3.0 PURPOSE AND NEED FOR PROPOSED ACTION AND PROPOSED ACTION DESCRIPTION

The proposed Federal action is for the U.S. Department of Energy to provide, through a cooperative agreement with The Partnership, cost-shared funding support for the design, construction and operation of a nominal 260 ton-per-day Liquid Phase Methanol facility in Kingsport, Tennessee. This section addresses the purpose and need for the project and provides a description of the proposed facility.

3.1 Purpose of and Need for the Project

The primary purpose of this project is to demonstrate the commercial viability of a Liquid Phase Methanol facility to produce methanol from coal-derived synthesis gas (a mixture of hydrogen and carbon monoxide). Successful future commercial-scale application of LPMEOH™ technology could result in cost effective production of chemical feedstocks and clean burning alternative fuels from coal.

The U.S. Department of Energy's action is needed to assist the development of alternative fuel technologies that operate in an environmentally responsible manner. Developing superior technologies to produce clean fuels and chemicals from coal is a principal research and development objective of the U.S. Department of Energy. Success in this effort would have a major, positive impact on the economy of the United States. It would make a significant contribution to the balance of trade deficit, contribute to long-term energy pricing stability and to energy and military security, and create significant amounts of domestic employment. The United States needs future sources of alternative liquid fuels and chemical feedstocks. With domestic oil production declining and imports rising, the potential for producing affordable liquid fuels and chemical feedstocks from non-petroleum sources could one day prove both strategically and economically important.

The principal means envisioned to achieve these goals is through the continued development of technologies to utilize domestic coal reserves. Coal is of obvious interest because it is the United States' most abundant fossil fuel. The United States is estimated to have reserves (recoverable with present technology at current prices) of at least 268 billion tons, as compared to only 10 billion tons equivalent of natural gas and eight billion tons equivalent of oil. At current rates, America's recoverable reserves of coal could satisfy the nation's consumption for nearly 300 years (World Reserves Institute 1990).

The U.S. Department of Energy's action is needed to address environmental effects resulting from coal conversion and combustion. The U.S. Department of Energy cost-shared funding is intended to support the development of clean burning liquid fuels from coal-derived synthesis gas. With the passage of the Clean Air Act Amendments (CAAA) of 1990, stringent measures have been mandated to control emissions of the principal acid rain precursors, sulfur dioxide (SO_2) and nitrogen oxides (NO_x). The U.S. Department of Energy Clean Coal Technology Program is intended to encourage development of technologies that fully utilize coal's energy potential while avoiding increased pollution. The use of IGCC technology for electric power will play a major role in providing clean energy.

The IGCC electric power generation process is an advanced clean coal technology with high thermal efficiency, superior environmental performance, and the ability to handle all coals (from lignite to high-ranked bituminous) and other (waste) hydrocarbon feedstocks. The U.S. Department of Energy states in the Spring 1992 issue of Clean Coal Today, "IGCC plants are viewed as superior to today's conventional coal plants and are almost certain to be one of the lowest cost fossil fuel sources of electric power generation in the 21st century. Compared to today's conventional coal burning methods, an IGCC plant can produce up to 25 percent more electricity from a given amount of coal. Air pollutants can also be removed more efficiently from gas produced in a pressurized IGCC system than from the flue gas which results when coal is burned directly." Integrated coal/waste gasification power plants are more efficient and cleaner than direct coal/waste combustion power plants. Integrated gasification also has the advantage of providing a replacement for natural gas in existing natural gas-fired combustion turbines, including cogeneration systems. Therefore, integrated gasification can be effective for hedging the risk of uncertain natural gas prices in the short term, and for replacing natural gas in the long term. The Environmental Impact Statement for the Clean Coal Technology Program (DOE/EIS-0146) shows that in the year 2010, with commercial implementation of the IGCC technology, the national emissions of SOx and NOx would be cut in half (compared to 1985 levels); even CO2 would be somewhat reduced. This is while energy use is continuing to grow at forecasted rates (1-2%/yr).

The LPMEOH™ process, developed by Air Products in a cooperative effort with the U.S. Department of Energy over a period of twelve years, is an advanced indirect liquefaction technology that is particularly well-suited for integration with coal-based synthesis gas processes. It was developed specifically to be used with an IGCC Power Plant and is the only methanol technology that can be utilized on a OTM basis. No water gas shift or CO2 cleanup is required. This provides for a low capital cost plant.

The OTM process is inherently suited to on/off operation, able to utilize any excess capacity of the coal gas system on an hour-by-hour basis. During periods of low electric power demand, excess coal-derived synthesis gas is converted to methanol. This methanol can in turn be used as a fuel in gas turbines to satisfy peak load requirements or it could be sold on the open market. The methanol revenues would be used to reduce the power cost to the electric customer.

Methanol is a clean burning, storable fuel with versatile applications. As a combustion fuel, particularly for gas turbines used in electric power generation, it provides extremely low emissions. Methanol can also serve as a primary transportation fuel or an octane-enhancing transportation fuel additive. In fuel usage, methanol forms less smog than gasoline fuels, and when used in heavy-duty vehicles, particulate emissions are virtually eliminated and NOx emissions are cut by half.

The demonstration project would meet key objectives of the National Energy Strategy and of the Clean Air Act Amendments of 1990 (CAAA). The methanol could be used to provide peak electric power when needed, or as a clean liquid coproduct that will be in increasing demand as the Nation turns toward cleaner alternatives. Successful demonstration of the combined IGCC/OTM technologies would advance an environmentally clean, coal-based alternative for power plants and would help contain electricity prices while meeting the more stringent environmental requirements in the CAAA.

3.2 Description of the Proposed Project

This section provides a detailed description of the design, construction, and operation of the proposed demonstration project. Information provided includes a description of the proposed project elements, operational and performance characteristics relevant to the NEPA environmental review to be performed by the U.S. Department of Energy, and an overview of the construction schedule.

The Air Products Liquid Phase Conversion Co., L.P., proposes to build a liquid phase methanol production unit that would demonstrate the commercial viability of the LPMEOH™ process.

The project objective would be to demonstrate on a commercial scale (nominal 260 TPD) the production of methanol from coal-derived synthesis gas using the LPMEOH™ process and to determine the suitability of methanol produced during this demonstration for use as a low-SO_2, low-NO_x alternative fuel in boiler, turbine, and transportation applications and as a chemical feedstock. Important issues which would be confirmed under the proposed demonstration are:

- Demonstration of the scale-up of the slurry reactor from the 13 tons-per-day LPMEOH™ Alternate Fuels Development Unit to a nominal 260 tons-per-day.

- The ability to demonstrate long-term operation on actual coal-derived synthesis gas.

- Reliable on/off LPMEOH™ process operation in an integrated gasification facility.

- Demonstration of the reliability of the as-produced product methanol for its intended uses in applications such as a fuel in transportation or stationary units.

- Subject to design verification testing, demonstration of the slurry reactor's capability to produce dimethyl ether as a mixed co-product with methanol.

- Confirmation of commercial economics for the LPMEOH™ process.

The methanol product would be tested for suitability as both a stationary fuel and as a transportation fuel. These end-use tests would provide a basis for the comparison of the methanol product with conventionally accepted fuels including emission levels and economic viability. The methanol product will also be tested for the suitability as a chemical feedstock.

The program goal of demonstrating methanol as a fuel would lead to greater use of oxygenated fuels, which burn cleaner than conventional fuels, thereby reducing air emissions from mobile and stationary sources.

3.3 Site Location and Characteristics

The 0.6 acre site proposed for the LPMEOH™ facility is located in Kingsport, Tennessee at the Eastman facility. The Eastman facility is on the western edge of Sullivan County and includes a small portion of Hawkins County. The world headquarters of Eastman Chemical Company are also located in Kingsport. The

The location of the proposed demonstration unit on Long Island is shown on Figure 2.2-2. A photograph of the Eastman facility as it currently exists is also shown on Plate 2.2. The current site is a stoned area bounded to the north by a fence separating the proposed unit area from a parking lot, to the west by an interplant road that runs between the proposed unit area and an existing plant, to the east by a pipe rack and an interplant road, and to the south by an existing methyl acetate plant. The new facility will resemble the existing facility surroundings.

Eastman has 414 buildings on 3,890 acres of land. The chemical manufacturing facilities are located on the 1,046 acre main plant site which also includes 40.1 acres of warehouse area under roof and more than 1.16 million square feet of office space. The proposed project site is located adjacent to existing manufacturing facilities which are producing similar type products including methanol.

The area outside the boundaries of the Eastman facility is generally highly industrial. Besides Eastman Chemical Company, other major businesses in Kingsport are AFG Industries Inc., a glass-maker; Arcata Graphics, a manufacturer of books; General Shale Products Corp., a brick and block manufacturer; JPS Converter & Industrial Corp., a maker of cotton print cloth; Kingsport Foundry & Manufacturing Corp., a ferrous, machine, and nonferrous castings maker; Mead Paper; and Davis Pipe and Metal Fabricators.

3.4 Physical Facility Description

The proposed project includes the four major process areas with their associated equipment (reactor area, purification area, catalyst preparation area, and storage/utilities). The proposed unit will closely resemble the adjacent Eastman process plants, including process equipment in steel structures.

All of the LPMEOH™ process area will be situated on concrete pads with stormwater collected in a drain system that is routed to the oil/water separator per Figure 6.3-1.

Reaction Area

The reaction area will include the reactor itself, a steam drum, a skidded compressor with its ancillary equipment, separators, heat exchangers, and pumps. The equipment will be supported by a matrix of structural steel. The most salient feature will be the reactor, since it will be approximately 84' tall.

Purification Area

The purification area will feature two distillation columns, one approximately 82' tall, the other 97' tall. These columns will resemble the columns of the surrounding process areas. In addition to the columns, this area will include the columns' reboilers, condensers, air coolers, separators and pumps.

Storage/Utilities

The storage/utility area will include two diked tanks for methanol, two tanks for oil storage, a slurry holdup tank, trailer loading/unloading area, and buried oil/water separator.

Catalyst Preparation Area

The catalyst preparation area will be under roof in a building with partial walls, in which the catalyst preparation vessels, slurry handling equipment, and spent slurry disposal equipment will be housed. In addition, a hot oil utility system will be included.

3.5 Process Description

The LPMEOH™ process will be integrated with the Eastman Gasification plant as shown in Figure 3.5-1. In this design the raw synthesis gas is cooled, cleaned, and processed through the LPMEOH™ unit, where a portion of the gas is converted to methanol for use as a coal-to-chemicals intermediate product. A portion of the methanol will be used in on-site and off-site fuels testing.

The liquid phase methanol plant consists of four main sections: methanol synthesis, product purification, storage/utilities, and catalyst slurry preparation and handling. The process and instrumentation are shown in Figure 3.3-2. Below is a discussion of each major plant section.

3.5.1 Methanol Synthesis: Reactor Area

Methanol is formed by the reaction of hydrogen with carbon monoxide and carbon dioxide. Synthesis gas containing carbon monoxide, carbon dioxide, hydrogen, and other nonreactive gases, is preheated to the reaction temperature and then fed into the LPMEOH™ reactor. Inside the reactor is a mixture of mineral oil and solid particles of metallic catalyst. This solid/liquid mixture is called a slurry. The synthesis gas is introduced to the reactor and the gases dissolve in the oil and eventually contact the catalyst particle surface, where the methanol formation reaction occurs. The methanol then diffuses through the mineral oil, separates from the mineral oil mixture, and leaves the reactor as a vapor.

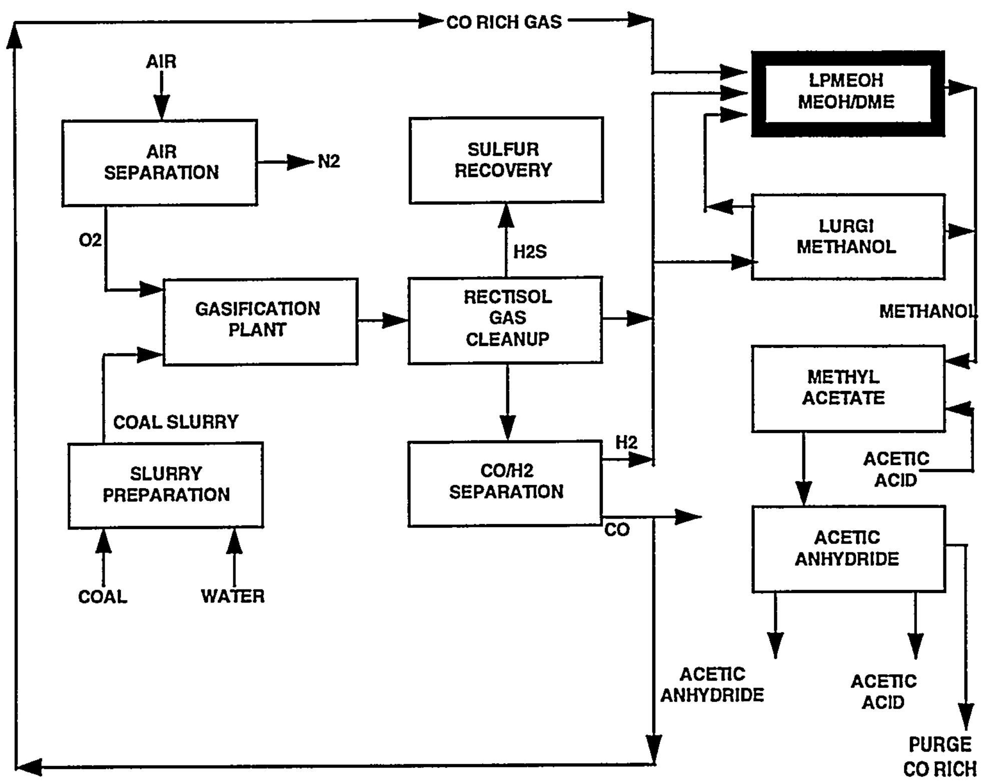

FIGURE 3.5-1 INTEGRATION OF LPMEOH™ UNIT INTO EASTMAN KINGSPORT PLANT

FSF 5/15/96

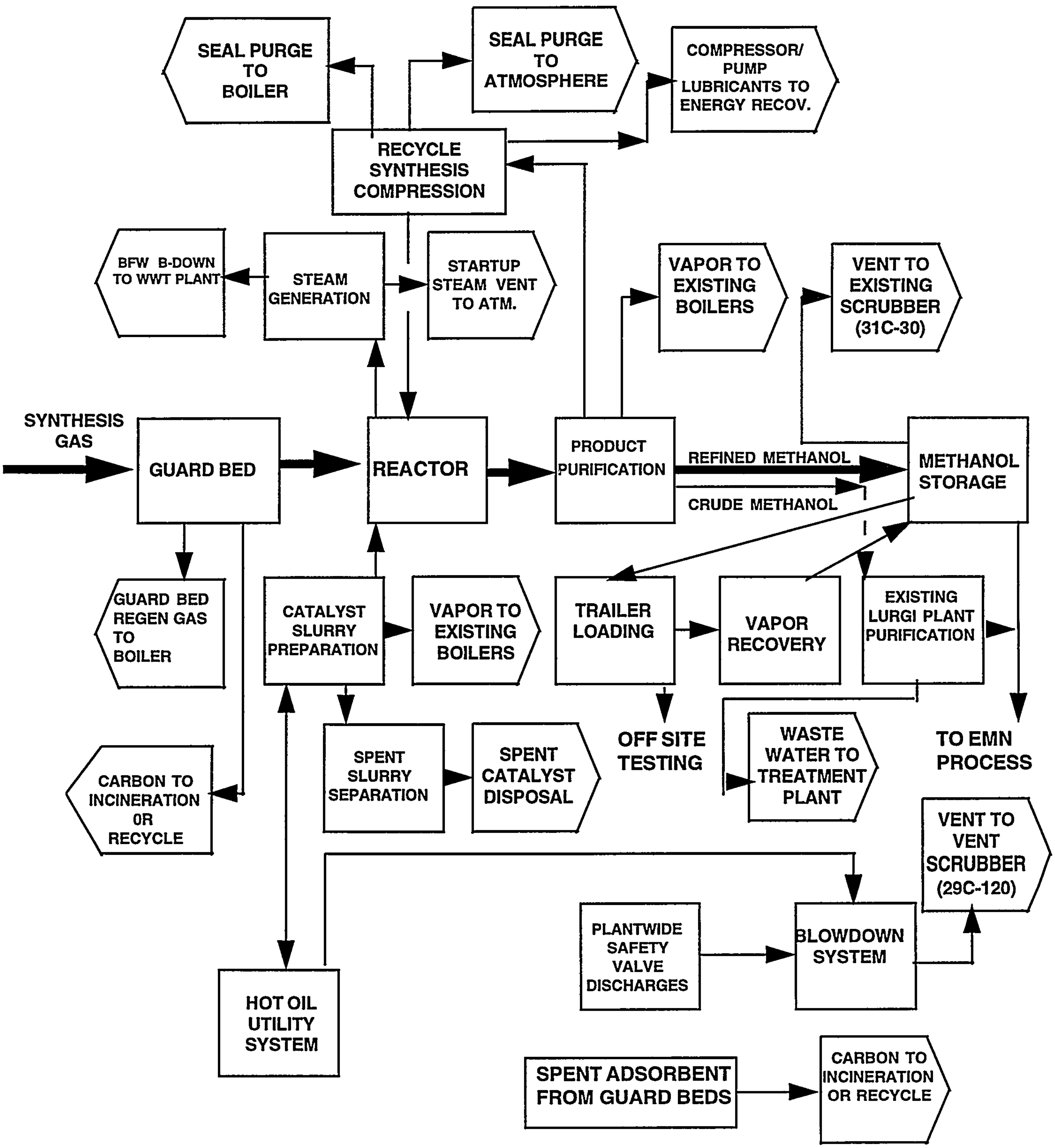

FIGURE 3.5-2 LPMEOH™ DEMONSTRATION UNIT PROCESS AND WASTE STREAMS

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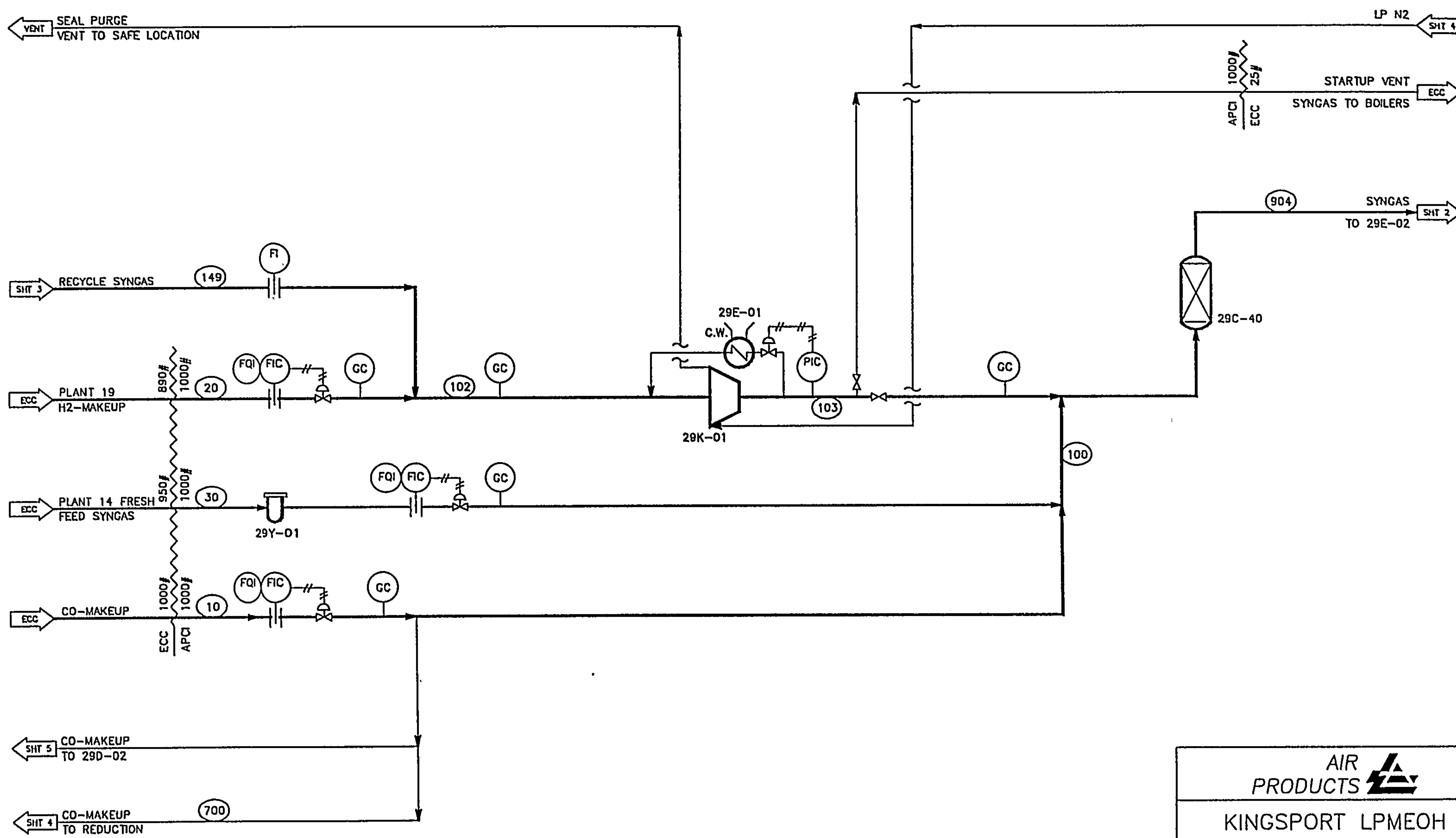


NOTE: LOCATION OF 29C-40 GUARD BED IS SUBJECT TO CHANGE PENDING FINAL RESULTS OF FEED STREAM ANALYSIS

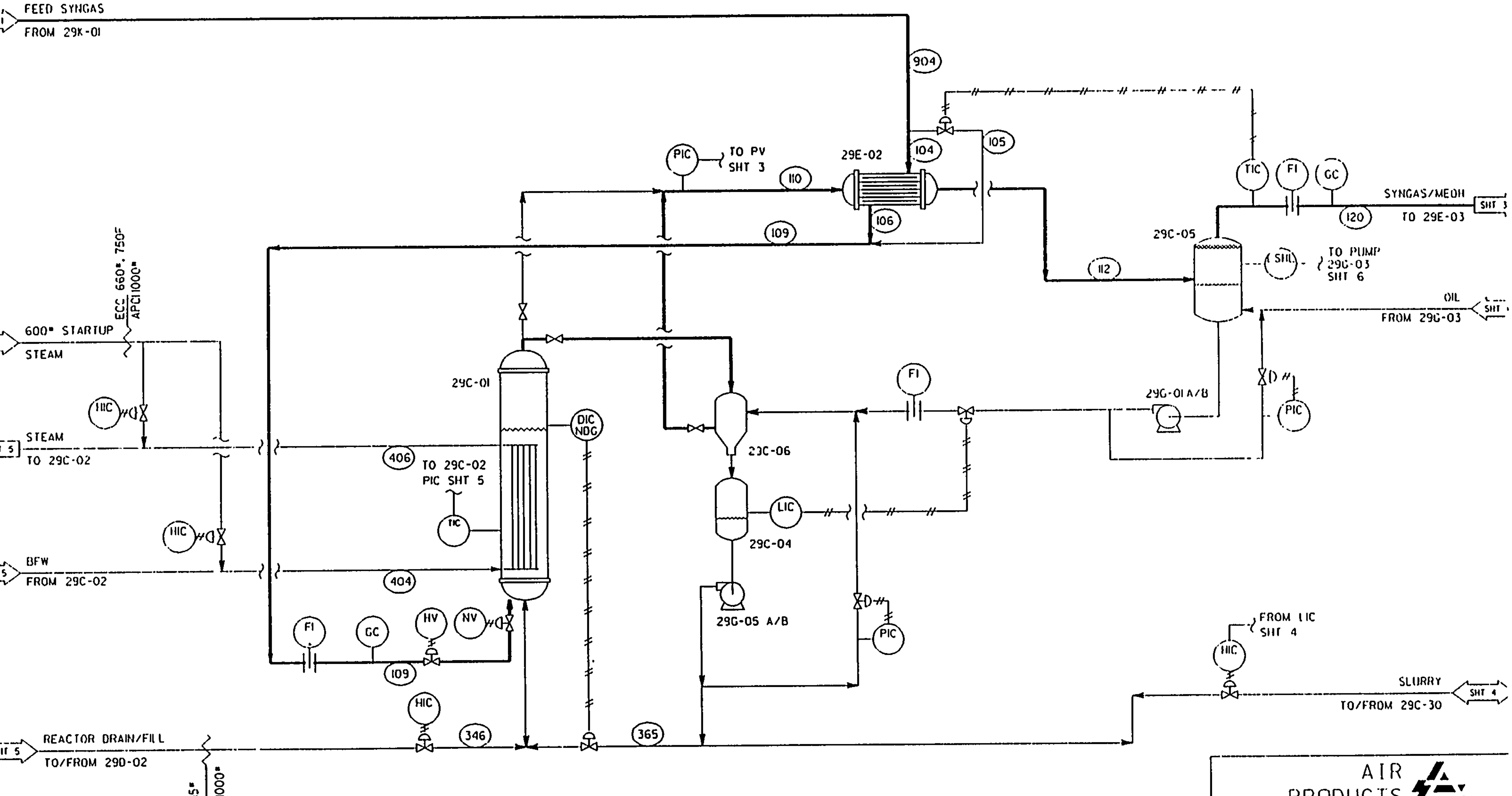
9/27/94	JMR/CMC	VES	WRB	TEC	ADB	DPD	GAM	DPB	ECH	JLD
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

AIR PRODUCTS

KINGSPORT LPMEOH
FEED SECTION

DRG. NO. LPM1	SHEET NO. 1
00-3-8215	REV. NO 0*

Rev 3/8/95 JJ



AIR PRODUCTS

KINGSPORT LPMEOH SYNTHESIS SECTION

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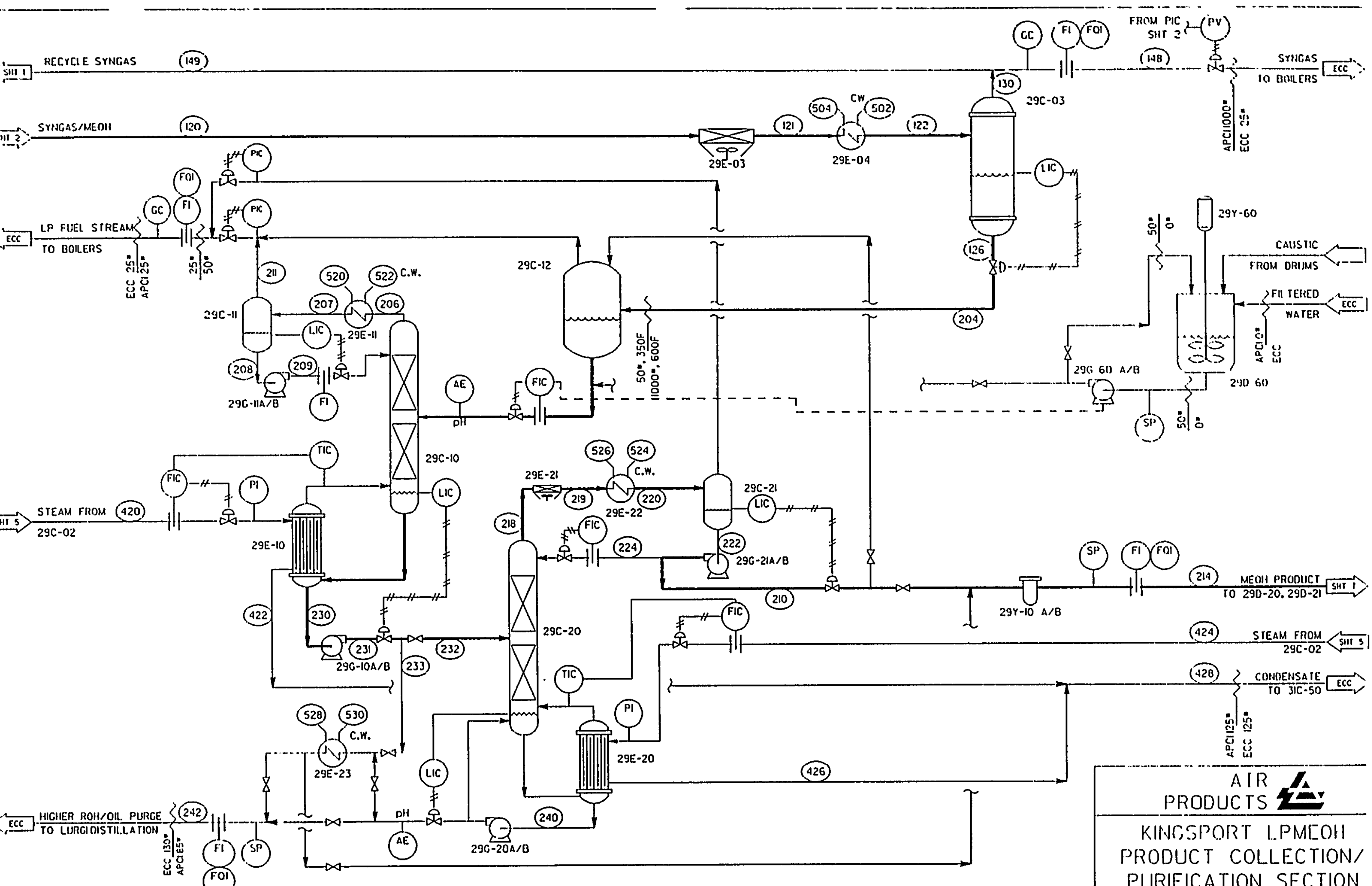
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

DRG. NO. LPM2 — SHEET 2

00-3-8215 — REV. N 0

Rev 3/8/95 [initials]



AIR PRODUCTS

KINGSPORT LPMEOH
PRODUCT COLLECTION/
PURIFICATION SECTION

DRG. NO. LPM3

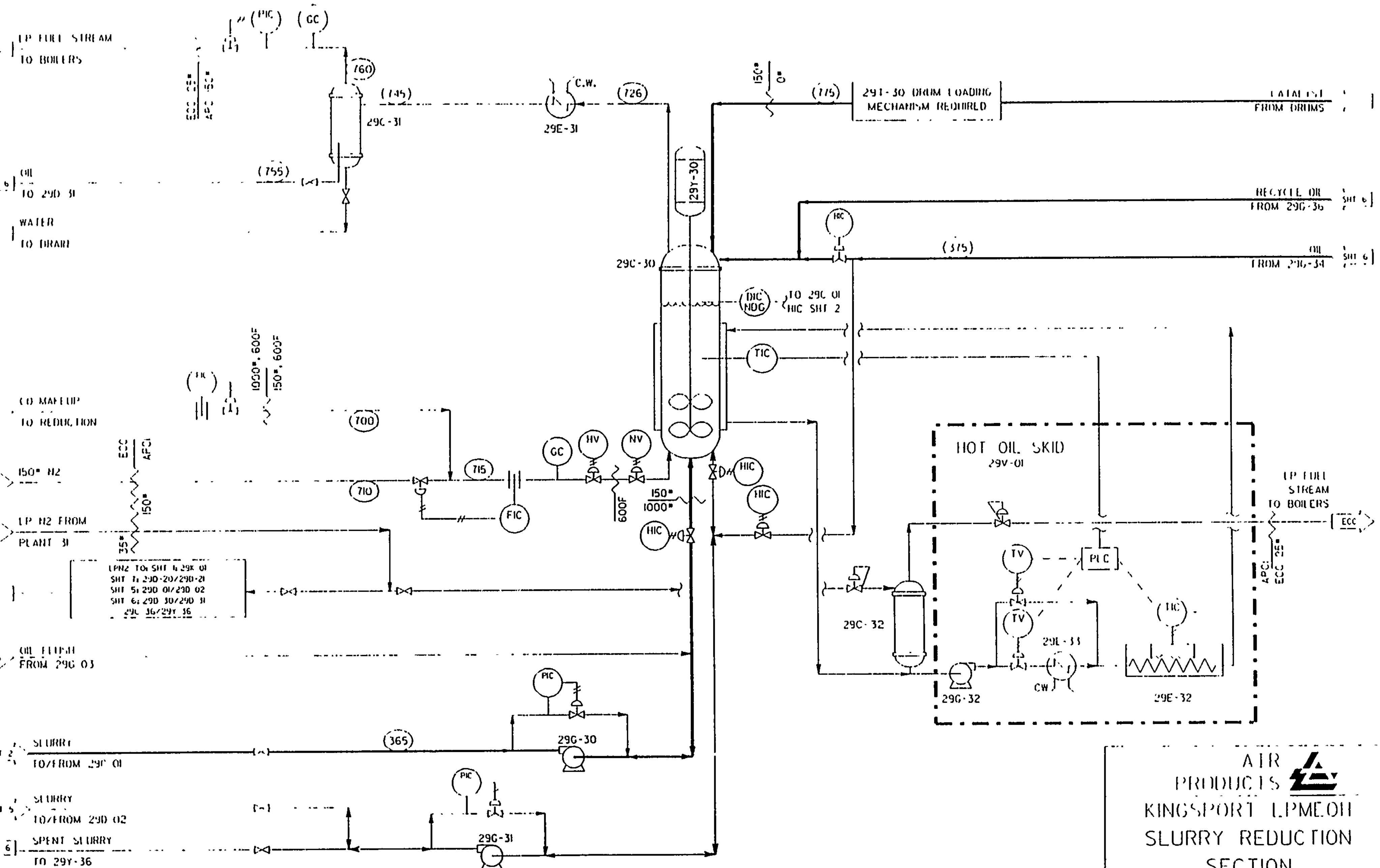
00-3-8215

SHEET 3

REV. NO. 0

6/16/94	JMR	VES	WRB	TEC	ADB	DPD	GAM	DPB	ECH	JLD
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

Rev 3/8/95 JJ



AIR PRODUCTS

KINGSPORT LPMEOH
SLURRY REDUCTION SECTION

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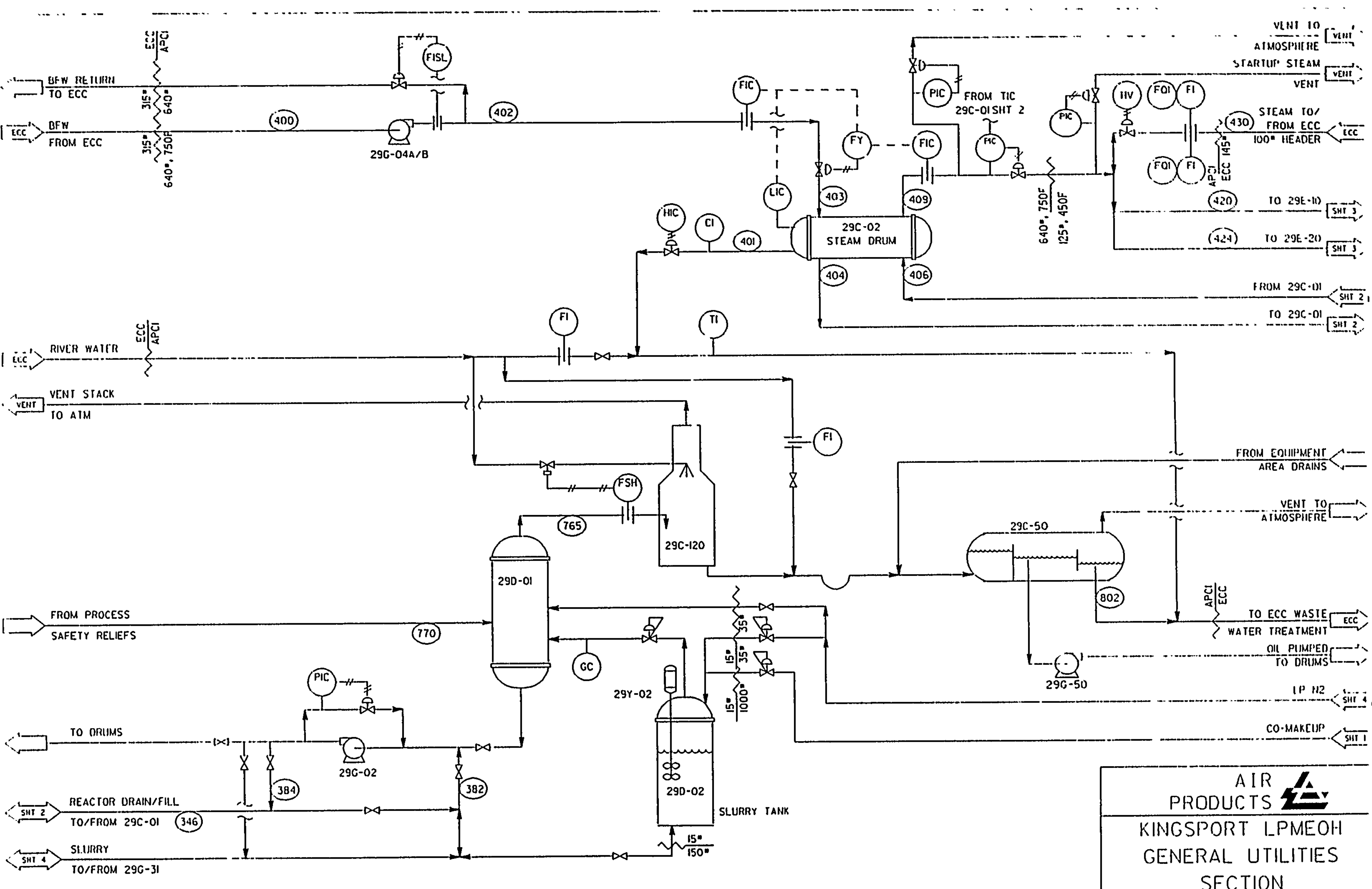
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

DRG. NO. LPM4 00-3 8215 SHEET 4 REV. NO. 0

Rev 3/8/95



6/16/94	JMR	VES	WRB	TEC	ADB	DPD	GAM	DPB	ECH	JLD
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

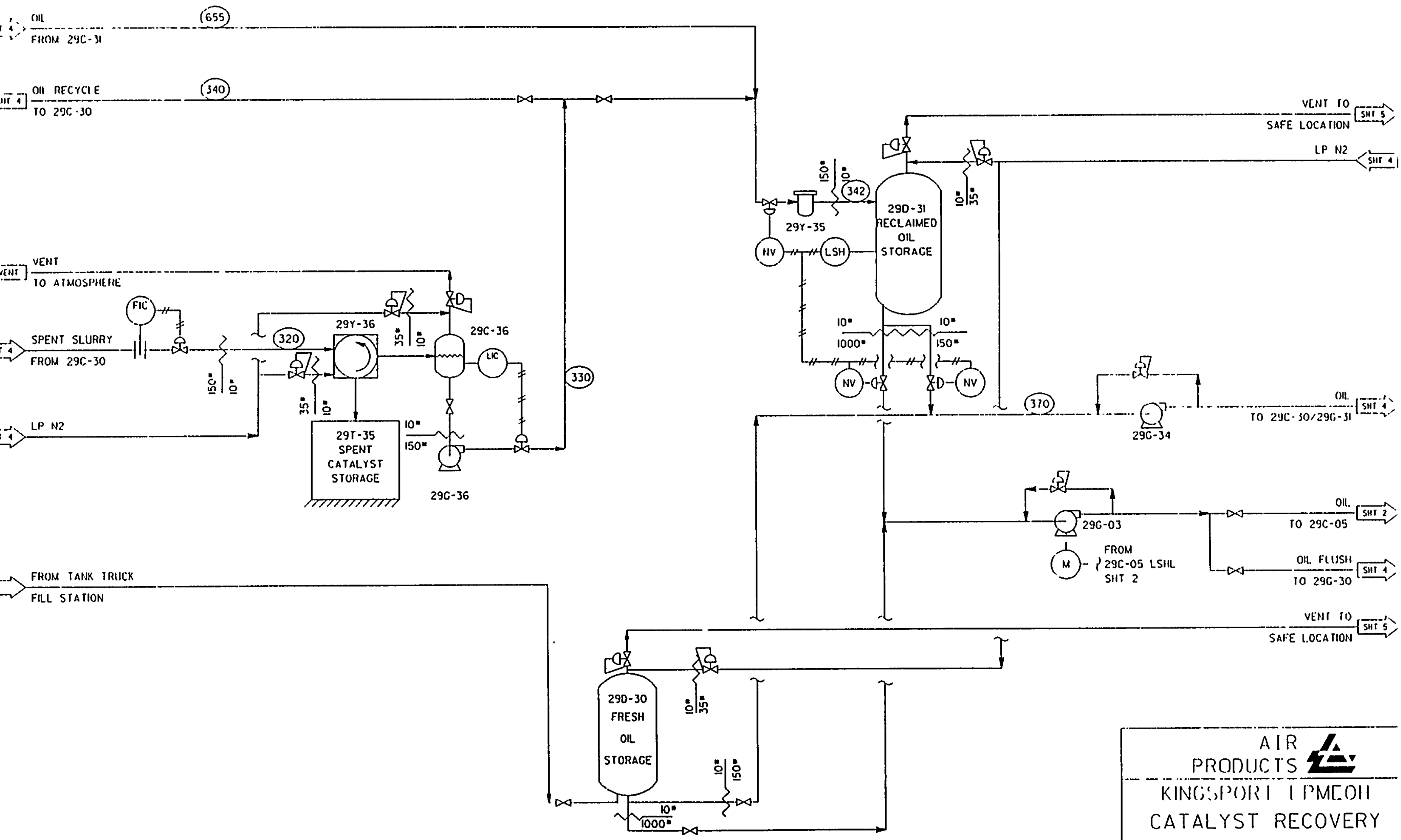
AIR PRODUCTS

KINGSPORT LPMEOH
GENERAL UTILITIES
SECTION

DRG. NO. LPM5
00-3-8215

SHEET 5
REV. NO. 0

Rev 3/8/95 JJ



AIR PRODUCTS

KINGSPORT LPMEOH
CATALYST RECOVERY
SECTION

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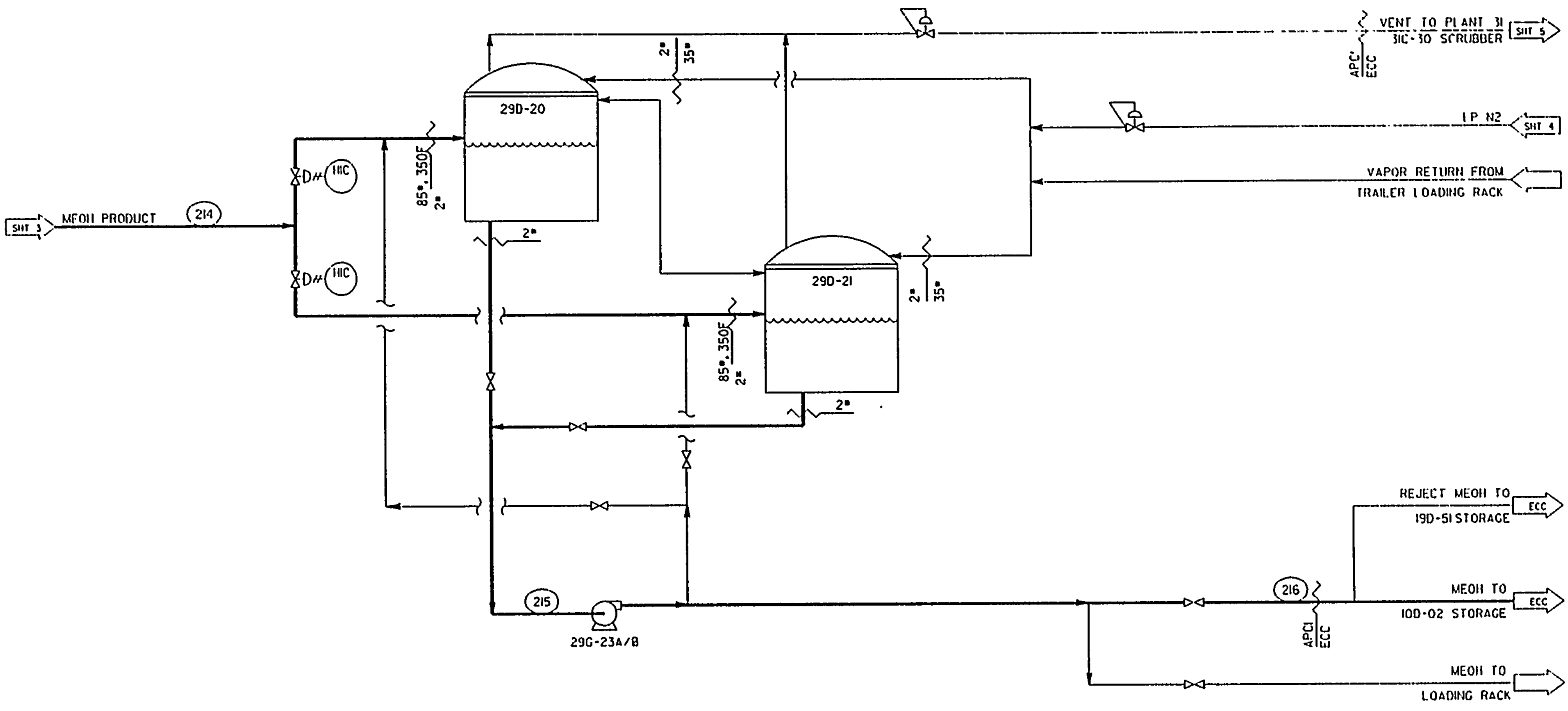
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

DRG. NO. LPM6
00-3-8215
SHEET 6
REV. NO. 0

Rev 3/8/95



AIR PRODUCTS

KINGSPORT LPMEOH
PRODUCT STORAGE
SECTION

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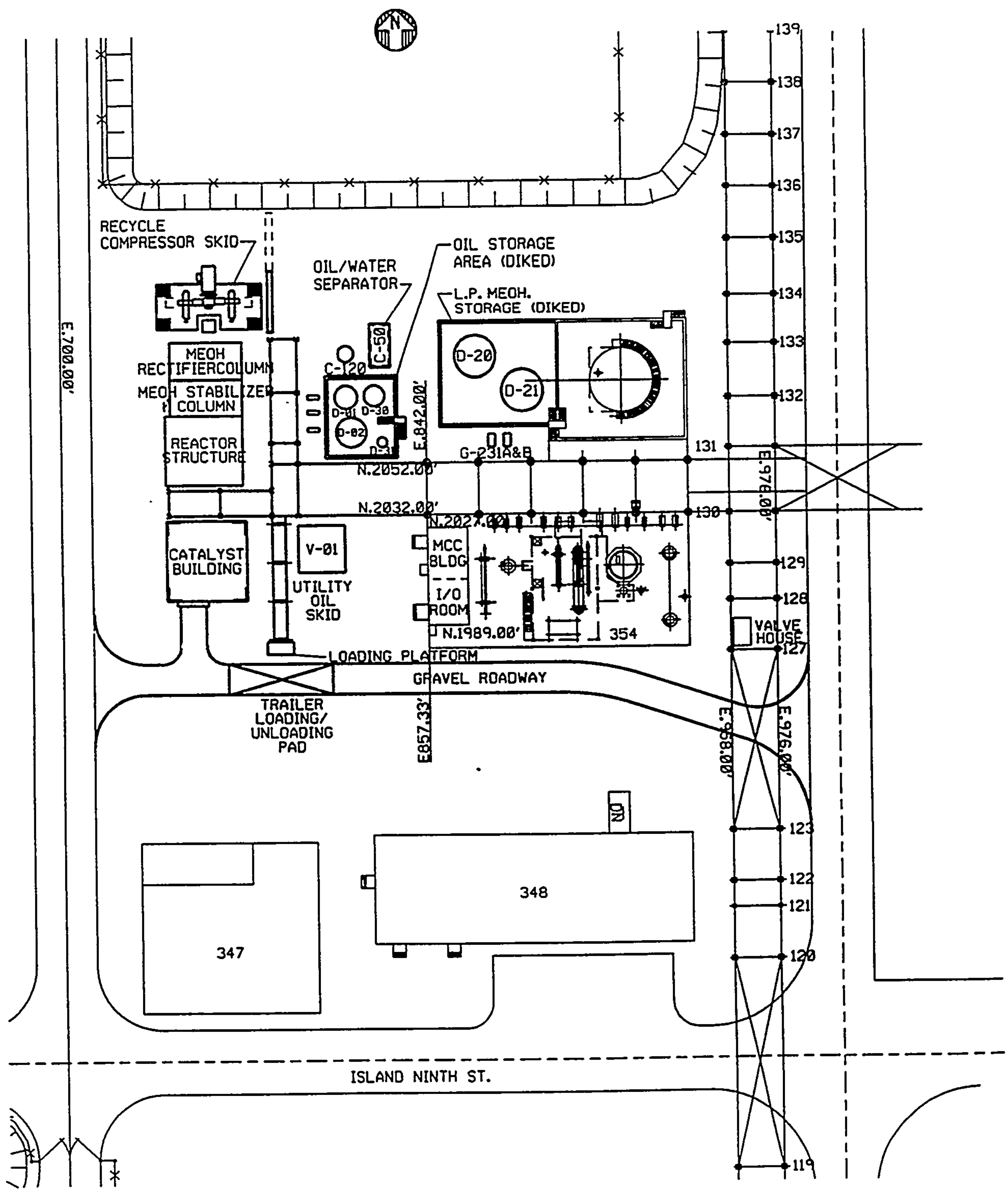
DWG DATE	PROCESS ENGINEER	PROCESS APPROVAL	BUSINESS AREA REPRESENTATIVE	SYSTEMS ENGINEER	PSG TECHNOLOGY	PROJECT ENGINEER	PROCESS CONTROLS	ENGINEERING SAFETY	PRODUCTION & DELIVERY	MACHINERY

DRG. NO. LPM7 SHEET 7

00-3-8215 REV. NO 0

Rev 3/8/95 JJ



0 10 20 30 40 50 100

SCALE 1"=30'-0"

TITLE PRELIMINARY FACILITY ARRANGEMENT KINGSPORT LIQUID PHASE METHANOL KINGSPORT, TN	AIR PRODUCTS ALLENTOWN, PENNSYLVANIA ©Air Products and Chemicals, Inc., 1990 All rights reserved Unpublished TOTAL SAFETY
FILE 38215FD1.DGN	DWG NO. 00-3-8215-6299 D REV. P4
SCALE 1"=30'-0" WT.	SHEET 1

FIGURE 3.5-4 **LPMEOH Project 00-3-8215 Vessel List**

Tank #	Description	Liquid Contents	Diameter (Ft)	Lng/Hgt(Ft)	Volume (Gal)	Design % Full	Normal Operating Capacity (Gal)	Plant Location
29C-01	LPMEOH Reactor	Drakeol, Catalyst	7.8	62.0	22,162	84	17,103	Synthesis
29C-02	Steam Drum	Water	5.5	18.5	3,288	50	1,645	Synthesis
29C-03	H.P. Methanol Separator	Crude Methanol	3.7	10.5	845	**	**	Synthesis
29C-04	Reactor Cyclone Holding Drum	Drakeol	**	**	**	**	**	Synthesis
29C-05	Reactor Economizer K.O. Drum	Drakeol	**	**	**	**	**	Synthesis
29C-06	Reactor Cyclone	Drakeol	**	**	**	**	**	Synthesis
29C-10	Methanol Stabilizer Column	Crude Methanol	4.3	89.0	9,668	**	**	Purification
29C-11	Methanol Stabilizer Reflux Drum	Methanol	2.5	10.9	400	50	200	Purification
29C-12	L. P. Methanol Separator	Crude Methanol	8.0	22.0	8,272	40	**	Purification
29C-20	Methanol Rectifier Column	Fuel-Grade Methanol	4.5	124.0	14,753	**	**	Purification
29C-21	Methanol Rectifier Reflux Drum	Methanol	3.0	9.5	502	50	250	Purification
29C-30	Catalyst Reduction Vessel	Drakeol, Catalyst	4.0	20.0	1,880	75	1,410	Catalyst Building
29C-31	Reduction Condensate Accumulator	Water, Drakeol	1.2	5.6	47	**	**	Catalyst Building
29C-32	Utility Oil Surge Tank	Utility Oil	3.5	9.5	893*	**	790	Slurry Reduction Area
29C-36	Slurry Centrifuge Surge Pot	Drakeol	2.0	4.7	110	30	33	Catalyst Building
29C-50	Oil/Water Separator-Coalescer	Rain Water	**	11.5 x 7.8 x 4.7	3,125*	---	1,800	Yard Area
29C-120	Vent Quench Drum	PSV Vents	5 / 2.5	20 / 30	4,200	0	0	Yard Area
29D-01	Blowdown Drum	Drakeol, Catalyst, Methanol	8.0	16.1	6,054	40	0	Synthesis
29D-02	Slurry Tank	Drakeol, Catalyst	12.0	18.7	15,821	70	0	Storage
29D-20/21	Methanol Lot Tanks	Product Methanol	16.0	24.9	37,451	80	30,000	Product Storage
29D-30	Fresh Oil Storage Tank	Fresh Drakeol	9.0	22.1	10,517	50	5000	Storage
29D-31	Reclaimed Oil Storage Tank	Recovered Drakeol	4.0	10.6	996	50	400	Storage
29 E-10	Methanol Stabilizer Reboiler	Fuel-Grade Methanol	**	**	**	**	**	Purification
29 E-20	Methanol Rectifier Reboiler	Product Methanol	**	**	**	**	**	Purification
29K-01	Syngas Compressor Lube Oil Console	Lube Oil	**	5 x 5 x 4	748*	**	600	Yard Area
29T-35	Spent Catalyst Hopper	Spent Catalyst	**	3.5 x 3.5 x 3.5	300*	80	240	Catalyst Building
29Y-36	Slurry Centrifuge	Drakeol, Catalyst	1.2	2.5	---	---	<50*	Catalyst Building

* preliminary estimate   ** information not currnetly available

Any entrained slurry droplets leaving through the top of the reactor with the product gas are subsequently removed in a condensing heat exchanger, where the gas is cooled by the reactor inlet gas stream. The condensed liquid oil droplets are collected in a sump and pumped back to the LPMEOH™ reactor, thereby conserving mineral oil that might otherwise need to be stripped from the product and sent to the wastewater treatment facility.

The heat liberated during the exothermic methanol synthesis reaction is absorbed by the slurry and is removed by means of heat exchange coils inside the reactor. By generating steam within the heat exchanger tubes, the heat is removed from the slurry and the steam is used by the plant's utility steam system. The system will vent steam during plant startup transients.

Part of the reactor area is the recycle synthesis gas compressor. This compressor will recycle unconverted synthesis gas from the outlet of the reactor as well as three possible makeup streams exiting from the existing Eastman gasification facility's Lurgi methanol production unit (which normally is a Lurgi waste stream routed to the plant boilers). The compressor then raises the pressure of the unconverted synthesis gas and the Lurgi hydrogen and feeds them to the reactor for methanol production. This component of the system enhances the economics of the plant by using vapors that might otherwise be discarded as waste and converting these gases to methanol. One waste stream originating from the compressor is the seal purge, a flow of nitrogen intended to keep gases within the compressor from leaking out at the seals of the compressor shaft. Some traces of synthesis gas will be released to the atmosphere from this vent, but quantities are expected to be very small (approximately 2 TPY). Another waste stream from the compressor, and from all pumps and rotating equipment for the entire process, is the waste from used lubricants. This used oil will be disposed of via energy recovery in the plant's waste oil boilers.

The reactor section also includes guard beds, vessels filled with various adsorbents, designed to purify the synthesis gas feed stream of catalyst poisons. These adsorbents will be removed at some frequency for off-site regeneration, incineration, or disposal to a permitted facility. Adsorbents currently planned include activated carbon, which could be regenerated or incinerated, and zinc oxide, which would probably be disposed of as solid waste at a permitted facility.

3.5.2 Purification Area

The crude methanol leaving the reactor contains some dissolved gases, methyl formate, water, and higher alcohols. The crude methanol is purified in the purification section of the plant, consisting of two distillation columns. In these columns, the methanol product is stripped of dissolved gases and separated from lighter boiling hydrocarbons, higher alcohols, water, and oil.

The non-methanol components of the reactor outlet leave the purification section in two streams. The vapor stream, consisting of the dissolved gases and lighter boiling impurities such as methyl formate, is sent to on-site boilers as fuel. The bottom draw from the columns, containing crude methanol, higher alcohols, traces of mineral oil carried over from the reactor, and water, is sent to the existing Eastman Lurgi methanol unit's distillation area for further processing to separate the methanol from the oil, higher alcohols, and water. In the Lurgi purification section, the water separated from the product is directed to Eastman's wastewater treatment facility and the unusable hydrocarbons and higher alcohols are combusted in the boilers.

3.5.3 Methanol Storage/Proposed Project Utilities

The purified methanol produced from the LPMEOH™ process is to be used for further chemical production in the Eastman facility as well as for on-site and off-site fuels testing. The product should also meet MTBE manufacturers' requirements for methanol feeds.

The methanol is pumped from the distillation column area to the twin lot tanks, each of which holds ten hours of product at 260 tons-per-day production rate. After purity checks are conducted on the product, the methanol is pumped to the Eastman facility's methanol storage tanks. The lot tanks will be located inside dikes. Vapors from the stored methanol will be collected and routed to the existing absorber located at Eastman's Methyl Acetate Plant 31.

The proposed project utilities include oil storage tanks, a trailer loading/unloading area, and a buried oil/water separator. The oil storage tanks will be vented to the atmosphere, but due to the low volatility of this oil, emissions from these tanks are expected to be negligible (less than 0.005 TPY).

The trailer loading/unloading area will provide for loading of methanol product to ISO containers and for offloading of mineral oil to the oil storage tank.

The oil/water separator will collect water drained from the process area pads and will separate oil from stormwater (as well as water generated from firewater system tests). The water will be transferred to Eastman's wastewater system as shown on Figure 7.3-1. Oil will be removed to drums or to waste oil collection trucks and disposed of off-site or by routing to the boilers.

3.5.4 Catalyst Preparation, Oil Recovery, and Slurry Handling/Reduction

Impurities in the synthesis gas will eventually deactivate the catalyst, requiring new catalyst to be added and spent catalyst to be removed. The forming of fresh catalyst slurry and the process of preparing the spent catalyst for disposal is performed in the catalyst handling building.

Fresh slurry is made by introducing the catalyst powder into a vessel of mineral oil, then chemically reducing from the oxide form to -- or activating -- the catalyst by sparging in a mixture of nitrogen and synthesis gas while the vessel contents are heated and agitated. The reduction procedure takes approximately 30 hours. The result is a 35 to 40 wt% slurry mixture ready to be used in the reactor.

As new catalyst slurry is added to the LPMEOH™ reactor, the catalyst inventory is maintained by withdrawing an equivalent amount of partially deactivated or spent slurry from the reactor. The spent slurry is transferred back to the catalyst reduction vessel where it is cooled and its dissolved gases are purged. Vent streams from the catalyst reduction vessel are collected and combusted in Eastman's boilers.

After cooling, the spent slurry is transferred to the centrifuge. This centrifuge removes the oil from the slurry and discharges a high solids cake to a waste bin. The reclaimed oil is sent to an oil storage tank and is eventually returned to the process. The spent catalyst cake may be sold to a metals reclaimer or disposed of in a permitted waste management facility.

Plantwide vent headers will collect the discharges of safety valves for discharge into the blowdown tank, which will be vented to a quench tank vent prior to being vented to atmosphere. Since lifting of safety valves is an unplanned and infrequent event, discharges from these valves is not considered significant.

Within the catalyst preparation process area is the utility hot oil skid that provides heat for the catalyst reduction vessel. The utility hot oil skid will include an oil surge tank, pump, heater, and cooler. There are some fugitive emissions expected from this unit. Vapors will be collected from the utility oil surge tank and combusted in Eastman's on-site boilers.

3.6 Pollution Control

3.6.1 Air Pollution Emissions Control

The proposed project will result in small increases of emissions to the atmosphere. The new unit will be integrated into the existing production facility and will benefit from the use of existing air emission control equipment. There will be no changes in emissions from the coal gasification unit which supplies the feedstock to the LPMEOH™

unit. The two methanol storage tanks will be vented through an existing absorber. The two mineral oil tanks will be vented to the atmosphere. Because of the extremely low volatility of the mineral oil, the emissions are estimated to be negligible (less than 0.005 TPY).

Fugitive emissions from the pumps, valves, connectors, and pressure relief devices have been calculated to be approximately 10.8 TPY. These fugitive emissions will be minimized by the proper selection of materials and components designed for low levels of chemical leakage. Equipment leak emissions will be monitored by a leak detection and repair program that will be proposed in the monitoring plan. Proposed construction activities may result in the generation of some fugitive dust. The construction will not involve moving large quantities of earth. The site is less than an acre in size and will not require recontouring. The site has a gravel cover and precautions will be taken to preserve the gravel for reuse. Support caissons will be drilled and there will be shallow excavations for building foundations, but no other earth moving activities will occur. Construction is projected to last 14 months.

3.6.2 Liquid Waste Generation and Disposal

3.6.2.1 Construction Wastewater

Construction of the proposed project is not expected to impact existing surface water or groundwater resources. The proposed site has already been leveled, graded, and backfilled with compacted shale and a gravel cover. The potential for soil erosion and impacts on surface water will be minimized by removing cuttings from caisson excavations as they are produced and, if needed, by sand-bagging existing storm drains. The first phase of construction, following the placement of caissons, will be the pouring of concrete pads and curbing with underdrains to the interceptor (wastewater) sewer system. Once the pads are in place, any precipitation falling on the process, materials handling and storage areas will be collected and routed to the wastewater treatment facility by the interceptor sewer system.

3.6.2.2 Operational Wastewater

Potential impacts on surface water or groundwater due to the operation of the proposed facility are related to water used for cooling, process wastewater, and stormwater runoff. Stormwater runoff from the proposed unit is not expected to have any effect on surface water or groundwater resources. Runoff in areas unaffected by the manufacturing operation will be collected by an existing stormwater drainage system and routed to the South Fork Holston River. Areas potentially influenced by manufacturing will have collection systems for precipitation routed to the interceptor (wastewater) sewer system. These areas include process areas, the catalyst building, oil tank truck unloading pad, methanol storage area, and the oil storage area. A schematic diagram of this collection system is provided in Figure 6.3-1

Process wastewater flows from the proposed unit is expected to increase Biochemical Oxygen Demand (BOD) discharges from the LPMEOH™ unit. The proposed unit is expected to add 4180 lb/day BOD load and 1150 gal/day flow to the existing wastewater treatment facility. These discharges will not have any affect on the treatment facility or on the quality of its discharge to the South Fork Holston River.

water discharge to the South Fork Holston River. No adverse effect from these discharges is anticipated.

One final liquid waste stream is expected for the proposed unit. An oil/water separator is planned as a pretreatment step for stormwater runoff collected from the unit prior to discharge to the interceptor sewer. Oil collected from this separator will be managed through energy recovery on an as-needed basis.

A liquid waste stream not discussed above consists of compressor and pump lubricants. These liquid wastes will be managed through combustion for energy recovery; this stream is estimated to be 6.5 TPY.

3.6.3 Solid Waste Generation and Disposal

3.6.3.1 Construction Waste

During construction, some waste steel and other metals are expected to be generated, as well as normal construction debris (wood, concrete, paper, and other garbage). The daily volume of construction debris will be highly variable and dependent on the nature of construction activities. Based upon experience with other construction projects of this type, it is estimated that a total of 3,000 to 5,000 cubic yards of waste will be generated. Debris will be stored in on-site dumpsters, with each contractor responsible for managing and disposing of their own debris. It is anticipated that the on-site Eastman landfill will be used as the disposal site for this limited solid waste stream.

3.6.3.2 Operational Waste

Three solid waste streams are expected for the proposed unit. The first is spent methanol catalyst. Management of this waste may include a number of options. Emphasis will be placed on recycling and re-use. If possible the spent catalyst will be sent to a metals reclaimer for recycling. Another option would be incineration in Eastman's on-site incineration facility with residual ash disposal in a permitted hazardous waste disposal facility. The ash produced will be less than 1% of the ash currently being disposed of from this facility.

The second solid waste stream is activated carbon-carbonyl adsorbent from the guard beds. If possible the carbon will be regenerated and reused. Alternate options include disposal through on-site incineration. The third waste stream is a zinc oxide or other type of sulfur adsorbent. Management of this waste may include recycling or disposal in permitted off-site facilities.

These solid waste streams are typical of solid wastes already being managed successfully at Eastman. No adverse environmental impacts are anticipated due to the management of solid wastes from the proposed unit.

3.7 Safety Features

3.7.1 Fire Protection System

A comprehensive on-site fire protection system will be installed to control and extinguish fires in the process areas. The system will be designed to conform with the

Uniform Fire Code and all applicable National Fire Protection Association standards, as well as all state and local requirements. The system will include a capability to control fires by means of a fire water system and portable fire extinguishers; appropriate response to the range of potential fire situations at the unit will therefore be possible. All unit operators will be trained in the operation of the fire protection system.

The fire water system will include a fire water supply loop, fire hydrants, sprinkler and/or deluge systems, and hoses placed at key locations. An underground fire main pipeline will be installed, and hydrants with associated hose stations installed at appropriate locations. The existing fire water loop in the Eastman facility will be tied into for the new fire water system.

To supplement the fire water system, portable fire extinguishers will be provided at key locations within the unit. The type and number of extinguishers will satisfy all applicable code requirements.

3.7.2 Instrumentation and Controls

In order to maximize safe operation of the proposed LPMEOH™ unit, operations will be centrally directed from a control room. Unit instruments and controls will be designed to ensure safe startup, operation, and shutdown of the facility. The control system will also perform the major monitoring of operational parameters, annunciation, and reporting functions.

3.7.3 Medical Facilities

First aid kits, eyewash stations, and safety showers will be provided in the process area. This equipment will facilitate rapid medical response in an emergency situation.

3.7.4 Facility Design for On-site/Off-site Safety

Any potential safety hazards to personnel, equipment, and the community will be considered when producing equipment layouts and equipment locations. Local, state, federal standards and ordinances, including those established by the Occupational Safety and Health Administration (OSHA) and National Fire Protection Association (NFPA), as well as APCI company standards will be reviewed to minimize exposure to potential hazards.

Local emergency services such as fire departments, hospitals, and ambulance services will be identified, located, and contacted prior to startup of the unit. The Partnership will work with the local safety agencies to develop any safety and emergency procedures and plans required.

3.8 Transportation Features

Local traffic volumes will increase slightly during the peak construction period. Construction worker vehicles and trucks delivering equipment and supplies will access the site on a regular basis. However, the proximity of the site to a major transportation network, the ability to use rail for transport of some of the equipment, the potential to schedule construction shifts to avoid peak commuter travel periods, and the limited network, the ability to use rail for transport of some of the equipment, the potential to schedule construction shifts to avoid peak commuter travel periods, and the limited duration of the peak construction period are expected to minimize the effect of project construction on surrounding roadways.

During unit operations, project-related traffic will be minimal. This traffic will consist of catalyst deliveries (up to three truckloads per year), mineral oil deliveries (six to eight trucks per year), guard-bed adsorbent deliveries (one truck per year), and the removal of waste material (approximately one truck per month). In addition, off-site fuel demonstration pickups will be approximately 50 to 60 trucks over 12 to 18 months.

3.9 Construction Characteristics

Construction of the proposed LPMEOH™ unit is scheduled to begin in September of 1995 provided that the NEPA review is positive and all requisite construction approvals are obtained. Construction worker population is expected to start at 12 during initial mobilization for tie-in work and up-front construction work. The number of construction workers would gradually increase, peaking at approximately 135 by June of 1996. This peak workforce level is expected to be maintained for a period of approximately one month, after which the total number would gradually decrease until the construction is completed.

Construction would be scheduled for a typical 40-hour work week, with occasional periods of up to 60-hour work weeks. While the exact timing of the construction shift has not yet been determined, it is expected that work would generally occur during daytime hours.

Construction activities will include the following:

- setup and assembly of temporary office and warehouse facilties a short distance from the west boundary of the site;
- installation of temporary utilities (electricity, water, phone, sewage);
- preparation of construction parking and equipment staging areas;
- tie-in work to existing plant systems;
- disposal of wastes during construction;
- excavation and construction of foundations;
- erection of permanent facility steel structures and equipment;
- installation of mechanical, electrical, and instrumentation systems including permanent utilities; and
- commissioning and startup of the unit.

The proposed construction timetable is shown on Table 3.9-1. Staging and laydown areas will be established on the site during the first phase of construction. This area will be used for storage of bulk material such as structural steel, piping, mechanical equipment, electrical equipment, cable reels, and miscellaneous items. In addition, some materials may be stored locally and transported to the site by truck or stored inside the Eastman facility.

On-site parking will be provided for all construction employees. A security fence will be installed between the parking area and the site. The construction workforce will be drawn to the greatest extent possible from the local and regional area. Workers skilled as carpenters, masons, iron workers, welders, pipefitters, millwrights, insulators, painters, electricians, technicians, and engineers will be required. Due to the greatest possible use of the local workforce, in-migration would not result in significant stress upon the capacity of public and community services, such as educational facilities, health care and human services, police and fire protection, or public utilities.

TABLE 3.9-1 CONSTRUCTION SCHEDULE

MILESTONE	START	COMPLETE
NEPA Review	4/15/94	6/30/95
Civil Construction -- Piling, Foundations, and UG*	10/1/95	1/30/96
Steel Erection	1/11/96	3/25/96
Mechanical	1/16/96	9/26/96
Instrument/Electrical	3/18/96	10/10/96
Insulation and Painting	5/13/96	11/1/96
Plant Commissioning	8/9/96	11/27/96
Start-up	11/27/96	1/07/97

*UG = underground

3.10 Operational Characteristics

Once construction and start-up of the proposed demonstration unit are completed, it will be operated seven days a week, 24 hours per day. Three eight-hour shifts will be worked each day. No new employees are anticipated to be hired to staff the unit, since there will be sufficient employees within the existing Eastman facility to man the new plant.

A comprehensive training and start-up program will be implemented to ensure safe and efficient operation of the new facility.

3.11 Facility Pollution Prevention Measures

The proposed demonstration unit will include design and operating features to prevent pollution to the environment. Some of these features include:

- The use of low-leakage mechanical components in pumps, valves, and other systems to minimize the level of fugitive emissions.

- The use of secondary containment in the methanol and oil storage areas to eliminate the potential for discharge to the environment in the event of a tank or system leak.

- The implementation of a Preventive Maintenance (PM) program which includes procedures for reducing the potential of equipment failures that could lead to releases. These procedures include identification of applicable equipment and systems, periodic inspections, adjustments, and parts replacement.

- Potential sources of fugitive emissions and/or leaks will be detected and proactively managed through an environmental monitoring plan featuring periodic leak patrols.

- Good housekeeping practices will be employed at the unit. Housekeeping practices include neat and orderly storage of chemicals, prompt removal of small spills, regular refuse pickup, and proper storage of containers away from walkways and roads.

In addition, since the proposed facility will be constructed and operated by the Partnership in which Air Products is the general partner, it will be required to implement the pollution prevention programs which have been adopted by both companies. Both Air Products and Eastman have adopted the requirements of the Chemical Manufacturer's Association (CMA) Responsible Care Pollution Prevention Code of Management Practices. The initiative entitled "Responsible Care: A Public Commitment" commits member companies to improve performance in response to public concerns about the impact of chemicals on health, safety, and the environment. The Pollution Prevention Code consists of 14 management practices which provide the framework for companies to achieve ongoing reductions in the amount of contaminants and pollutants generated and released to the environment. Key concepts that are emphasized by this code include:

- **All Waste, All Media.** It applies to all wastes and releases to all media (e.g., air, water, land).

- **Preferred Reduction Hierarchy.** It embraces a pollution prevention hierarchy in which source reduction is preferred over recycle/reuse/reclaim which is in turn preferred over treatment.

- **Continuous Improvement.** It requires ongoing reductions of wastes and releases with a goal of establishing a long-term downward trend in the amount of wastes generated and releases to the environment. In other words, it requires continuous improvement as long as wastes or releases are generated.

The 14 management practices set out in the code are as follows:

1. A clear commitment by senior management, through policy, communications, and resources, to ongoing reductions at the facility in releases to the air, water, and land and in the generation of wastes.

2. A quantitative inventory of the facility wastes generated and released to the air, water and land, measured or estimated at the point of generation or release.

3. Evaluation, sufficient to assist in establishing reduction priorities, of the potential impact of each release on the environment and the health and safety of employees and the public.

4. Education of, and dialogue with, employees and members of the public about the inventory, impact evaluation, and risk to the community. This practice includes requirements under the Superfund Amendments and Reauthorization Act (SARA) Title 311 Emergency Planning Notification and SARA Title 312 Tier II Inventory Reporting programs.

5. Establishment of priorities and plans for waste and release reduction, taking into account both community concerns and the potential health, safety, and environmental impacts as determined under Practices 3 and 4.

6. Ongoing reductions of wastes and releases, giving preferences first to source reduction, second to recycle/reuse, and third to treatment. These techniques may be used separately or in combination with one another.

7. Measurement of progress at the facility in reducing the generation of wastes and in reducing release to the air, water and land by updating the quantitative inventory at least annually. This update includes annual summaries of SARA 313 Releases quantities and of all hazardous and non-hazardous solid waste quantities.

8. Ongoing dialogue with employees and members of the public regarding waste and release information, progress in achieving reduction, and future plans. This dialogue would be at a personal, face to face level, where possible, to obtain feedback.

9. Inclusion of waste and release prevention objectives in research and in design of new or modified facilities, processes, and products.

10. An ongoing program for promotion and support of waste and release reduction by others. This program would include commitment to the EPA 30/50 Voluntary Reduction Program.

11. Periodic evaluation of waste management practices associated with operations and equipment at the facility, taking into account community concerns and health, safety, and environmental impacts and implementation of ongoing improvement. The facility would be undergoing periodic internal environmental audits and inspections to assure ongoing compliance.

12. Implementation of a process for selecting, retaining, and reviewing contractors taking into account sound waste management practices that protect the environment and the health and safety of employees and the public.

13. Implementation of engineering and operating controls at the facility to improve prevention and early detection of releases that may contaminate groundwater. This includes routine inspection of spill containment devices under the provisions of the SPCC Plan.

14. Implementation of an ongoing program for addressing operating and waste management practices and for working with others to resolve identified problems, taking into account community concerns as well as health, safety and environmental impacts.