 0



SECTION @ COLUMN LINE E

FILE C:\C\CCI\J93002\A\5012

NO.	DATE	REVISION
0	1/28/94	ISSUE FOR CONSTRUCTION

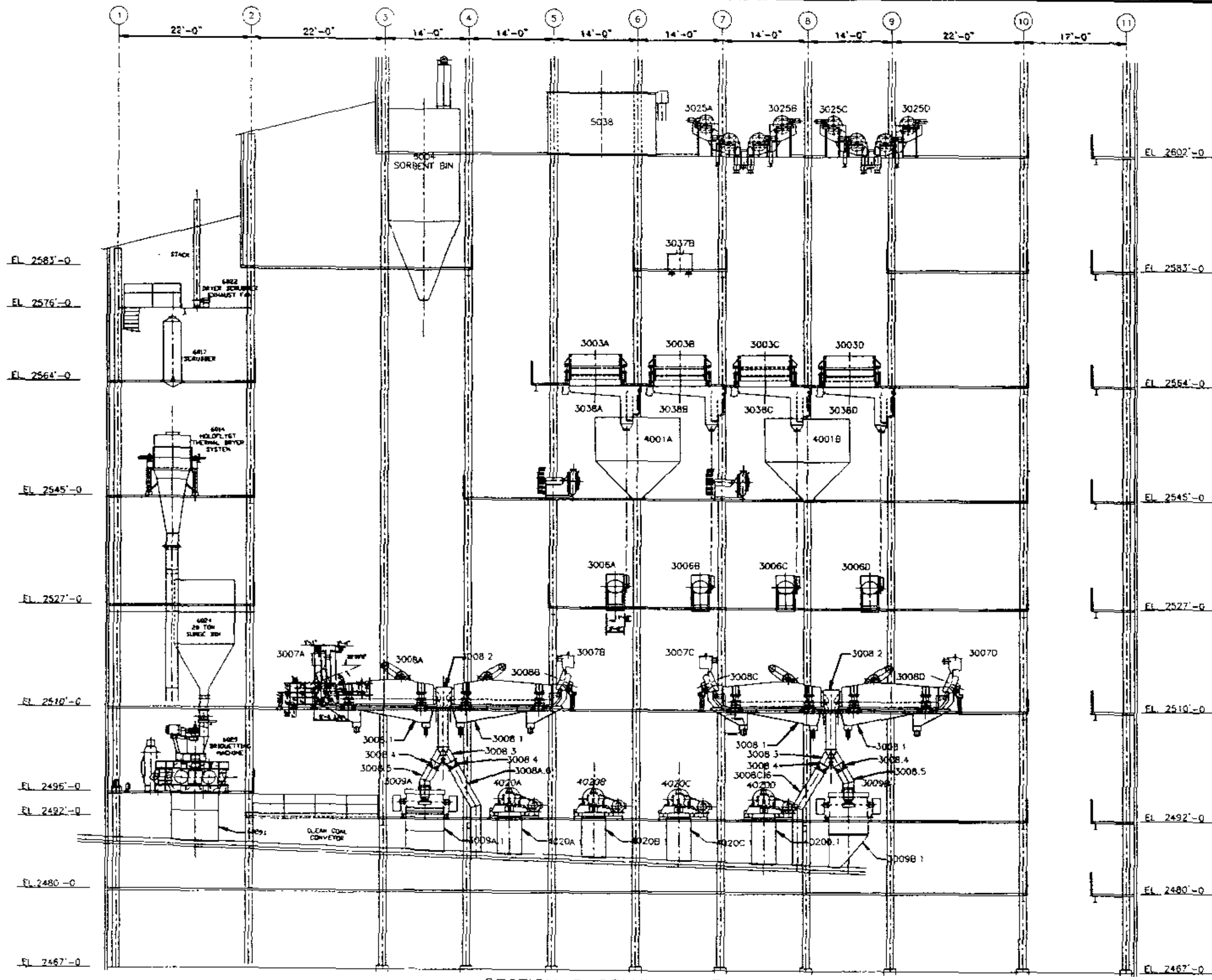
SCALE 1/8"=1'-0 — DESIGNED BY J.P.L. 11-8-93 — DRAWN BY G.KLUMM 11-8-93

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - SECTION @ COLUMN LINE E

JOB No US4-9300' — DWG No 30-01-5012 — REVISION P-0



SECTION @ COLUMN LINE F

NOTE
WORK THIS DWG WITH CHUTEWORK REFERENCE
DWG.#'S 30-01-5508, 30-01-5509, 30-01-5531,
30-01-5533, 30-01-5548, 30-01-5572
& 30-01-5576

NO.	DATE	REVISION	APP.
0	1/18/95	ISSUE FOR CONSTRUCTION	

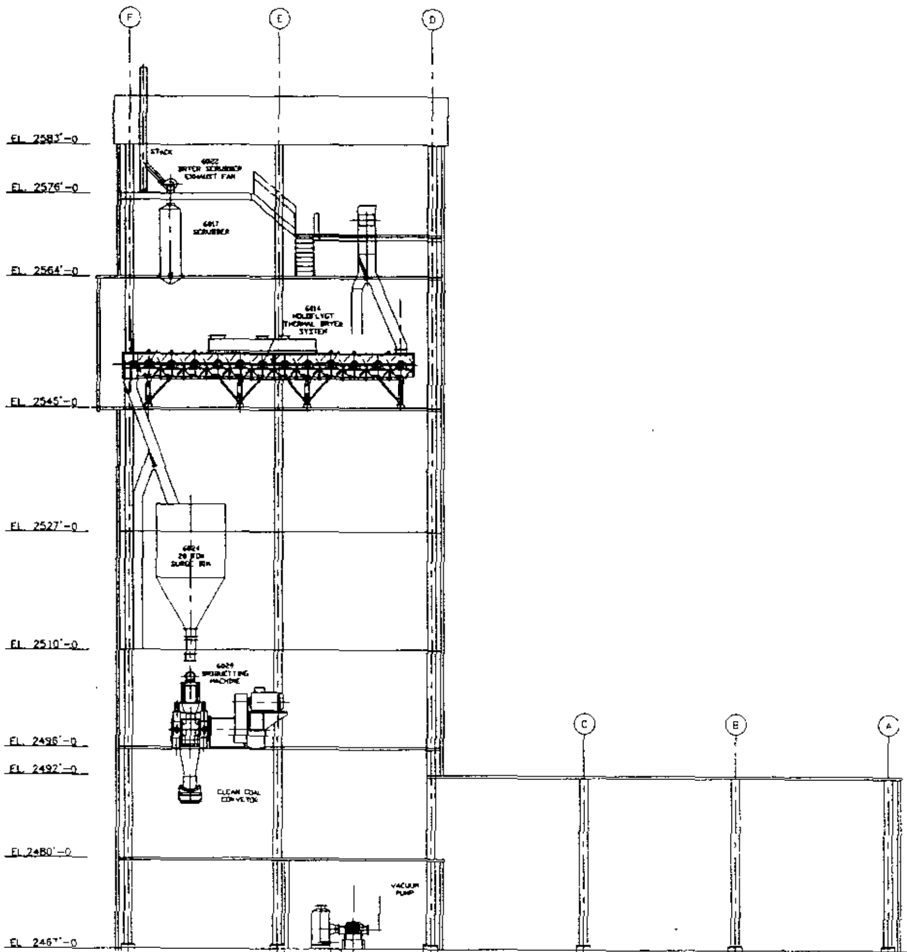
SCALE 1/8"=1'-0"
DESIGNED BY J.R.L. 11-18-93
DRAWN BY J.R.LUNN 1-18-95

Custom Coals International

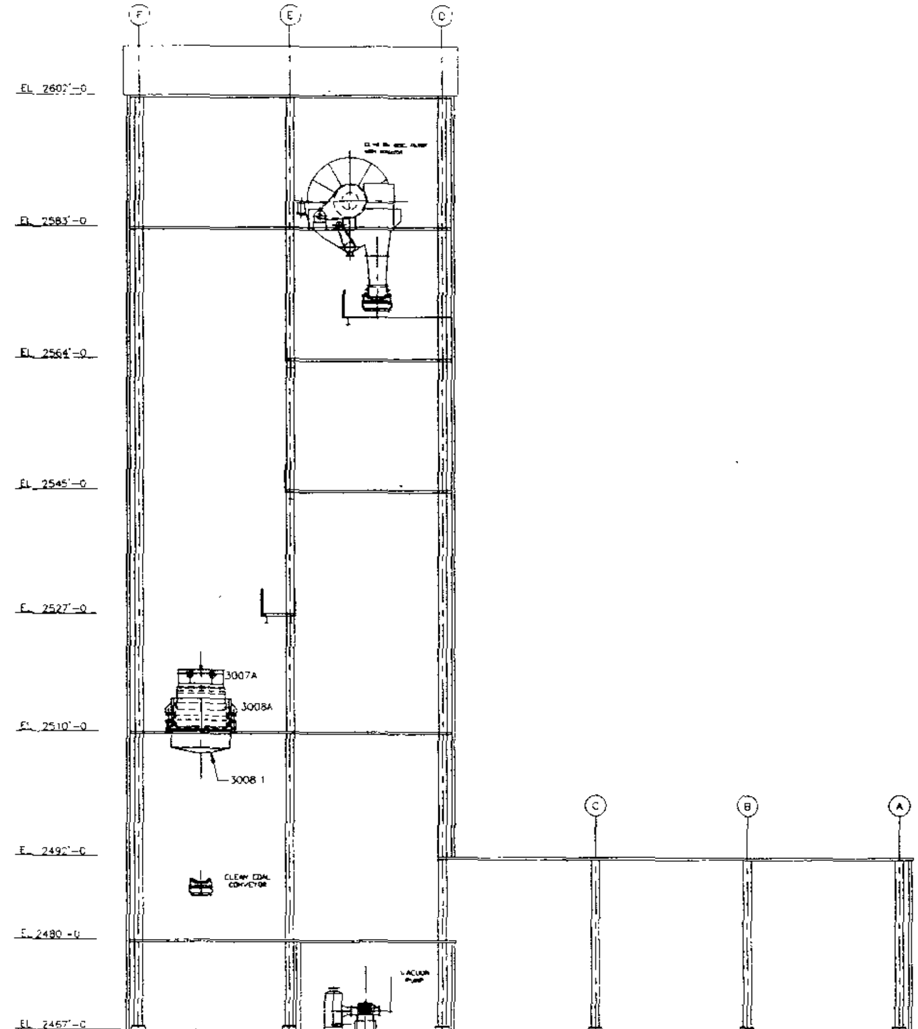
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - SECTION @ COLUMN LINE F

JOB No USA-9300 | DWG No 30-01-5013 | REVISION R-0



SECTION @ COLUMN LINE 2



SECTION @ COLUMN LINE 3

NOTE
WORK THIS DWG WITH CHUTEWORK REFERENCE
DWG# S 30-01-5509 & 30-01-5548

NO.	DATE	REVISION	BY	CHK	APP
0	11/10/93	ISSUE FOR CONSTRUCTION			

APPROVAL		
SCALE 1/8"=1'-0	DATE	
DESIGNED BY JRL	11/10/93	
DRAWN BY JRL	11/10/93	
CHECKED BY		
APPROVED BY		
APPROVED BY		

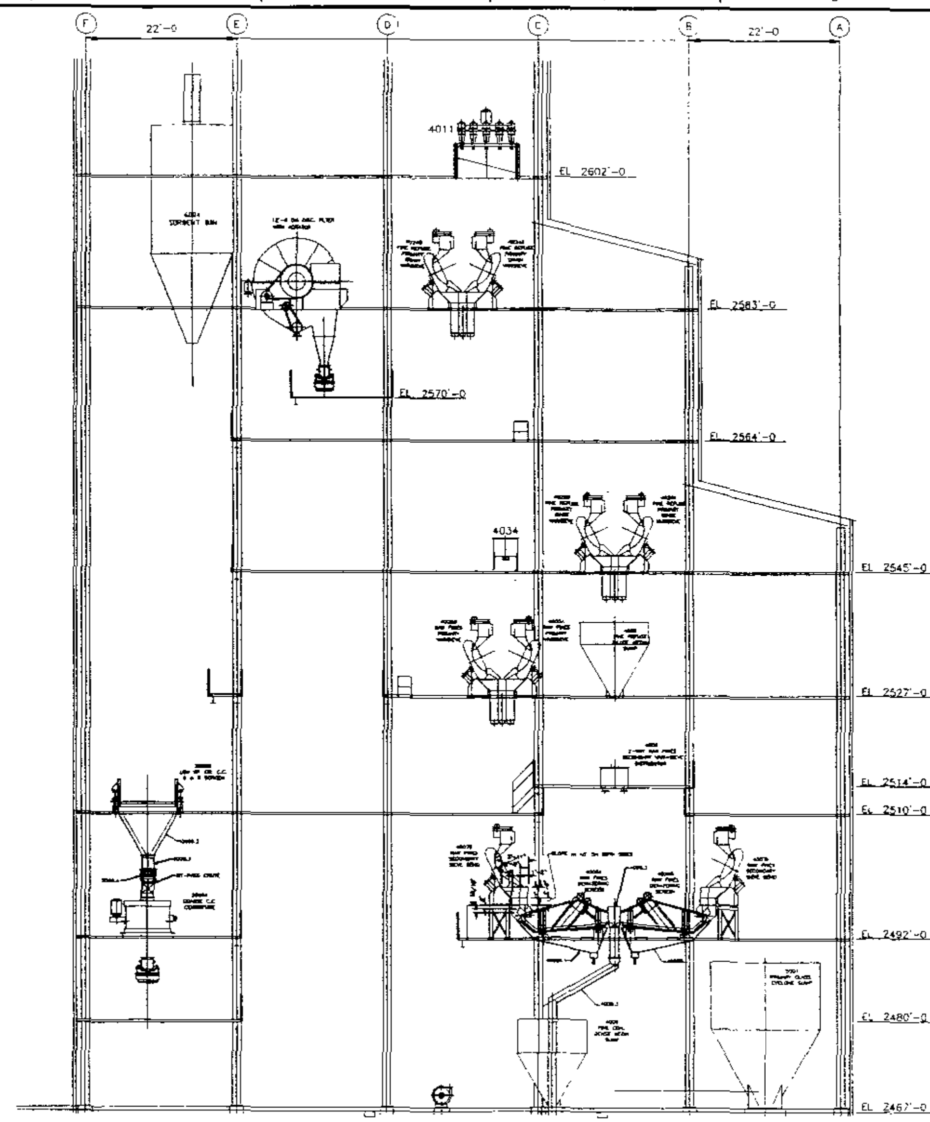
PROFESSIONAL SEAL

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - SECTION @ COLUMN LINES 2 & 3

JOB No USA-93001 | DWG No 30 01-5014 | REVISION R-0



SECTION @ COLUMN LINE 4

NOTE
WORK THIS DWG. WITH CHUTEWORK REFERENCE DWG #'S 30-01-5509, 30-01-5514, 30-01-5531 & 30-01-5576

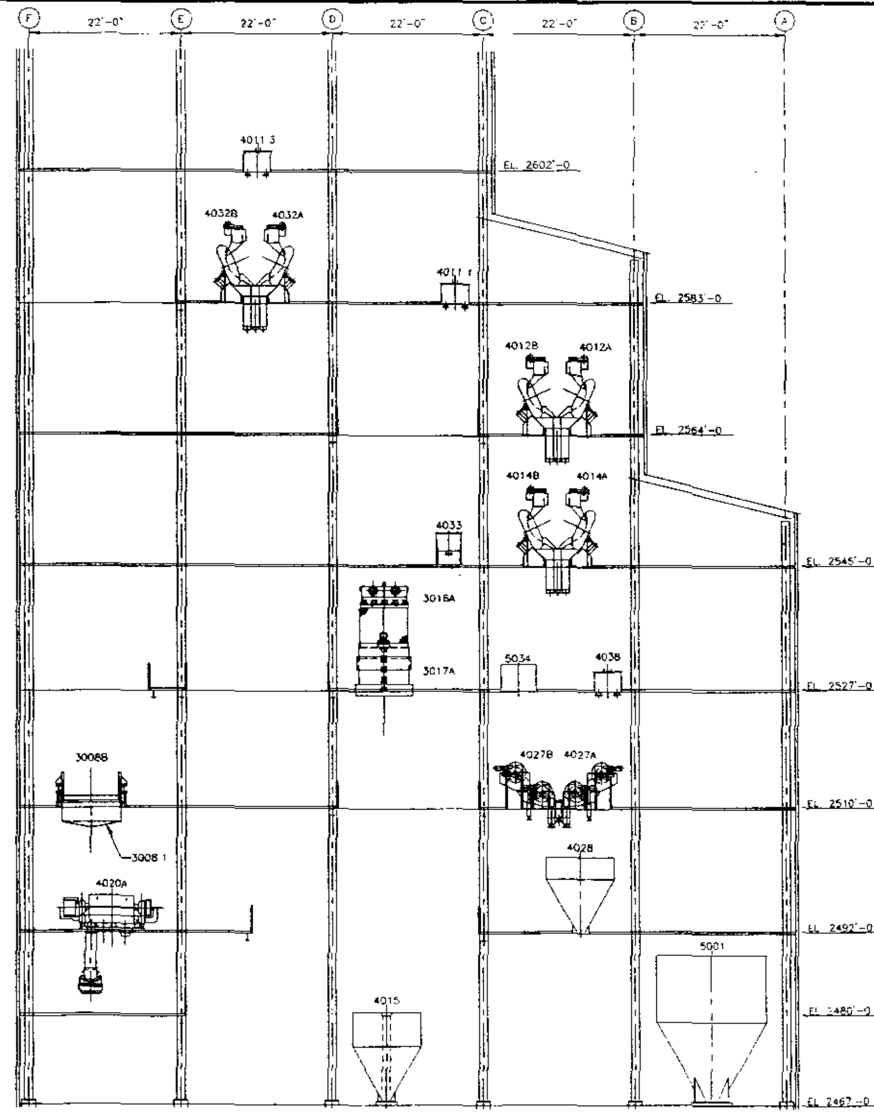
NO.	DATE	REVISION
0	1/20/94	ISSUE FOR CONSTRUCTION

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA.

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - SECTION @ COLUMN LINE 4

JOB No USA-23001 DWG No 30-01-5015 REVISION R-0



SECTION @ COLUMN LINE 5

FILE C:\002\5016

NOTE
WORK THIS DWG WITH CHUTEWORK REFERENCE
DWG#'S 30-01-5509 & 30-01-5533

NO.	DATE	REVISION	BY	APP	APP.
0	11/30/94	ISSUE FOR CONSTRUCTION			

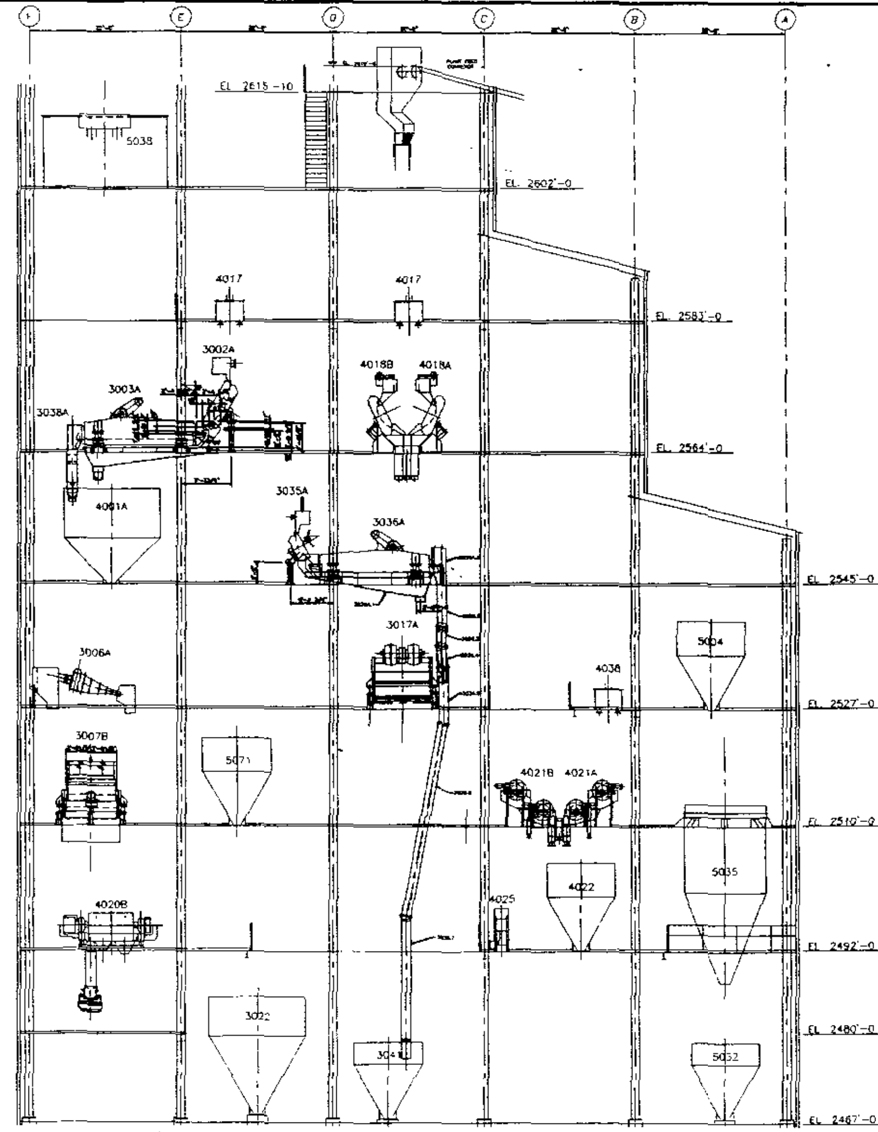
SCALE 1/8"=1'-0
DESIGNED BY J.R.L. 11-4-93
DRAWN BY G.H.LYON 11-4-93

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT – SECTION @ COLUMN LINE 5

JOB No USA-93001 DWG No 30-01-5016 REVISION R-0



SECTION @ COLUMN LINE 6

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NOTE
WORK THIS DWG WITH CHUTEWORK REFERENCE
DWG.#'S 30-01-5568, 30-01-5512, 30-01-5533
30-01-5579, 30-01-5582 & 30-01-5583

NO.	DATE	REVISION
0	11/8/93	ISSUE FOR CONSTRUCTION

SCALE 1/8"=1'-0

DATE 11-8-93

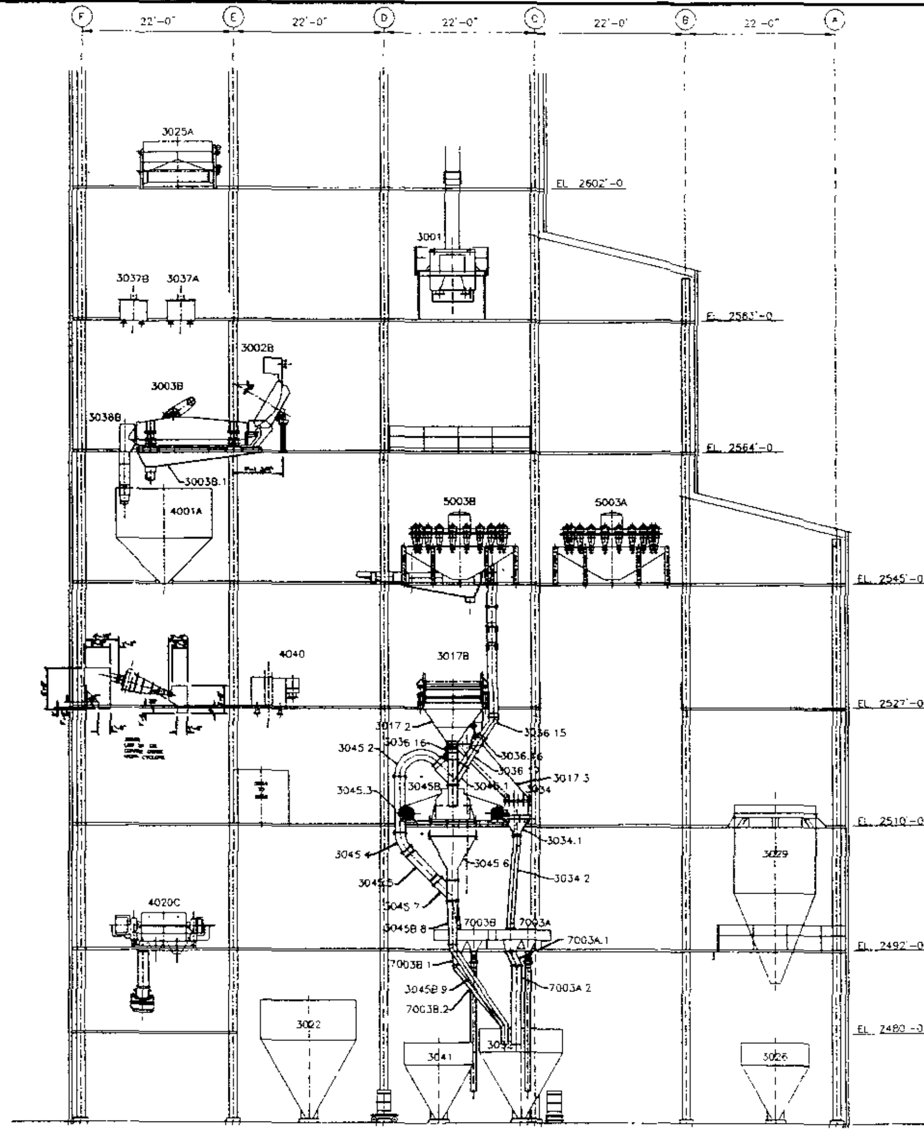
DRAWN C.H.LUNN 11-8-93

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA.

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - SECTION @ COLUMN LINE 6

JOB No USA-93301 | DWG No 30-01-5017 | REVISION R-0



SECTION @ COLUMN LINE 7

NOTE
WORK THIS DWG WITH CHUTEWORK REFERENCE
DWG#'S 30-01-5508, 30-01-5511, 30-01-5512,
30-01-5533, 30-01-5534, 30-01-5535,
30-01-5577, 30-01-5578, 30-01-5583
& 30-01-5584

NO.	DATE	REVISION
		ISSUE FOR CONSTRUCTION

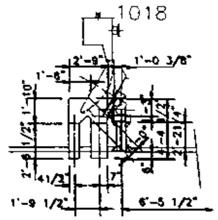
SCALE 3/8"=1'-0 — DATE 11-19-93

Custom Coals International

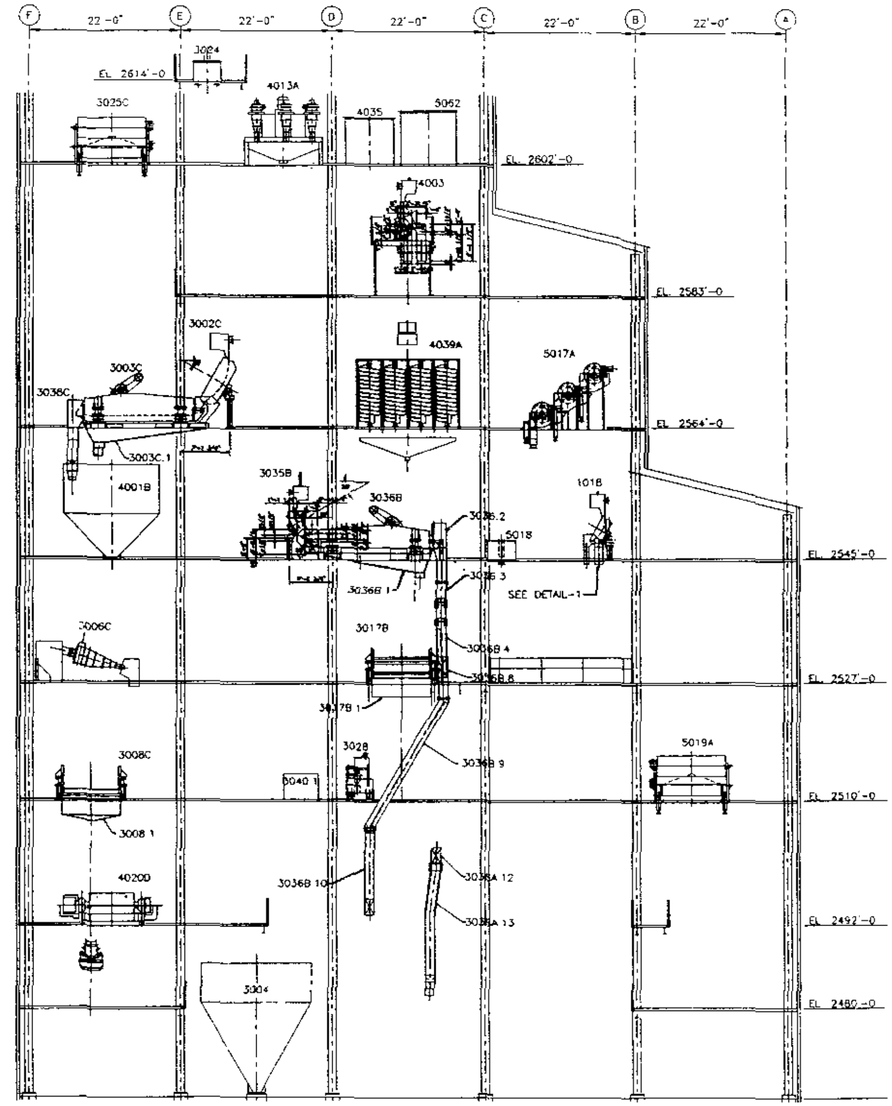
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT – SECTION @ COLUMN LINE 7

JOB No GSA-2300 — DWG No 30-01-5018 — REVISION P-0



DETAIL-1



SECTION @ COLUMN LINE 8

FILE C:\C\CCI\J93002\A\5019

NOTE
WORK THIS DWG WITH CHUTEWORK REFERENCE
DWG.#'S 30-01-5508, 30-01-5509, 30-01-5511,
30-01-5512, 30-01-5523, 30-01-5580
30-01-5582 & 30-01-5583

NO.	DATE	REVISION	BY	CHK APP	APP
0	12/8/93	ISSUE FOR CONSTRUCTION			

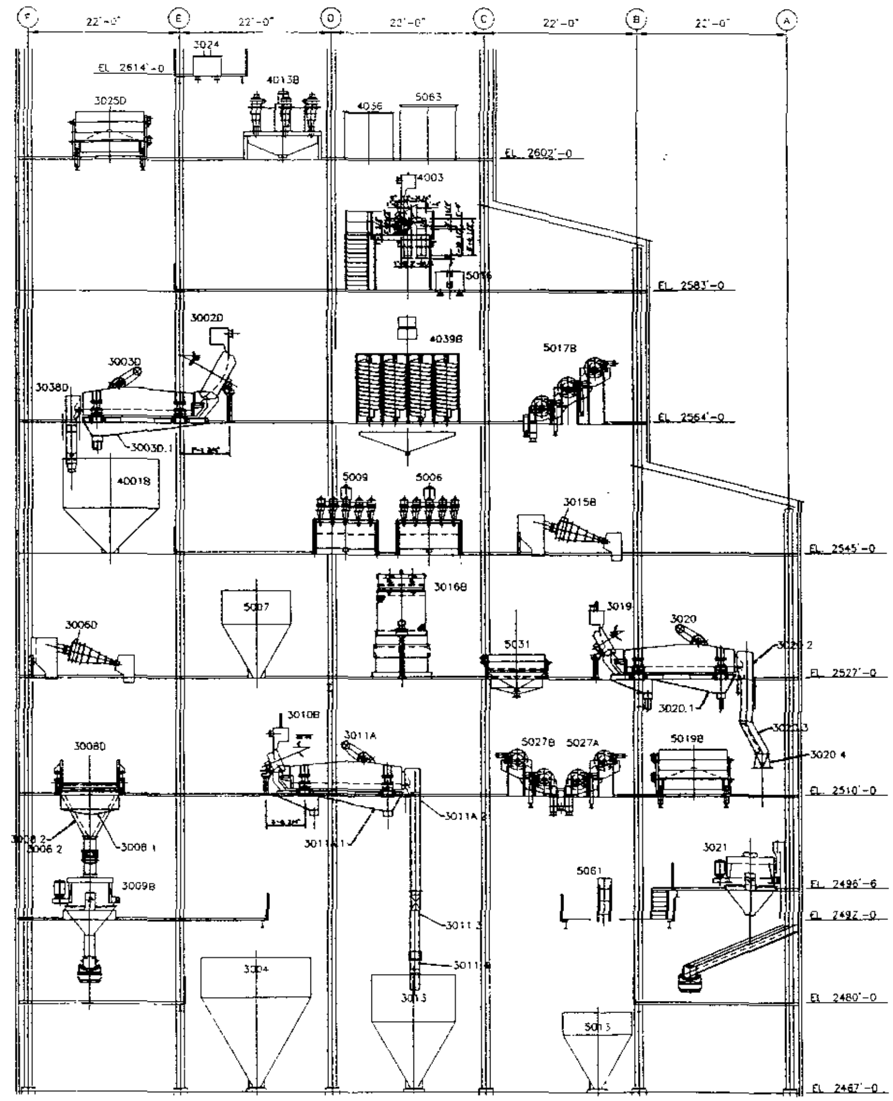
SCALE: 1/8"=1'-0"		DATE
DESIGNED BY	J.R.L.	11-8-93
DRAWN BY	G.R.LUDDI	11-8-93
CHECKED BY		
APPROVED BY		

Custom Coals International

CUSTOM COALS PLANT No.1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - SECTION @ COLUMN LINE 8

JOB No US4-93001 | DWG No 30-01-5019 | REVISION R-0



SECTION @ COLUMN LINE 9

FILE C:\C\CCI\J93002\A\5020

NOTE:
WORK THIS DWG WITH CHUTEWORK REFERENCE
DWG #'S 30-01-5508 30-01-5509 30-01-5510
30-01-5531 30-01-5532 30-01-5536
& 30-01-5572

NO	DATE	REVISION
0	11/8/93	ISSUE FOR CONSTRUCTION

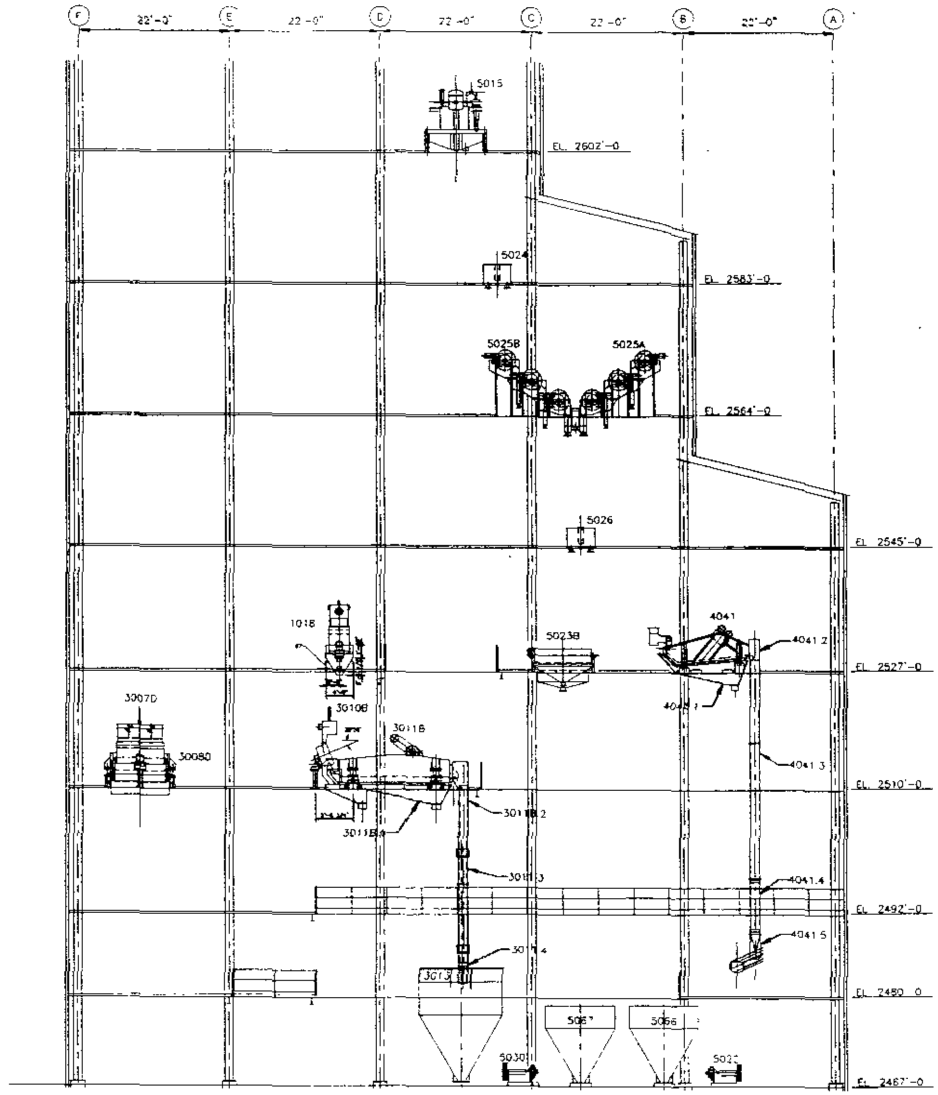
SCALE 1/8"=1'-0 — DESIGNED J.R.L. 11-8-93 — DRAWN C.M.LUHN 11-8-93

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA.

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT - SECTION @ COLUMN LINE 9

JOB No. USA-93001 — DWG No. 30-01-5020



SECTION @ COLUMN LINE 10

SECTION @ COLUMN LINE 10

NOTE
WORK THIS DWG WITH CHUTEWORK REFERENCE
DWG #'S 30-01-5510 & 30-01-5515

NO.	DATE	REVISION		
0	11/30/93	ISSUE FOR CONSTRUCTION		

CONSTRUCTION APPROVAL

APPROVAL

SCALE	1/8"=1'-0	DATE
DESIGNED BY	J.P.L.	11-8-93
DRAWN BY	G.KLUMN	11-8-93
CHECKED BY		
APPROVED BY		
APPROVED BY		

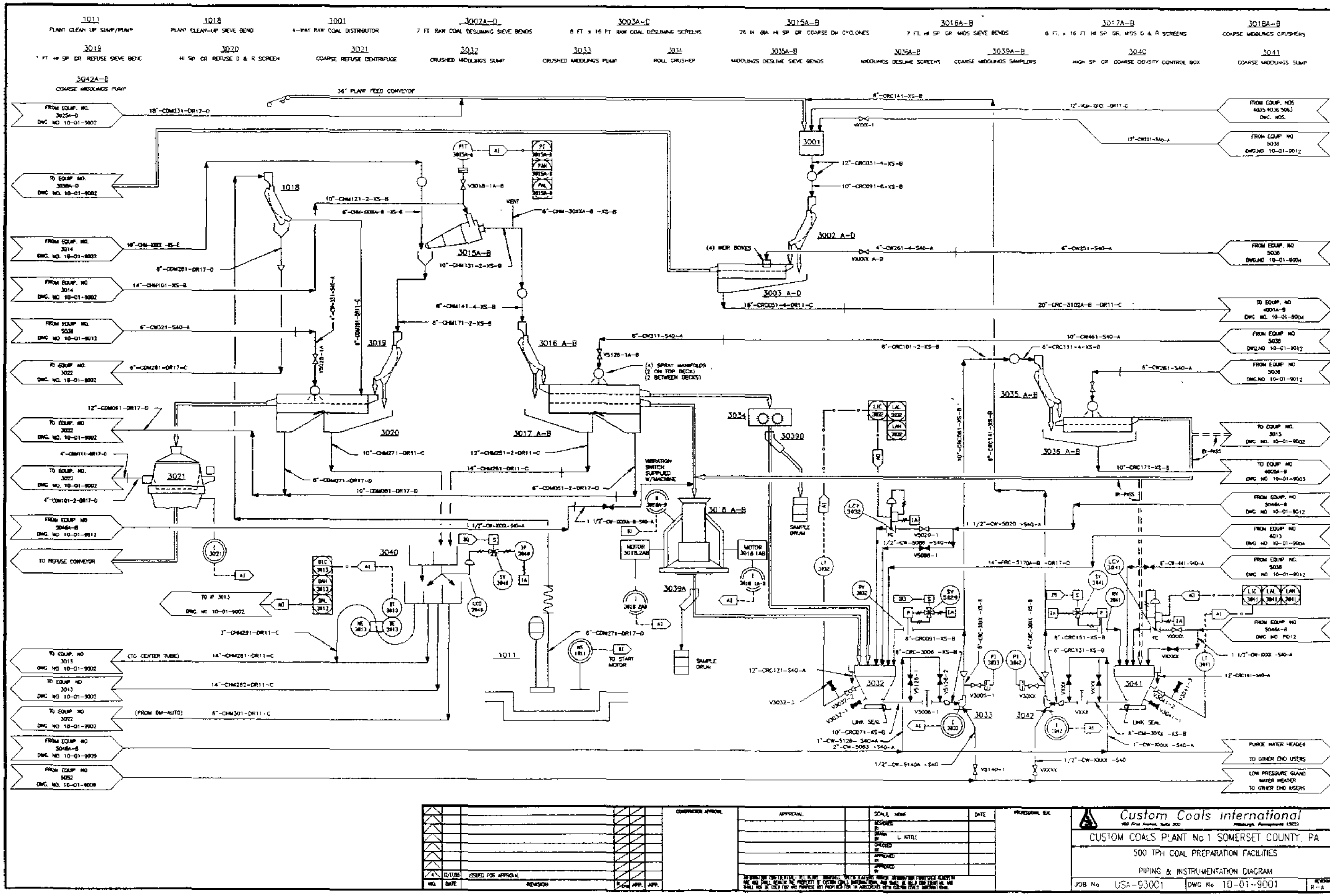
PROFESSIONAL SEAL

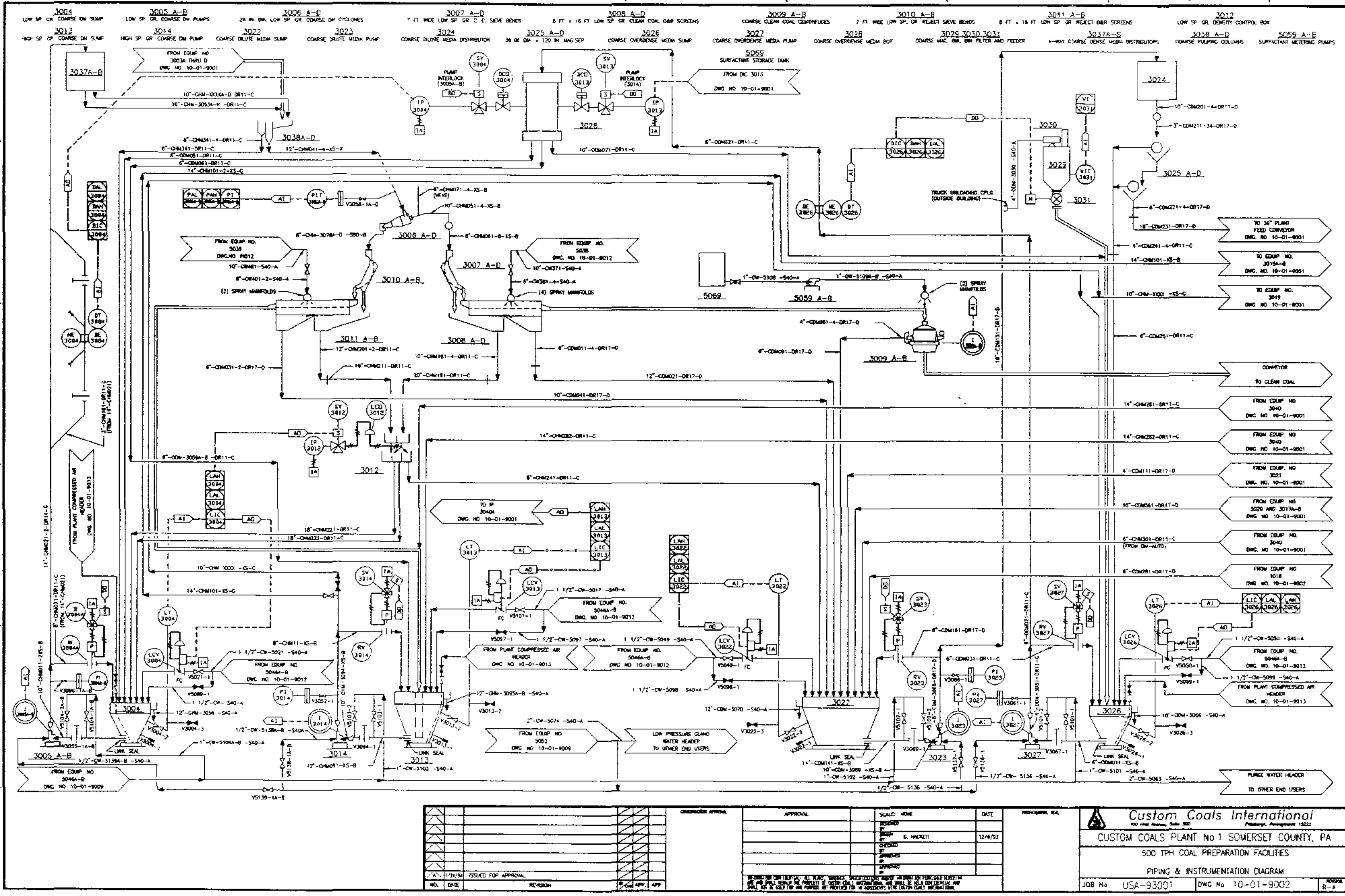
Custom Coals International

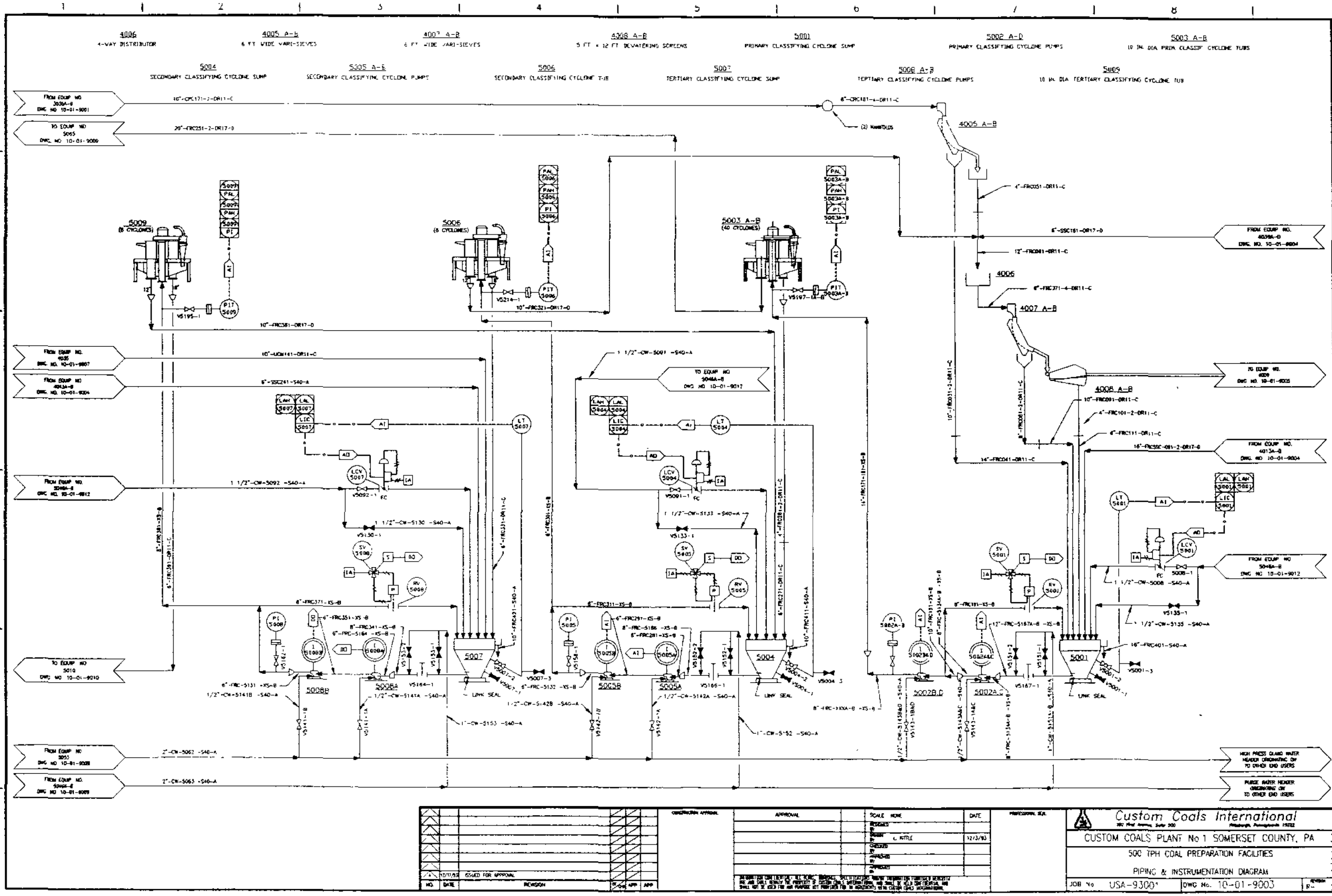
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES
COAL PREPARATION PLANT
GENERAL ARRANGEMENT – SECTION @ COLUMN LINE 10

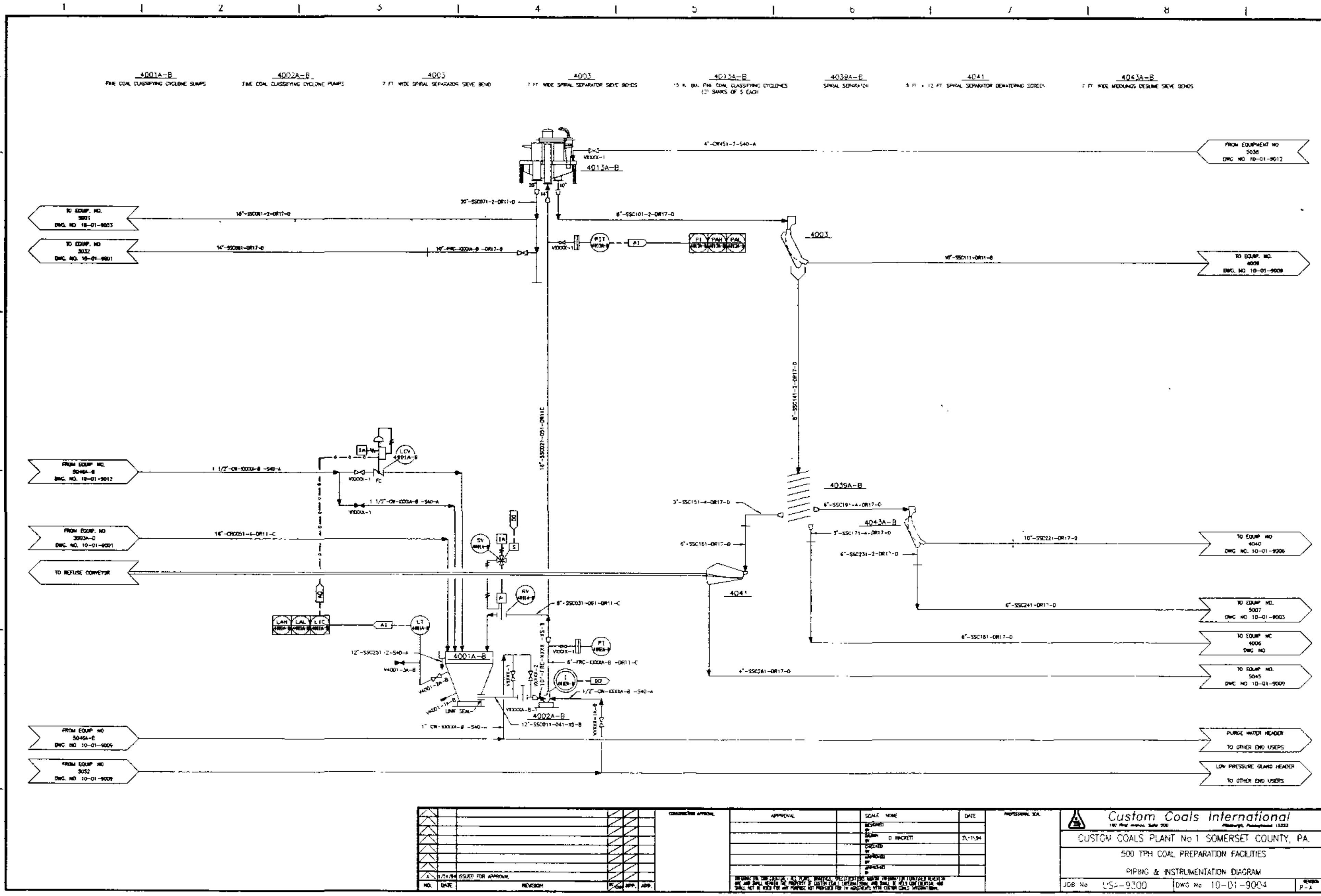
JOB No 13-93001 DWG No 30-01-5021 REVISION R-0


1011 PLANT CLEAN UP SUMP/PUMP
1018 PLANT CLEAN-UP SIEVE BEND
3001 4-WAY RAW COAL DISTRIBUTOR
3002A-D 7 FT RAW COAL DESLIMING SIEVE BENDS
3003A-C 8 FT x 16 FT RAW COAL DESLIMING SCREENS
3015A-B 26 IN DIA HI SP GR COARSE DM CYCLONES
3016A-B 7 FT HI SP GR MIDS SIEVE BENDS
3017A-B 8 FT x 16 FT HI SP GR MIDS D & R SCREENS
3018A-B COARSE MIDDLINGS CRUSHERS
3019 7 FT HI SP GR REFUSE SIEVE BEND
3020 HI SP GR REFUSE D & R SCREEN
3021 COARSE REFUSE CENTRIFUGE
3032 CRUSHED MIDDLINGS SUMP
3033 CRUSHED MIDDLINGS PUMP
3034 ROLL CRUSHER
3035A-B MIDDLINGS DESLIME SIEVE BENDS
3036A-B MIDDLINGS DESLIME SCREENS
3039A-B COARSE MIDDLINGS SAMPLERS
3040 HIGH SP GR COARSE DENSITY CONTROL BOX
3041 COARSE MIDDLINGS SUMP
3042A-B COARSE MIDDLINGS PUMP
36" PLANT FEED CONVEYOR
TO REFUSE CONVEYOR
PURGE WATER HEADER TO OTHER DM USERS
LOW PRESSURE GLAND WATER HEADER TO OTHER DM USERS
Custom Coals International
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA
500 TPH COAL PREPARATION FACILITIES
PIPING & INSTRUMENTATION DIAGRAM
JOB No USA-93001
DWG No 10-01-9001
ISSUED FOR APPROVAL

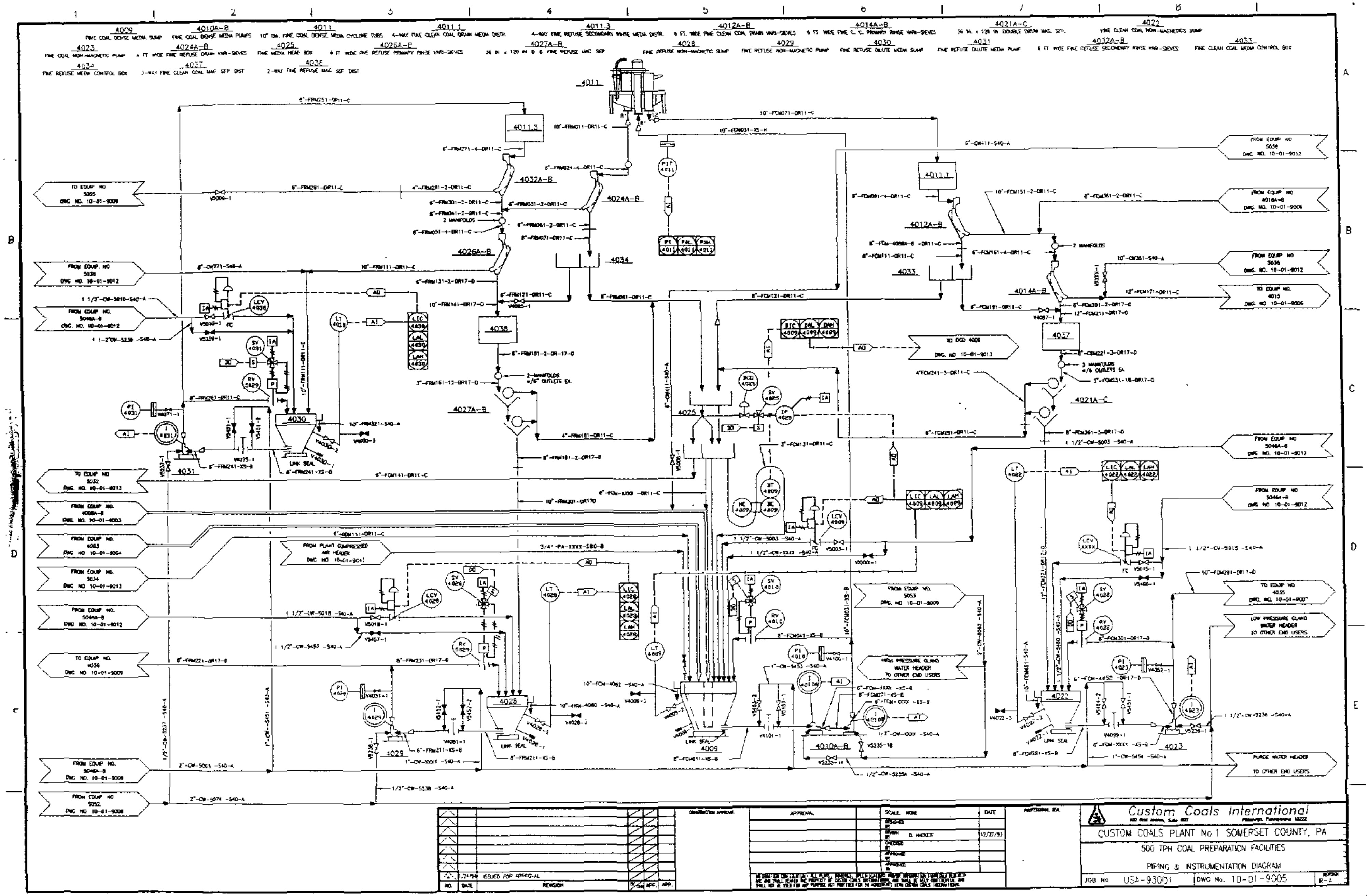

3004 LOW SP GR COARSE DM SUMP
3005 A–B LOW SP GR COARSE DM PUMPS
3006 A–D 26 IN DIA LOW SP GR COARSE DM CYCLONES
3007 A–D 7 FT WIDE LOW SP GR 2 C SIEVE BENDS
3008 A–D 8 FT x 16 FT LOW SP GR CLEAN COAL D&R SCREENS
3009 A–B COARSE CLEAN COAL CENTRIFUGES
3010 A–B 7 FT WIDE LOW SP GR REJECT SIEVE BENDS
3011 A–B 8 FT x 16 FT LOW SP GR REJECT D&R SCREENS
3012 LOW SP GR DENSITY CONTROL BOX
3013 HIGH SP GR COARSE DM SUMP
3014 HIGH SP GR COARSE DM PUMP
3022 COARSE DILUTE MEDIA SUMP
3023 COARSE DILUTE MEDIA PUMP
3024 COARSE DILUTE MEDIA DISTRIBUTOR
3025 A–D 36 IN DIA x 120 IN MAG SEP
3026 COARSE OVERDENSE MEDIA SUMP
3027 COARSE OVERDENSE MEDIA PUMP
3028 COARSE OVERDENSE MEDIA BOX
3029,3030,3031 COARSE MAG. BIN, BIN FILTER AND FEEDER
3037A–B 4-WAY COARSE DENSE MEDIA DISTRIBUTORS
3038 A–D COARSE PULPING COLUMNS
5059 A–B SURFACTANT METERING PUMPS
5059 SURFACTANT STORAGE TANK
FROM EQUIP NO 3003A THRU D DWG NO 10-01-9001
FROM DIC 3013 DWG NO 10-01-9001
TRUCK UNLOADING CPLG (OUTSIDE BUILDING)
TO 36" PLANT FEED CONVEYOR DWG. NO 10-01-9001
TO EQUIP NO. 3015A-B DWG. NO. 10-01-9001
TO EQUIP NO. 3019 DWG NO 10-01-9001
CONVEYOR TO CLEAN COAL
FROM EQUIP NO 3040 DWG NO 10-01-9001
FROM EQUIP NO 3021 DWG. NO. 10-01-9001
FROM EQUIP NO 3020 AND 3017A-B
FROM EQUIP NO 1018 DWG NO 10-01-9002
FROM PLANT COMPRESSED AIR HEADER DWG NO 10-01-9013
FROM EQUIP NO 5046A-B DWG NO 10-01-9012
FROM EQUIP NO 5052 DWG NO 10-01-9009
LOW PRESSURE GLAND WATER HEADER TO OTHER END USERS
PURGE WATER HEADER TO OTHER END USERS
FROM EQUIP NO 5046A-B DWG NO 10-01-9009
TO IP 3040A DWG NO 10-01-9001
Custom Coals International
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA
500 TPH COAL PREPARATION FACILITIES
PIPING & INSTRUMENTATION DIAGRAM
JOB No USA-93001
DWG No 10-01-9002
REVISION R-A
SCALE: NONE
D. HACKETT 12/4/93
A 1/24/94 ISSUED FOR APPROVAL

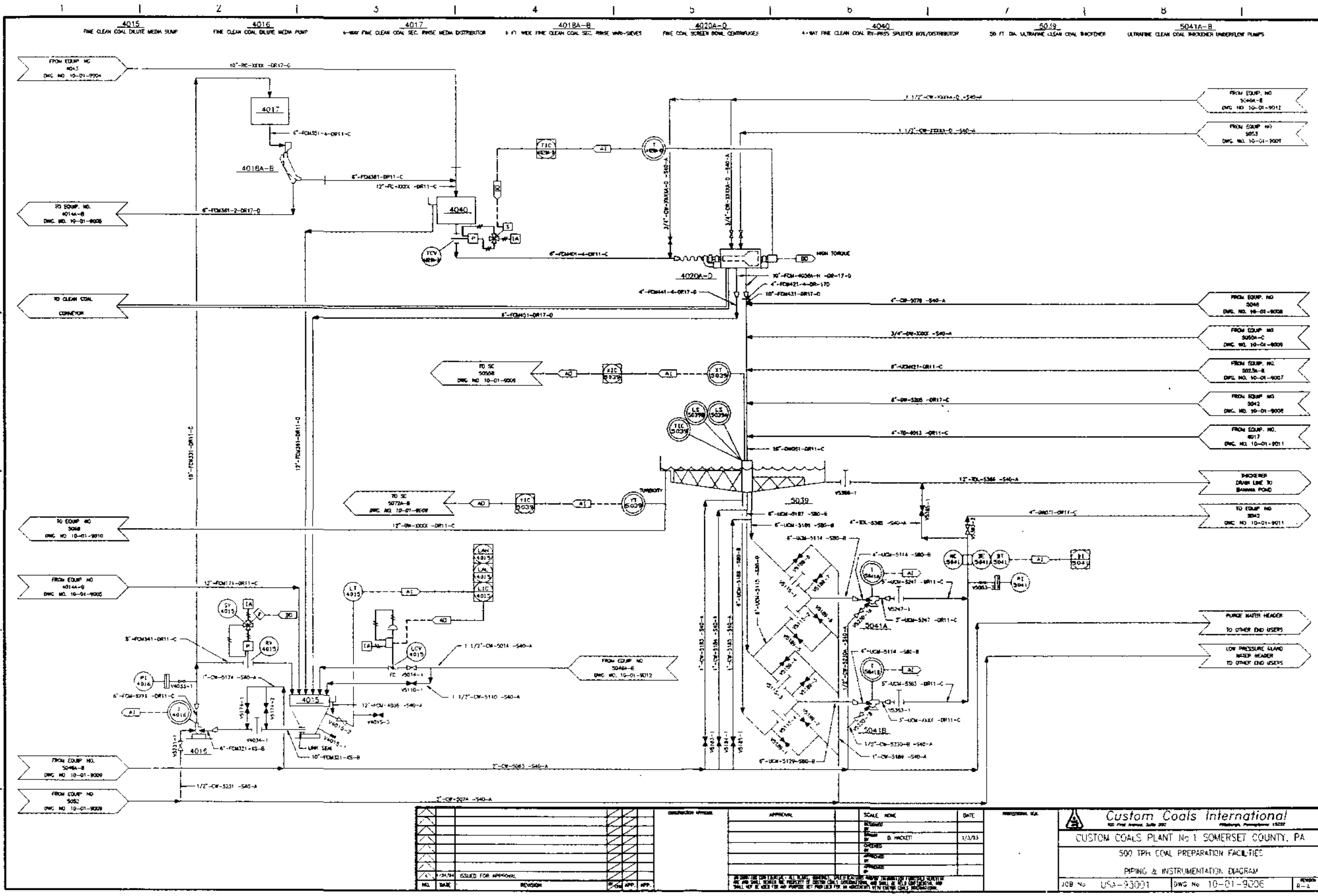


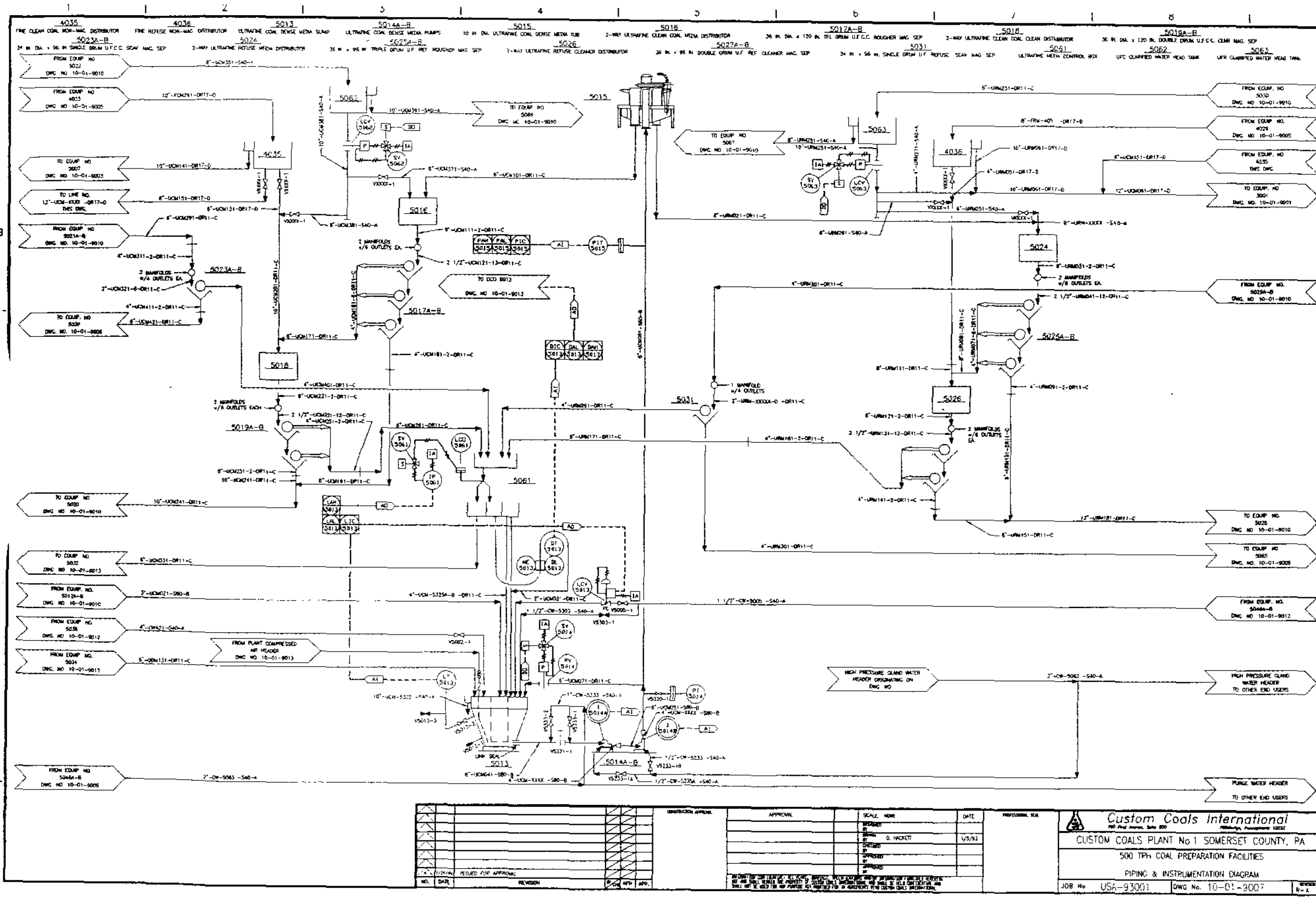
4006 4-WAY DISTRIBUTOR
4005 A-B 6 FT WIDE VARI-SIEVES
4007 A-B 6 FT WIDE VARI-SIEVES
4308 A-B 5 FT x 12 FT DEWATERING SCREENS
5001 PRIMARY CLASSIFYING CYCLONE SUMP
5002 A-D PRIMARY CLASSIFYING CYCLONE PUMPS
5003 A-B 10 IN. DIA PRIM CLASSIF CYCLONE TUBS
5004 SECONDARY CLASSIFYING CYCLONE SUMP
5005 A-E SECONDARY CLASSIFYING CYCLONE PUMPS
5006 SECONDARY CLASSIFYING CYCLONE TUB
5007 TERTIARY CLASSIFYING CYCLONE SUMP
5008 A-B TERTIARY CLASSIFYING CYCLONE PUMPS
5009 10 IN. DIA TERTIARY CLASSIFYING CYCLONE TUB
5009 (8 CYCLONES)
5006 (8 CYCLONES)
5003 A-B (40 CYCLONES)
LINK SEAL
HIGH PRESS GLAND WATER HEADER ORIGINATING ON TO OTHER END USERS
PURGE WATER HEADER ORIGINATING ON TO OTHER END USERS
ISSUED FOR APPROVAL
NO. DATE REVISION
APPROVAL
SCALE NONE
DATE
Custom Coals International
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA
500 TPH COAL PREPARATION FACILITIES
PIPING & INSTRUMENTATION DIAGRAM
JOB No. USA-9300
DWG No. 10-01-9003

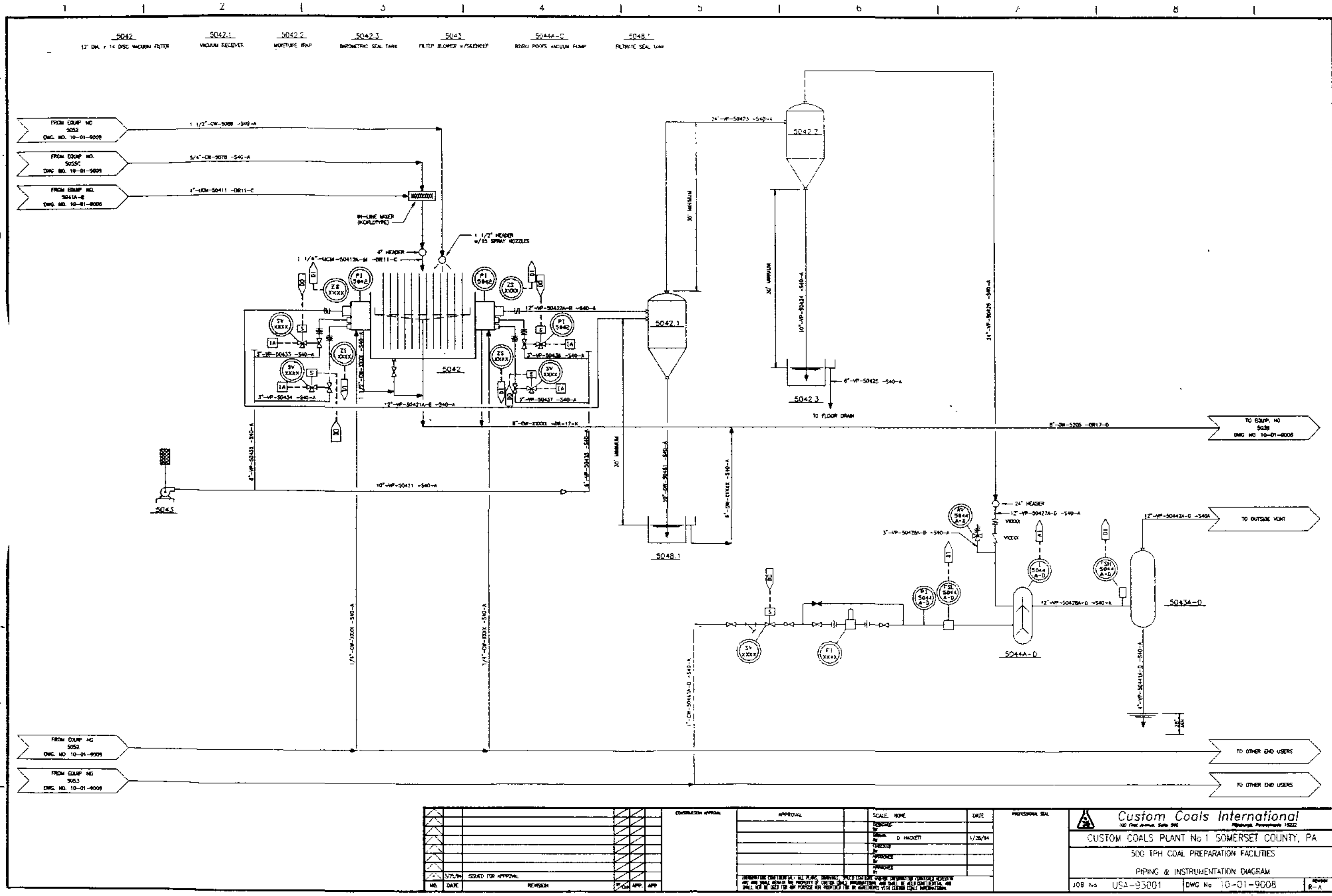


4001A-B
FINE COAL CLASSIFYING CYCLONE SUMPS
4002A-B
FINE COAL CLASSIFYING CYCLONE PUMPS
4003
7 FT WIDE SPIRAL SEPARATOR SIEVE BEND
4013A-B
4039A-B
SPIRAL SEPARATOR
4041
4043A-B
TO REFUSE CONVEYOR
PURGE WATER HEADER
TO OTHER END USERS
LOW PRESSURE GLAND HEADER
TO OTHER END USERS
ISSUED FOR APPROVAL
REVISION
APPROVAL
SCALE NONE
DATE
Custom Coals International
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA.
500 TPH COAL PREPARATION FACILITIES
PIPING & INSTRUMENTATION DIAGRAM
JOB No USA-9300
DWG No 10-01-9004

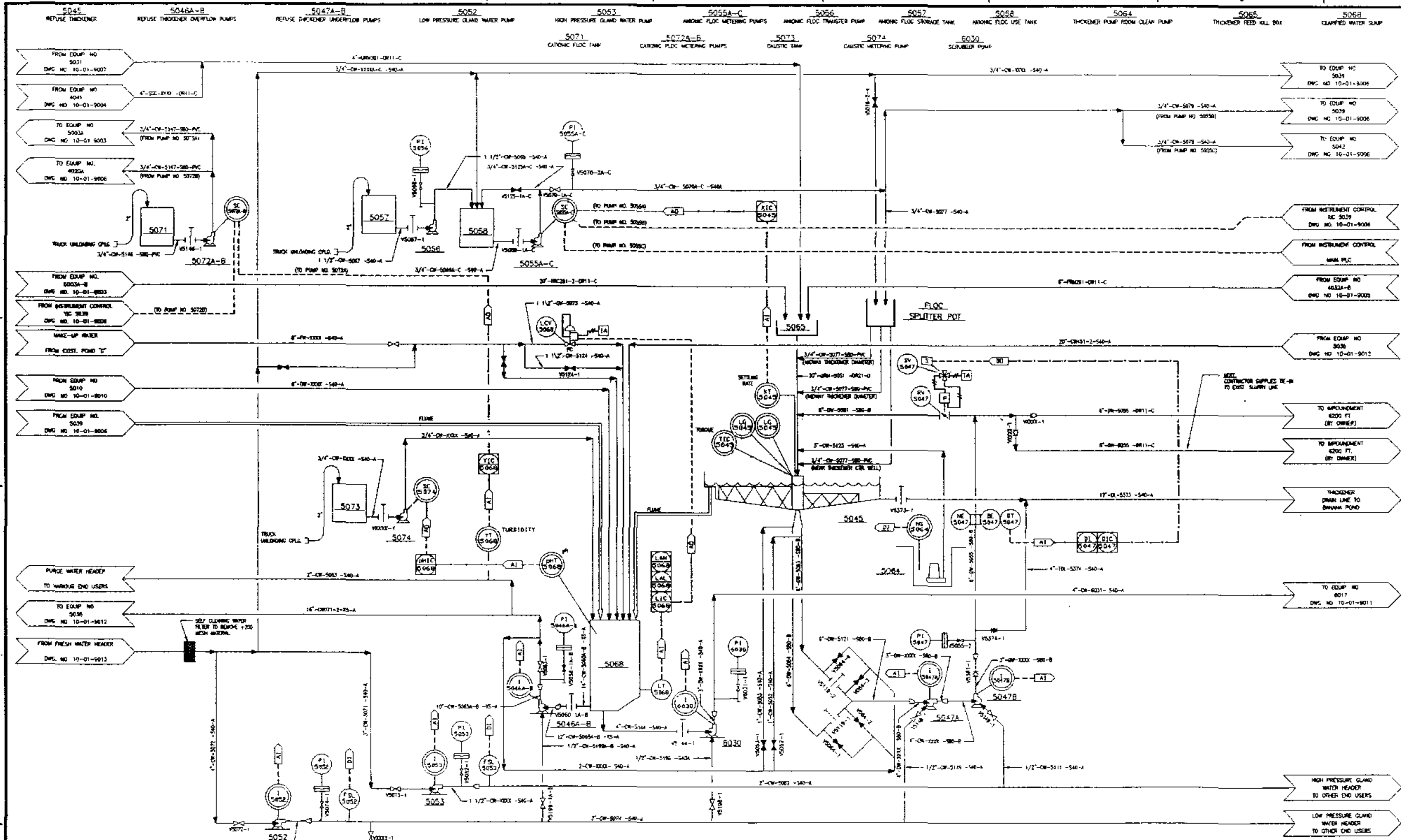

Custom Coals International
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA
500 TPH COAL PREPARATION FACILITIES
PIPING & INSTRUMENTATION DIAGRAM
JOB No. USA-93001
DWG No. 10-01-9005
ISSUED FOR APPROVAL
REVISION
SCALE NONE
DATE
APPROVAL
CONSTRUCTION APPROVAL
PROFESSIONAL SEAL


4015
FINE CLEAN COAL DILUTE MEDIA SUMP
4016
FINE CLEAN COAL DILUTE MEDIA PUMP
4017
4-WAY FINE CLEAN COAL SEC. RINSE MEDIA DISTRIBUTOR
4018A-B
6 FT WIDE FINE CLEAN COAL SEC. RINSE WAS-SIEVES
4020A-D
FINE COAL SCREEN BOWL CENTRIFUGES
4040
4-WAY FINE CLEAN COAL BY-PASS SPLITTER BOX/DISTRIBUTOR
5039
50 FT DIA ULTRAFINE CLEAN COAL THICKENER
5041A-B
ULTRAFINE CLEAN COAL THICKENER UNDERFLOW PUMPS
TO CLEAN COAL CONVEYOR
HIGH TORQUE
TURBIDITY
PURGE WATER HEADER TO OTHER END USERS
LOW PRESSURE GLAND WATER HEADER TO OTHER END USERS
THICKENER DRAIN LINE TO BANANA POND
LINK SEAL
ISSUED FOR APPROVAL
REVISION
APPROVAL
SCALE NONE
DATE
D. HACKETT
Custom Coals International
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA
500 TPH COAL PREPARATION FACILITIES
PIPING & INSTRUMENTATION DIAGRAM
JOB No USA-93001
DWG No 10-01-9006


Custom Coals International
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA
500 TPH COAL PREPARATION FACILITIES
PIPING & INSTRUMENTATION DIAGRAM
JOB No USA-93001
DWG No. 10-01-3007
ISSUED FOR APPROVAL
D. HACKETT
1/5/93



5042
12' DIA. x 14 DISC VACUUM FILTER
5042.1
VACUUM RECEIVER
5042.2
MOISTURE TRAP
5042.3
BAROMETRIC SEAL TANK
5043
FILTER BLOWER w/SILENCER
5044A-C
BOSVU POOYS VACUUM PUMP
5048.1
FILTRATE SEAL TANK
FROM EQUIP NO 5053 DWG. NO. 10-01-9009
FROM EQUIP NO. 5055C DWG. NO. 10-01-9009
FROM EQUIP NO. 5041A-B DWG. NO. 10-01-9008
IN-LINE MIXER (KOFLOTYPE)
4" HEADER
1 1/2" HEADER w/15 SPRAY NOZZLES
TO FLOOR DRAIN
TO EQUIP. NO 5038 DWG NO 10-01-9008
TO OUTSIDE VENT
24" HEADER
5044A-D
50434-D
30' MINIMUM
FROM EQUIP NO 5052 DWG. NO. 10-01-9009
FROM EQUIP NO 5053 DWG. NO. 10-01-9009
TO OTHER END USERS
TO OTHER END USERS
Custom Coals International
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA
500 TPH COAL PREPARATION FACILITIES
PIPING & INSTRUMENTATION DIAGRAM
JOB No USA-93001
DWG No 10-01-9008
R-A
SCALE NONE
D HACKETT
1/26/94
ISSUED FOR APPROVAL
APPROVAL
CONSTRUCTION APPROVAL
PROFESSIONAL SEAL
REVISION
NO. DATE



NO.	DATE	REVISION		
A	3/25/94	ISSUED FOR APPROVAL		

SCALE: NONE — DRAWN: J. HACKETT — 2/7/94

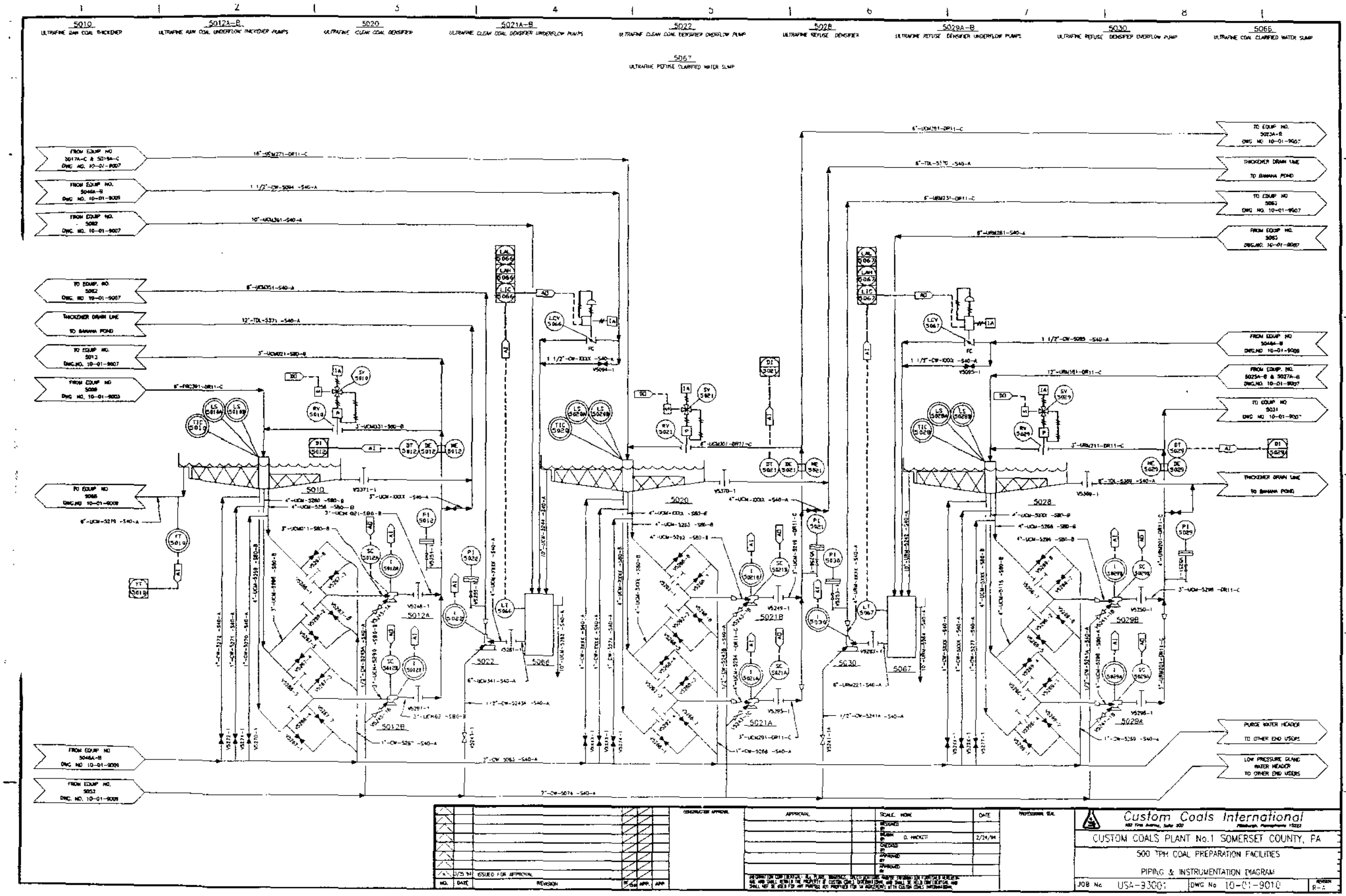
Custom Coals International

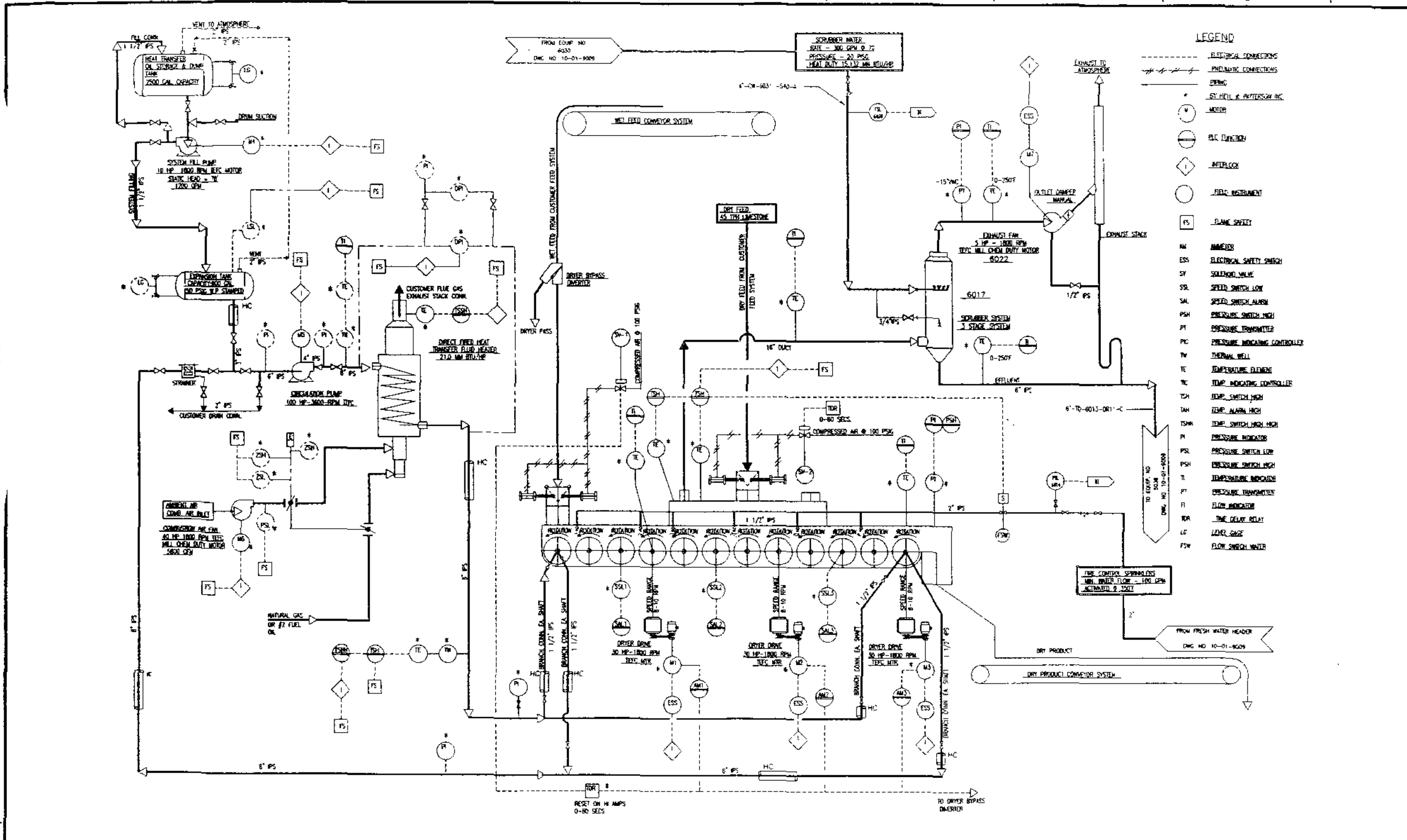
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES

PIPING & INSTRUMENTATION DIAGRAM

JOB No. USA-93001 DWG No. 10-01-9009


5010
ULTRAFINE RAW COAL THICKENER
5012A-B
ULTRAFINE RAW COAL UNDERFLOW THICKENER PUMPS
5020
ULTRAFINE CLEAN COAL DENSIFIER
5021A-B
ULTRAFINE CLEAN COAL DENSIFIER UNDERFLOW PUMPS
5022
ULTRAFINE CLEAN COAL DENSIFIER OVERFLOW PUMP
5028
ULTRAFINE REFUSE DENSIFIER
5029A-B
ULTRAFINE REFUSE DENSIFIER UNDERFLOW PUMPS
5030
ULTRAFINE REFUSE DENSIFIER OVERFLOW PUMP
5066
ULTRAFINE COAL CLARIFIED WATER SUMP
5067
ULTRAFINE REFUSE CLARIFIED WATER SUMP
PURGE WATER HEADER
TO OTHER END USERS
LOW PRESSURE GLAND WATER HEADER
TO OTHER END USERS
THICKENER DRAIN LINE
TO BANANA POND
ISSUED FOR APPROVAL
Custom Coals International
CUSTOM COALS PLANT No.1 SOMERSET COUNTY, PA
500 TPH COAL PREPARATION FACILITIES
PIPING & INSTRUMENTATION DIAGRAM
JOB No. USA-93001
DWG No. 10-01-9010
REVISION R-A



NO.	DATE	REVISION	
	3/2/94	ISSUED FOR APPROVAL	

SCALE 1/8"=1'-0"

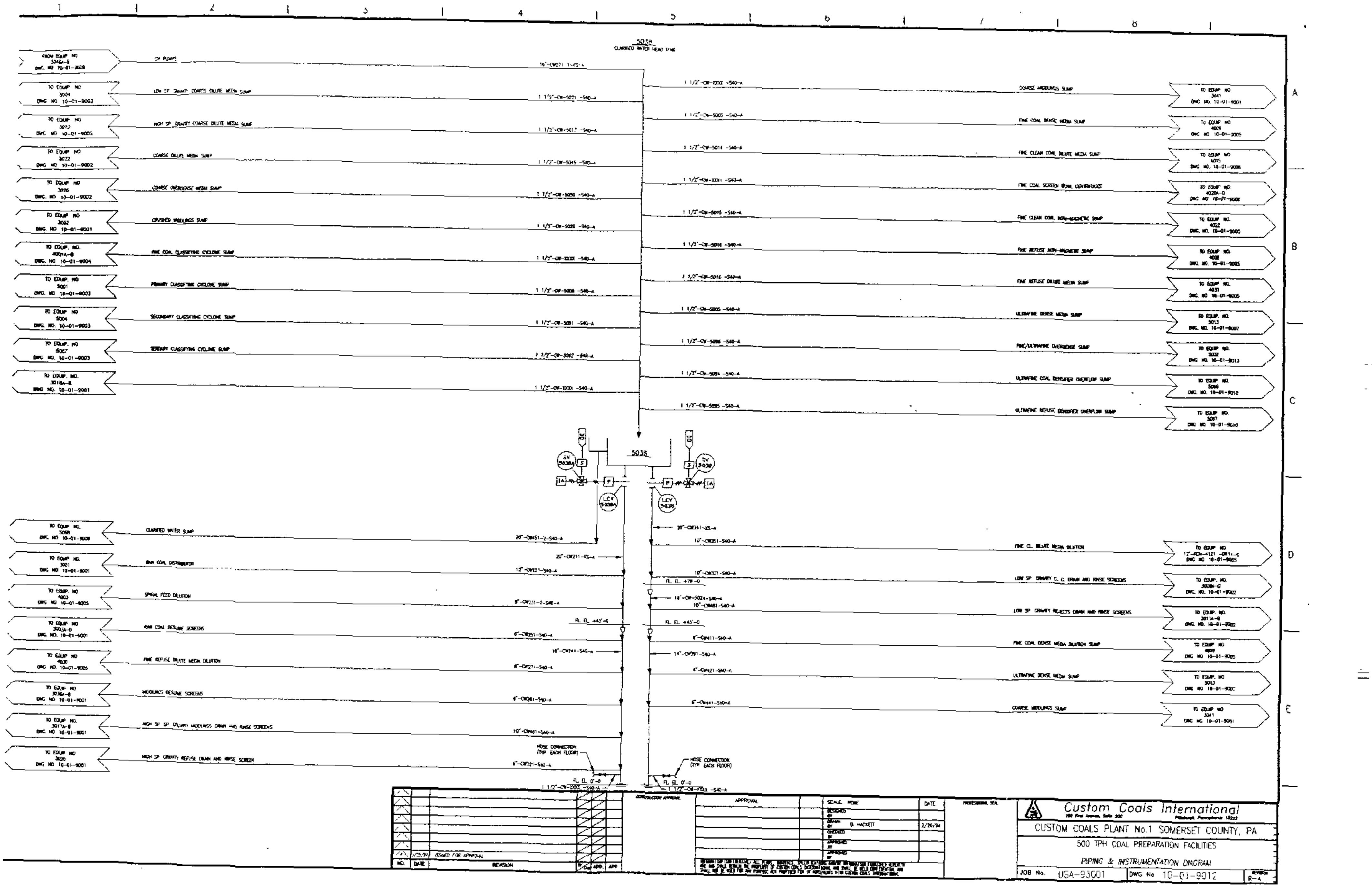
Custom Coals International

CUSTOM COALS PLANT No.1 SOMERSET COUNTY, PA

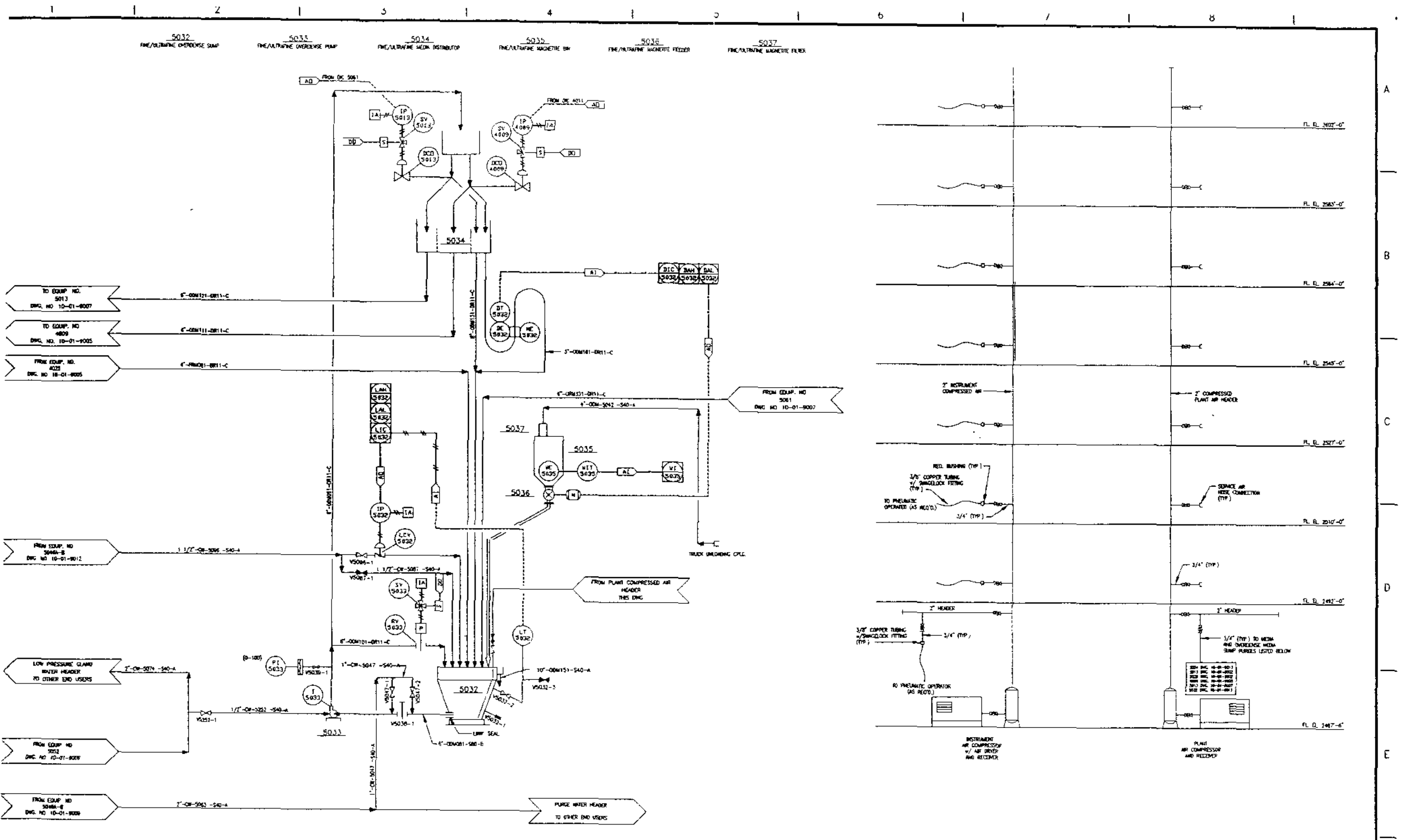
500 TPH COAL PREPARATION FACILITIES

PIPING & INSTRUMENTATION DIAGRAM

JOB No. USA-93001 | DWG No. 10-01-901



5038
CLARIFIED WATER HEAD TANK
5038
Custom Coals International
CUSTOM COALS PLANT No.1 SOMERSET COUNTY, PA
500 TPH COAL PREPARATION FACILITIES
PIPING & INSTRUMENTATION DIAGRAM
JOB No. USA-93001
DWG No 10-01-9012
REVISION R-A
SCALE NONE
DATE
APPROVAL
ISSUED FOR APPROVAL
REVISION



NO.	DATE	REVISION	BY	CHK.	APP.	APP.
A	3/25/94	ISSUED FOR APPROVAL				

CONSTRUCTION APPROVAL

APPROVAL

SCALE: NONE
DESIGNED BY
DRAWN BY: R. HACKETT — DATE 2/17/94
CHECKED BY
APPROVED BY
APPROVED BY

PROFESSIONAL SEAL

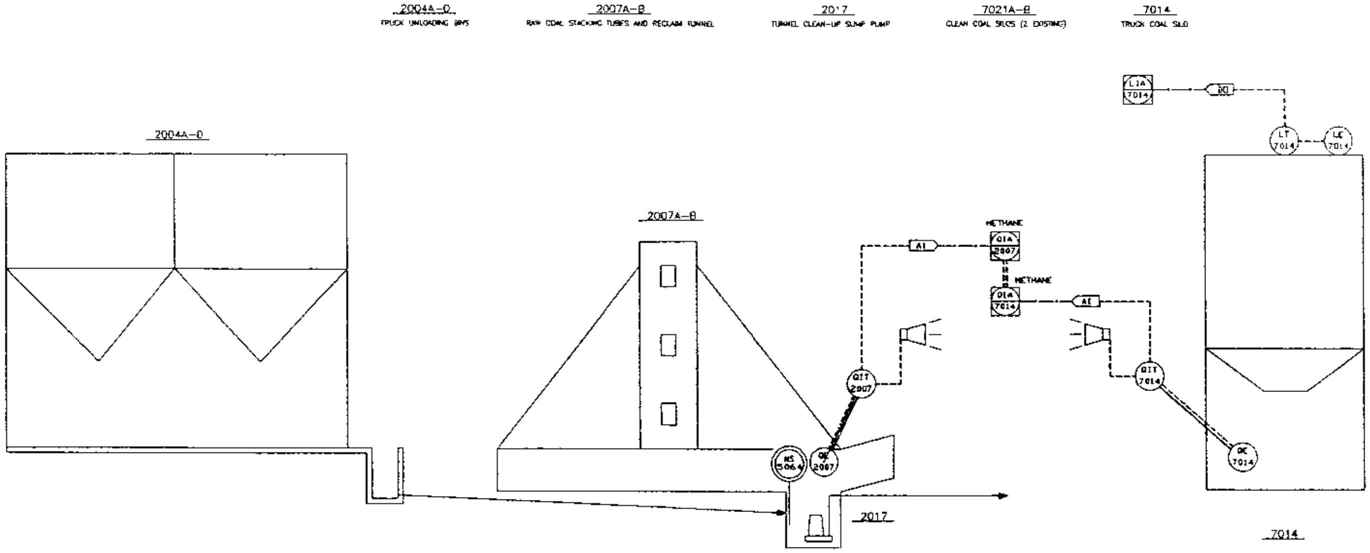
Custom Coals International

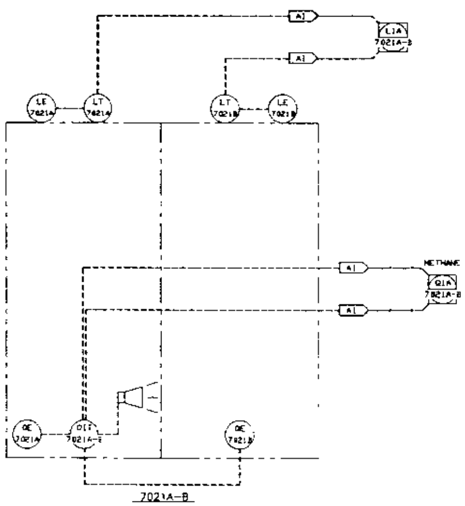
CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

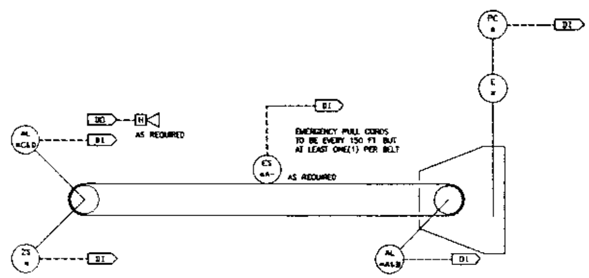
500 TPH COAL PREPARATION FACILITIES

PIPING & INSTRUMENTATION DIAGRAM

JOB No. USA-93001 | DWG No. 10-01-9013 | REVISION R-A







- * INDICATES BELT CONVEYOR UNIT NUMBER
- AL INDICATES BELT ALIGNMENT LIMIT SWITCHES
- ZS INDICATES SPEED SWITCH
- ES INDICATES EMERGENCY PULL CORD COMPLETE WITH CABLE
- PL INDICATES PLUGGED CHUTE SWITCH
- H INDICATES HORN

TYPICAL FOR ALL CONVEYORS

CONVEYOR SCHEDULE

(2005A) RAW COAL STACKING CONVEYOR NO 1
(2005B) RAW COAL STACKING CONVEYOR NO 2
(2009) RAW COAL RECLAIM CONVEYOR NO 3
(2018) PLANT FEED CONVEYOR NO 4
(6001) THERMAL DRYER FEED CONVEYOR NO 5

(7001) CLEAN COAL COLLECTING CONVEYOR NO 6
(7005) CLEAN COAL SILO FEED CONVEYOR NO 8
(7007 CLEAN COAL SILO TRANSFER CONVEYOR NO 9
(7009) RAIL LOADOUT CONVEYOR NO. 10
(7012) TRUCK SILO FEED CONVEYOR NO 11
(7016) TRUCK COAL SILO RECLAIM CONVEYOR NO 12
(8001) PLANT REFUSE CONVEYOR NO 13
(8004) BREAKER REJECTS CONVEYOR NO 14

NO.	DATE	REVISION	BY	CHKD	APP	APP
A	3/25/94	ISSUED FOR APPROVAL				

CONSTRUCTION APPROVAL | APPROVAL | SCALE NONE | DESIGNED BY | DRAWN BY D. HACKETT | DATE 3/11/94 | CHECKED BY | APPROVED BY | APPROVED BY | PROFESSIONAL SEAL

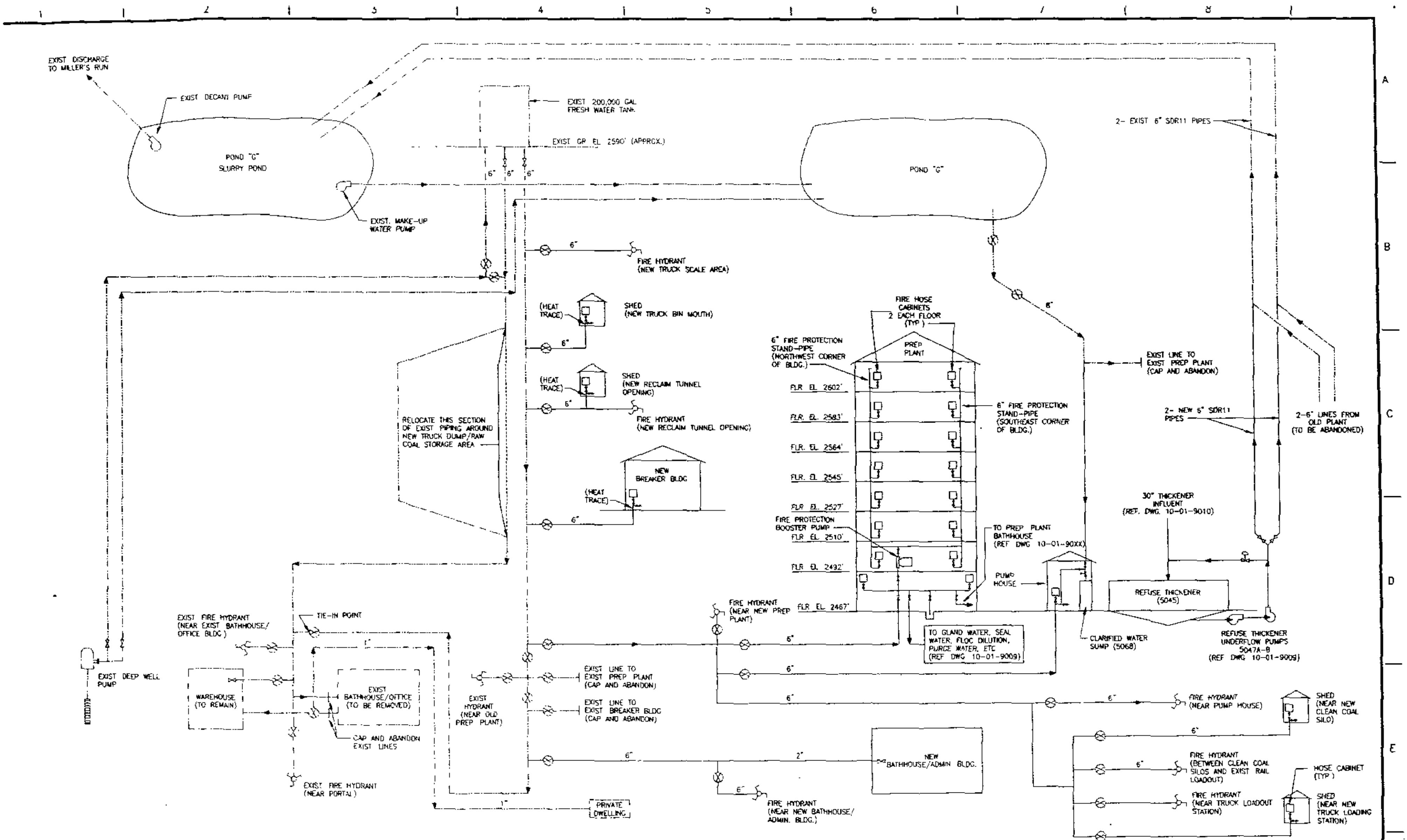
Custom Coals International
100 Fifth Avenue, Suite 300 Pittsburgh, Pennsylvania 15222

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA.

500 TPH COAL PREPARATION FACILITIES

PIPING & INSTRUMENTATION DIAGRAM

JOB No. USA-93001 | DWG No. 10-01-9014 | REVISION R-A



NO.	DATE	REVISION			

CONSTRUCTION APPROVAL | APPROVAL | SCALE NONE | DESIGNED BY | DRAWN BY D. HACKETT | CHECKED BY | APPROVED BY | APPROVED BY | DATE 2/17/94 | PROFESSIONAL SEAL

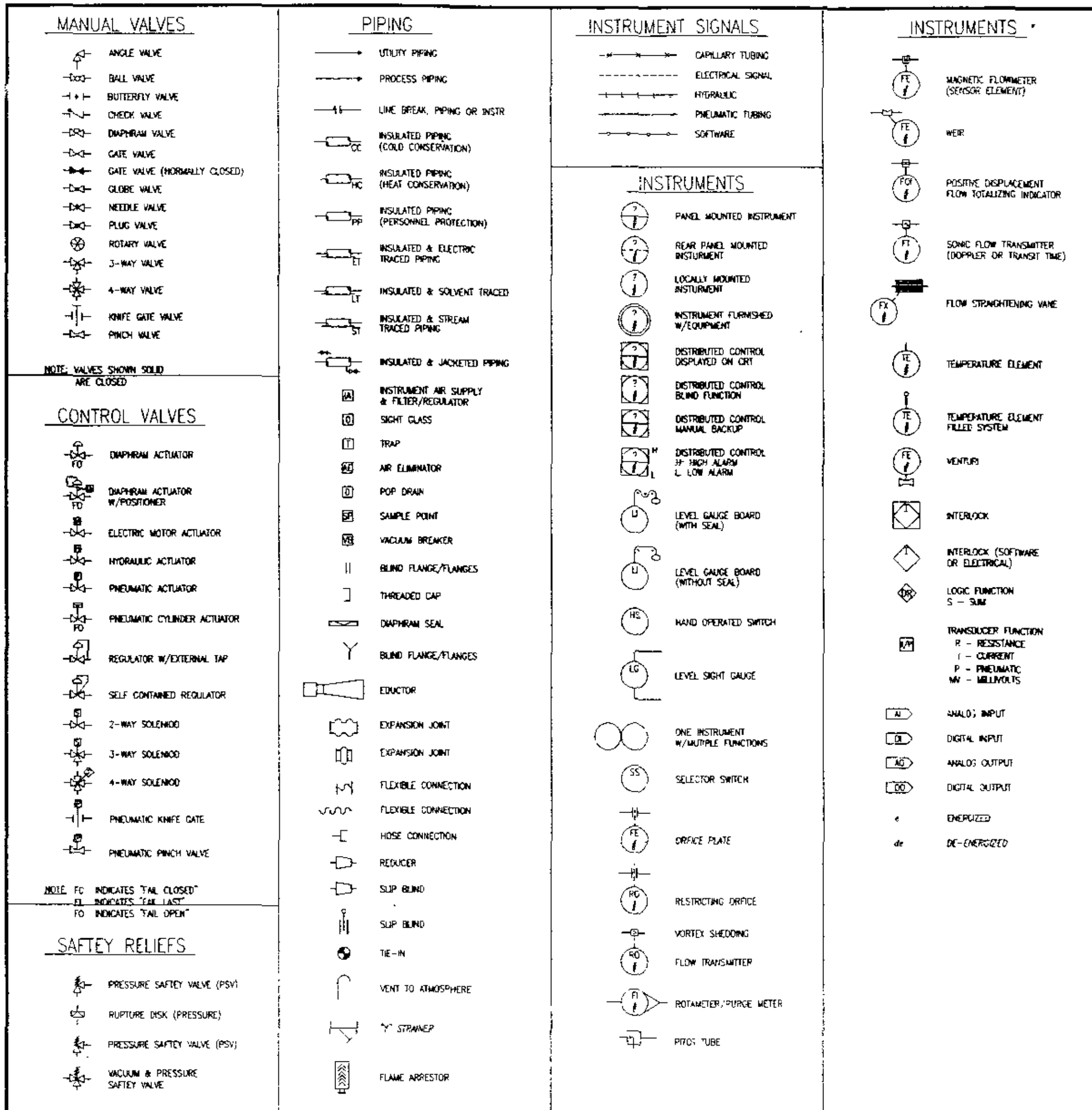
Custom Coals International

CUSTOM COALS PLANT No. 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES

PIPING & INSTRUMENTATION DIAGRAM

JOB No. US4-93001 | DWG No. 10-01-9015 | REVISION R-A



LINE CODE

10"-CW-5029-S40-A

LINE SIZE — FLUID SYMBOL — LINE NUMBER — PIPING SCHEDULE — PIPING SPECIFICATION

FLUID SYMBOLS

PREFIX	SERVICE	PREFIX	SERVICE
CDM	COARSE DILUTE MEDIA		
CHM	COARSE HEAVY MEDIA		
CM	CRUSHED MIDDLINGS		
CRC	COARSE RAW COAL		
CW	CLARIFIED WATER		
DW	DEWARTERING		
FC	FINE COAL		
FCM	FINE COAL MEDIA		
FM	FINE MIDDLINGS		
FR	FINE REFUSE		
FRC	FINE RAW COAL		
FRM	FINE REFUSE MEDIA		
ODM	OVERDENSE MEDIA		
TD	THERMAL DRYER		
UCM	ULTRA-FINE COAL MEDIA		
URM	ULTRA-FINE REFUSE MEDIA		
SSC	SPIRAL SEPARATOR CIRCUIT		
PCA	PLANT COMPRESSED AIR		

INSTRUMENTS FUNCTION IDENTIFICATION SYMBOLS

LTR	1st LETTER	2nd LETTER	3rd LETTER	4th LETTER	LAST LETTER
A	ANALYZER	ALARM	ALARM	ALARM	ALARM
B	BURNER (FLAME)				
C	CONTROL (LOOP)	CONTROLLER	CONTROLLER	CONTROLLER	CONTROLLER
D	DENSITY	DIFFERENTIAL			DRIVE OPERATOR
E	VOLTAGE				
F	FLOW	RATIO	FLOW	FLOW	
G	GAUGE	GAUGE			GLASS
H	HAND (MANUAL)		HIGH	HIGH	HIGH
I	AMPERES	INDICATOR			INDICATOR
J	POWER				MTR. PB & LGT
K	TIME (COUNT)				
L	LEVEL	LEVEL	LOW	LOW	LOW
M	MOISTURE				METER
N	FLOAT SWITCH				
O	OPERATIONAL				
P	PRESSURE	PRESSURE	PRESSURE		PNEUMATIC
Q	SPECIAL	INTEGRATE	INTEGRATE	INTEGRATE	INTEGRATE
R	RECIRCULATION	RECORDER	RECORDER	RECORDER	RECORDER
S	SPEED, SOLENOID	SAFETY	SWITCH	SWITCH	SWITCH
T	TORQUE	TEMPERATURE	TEMPERATURE		TRANSMITTER
U	MULTIVARIABLE	MULTIVARIABLE			MULTIVARIABLE
V	VIBRATION	VALVE	VALVE	VALVE	VALVE
W	WEIGHT				WELL
X	SETTING RATE				
Y	TURBIDITY				
Z	POSITION				COMPUTER
pH	pH				

NO. | DATE | REVISION | BY | APP | APP

CONSTRUCTION APPROVAL | APPROVAL | SCALE 1:1 | DATE | PROFESSIONAL SEAL

DESIGNED BY | DRAWN BY NFW | 1/17/94 | CHECKED BY | APPROVED BY | APPROVED BY

Custom Coals International

CUSTOM COALS PLANT No 1 SOMERSET COUNTY, PA

500 TPH COAL PREPARATION FACILITIES

XXXXXXXXXXXXXX

JOB No. 1154-37001 | DWG No. | REVISION

TABLE A-PROCESS FLOW DIAGRAMS MATERIAL BALANCE

Stream	Ton/H Coal	Ton/H Mag	Ton/H Water	Ton/H Slurry	GPM Coal	GPM Mag	GPM Water	GPM Slurry	% Sol. or % S.M.*
1	500	0	26	526	1,332	0	105	1,437	95.1*
2	6	0	947	953	16	0	3,786	3,802	0.6
3	0	0	25	25	0	0	98	98	0.0
4	0	0	113	113	0	0	452	452	0.0
5	0	0	242	242	0	0	966	966	0.0
6	0	0	379	379	0	0	1,516	1,516	0.0
7	0	0	381	381	0	0	1,523	1,523	0.0
8	506	0	1,734	2,240	1,348	0	6,930	8,278	22.6
9	364	0	64	428	970	0	257	1,227	14.7*
10	0	0	120	120	0	0	480	480	0.0
11	142	0	1,790	1,932	378	0	7,153	7,531	7.3
12	142	0	1,790	1,932	378	0	7,153	7,531	7.3
13	142	0	1,790	1,932	378	0	7,153	7,531	7.3
14	117	0	223	340	312	0	891	1,203	34.4
15	25	0	1,567	1,592	67	0	6,262	6,329	1.6
16	25	0	1,567	1,592	67	0	6,262	6,329	1.6
17	19	0	1,715	1,194	51	0	4,697	4,748	1.6
18	6	0	392	398	16	0	1,565	1,581	1.5
19	0	0	86	86	0	0	343	343	0.0
20	117	0	309	426	312	0	1,234	1,546	27.5

TABLE A-PROCESS FLOW DIAGRAMS MATERIAL BALANCE

Stream	Ton/H Coal	Ton/H Mag	Ton/H Water	Ton/H Slurry	GPM Coal	GPM Mag	GPM Water	GPM Slurry	% Sol. or % S.M.*
21	117	0	309	426	312	0	1,234	1,546	27.5
22	5	0	11	16	13	0	45	58	31.3
23	12	0	24	36	32	0	96	128	33.3
24	100	0	273	373	266	0	1,093	1,359	26.8
25	99	0	188	287	264	0	750	1,014	34.5
26	1	0	86	87	3	0	343	346	1.1
27	5	0	3	8	13	0	11	24	62.5
28	0	241	120	361	0	193	483	676	66.8
29	0	36	18	54	0	29	72	101	66.7
30	0	71	36	107	0	57	142	199	66.4
31	0	134	67	201	0	107	268	375	66.7
32	364	868	1,217	2,449	970	694	4,863	6,527	50.3
33	107	347	487	941	285	278	1,945	2,508	50.3
34	357	521	730	1,508	685	416	2,918	4,019	51.6
35	0	0	200	200	0	0	800	800	0.0
36	0	0	400	400	0	0	1,600	1,600	0.0
37	0	43	61	104	0	35	243	278	41.3
38	0	330	462	792	0	264	1,848	2,112	41.7
39	0	495	694	1,189	0	396	2,772	3,168	41.6
40	0	17	206	223	0	14	821	835	7.6

TABLE A-PROCESS FLOW DIAGRAMS MATERIAL BALANCE

Stream	Ton/H Coal	Ton/H Mag	Ton/H Water	Ton/H Slurry	GPM Coal	GPM Mag	GPM Water	GPM Slurry	% Sol. or % S.M.*
41	0	26	392	418	0	21	1,565	1,586	6.2
42	0	825	1,156	1,981	0	659	4,620	5,279	41.6
43	257	0	45	302	685	0	181	866	14.9*
44	5	0	36	41	13	0	145	158	13.9
45	107	0	19	126	285	0	76	361	15.1
46	0	797	1,117	1,914	0	637	4,464	5,101	41.6
47	0	28	39	67	0	22	156	178	41.8
48	0	960	1,274	2,234	0	767	5,092	5,859	43.0
49	0	92	122	214	0	74	486	560	43.0
50	5	71	672	748	13	57	2,687	2,757	10.2
51	1	36	329	366	3	29	1,313	1,345	10.1
52*	252	0	9	261	672	0	36	708	3.4*
53	0	107	54	161	0	86	214	300	66.5
54	6	107	1,001	1,114	16	86	4,000	4,102	10.1
55	107	613	632	1,352	246	489	2,524	3,259	53.3
56	73	158	157	388	195	126	627	948	59.3
57	34	455	475	964	51	363	1,897	2,311	50.7
58	0	0	100	100	0	0	400	400	0.0
59	73	0	13	86	195	0	52	247	15.1*
60	1	0	10	11	3	0	41	44	9.1

TABLE A-PROCESS FLOW DIAGRAMS MATERIAL BALANCE

Stream	Ton/H Coal	Ton/H Mag	Ton/H Water	Ton/H Slurry	GPM Coal	GPM Mag	GPM Water	GPM Slurry	% Sol. or % S.M.*
61	72	0	3	75	192	0	11	203	4.0*
62	0	12	94	106	0	10	376	386	11.3
63	21	0	3	24	17	0	11	28	12.5*
64	0	31	32	63	0	25	127	152	49.2
65	0	145	150	295	0	116	599	715	49.2
66	0	437	451	888	0	348	1,799	2,147	49.2
67	0	582	601	1,183	0	464	2,398	2,862	49.2
68	0	0	200	200	0	0	800	800	0.0
69	0	18	219	237	0	15	874	889	7.6
70	0	577	595	1,172	0	460	2,376	2,836	49.2
71	0	5	6	11	0	4	22	26	45.5
72	0	0	40	40	0	0	160	160	0.0
73	77	0	19	96	205	0	77	282	19.8*
74	21	0	3	24	17	0	11	28	12.5*
75	13	0	3	16	35	0	13	48	18.8*
76	90	0	23	113	240	0	90	330	79.8
77	40	0	438	478	107	0	1,749	1,856	8.4
78	111	0	25	136	296	0	101	397	18.4*
79	6	0	392	398	16	0	1,565	1,581	1.5
80	117	0	417	534	312	0	1,666	1,978	21.9

TABLE A-PROCESS FLOW DIAGRAMS MATERIAL BALANCE

Stream	Ton/H Coal	Ton/H Mag	Ton/H Water	Ton/H Slurry	GPM Coal	GPM Mag	GPM Water	GPM Slurry	% Sol. or % S.M.*
81	0	0	110	110	0	0	440	440	0.0
82	0	0	310	310	0	0	1,238	1,238	0.0
83	0	0	204	204	0	0	815	815	0.0
84	0	0	67	67	0	0	266	266	0.0
85	0	0	174	174	0	0	697	697	0.0
86	18	0	34	52	48	0	134	182	34.6
87	0	0	2,168	2,168	0	0	8,665	8,665	0.0
88	0	0	9	9	0	0	34	34	0.0
89	12	0	1,801	1,813	32	0	7,198	7,230	0.7
90	24	0	73	97	64	0	288	352	24.7
91	25	0	332	357	67	0	1,328	1,395	7.0
92	24	0	72	96	64	0	288	352	25.0
93	25	0	332	357	67	0	1,328	1,395	7.0
94	1	0	260	261	3	0	1,040	1,043	0.4
95	24	0	72	96	64	0	288	352	25.0
96	1	0	260	261	3	0	1,040	1,043	0.4
97	24	0	20	44	64	0	78	142	54.5
98	0	0	53	53	0	0	210	210	0.0
99	36	0	1,873	1,909	96	0	7,486	7,582	1.9
100	37	0	329	366	99	0	1,314	1,413	10.1

TABLE A-PROCESS FLOW DIAGRAMS MATERIAL BALANCE

Stream	*Ton/H Coal*	*Ton/H Mag*	*Ton/H Water*	*Ton/H Slurry*	*GPM Coal*	*GPM Mag*	*GPM Water*	*GPM Slurry*	*% Sol. or % S.M.**
101	0	144	96	240	0	115	385	500	60.0
102	16	0	393	409	43	0	1,571	1,614	3.9
103	24	0	45	69	64	0	178	242	34.8
104	0	0	191	191	0	0	815	815	0.0
105	18	7	13	38	48	5	107	160	65.8
106	18	0	34	52	48	0	134	182	34.6
107	0	7	170	177	0	5	788	793	4.0
108	18	7	204	229	48	5	922	975	10.9
109	0	24	64	88	0	19	255	274	27.3
110	0	30	234	264	0	24	1,043	1,067	11.4
111	0	0	242	242	0	0	966	966	0.0
112	0	0	242	242	0	0	966	966	0.0
113	0	30	19	49	0	24	77	101	61.2
114	0	54	83	137	0	43	332	375	39.4
115	0	47	128	175	0	38	510	548	26.9
116	0	24	64	88	0	19	255	274	27.3
117	18	54	154	226	48	43	617	708	31.9
118	18	131	159	308	48	105	636	789	48.4
119	18	14	30	62	48	11	120	179	51.6
120	18	14	342	374	48	11	1,367	1,426	8.6

TABLE A-PROCESS FLOW DIAGRAMS MATERIAL BALANCE

Stream	Ton/H Coal	Ton/H Mag	Ton/H Water	Ton/H Slurry	GPM Coal	GPM Mag	GPM Water	GPM Slurry	% Sol. or % S.M.*
121	0	59	65	124	0	47	258	305	47.6
122	0	14	309	322	0	11	1,233	1,244	4.3
123	0	72	373	446	0	58	1,491	1,549	16.1
124	0	59	65	123	0	47	258	305	48.0
125	0	59	35	93	0	47	138	185	63.4
126	0	118	99	217	0	94	396	490	54.4
127	0	185	179	365	0	148	717	865	50.7
128	0	118	129	247	0	94	516	610	47.8
129	18	0	237	255	48	0	949	997	7.6
130	36	185	314	535	96	148	1,253	1,497	41.3
131	0	0	341	341	0	0	1,364	1,364	0.0
132	18	0	34	52	48	0	134	182	34.6
133	0	0	312	312	0	0	1,247	1,247	0.0
134	30	0	368	398	80	0	1,470	1,550	7.5
135	30	0	56	86	80	0	223	303	34.9
136	117	0	12	129	312	0	46	358	9.3*
137	12	0	25	37	32	0	98	130	32.4
138	0	0	341	341	0	0	1,364	1,364	0.0
139	0	0	207	207	0	0	829	829	0.0
140	0	0	153	153	0	0	610	610	0.0

TABLE A-PROCESS FLOW DIAGRAMS MATERIAL BALANCE

Stream	Ton/H Coal	Ton/H Mag	Ton/H Water	Ton/H Slurry	GPM Coal	GPM Mag	GPM Water	GPM Slurry	% Sol. or % S.M.*
141	0	0	91	91	0	0	362	362	0.0
142	0	0	54	54	0	0	215	215	0.0
143	11	76	54	141	29	61	215	305	61.7
144	11	76	260	348	29	61	1,040	1,130	25.0
145	8	6	101	116	21	5	405	431	12.1
146	9	9	228	246	24	7	912	943	7.3
147	19	83	155	257	51	66	620	737	39.7
148	0	0	243	243	0	0	972	972	0.0
149	17	15	86	118	45	12	345	402	27.1
150	0	15	6	21	0	12	25	37	28.6*
151	0	0	242	242	0	0	966	966	0.0
152	19	83	65	166	51	66	258	375	61.4
153	0	0	80	80	0	0	319	319	0.0
154	0	0	80	80	0	0	319	319	0.0
155	3	34	60	97	8	27	240	275	38.1
156	3	34	140	177	8	27	559	594	20.9
157	26	119	147	291	69	95	586	750	49.8
158	7	36	82	125	19	29	328	376	34.4
159	0	0	82	82	0	0	326	326	0.0
160	7	36	164	207	19	29	654	702	20.8

TABLE A-PROCESS FLOW DIAGRAMS MATERIAL BALANCE

Stream	Ton/H Coal	Ton/H Mag	Ton/H Water	Ton/H Slurry	GPM Coal	GPM Mag	GPM Water	GPM Slurry	% Sol. or % S.M.*
161	4	2	104	110	11	2	414	427	5.5
162	3	4	121	128	8	3	485	496	5.5
163	0	30	19	48	0	24	74	98	62.5
164	2	68	32	102	5	54	128	187	68.6
165	2	83	38	123	5	66	153	224	69.1
166	7	6	39	52	19	5	156	180	25.0
167	0	6	4	10	0	5	15	20	60.0
168	0	36	22	58	0	29	90	118	62.1
169	2	119	61	181	5	95	242	342	66.9
170	7	6	225	238	19	5	899	923	5.5
171	0	0	186	186	0	0	743	743	0.0
172	7	0	35	42	19	0	141	160	16.7
173	0	0	186	186	0	0	743	743	0.0
174	17	0	80	97	45	0	320	365	17.5
175	0	0	46	46	0	0	185	185	0.0
176	0	0	45	45	0	0	181	181	0.0
177	17	0	6	23	45	0	23	68	26.1*
178	17	0	52	69	45	0	208	253	24.6
179	17	0	379	396	45	0	1,515	1,560	4.3
180	0	0	46	46	0	0	185	185	0.0