PROJECT SCOPE REPORT

PROJECT CEA-2417

MCS-1016

W. G. KRUMMRICH PLANT - SAUGET, ILLINOIS

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Prepared by: A. J. Heinze
August 4, 1970

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PROJECT SCOPE REPORT

CEA 2417

MCS - 1016

W. G. Krumrich Plant

Sauget, Illinois

By: A. J. Heinze
August 4, 1970

MONS 057320

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1.1 Summary

This scope report describes the facilities required to manufacture MCS-1016 at the W. G. Krummrich plant. The project essentially consists of a vacuum fractionation column system which produces MCS-1016 as an overhead product from the Aroclor 1142 feed using recently developed distillation technology.

The nominal design capacity of the new facility is 55 M pounds per year of MCS-1016 product. Assuming project approval by September 1970, the targeted completion date is June 1971.

The column feed (Aroclor 1142) will be produced via the exis ing manufacturing process in Dept. 246 at the WGK plant. This feed will be refined to the MCS-1016 product in a 30 plate fractionating column operating in a semi-continuous fashion. This material will be further refined in the existing department absorption columns prior to storage. The bottoms material from the fractionator will be distilled in an existing straight "take-over" still to remove montar and then chlorinated to Aroclor 1254 and 1260.

Recent pollution problems associated with polychlorinated biphenyls have created an urgent need for improved, biodegradable polychlorinated biphenyls for Aroclor. MCS-1016 is the improved biodegradable substitite product for Aroclor 1242. Accordingly, due to the ecological nature of this project, time is of the essence in completing the work and starting operation as soon as reasonably possible. Although no overtime engineering work is planned, the overall design and construction schedules will be tight and will be carefully followed and expedited as required to meet the targeted completion date.

The expected capital cost of this project is $640,000.

1.2 Process Technology

1.21 Process Description

Aroclor 1142 (column feed) will be produced via the existing manufacturing process in the existing continuous chlorination unit and in a new continuous line which will consist of three of the existing batch chlorinators piped together and equipped with a new Densitrol density controller. The combined 1142 streams will be air-blown in existing blow tank (Item 422) and then pumped to the existing 15,000 gallon intermediate storage tank (Item 424).

The new column system, which will be operated semi-continuously, will be fed from Item 424 storage tank. An initial 1142 charge, including lime, will be pumped into the column still pot. Vapors are then generated by pumping the still pot liquid thru the gas-fired reboiler and the column is put on total reflux. After temperatures have lined out, distillate product is cut forward, cooled and pumped thru absorption columns to storage. A column run will consist of approximately 40,000 gallons. At the end of a run, the still pot contents are "boiled down" to an end point temperature of approximately 300°C and the pot "residue" is transferred to the residue surge tank.

Residue from the surge tank is pumped to the existing #2 still system where "High Boilers" are taken overhead and Montar is removed. The "High Boiler" stream is then batch chlorinated to Aroclor 1154 or 1160 in an existing chlorinator. Aroclor 1154 or 1160 is then refined in the existing #4 still system and pumped thru existing absorbers to storage. Residue from the #4 still is recycled back to the #2 still system for "boil down".

Organic Research have made several lab scale runs to determine the degree of fractionation required for the new MCS-1016 product. Research have also demonstrated at Anniston the feasibility of chlorinating high boilers (fractionator bottoms) to a salable Aroclor 1260 product. Additional work is currently being done to demonstrate the feasibility of chlorinating high boilers to Aroclor 1254.

1.22 Raw Materials and Usages

Raw materials for the project are Aroclor 1142 and Hydrated Lime. Raw material specification sheets as indicated below are attached in Appendix A.

Raw Material	Code No.	Issue Date
Aroclor 1142	--	10/21/68
Hydrated Lime	38,800	4/7/70

Lime usage is estimated at approximately 400 lbs./run or 160 lbs./day.

Aroclor 1142 usage is approximately 1.25 lbs./lb. MCS-1016.

1.23 Products and By-Products

The MCS-1016 product specification sheet is being developed by Organic Research. A "Typical Properties" sheet for MCS-1016 is attached in Appendix A.

MCS-1016 product will be stored in 3 sets of 6 aluminum storage tanks making a total of 126 M gallons. This method of storage is required to have reasonable run times and to retain the complete product component range for a column run. Tankage identity for 1016 storage is as follows:

Dept. Item No.	M Gal	Present Usage
117	20	Aroclor 1242 Storage
118	20	Aroclor 1248 Storage
119	20	Aroclor 1242 Storage
558	22	Aroclor 1242 Storage
559	22	Aroclor 1242 Storage
(1-314)	22	New Tank
Total	126	

Aroclor 1254 will be stored in 2 aluminum storage tanks as follows:

Dept. Item No.	M Gal	Present Usage
560	22	Aroclor 1254
562	22	Aroclor 1254
Total	44	

Aroclor 1260 will be stored in one 22 M gallon aluminum tank, presently used for 1260.

Aroclors 1248 and 1262 will no longer be produced at WGK plant.

1.24 Waste Streams

One potential waste stream which will require disposal is excess high boilers from the fractionator. One of the economic premises of this project is that all future Aroclor 1254 and 1260 will be made at WGK by chlorinating (and further refining) the fractionator high boiler stream, assuming the availability of this material from MCS-1016 sales requirements. At the project design capacity of 55.5 M lbs./year of MCS-1016 (present 1974 sales forecast). The Aroclor 1254 and 1260 sales forecasts are such that all the high boilers are consumed for these requirements, leaving no excess. However, a product requirement imbalance could occur such that excess high boilers (not needed for Aroclor 1254 or 1260) would have to be disposed of. Should this situation materialize, the excess high boilers would be burned in the proposed Aroclor incinerator at WGK.

1.25 Personnel, Property and Public Hazards

This project will not create any new hazards in Dept. 246 compared to the present manufacturing process. In the present operation, Aroclors are handled at elevated temperatures in a safe manner which is the only potential hazard for this project.

One design objective, however, will be to develop a safe method of charging hydrated lime from 50# bags to the lime slurry tank prior to a column run.

1.3 Manufacturing Facilities

The following information is included in the Appendix of this report:

Equipment Summary Sheets - Appendix B

Plot Plan and Equipment Layout - Appendix D

Process Flow Diagrams - Appendix E

Instrument List - Appendix F

Scope of Work - Appendix G

1.31 Description

The major equipment items to be installed for the production of the MCS-1016 product are as follows:

a) Fractionating Column - a 30 plate, stainless steel, insulated, self-supported column.

b) Condenser - a 2400 sq.ft. stainless steel (tubes), shell-and-tube unit supported above the top of the column.

c) Still Pot - a 12,500 gallon, horizontal, steel vessel with a submerged circulating pump.

d) Residue Surge Tank - a 12,500 gallon, horizontal, steel vessel with a submerged pump.

e) Storage Tank - a 22,000 gallon, vertical, flat bottom, aluminum storage tank for MCS-1016.

1.32 Design Capacity

The nominal design capacity of the new MCS-1016 fractionation facility is 55 M lbs./year.

The anticipated fractionator operating cycle time will be 60 hours/run, broken down as follows:

		Hours
a)	Charge initial Aroclor 1142 to Still Pot, and charge lime slurry.	1.00
b)	Attain total reflux and line out column temperatures	2.50
c)	Start feed and product draw-off	54.25
d)	Boil down and pump out residue	2.25
	Total	60.0

Overall on-stream time approximately 90%

1.33 Storage and Shipping Requirements

Product storage facilities are noted in detail in Section 1.23 of this report. The loading facilities for the existing Aroclor products will be used with an additional loading arm assembly provided (at spot 3 on track 11) for increased MCS-1016 loading flexibility. No extensions are anticipated to be made to the existing loading/unloading docks.

1.34 Flexibility and Future Expansion

Due to the expected limited sales life of the MCS-1016 product, no specific provisions for future expansion are included in the project.

One possible future replacement for MCS-1016 is Aroclor 1230 with the 4-4' dichlorobiphenyl removed. The 4-4' cut and can be separated using a batch distillation process. With the addition of three fractions receivers and some piping modifications, the MCS-1016 fractionator system could be converted over to produce the distilled Aroclor 1230 substitute product. The ultimate capacity of this product depends on the results of current research work on this distillation process.

1.4 Utilities

The utility requirements along with the various utility sources are discussed under Utilities Facilities below.

1.41 Utilities Summary

The utilities summary and requirements sheets are attached in Appendix C.

1.42 Utilities Facilities

a) 80 psig Saturated Steam - The design requirement for 80# steam is 350 lbs./hr. Tie in will be made to the existing department 80# system. The existing steam meter is adequate for this additional usage.

1.42 Utilities Facilities (Con't)

b) 200 psig Saturated Steam - The design requirement for 200# steam is 230 lbs./hr. Connection will be made to the existing 2" 200# steam header. The existing steam meter is adequate for this additional usage.

c) City Water - City water will be used in the column jet condenser and fume scrubber. The design requirement is 130 GPM. Connection will be made to the existing department city water break tank system.

d) Cooling Tower Water - The design cooling water requirement is 500 GPM. Water will be supplied from the No. 11 cooling tower. Use will be made of the existing cooling tower pumps. A new integrating type water flow meter is to be provided.

e) Natural Gas - The column reboiler furnace will be fired with either "interruptable" natural gas or with fuel oil (see f) below). The design requirement for gas is 1900 Therms per day. The 3" gas supply line will be extended from the SW corner of Dept. 254 to the meter in Dept. 246. A new in-line type gas meter is included.

f) Fuel Oil - A No. 2 heating oil back-up system will be provided for the column reboiler service. This system will consist of a 10,000 gallon oil storage tank and feed pump. Fuel oil will be received from an oil shuttle truck about once per week (when operating on oil) delivered into the storage tank using the truck pump. The design fuel oil usage rate is 60 GPH.

g) Instrument Air - Design requirements are 15 CFM. This air will be supplied from the plant centralized instrument air system and connection will be made to the existing department air header.

h) Electrical - Electrical power for the required 116 connected HP load will be supplied via the No. 3 circuit at No. 8 sunstation. A new 500 MCM cable will be installed.

i) Nitrogen - Nitrogen will be used as an inert blanketing gas for the new MCS-1016 storage tank. Connection will be made to the existing N_2 blanketing piping system in the tank farm.

1.5 Reference Reports

a) J. E. Silver, Suggested Procedure for Aroclor 1242B (MCS-1016), Report No. P-1565, April 30, 1970.

b) G. L. Arnett (Anniston) memo to R. H. Munch dated July 17, 1970 regarding "high boiler" chlorination to Aroclor 1254 and Aroclor 1260.

Monsanto
ORGANIC CHEMICALS DIVISION
W. G. Krummrich Plant
RAW MATERIAL
SPECIFICATION

MATERIAL CODE	MATERIAL
38800	Lime, Hydrated
PLANT: WGK	USING DEPTS.: 287, 750, 246
DATE EFFECTIVE: 4/7/70	SUPPLIER: Mississippi Lime Co.

APPROVALS

PRODUCTION: T. W. Dalton / B. Corlew	RESEARCH: M. E. Gibbs
PROCUREMENT: J. Leverle	QUALITY CONTROL (Chief Chemist): R. Blowers

GENERAL DESCRIPTION

CHEMICAL FORMULA: $Ca(OH)_2$

SUPERSEDES SPECS OF	SAMPLE FOR ANALYSIS	ISSUED BY
8/13/69	1 x 16 oz. W.M. Bottle	Higgerson/Stites

CHARACTERISTIC	LIMITS	METHOD
Appearance	Fine white or slightly gray powder, free from lumps or gritty material	10,188
Assay ($Ca(OH)_2$)	92.00%, min.	10,191
Carbonates as ($CaCO_3$)	3.00%, max.	10,193
Magnesium	0.50%, max.	10,192
Sulfates (as SO_3)	0.30%, max.	10,189

Supplier's certificate of analysis to be sent on day of shipment to:

Chief Chemist, Monsanto Co., Sauget, Illinois

(R) Routine Analysis. All others Analyzed by request only.

WGK-216

MONS 057330

Monsanto
ORGANIC CHEMICALS DIVISION

FINISHED PRODUCT SPECIFICATION

PRODUCT: Aroclor 1142 Crude Commercial			DEPT.: 27-Ann.
PLANT: Anniston-WGK	PRODUCT CODE:	USE: Sales	
DATE EFFECTIVE: 10/21/68	SALES CODE: 1040-130-04/11/03/09		

APPROVALS

PRODUCTION: J. W. Molloy	RESEARCH: M. E. Gibbs
SALES: W. E. Ault	QUALITY CONTROL (Chief Chemist): W. J. Gresham — G. W. Miller, Ann.

GENERAL DESCRIPTION

CHEMICAL FORMULA

MOL WT.

SUPERSEDES SPECS. OF	SAMPLE FOR ANALYSIS	ISSUED BY
2/26/65	WGK 2.16 oz. W.M. Bottle Ann. 1 at. Bot.	E. McEntire/G. Stites

CHARACTERISTIC		LIMITS	METHOD: Anniston	METHOD: WGK
UNRESTRICTED INFORMATION				
(R)	Appearance and Color	Brown to black Oily liquid		10084
(R)	Sp. Gr. @25°/15.5°C.	1.384 - 1.394	14-49-54	10114
(R)	Acid Number (mg. KOH/g.)	0.7, max.	14-46-54	11532
RESTRICTED INFORMATION				
(R)	Acid Number (mg. KOH/g.)	0.2, max. *	14-46-54	11532

* When stored in non-lacquered metal containers.

MONS 057331

(R) Routine Analysis. All others Analyzed by request Only

MCS-1016

TYPICAL PROPERTIES

COLOR (APHA)	10
CONDITION	CLEAR
SP. GR. @ 25/15.5°C	1.363
ACIDITY (Mg. KOH/g.)	0.001
MOISTURE (PPM)	40
REFRACTIVE INDEX @ 25°C	1.6210
INORGANIC (FREE) CHLORIDES (PPM)	0.02
POUR POINT (°C)	-18
DIELECTRIC CONSTANT (1000 CYCLES @ 100°C)	4.96
RESISTIVITY (500 VDC @ 100°C, D.1" GAP) AS OHM-CM X 10^9	$353X10^3$
HYDROLYSIS STABILITY (PPM AS CHLORIDES)	0.10
MONSANTO STABILITY (PPM AS CHLORIDES)	0.06
DISTILLATION RANGE (ASTM D-20, CORRECTED)	
10% DISTILLED (BY WT.) °C	324
90% DISTILLED (BY WT.) °C	342
DIELECTRIC STRENGTH @ 25°C (KV)	50
FLASH POINT (°F)	354
FIRE POINT (UP TO B.P.)	NONE
VISCOSITY @ 100°F (SUS)	70.6
FIXED CHLORIDE (%)	41.3
(G-E) THERMAL CHEM. CHLORIDES (PPM)	0.16
(WESTINGHOUSE) HYDROLIZABLE CHLORINE (PPM)	0.26

APPENDIX B-1

CENTRAL ENGINEERING DEPARTMENT EQUIPMENT INFORMATION SUMMARY

PREPARED BY	CEA NO.	AREA	PAGE
A.J HEINZE	2417	1	1 OF 3
APPROVED BY	INITIAL ISSUE	REV. NO.	REV. ISSUED
	8-28-70		

PROJECT NAME: MCS-1016 FRACTIONATION - WGK

CED EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	OPERATING WEIGHT (POUNDS)	REMARKS	SOURCE*	ESTIMATED PRICE 100
1-301-000	COLUMN	1	8'-6" ϕ x 43'-6"	316 L S.S.	115,000	18' SKIRT 550°F & F.V. CODE STAMPED	R	CEA 4877 ITEM AS-201
1-301-001	COLUMN TRAYS	25	SIEVE	316 L S.S.	—	EXIST. TRAYS	R	—
		5	SIEVE	304 S.S.	—	TO BE INSTALLED	N	
1-302-000	COLUMN CONDENSER	1	2400 SQ.FT. 37" SHELL 10' LONG	AL. TUBES STEEL SHELL	12,000	3/4" x 14 Ga. TUBES 400°F & F.V. OIL COOLED	R	ITEM TT-202
1-303-000	REFLUX SPLITTER	1	10:1 MAX. R.R.	ALUMINUM	—	50 PSIG DESIGN 300°F DES. TEMP.	N	
1-304-000	PROD. COOLER	1	92 SQ. FT. U-TUBE UNIT	MONEL TUBES STEEL SHELL	—	TUBES 30 PSI & F.V. WATER COOLED 400°F DESIGN	N	—
1-305-000	STILL POT	1	12,500 GAL 11'-6" ϕ x 16'-0"	STEEL	180,000	HORIZ. STILL 650°F & F.V. SADDLE SUPPORT	N	—
1-306-000	STILL CIRC. PUMP	1	650 GPM 45' TDH	STAINLESS STEEL	—	SUBMERGED UNIT - MOUNTED IN STILL POT.	R	ITEM PP-203
1-306-001	PUMP MOTOR	1	30 HP	—	—	1200 RPM	R	"
1-307-000	COLUMN REBOILER	1	6 M BTU/HR GAS FIRED	STEEL TUBES	25,000	CYLIND.- VERT. 100 PSIG & 700°F DESIGN	R	—
1-308-000	COLUMN EJECTOR SYSTEM	1	15 LBS/HR AIR 20 MM SUCTION	MONEL / C.I.	—	TWO STAGE 150# MOTIVE STM.	N	—
1-309-000	THERMINOL SURGE TANK	1	300 GAL. 3'-6" ϕ x 4'-3"	STEEL	3,000	500°F DES. TEMP. 40 PSIG. & PRES.	N	—

CE-224

*SOURCE: N = NEW E = EXISTING R = TO BE RELOCATED

MONS 057333

CENTRAL ENGINEERING DEPARTMENT EQUIPMENT INFORMATION SUMMARY

PREPARED BY	CEA NO	AREA	PAGE
A.J. HEINZE	2417	1	2 OF 3
APPROVED BY	INITIAL ISSUE	REV NO	REV. ISSUED
	7-29-70		

PROJECT NAME: MCS-1016 FRACTIONATION - WGK

CED EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	** OPERATING WEIGHT (POUNDS)	REMARKS	SOURCE*	ESTIMATED PRICE ($)
1-310-000	THERMINOL CIRC. PUMP	1	500 GPM 75' TDH	D.I.	—	DEAN PROCESS PUMP 4"x6"	R	CEA 4877 ITEM PP206-A
1-310-001	PUMP MOTOR	1	40 HP TEFC	—	—	1750 RPM	N	—
1-311-000	THERMINOL COOLER	1	4M BTU/HR 160 SQ FT. FXTS	STEEL	—	EXPANSION JOINT 3/4" TUBE 12' LONG	N	—
1-312-000	RESIDUE SURGE TANK (HAIRPIN COIL)	1	12,500 GAL 11'-6"ϕ x 16'-0"	STEEL	130,000	HORIZONTAL 650°F 30 PSIG SADDLE SUPPORT	N	—
1-313-000	RESIDUE TANK PUMP	1	100 GPM 60' TDH	D.I.	—	J. CRANE MECH SEAL DURCO	N	—
1-313-001	PUMP MOTOR	1	7½ HP TEFC	—	—	1750 RPM	N	—
1-314-000	1016 STORAGE TANK	1	22,000 GAL. 12'-6" x 24'-0"	ALUMINUM 5052	—	INSULATED STM. HEAT. PANELS	N	—
1-315-000	1016 STORAGE PUMP	1	150 GPM @ 40' TDH	316 S.S.	—	J.CRANE MECH. SEAL DURCO 3X2-13	N	—
1-315-000	PUMP MOTOR	1	25 HP 1750 RPM	—	—	ENCAPSULATED	N	—
1-316-000	FUEL OIL STORAGE TANK	1	10,000 GAL 11'-0"ϕ x 15'	STEEL	—	VERT. FLAT BTM. STEAM HEATED ATM. 500°F DES.	N	—
1-317-000	FUEL OIL SUPPLY PUMP	1	100 GPH 50 PSIG	D.I.	—	WORTHINGTON GEAR PUMP w/MECH SEAL	N	—
1-317-001	PUMP MOTOR	1	1½ HP TEFC	—	—	1750 RPM	N	—

CE-224

* SOURCE: N=NEW E=EXISTING R=TO BE RELOCATED

** ESTIMATED WEIGHT FILLED WITH NORMAL CONTENTS OR TEST MATERIAL, WHICHEVER IS HEAVIER

MONS 057334

CENTRAL ENGINEERING DEPARTMENT — EQUIPMENT INFORMATION SUMMARY

PREPARED BY	CEA NO	AREA	PAGE
A. J. HEINEE	2417	1	3 OF 3

APPROVED BY	INITIAL ISSUE	REV NO	REV. ISSUED
	7-29-70		

PROJECT NAME: MCS-1016 FRACTIONATION - WGK

CED EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	QTY.	SIZE, RATING, MODEL, ETC	MATERIAL OF CONSTRUCTION	** OPERATING WEIGHT (POUNDS)	REMARKS	* SOURCE	ESTIMATED PRICE ($)
~~1-318-000~~	~~COLUMN JETS SUMP TANK~~	1	300 GAL. 3'-6"ϕ x 4'-3"	STEEL	—	CANCELLED	N	
~~1-319-000~~	~~OIL RETURN PUMP~~	1	10 GPM @ 30' TDH	D. I.	—	CANCELLED	N	
~~1-319-001~~	~~PUMP MOTOR~~	1	2 HP 1750 RPM	—	—	CANCELLED	N	
1-320-000	LIME SLURRY TANK	1	500 GAL. 4'-0" x 5'-3"	STEEL	—	LEG SUPPORTED INSULATED 30 PSIG 500°F DES.	N	
1-320-001	TANK AGITATOR	1	6-BLADE (FLAT) TURBINE	STEEL	—	100 RPM	N	
1-320-002	AGITATOR MOTOR	1	5 HP 1750 RPM	—	—	ENCAPSULATED	N	
1-321-000	LIME SLURRY TRANSFER PUMP	1	30 GPM @ 40' TDH	D. I.	—	CENTRIFUGAL MECH. SEAL	N	
1-321-001	PUMP MOTOR	1	5 HP 1750 RPM	—	—	ENCAPSULATED	N	
1-322-000	PRODUCT POLISH FILTER	2	ALSOP MODEL PAK 125-5	316 S.S.	—	ASBESTOS/CELLULOSE FILTER MEDIA 150 GPM FLOW	N	
1-323-000	FUME SCRUBBER	1	S&K MODEL 7010 W/SEPARATOR MODEL 7040	FURAN FIBERGLASS	—	12" SIZE; 1" DRAFT LARGE NOZZLE	N	
1-324-000	VENT CONDENSER	1	100 SQ FT.	SHELL - STEEL TUBES - MONEL			N	

MONS 057335

CE 224

* SOURCE: M - NEW E - EXISTING R - TO BE RELOCATED

** PERMISSIBLE WEIGHT OF ...

UTILITIES SUMMARY

CENTRAL ENGINEERING DEPARTMENT

APPENDIX C-1

PROJECT NAME	PREPARED BY	APPROVED BY	CEA NO	AREA	PAGE
MCS-1016 FRACTIONATION-WGK	A.J. HEINZE		2417	1	1 of 2

UTILITY SERVICE	UNITS	INITIAL ISSUE DATE 7-29-70		REV. 1 DATE		REV. 2 DATE		REV. 3 DATE	
		AVERAGE	DESIGN	AVERAGE	DESIGN	AVERAGE	DESIGN	AVERAGE	DESIGN
NATURAL GAS	THERMS/DAY	1580	1900						
(FUEL OIL)	GPH	49	60						
ELECTRICAL	CONN. HP	—	114						
STEAM-80 PSIG	LBS/HR	260	350						
STEAM-200 PSIG	LBS/HR	200	230						
COOLING TOWER WATER	GPM	445	500						
CITY WATER	GPM	110	130						
INSTRUMENT AIR	CFM	10	15						
NITROGEN	SCFD	940	1000						
MONS 057336									

Blank Space Indicates This Utility Requirement Has Not Been Checked Since Last Revision

UTILITIES REQUIREMENTS

CENTRAL ENGINEERING DEPARTMENT

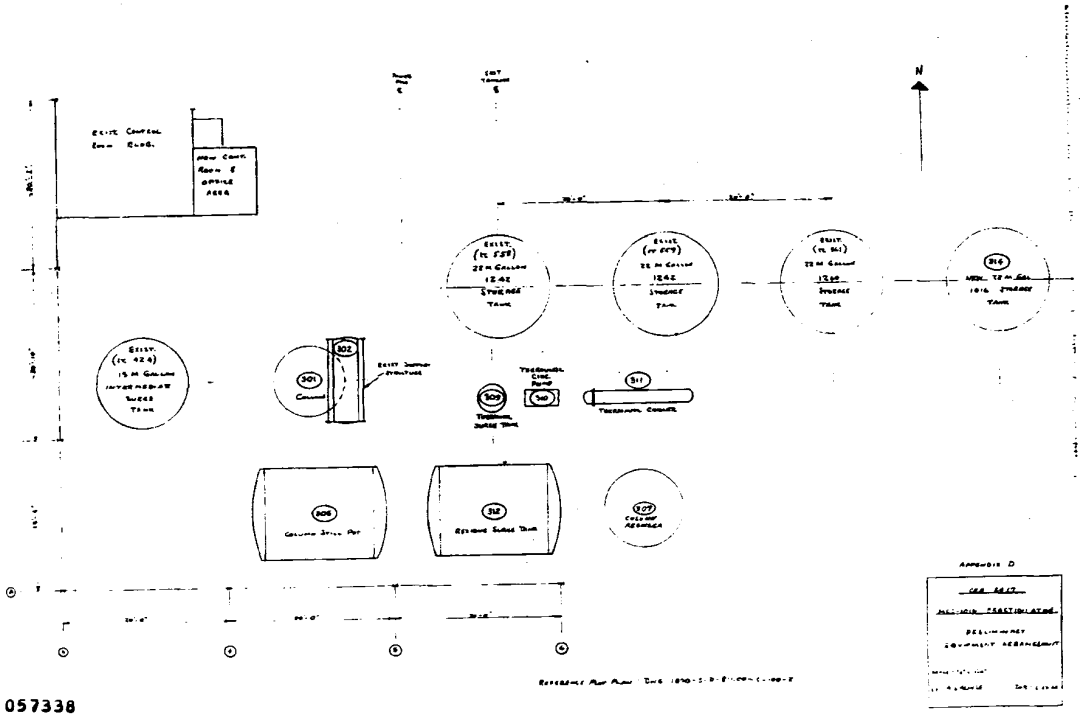
PREPARED BY	CEA NO	AREA	PAGE
A. J. HENIZE	2417	1	2 of 2
APPROVED BY	INITIAL ISSUE 7-27-70	REV NO	REV ISSUED

PROJECT NAME: MCS-1016 FRACTIONATION - WGR

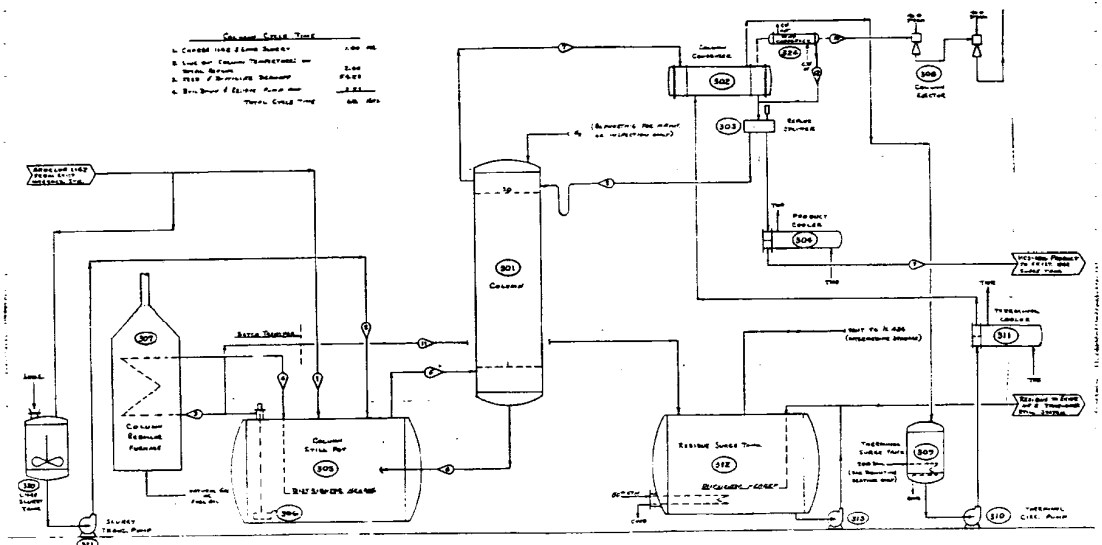
CEO EQUIPMENT IDENTIFICATION NUMBER	DESCRIPTION OF EQUIPMENT ITEM	NATURAL GAS THERMS/DAY		(FUEL OIL) GPH		ELECTRICAL CONNECTED HP		STEAM, 80 PSIG LBS/HR		STEAM, 200 PSIG LBS/HR		TOWER WATER GPM		CITY WATER GPM		NITROGEN SCF/DAY	
		AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM
1-304	PRODUCT COOLER	—	—	—	—	—	—	—	—	—	—	45	60	—	—	—	—
1-306	STILL CIRC. PUMP	—	—	—	—	—	30	—	—	—	—	—	—	—	—	—	—
1-307	COLUMN REBOILER	1580	1900	49	60	—	—	—	—	—	—	—	—	—	—	—	—
1-308	COLUMN EJECTOR	—	—	—	—	—	—	—	—	200	230	—	—			—	—
1-310	THERMINOL CIRC. PUMP	—	—	—	—	—	40	—	—	—	—	—	—	—	—	—	—
1-311	THERMINOL COOLER	—	—	—	—	—	—	—	—	—	—	400	440	—	—	—	—
1-313	RESIDUE TANK PUMP	—	—	—	—	—	7 1/2	—	—	—	—	—	—	—	—	—	—
1-314	#6 MCS-1016 STORAGE TANK	—	—	—	—	—	—	80	100	—	—	—	—	—	—	940	1000
1-315	STORAGE PUMP	—	—	—	—	—	25	—	—	—	—	—	—	—	—	—	—
1-316	FUEL OIL STORAGE TANK.	—	—	—	—	—	—	80	100	—	—	—	—	—	—	—	—
1-317	FUEL OIL SUPPLY PUMP	—	—	—	—	—	1 1/2	—	—	—	—	—	—	—	—	—	—
~~1-319~~	~~OIL RETURN PUMP~~	CANCELLED		—	—	—		—	—	—	—	—	—	—	—	—	—
1-320	LIME SLURRY TANK AGITATOR	—	—	—	—	—	5	—	—	—	—	—	—	—	—	—	—
1-321	LIME SLURRY TRANS. PUMP	—	—	—	—	—	5	—	—	—	—	—	—	—	—	—	—
1-323	FUME SCRUBBER	—	—	—	—	—	—	—	—	—	—	—	—	85	100	—	—
—	STEAM TRACING	—	—	—	—	—	—	100	150	—	—	—	—	—	—	—	—
1-324	VENT CONDENSER	—	—	—	—	—	—	—	—	—	—	—	—	25	30	—	—
	TOTALS	1580	1900	49	60	—	114	260	350	200	230	445	500	110	130	940	1000

CE-300

MONS 057337


N
EXIST. CONTROL ROOM BLDG.
NEW CONT. ROOM & OFFICE AREA
EXIST. (TK 559) 22 M GALLON 1242 STORAGE TANK
EXIST. (TK 559) 22 M GALLON 1242 STORAGE TANK
EXIST. (TK 561) 22 M GALLON 1240 STORAGE TANK
314
1016 STORAGE TANK
EXIST. (TK 424) 15 M GALLON INTERMEDIATE SWEEP TANK
302
301
COLUMN
EXIST. SUPPORT STRUCTURE
309
TREATMENT SURGE TANK
TREATMENT CIRC. PUMP
310
311
TREATMENT COOLER
306
COLUMN STILL POT
312
REFUSING SURGE TANK
307
COLUMN REGENERATOR
APPENDIX D
DESIGN PRACTICALITY
PRELIMINARY EQUIPMENT ARRANGEMENT

MONS 057338



	1	6	7	8	9	10	11	12	1	2	3	10	11	12
	Column Feed	Light Cuttings	Reference Point	Reference Point	Reference Point	Column Bottom Liq.	Column Bottom Liq.		Column Reflux	Hot Distillate	Hot Liq.	Residue	Hot Effluent	
Mol. Wt.	74.08	(Benz.)	Interpolate	Interpolate	Interpolate	Interpolate	77.396		98.08+	78.08	<1	—	—	87+
Mole Fraction	~0.0	(Wat.)	—	—	—	—	—		—	—	—	(Water)	—	—
Wt. %	—	(Alc.)	—	—	—	—	99.8%		98.08+	100%	<1	—	—	67+
Total Lbs/Hr	11,000	—	220,000	220,000	21,000	210,000	—		—	220,000	—	20,000	—	—
Total Lbs/Hour	470,000	2,000	—	—	—	—	—		—	—	—	—	—	—
Temperature, °C	40	30	175	155	175	177	179		134	66	66	300	66	
Pressure, Psia (mm)	0	0	40	(40)	(40)	(40)	(40)		(40)	0	(0)	10	(0.2)	
Type Operation	Batch / Cont.	(Batch)	Semi-Continuous	Semi-Continuous	Semi-Continuous	Semi-Continuous	Semi-Continuous		Semi-Continuous	Semi-Continuous	Semi-Continuous	(Batch)	Semi-Continuous	

APPENDIX 8H

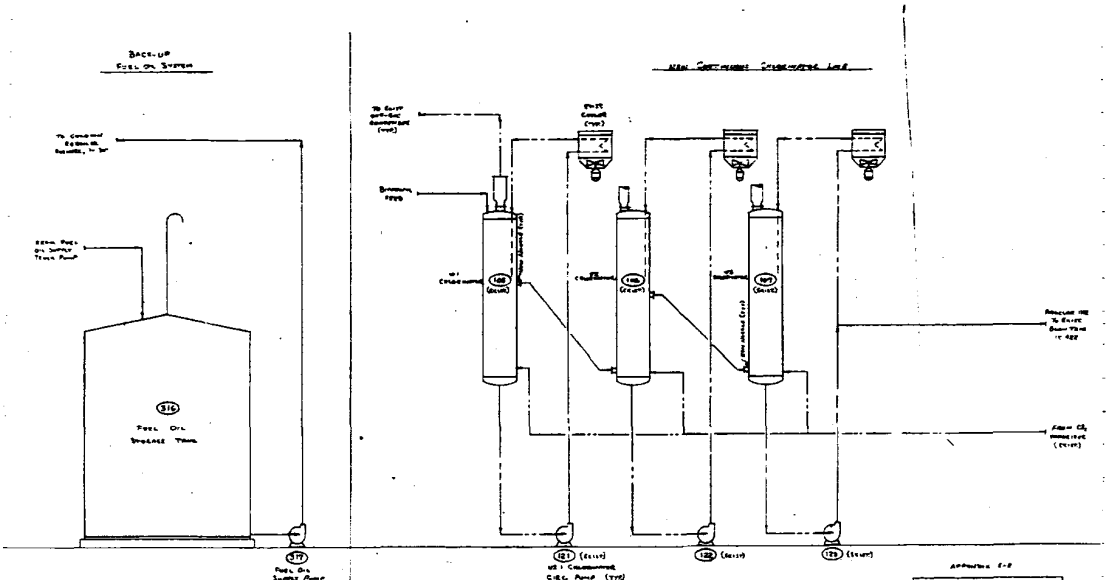
CEA-2612

MCS-1016 FRACTIONATION

PROCESS FLOW DIAGRAM

SHEET NO. 1

MONS 057339


BACK-UP
FUEL OIL SYSTEM
316
FUEL OIL
STORAGE TANK
317
FUEL OIL
SUPPLY PUMP
121 (SPARE)
122 (SPARE)
123 (SPARE)

MONS 057340

CENTRAL ENGINEERING DEPARTMENT

INSTRUMENT SUMMARY
MCS 1016
PROJ DEPT ARCOLOR
PLANT WGK DIVISION ORGANIC

APPENDIX F
EQUIP. IDENT. NO.
CEA NO. 2417 AREA NO.
BY R.L. NEARY
DATE 8-4-70 SHEET 1 OF 2

E = EXISTING
R = RELOCATED
N = NEW
F = FIELD
P = PANEL

INST. NO.	DESCRIPTION	SENSOR	TRANS.	CONT./END. SOURCE	CONT./END. LOC.	CONTROL VALVE SOURCE	CONTROL VALVE SIZE	CONTROL VALVE MAT'L	COMMENTS
TJRI	MULTI POINT RECORDER				P				12 PTS.
301-1 (1)	COLUMN BOTTOM	N	—	—	P	—	—	—	NEW TW
301-2 (2)	COL. TRAY 10	N	—	—	P	—	—	—	EXIST. TW
301-3 (3)	COLUMN TOP	N	—	—	P	—	—	—	EXIST. TW
305-1 (4)	STILL POT	N	—	—	P	—	—	—	
307-3 (5)	REBOILER RETURN	N	—	—	P	—	—	—	
312-2 (6)	RESIDUE SURGE TANK	N	—	—	P	—	—	—	
311-2 (7)	THERMINOL COOLER-TWR	N	—	—	P	—	—	—	
302-2 (8)	CONDENSER-THERMINOL OUT	N	—	—	P	—	—	—	
310-2 (9)	THERM. COOLER - THERM. IN	N	—	—	P	—	—	—	
PdI 301-4	COLUMN PRESSURE DROP	R	R	N	P	—	—	—	
PSE 301-5	COLUMN RUPTURE DISC	—	—	—	—	—	—	—	NEW [illegible]
PIC 301-6	COLUMN PRESSURE CONTROL	R	R	N	P	R	1	STL	
TICA 302-1	CONDENSER TEMP. CONT.	N	N	N	P	N	4	STL	
FI 303-1	REFLUX FLOW INDICATOR	N	N	N	P	—	—	—	
FIQC 303-2	PROD. FLOW TOTALIZER	N	N	N	P	—	—	—	RESET REFLUX SPLIT
TIC 304-1	PROD. TEMP. CONTROL	N	N	N	P	N	2	STL	
LICA 305-2	CRUDE FEED CONTROL	N	N	N	P	N	1½	STL	HIGH ALARM
FIA 306-1	REBOILER FLOW ING ALARM	N	N	N	P	—	—	—	LOW FLOW ALARM
HV 306-2	REMOTE OPER. VALVE	—	—	N	P	N	6"	STL	FOR EMPTYING
HV 306-3	REMOTE OPER. VALVE	—	—	N	P	N	3"	STL	STILL POT
307-1	FURNACE CONTROLS	N	N	N	F	—	—	—	BIT-GAS + OIL
TA 307-2	FURNACE TEMP. ALARM	N	N	N	F	—	—	—	HIGH ALARM
FIC 307-3	GAS FLOW CONTROL	N	N	N	P	N	2	STL	
FIC 307-4	OIL FLOW CONTROL	N	N	N	P	N	1	STL	
PCV 308-1	STEAM PRESS. REGULATOR	—	—	—	—	N	2	STL	
FI 308-2	INTERCONDENSER WATER FLOW	N	—	N	F	—	—	—	ROTAMETER
LI 309-1	THERM. SURGE TANK LEVEL	N	—	—	F	—	—	—	GAGE GLASS
FI 310-1	THERMINOL FLOW	N	—	N	F	—	—	—	ROTAMETER
TIC 311-1	THERMINOL TEMP. CONTROL	N	N	N	P	N	4	STL	
LIA 312-1	RESIDUE TANK LEVEL	N	N	N	P	—	—	—	HI+LO ALARM
LICA 318-1	OIL PUMPOUT CONTROLLER	N	N	N	F	N	1	STL	INTERFACE CONT. PANEL ALARM
LA 318-2	INTERFACE LEVEL ALARM	N	N	—	P	—	—	—	INTERFACE ALARM
LI 320-1	LIME SLURRY TANK LEVEL	N	—	—	F	—	—	—	GAGE GLASS
LI 316-1	FUEL OIL STG TANK LEVEL	N		N	F	—	—	—	VAREC GAGE

PRESSURE GAGES - 8 BOURDON TUBE
2 CHEMICAL SEAL
TEMPERATURE GAGES - 6 BIMETALLIC DIAL [illegible]

MONS 057341

CENTRAL ENGINEERING DEPARTMENT

INSTRUMENT SUMMARY
MCS 1016
PROJ/DEPT AROCLOR
PLANT WEK DIVISION ORGANIC

EQUIP. IDENT. NO
CEA NO. 24 7 AREA NO.
BY R.L. NEARY
DATE 8-4-70 SHEET 2 OF 2

INST. NO.	DESCRIPTION	SENSOR	TRANS	CONT/IND SURFACE	CONT/IND LOC	CONTROL VALVE SOURCE	CONTROL VALVE SIZE	CONTROL VALVE MAT'L	[illegible]
TIC 105-1	#1 CHLOR. TEMP. CONTROL	N	N	N	P	E	—	—	REPLACE
FIC 105-2	#1 CHLOR. CL_2 FLOW	E	E	N	P	E	—	—	PRESENT [illegible]
TIC 106-1	#2 CHLOR. TEMP. CONTROL	N	N	N	P	E	—	—	CONTROLLER [illegible]
FIC 106-2	#2 CHLOR. CL_2 FLOW	E	E	N	P	E	—	—	[illegible]
TIC 107-1	#3 CHLOR. TEMP. CONTROL	N	N	N	P	E	—	—	[illegible]
FIC 107-2	#3 CHLOR. CL_2 FLOW	E	E	N	P	E	—	—	
DRC 107-3	#3 CHLOR. DENSITY CONT.	N	N	N	P	—	—	—	RESET #3 [illegible]
LIC 107-4	CRUDE PROD. RATE CONTROL	N	N	N	P	N	1½	ST-L	
FIC 105-3	BIPHENYL FLOW CONTROL	N	N	N	P	N	1½	ST-L	
LIC 429-1	"CONDENSATE" RETURN CONT.	N	N	N	P	N	1"	ST-L	
FIC 540-1	ABSORBER FLOW CONTROL	N	N	N	P	N	1"	AL	
FIQ 300-1	TOWER WATER FLOWMETER	N	N	N	P	—	—	—	
FQ 300-2	GAS METER	N	—	N	F	—	—	—	

MONS 057342

Appendix G

Scope of Work

01 - Equipment Items

Refer to the Equipment Information Summary Sheets, Appendix B. (3 sheets)

02 - Instrument Items

A new 4 foot control panel is required using pneumatic type instrumentation. As much existing column instrumentation as possible will be relocated with the phthalic column system. Refer to the Instrument List, Appendix F.

03 - Setting and Testing Equipment

No unusual difficulties are anticipated. It should be noted, however, that the new fractionator and auxiliary equipment will be erected inside Dept. 246 battery limits and that "tight" conditions will exist as far as the mobility of construction equipment (crane, pile driver, etc.) is concerned.
Refer to the Preliminary Equipment Layout, Appendix D.

04 - Setting and Testing Instruments

No unusual circumstances are anticipated.

05 - Piling

The new fractionator, still pot and storage tank will be supported by pre-formed, concrete piles.

Item No.	Description	No. Piles	Length, ft.
1-301	MCS-1016 Fractionator	12	26
1-305	Column Still Pot	2	26
1-314	#6 MCS Storage Tank	7	26

06 - Excavation

The following excavation and backfill volumes will be required:

Item No.	Description	Cu. Yds. Excavation	Cu. Yds. Backfill
1-301	MCS-1016 Fractionator	43.0	5.0
1-305	Column Still Pot	10.0	6.0
1-307	Column Reboiler	6.7	4.3
1-309	Therminol Surge Tank	1.8	0.3
1-310	Therminol Circ. Pump	1.0	0.3
1-311	Therminol Cooler	1.5	0.4
1-312	Residue Surge Tank	10.0	6.0
1-314	#6 MCS-1016 Storage Tank	3.0	0.5
1-315	#6 MCS-1016 Storage Pump	1.0	0.3
Pipe Supports and Miscellaneous		7.5	3.5
	Totals	85.5	25.6

Allowance should be made for costs involved in removal of unforeseen underground obstructions.

07 - Foundations

The following volume of concrete will be required.

Item No.	Description	Concrete Cu. Yds.
1-301	Fractionator	42.7
1-305	Column Still Pot	6.6
1-307	Column Reboiler	2.6
1-309	Therminol Surge Tank	1.5
1-310	Therminol Circ. Pump	0.8
1-311	Therminol Cooler	1.3
1-312	Residue Surge Tank	6.6
1-314	#6 MCS-1016 Storage Tank	11.0
1-315	#6 MCS-1016 Storage Pump	0.8
Miscellaneous Pipe Supports		2.5
Process Area Paving and Curbs		40.0
	Total	116.4

08 - Supports, Platforms and Structures

Steel requirements are as follows:

a)	Saddles for Items 1-305 and 1-312	10 tons
b)	Tank Platforms	4 tons
c)	Ladders and Stairways	40 ft.
d)	Handrail and Toeplate	150 ft.
e)	Pipe Supports and Brackets	2 tons

All steel to be hot-dipped galvanized.

09 - Other Building Items

None required.

10 - Sprinklers and Fire Protection

No automatic sprinkler protection is required for the new equipment. The existing fire hydrant protection in Dept. 246 is considered adequate for the expanded department.

11 - Piping

Piping requirements for this project includes piping and valves for new process and utility requirements plus piping revision work around existing equipment.

a) C. Steel piping and valves required for new process and utility services follows. (List does not include small steam trap piping or valves.)

Size inches	Total Length, ft.	Pipe Spec.	No. Valves
24	30	F41	None
8	140	F41	5-Gate
6	1400	F41	5-Gate; 2 Butterfly
4	85	F11	3-Plug
3	330	F11	2-Gate; 5-Plug
2	410	F11	14-Plug
1½	200	F11	4-Plug

11 - Piping (Con't)

b) Aluminum piping and valves required for new process services follows:

Size inches	Total Length, ft.	Pipe Spec.	No. Valves
4	120	All	3-Plug
3	240	All	--
2	350	All	5-Plug

c) New fume scrubber piping includes 30 feet each of 8" and 12" Furan piping plus 40 feet of 12" Saran lined steel pipe.

(The following piping revisions and additions are needed to attain the intermediate product capacity in Dept. 246 required for this project.)

d) Revise piping around existing blow tank and intermediate storage tank: 50 feet of 2" Fll pipe, traced and insulate.

e) Revise piping around absorbers 532 (Aroclor 1242) and 540 (Aroclor 1254): 25 feet of 1½" A-11 pipe, trace and insulate. Also requires new Flow controller and automatic control valve.

f) Revise piping around 534 and 542 Product Tanks: 30 feet of 1½" All pipe, trace and insulate.

g) Install "high boiler" line to biphenyl head tank for batch chlorinators: 100 feet of 2" Fll pipe, trace and insulate.

h) Pipe up 3 batch chlorinators to make a new continuous line: the following are needed:

1) 130 feet of 1½" Fll pipe + 3 plug valves.

2) 40 feet of 2" Fll pipe + 2 plug valves.

3) 20 feet of 4" Fll pipe; trace and insulate all pipe.

In addition to the above piping, also required is a new Densitrol density controller, a new level controller and automatic control valve.

i) Install new "condensate" line from 429 storage to #1 chlorinator: 20 feet of 1½" Fll pipe + 2 plug valves; trace and insulate pipe.

j) Install line from #2 Blend Tank to #2 Receiving pump: 30 feet of 3" F11 pipe + 1 Plug valve; trace and insulate.

k) Install new overflow line from 103 head tank to 143 Blend Tank: 100 feet of 3" F11 pipe; trace and insulate.

Liberal allowance should be made for tubing for steam tracing; the majority of the above process piping will be steam traced. A liberal number of steam trap assemblies should also be included.

One steam-water-air hose station is included.

Allowance should be made for the installation of approximately 10 automatic control valves.

l) Install 5 - 316 S.S. mixing eductors per tank (S&K type 258 or equivalent) - total of 30 - in each MCS-1016 storage tank to assure adequate mixing of product for each column run.

12 - Ductwork

The only ductwork will be that required to fabricate a chute for hydrated lime on the lime slurry tank. This small chute will be made of 10 gauge, galvanized sheet metal.

13 - Electrical

The electrical classification to which the electrical systems apply is watertight.

The lighting requirements for the new process area are 6 - 175 watt mercury vapor fixtures. The lighting requirements for the new storage tank are 2 - 175 watt mercury vapor fixtures.

Electrical power will be supplied from circuit No. 3 at the No. 8 substation. 200 feet of 500 MCM cable will be installed (rings and saddles) from No. 3 circuit at the NE corner of Bldg. CT to the existing MCC building.

A lighting transformer and small lighting panel will be required for the low voltage lighting.

The new motor control center shall be installed in the existing MCC building. The new MCC shall consist of 3 vertical NEMA 1 front-mounting sections. New starters are required for motors as indicated:

13 - Electrical - (Con't)

Item No.	Description	HP	Remote P.B.	Inter-Lock
1-306-001	Still Circ. Pump Motor	30	yes	yes
1-310-001	Therminol Pump Motor	40	yes	no
1-311-001	Residue Pump Motor	7½	no	no
1-315-001	Storage Tank Pump Motor	25	no	no
1-317-001	Fuel Oil Pump Motor	1½	yes	yes
1-320-002	Slurry Agitator Motor	5	no	no
1-321-001	Slurry Tank Pump Motor	5	yes	no

A new 15-point annunciator panel is also included.

14 - Site Preparation

None required.

15 - Sewers - Drains and Plumbing

The new process equipment will be installed within the Dept. 246 battary limits on an area approximately 30 ft. wide and 70 ft. long.

A 10" wide trench will be installed lengthwise down the center of this new process area. The process area pad shall be sloped toward the trench. The effluent stream from the fractionator ejector condenser will flow to a barometric sump tank. The water overflow from this tank will discharge into the trench sewer. This new area will be completely enclosed by a curb to contain any spills. The trench will be covered with about 60 ft^2 of grating. This new trench will be extended north and then east about 70 ft. and tie into the existing storage tank area trench system. This extension will also be covered with about 60 ft^2 of grating. The total volume of excavation required for the process area trench and the trench extension is about 8 cu.yds.

16 - Underground Mains

None required.

17 - Yards, Roads and Fencing

The area in the existing tank farm where the new product storage tank is to be set will be paved and provided with a curb.

Estimated concrete required - 5 cu.yds.

Estimated excavation required - 8 cu.yds.

Estimated backfill required - 1 cu.yds.

18 - Railroads

None required.

19 - Insulation

The thermal insulation system for elevated temperatures will be calcium silicate, Spec. 100. For insulated piping, asbestos felt jacketing (Spec. 50) will be used. For insulated vessels, PVC-coated steel jacketing (Spec. 65X) will be used.

Approximately 75% of the steel and aluminum piping shown under Code 11 (Piping) will be insulated.

The new equipment to be insulated is as follows:

Item No.	Description	Spec.	Surface Sq.ft.
1-301-000	Column	-	190*
1-302-000	Col. Condenser	-	Exist. Insul.
1-305-000	Still Pot	3½"-100-65X	790
1-309-000	Therminol Surge Tank	2"-100-65X	65
1-310-000	Therminol Pump	1"-100-15	5
1-312-000	Residue Surge Tank	3½"-100-65X	790
1-314-000	Prod. Storage Tank	2"-100-65X	940
1-315-000	Storage Pump	1"-100-15	5
1-316-000	Fuel Storage Tank	1"-100-65X	520
1-317-000	Fuel Oil Pump	1"-100-15	5
1-320-000	Lime Slurry Tank	1½"-100-65X	90
1-321-000	Slurry Pump	1"-100-15	5
1-324-000	Vent Condenser	1"-100-15	30

Allowance should be made for instrument metering applications. Insulation will also be required on steam and condensate lines of steam trap assemblies.

*Insulation for new straight wall section added; See Code 92 for insulation repairs to Items 301 and 302.

20 - Painting

The following protective coatings are to be provided, using the WGK local interest standards as a guide.

Pump bases (5 total)	Coal Tar Epoxy	Kl.3 Std 601
Product Cooler, 1-304	Inorg. Zinc	Kl.3 Std 1300
Still Pot, 1-305	Inorg. Zinc	Kl.3 Std 1320
Therminol Tank, 1-309	Inorg. Zinc	Kl.3 Std 1300
Therminol Cooler, 1-311	Inorg. Zinc	Kl.3 Std 1300
Residue Surge Tank, 1-312	Inorg. Zinc	Kl.3 Std 1320
Fuel Oil Stg. Tank, 1-316	Inorg. Zinc	Kl.3 Std 1300
Vent Condenser 1-324	Inorg. Zinc	Kl.3 Std 1300
Lime Slurry Tank, 1-320	Inorg. Zinc.	Kl.3 Std 1300

Equipment items such as pumps, motors, speed reducers, etc., will be painted by manufacturer using mfg. std. paint system. All piping 3" and above (uninsulated) shall be painted.

21 - Walls, Masonry, Roofs and Roofing

None required.

22 - Spares

None required.

90 - Dismantling

The following equipment items will be dismantled at the Chocolate Bayou plant for transfer to the WGK plant for use on this project.

a) Item 1-301 Fractionating Column and Skirt

Note: The column condenser supporting structure, 24" aluminum overhead vapor duct plus all ladders, catwalks and platforms are to be relocated with the column for reuse at WGK.

b) Item 1-302 Column Condenser

c) Item 1-306 Still Circulating Pump and Motor

d) Item 1-310 Therminol Circulating Pump

(Refer to the equipment information summary sheets - Appendix B - for equipment sizes.)

Dismantle approximately 5 feet of the existing Dept. 246 (old) control panel to make room for the new panel.

92 - Repairs Expense

Allowance should be made for repairs to the column (1-301) and condenser (1-302) insofar as insulation is concerned. It is anticipated that part of the insulation on these items will be damaged during the dismantling procedure. Also repair existing controls for reboiler furnace.

93 - Relocation and Modification Expense

The following equipment modifications and relocations are included:

a) Install 1 new nozzle (for overflow line) on the top head of 143 blend tank.

b) Install 1 new overflow nozzle on existing biphenyl head tank to accommodate a larger "high boiler" charge volume to the batch chlorinator.

c) Install 4 new nozzles (1 on #1, 2 on #2 and 1 on #3 chlorinator) on the batch chlorinators to accommodate the new "continuous line" piping additions.

d) Install blanking strips on approximately 18 of the existing 25 sieve trays in fractionator 1-301. This is required to prevent these trays from weeping at the anticipated column operating conditions.

e) Relocate the existing hydrogen lines around the new reboiler furnace; 100 feet of 6" - F41 pipe for the low pressure line; 100 feet of 1" - F62 pipe for the high pressure line.

f) Modify the relocated 24" aluminum vapor duct from the fractionator to the overhead condenser.

g) Break out approximately 500 ft^2 of old concrete pad to make room for foundations in the new process area.