

APPENDIX A
BASIC SITE DESIGN CRITERIA

1.0 GENERAL AND METEOROLOGICAL

1.01 LOCATION: Southern Illinois

1.02 ELEVATION: 490 feet

1.03 CLIMATIC CONDITIONS:

- a. Maximum temperature, 103°F; R.H. 80% high; design for 90°F
- b. Minimum temperature, -15°F; R.H. 50% low; design for -15°F
- c. Design wet bulb temperature, 78°F
- d. Rainfall, 38 in./yr (average); 0.75 in./hr design
- e. Average wind velocity, 12 mph
- f. Maximum wind velocity, 50 mph (gusts)
- g. Direction of wind, NW 1Q; NW-SSW 2Q; S 3Q; S-NW 4Q
- h. Average annual snowfall, 20 in./yr
- j. Design for 25 lb/sq ft snow pack (omit if roof load known)
- k. Frost line - Design for 24-in. depth
- l. Lightning storms - Number per year, 50
- m. Dust storms - No special provisions required. Hail and Tornadoes Occur. Tornadoes occur March through June.

2.0 STRUCTURAL DATA

2.01 VERTICAL LIVE LOADS

a. Roofs, tank tops, etc., on horizontal projected area

Area in sq ft:	0-200	200-600	Over 600
Rise less than 4 in./ft	25	25	25 lb/sq ft
Rise 4 in./ft and steeper	per UBC		

b. Platform, stairs, and walks	<u>Loading (lb/sq ft)</u>
1. Pedestrian traffic only	75
2. Work area - uniform loading	50
3. Work area - concentrated loading	320

c. Floors on ground	<u>Uniform Load</u> (lb/sq ft) ^a	<u>Concentrated Load</u>
1. Control house	100	1,000 on 2-1/2 ft-sq ^b
2. Paved areas	100	15,000 wheel load
3. Other buildings	100	
Maintenance bldg	250	
Laboratory and Adminis- tration bldgs	75	
Stores warehouse	100	15,000 wheel load

d. Vessels and piping

1. See detailed sheet for weight of normal operating liquid contents.

2.02 EMPTY CONDITION

Weight of equipment in place and empty, with removable internal parts all installed and with dead load attachments such as platforms and operating lines in place, plus wind or earthquake.

2.03 TEST CONDITION

Empty weight plus weight of test water, without wind or earthquake.

2.04 OPERATING CONDITION

Empty weight plus weight of liquid at maximum level, plus wind, earthquake, or expansion forces.

^a100 recommended.

^b1,000 recommended.

2.05 LATERAL LOADS (Wind)

- a. Wind on vertical flat projected areas

<u>Feet aboveground</u>	<u>lb/sq ft</u>
0 to 30	15
30 to 50	20
50 to 100	25
100 to 500	30

- b. For circular equipment the wind pressure shall be assumed to act on 0.6 of projected area.
- c. For computing wind pressure on exposed open frame structures, use 130% of projected areas of all members.

2.06 LATERAL LOADS (Earthquake)^a

Uniform Building Code Zone 2

2.07 ALLOWABLE STRESSES

Allowable stresses may be increased 1/3 for lateral loadings and 1/5 during hydrostatic test.

2.08 STABILITY RATIO

- a. Minimum allowable stability ratio = $\frac{\text{Stabilizing Moment}}{\text{Overturning Moment}} = 1.5$
- b. Soil-bearing foundations to have positive soil pressure over whole footing except for erection load conditions (provided that toe pressure does not exceed allowable soil-bearing pressure).

3.0 FOUNDATIONS AND SOIL DATA

3.01 SOIL DATA

- a. Type of soil: sand; rocky.
- b. Subsoil strata not a factor.
- c. Elevation of water table varies.
- d. Piling not required.
- e. Special soil analysis reference: to be determined.

^aWind and earthquake forces are not additive.

3.02 FOUNDATIONS

a. Allowable bearing loads

<u>Soil Type</u>	<u>Depth</u>	<u>Vertical Load</u>	<u>Lateral Load</u>
Sand & rocky	3 ft	1,500 psf	-

b. Ultimate compressive strength after 28 days

1. Reinforced concrete 3,000 psi

c. Minimum coverage of reinforced steel

1. Formed sections: 2 in. (except 1-1/2 in. for No. 5 and smaller bars)
2. Unformed sections: 3 in.
3. Water contact: 3 in.

d. Minimum depth of foundations

1. Exterior walls and/or piers: 3 ft
2. Interior building footings: 3 ft
3. Frost line: 3 ft
4. Ground water depth: 4 to 20 ft
5. Termites and fungi are factors.

e. Elevations

1. Base elevation (Refinery Datum): 100.00 ft
2. Existing ground elevation: 560 to 590 ft
3. Finished grade: to be determined
4. High point of paving: to be determined

4.0 UTILITIES

4.01 AIR

- a. Instrument air at 60 psi and maximum dewpoint -20°F at 100 psi
- b. Utility air at 110 psi
- c. Starting air for compressors at atm

4.02 COOLING WATER

- a. Type: tower
- b. Maximum cold water temperature: Not applicable
- c. Design cold water temperature: 86°F
- d. Maximum hot water temperature: 120°F
- e. Design hot water temperature: 120°F
- f. Design water supply pressure at grade: 50 psig
- g. Design water return pressure at grade: 35 psig

4.03 COOLING TOWER

- a. Water inlet temperature: 115°F
- b. Water outlet temperature: 86°F
- c. Design wet bulb: 78°F
- d. Type of tower: induced
- e. Structural design-lateral load: See Section 2.0

4.031 Air Cooling: Process fluid minimum outlet temperature: 120°F

4.04 STEAM AND CONDENSATE

- a. High-pressure steam at 1,250 psi and 300°F superheat
- b. Low-pressure steam at 30 psi and 0°F superheat
- c. Intermediate-pressure steam at 600 psi and 200°F superheat
- d. Condensate system at 30 psi

4.05 BOILER FEEDWATER

- a. Supply pressure at plot limit: 60 psi
- b. Supply temperature at plot limit: 60°F

4.06 FUEL GAS

	<u>Inplant-produced Refinery Gas</u>
a. Pressure at plot limit	60 psig
b. Heating value at 1 atm	1035 Btu/scf
c. Composition:	---

4.07 LIQUID FUEL

- a. Type: SRC Liquid (in-process product)
- b. SP gravity: 1.1
- c. Viscosity (poises at 210°F): 9.0
- d. Heating value: 15,000 Btu/lb
- e. Supply pressure at plot limit: Not applicable
- f. Return pressure at plot limit: Not applicable
- g. Temperature at plot limit: 400°F

4.08 WATER SYSTEMS

	<u>Supply Pressure</u>	<u>Supply Temperature</u>	<u>Required Treatment</u>
a. Drinking	50 to 70 psi	Ambient	Settled, softened, and chlorinated
b. Sanitary	50 to 70 psi	Ambient	Settled, softened, and chlorinated
c. Fire system	90 psi	Ambient	Raw river water

4.09 SEWERS

a. Types

1. Sanitary
2. Oily Water
3. Surface runoff: ditches only
4. Chemical
5. Combine 2, 3, and 4: no

b. Materials and installation

<u>Sewer Systems</u>				
<u>Location</u>	<u>Sanitary</u>	<u>Oily Water</u>	<u>Runoff</u>	<u>Others</u>
1. Inside Buildings	CI	CI	-	-
2. Under concrete	CI	CI	CI	-
3. Under unpaved areas	VC to 12 in. RC>12 in.	VC to 12 in. RC>12 in.	ditch	-
4. Design velocity (ft/sec)	3 to 5	3 to 5	Under Pavement 3 to 5	-
5. Slope (%)	As below ^a	2	1	-
6. Minimum coverage (ft)	3	3	3	-
7. Manholes	Precast concrete at junctions and changes of direction Sealed at 300 ft minimum distance			
8. Manhole covers	CI, Plain	Bolted and gasketed	Bolted and gasketed	-
9. Junction boxes concrete	None	Sealed	Sealed	-

^a Minimum 2% to septic tank, 1% beyond.

5.0 ELECTRICAL EQUIPMENT

5.01 POWER SUPPLY AND CHARACTERISTICS

a. Source: Inplant generation - emergency firm power from local utility company

b. Routing overhead - trays

c. Service

		<u>Phase</u>	<u>Cycle</u>
1. Main supply	138kV	3	60
2. Primary distribution	138kV	3	60
3. Secondary distribution	2,300/480V	3	60
4. Lighting	480/208/120V	3	60
5. Emergency heating	-	-	-
6. Electrical instrumentation	24V	-	DC

5.02 SWITCHGEAR AND DESIGN DETAILS

a. To be developed as part of detail design.

5.03 MATERIAL CLASSIFICATION

See Drawing

a. Hazardous areas Class 1, Group D, Division 1

b. Semi-hazardous Class 1, Group D, Division 2

c. Nonhazardous NEMA

5.04 MOTORS

a. Size: 150 hp and up 2,200V 3 phase

b. Size: 3/4 hp to 125 hp 480V 3 phase

c. Size: 1/2 hp and smaller 120V 1 phase

5.05 METERING

a. Main Supply by local utility company.

b. Others to be determined.

6.0 INSTRUMENTS

	<u>Yes</u>	<u>No</u>
6.01 ACCOUNTING METERS REQUIRED		
a. Plant feed streams	X	
b. Plant product streams	X	
c. 1,250-psi steam system	X	
d. All others steam system	X (as per process required)	
e. Fresh water	X	
f. Sanitary water		X
g. Water (cooling)	X (as per process required)	
h. Air		X
i. Fuel gas	X	
j. Fuel oil	X	
k. Others chlorine, sulfuric acid, caustic KOH (liquid)		

6.02 PANELBOARD

- a. Type: local panels and main control center
- b. Instruments: electronic
- c. Arrangement of instruments: Graphic panel
- d. Chart drives: electrical

6.03 EMERGENCY SUPPLY OF INSTRUMENT AIR: Yes

6.04 INSTRUMENT AIR COOLER AND DRYER: Yes

6.05 MASTER INSTRUMENT AIR FILTERS: Yes

7.0 PROCESS DATA

7.01 PRODUCT TO STORAGE TEMPERATURES

- a. SNG 100°F

- b. Butane LPG 30°F
- c. Propane LPG -40°F
- d. Naphtha 90°F
- e. Fuel oil 130°F
- f. Liquid sulfur 250°F
- g. Solid sulfur ambient
- h. Anhydrous ammonia -30°F

7.02 EQUIPMENT DATA

	<u>Normal Contingency</u>	<u>Process Control Contingency</u>	
a. Pumps: feed, reflux, furnace, recirculating, product	-	10% 20% 10%	} see note
b. Compressors	-	10%	
c. Heat exchangers	-	0%	
d. Furnaces	-	10%	1 mm Btu minimum
e. Cooling tower	-	10%	
f. Others	-	-	

NOTE: Contingency for large pumps and compressors to be reviewed on a case by case basis (500 hp and over).

7.03 CODES - LATEST EDITIONS

- a. API-ASME Unfired Pressure Vessel: API 650 - Storage Tanks
ASME, Section VIII, Div 1
- b. ASA Piping Code: USAS B 31.3 - 1966 - Piping
USAS B 16.5 - Flanges and Fittings
USAS B 31.1 - Power Piping
- c. ASME Code Power Boilers: Section I
- d. National Electric Code: NEMA

- e. Uniform Building Code (by International Conference of Bldg. Officials.)
- f. National Plumbing Code: IBC
- g. Petroleum safety orders: apply
- h. Exceptions to codes: none

8.0 MISCELLANEOUS

8.01 SAFETY

- a. Maximum temperature for safety to personnel: 150°F
- b. Hazardous chemicals: chlorine, caustic, and sulfuric acid

8.02 WINTERIZATION

- a. Design considerations: Yes, -5°F for water, steam condensate and various process lines and instrumentation
- b. Degree required: as dictated by process requirements

8.03 NOISE ABATEMENT A FACTOR? Yes, all fans, compressors and generators

8.04 AIR POLLUTION REQUIREMENTS: Yes, per State of Illinois requirements

8.05 WATER POLLUTION REQUIREMENTS: Yes, per above

8.06 AIRCRAFT WARNING REGULATIONS: Yes, per above

8.07 SHIPPING PROBLEMS: None - Truck and railway both available

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