Appendix B – TXU Case

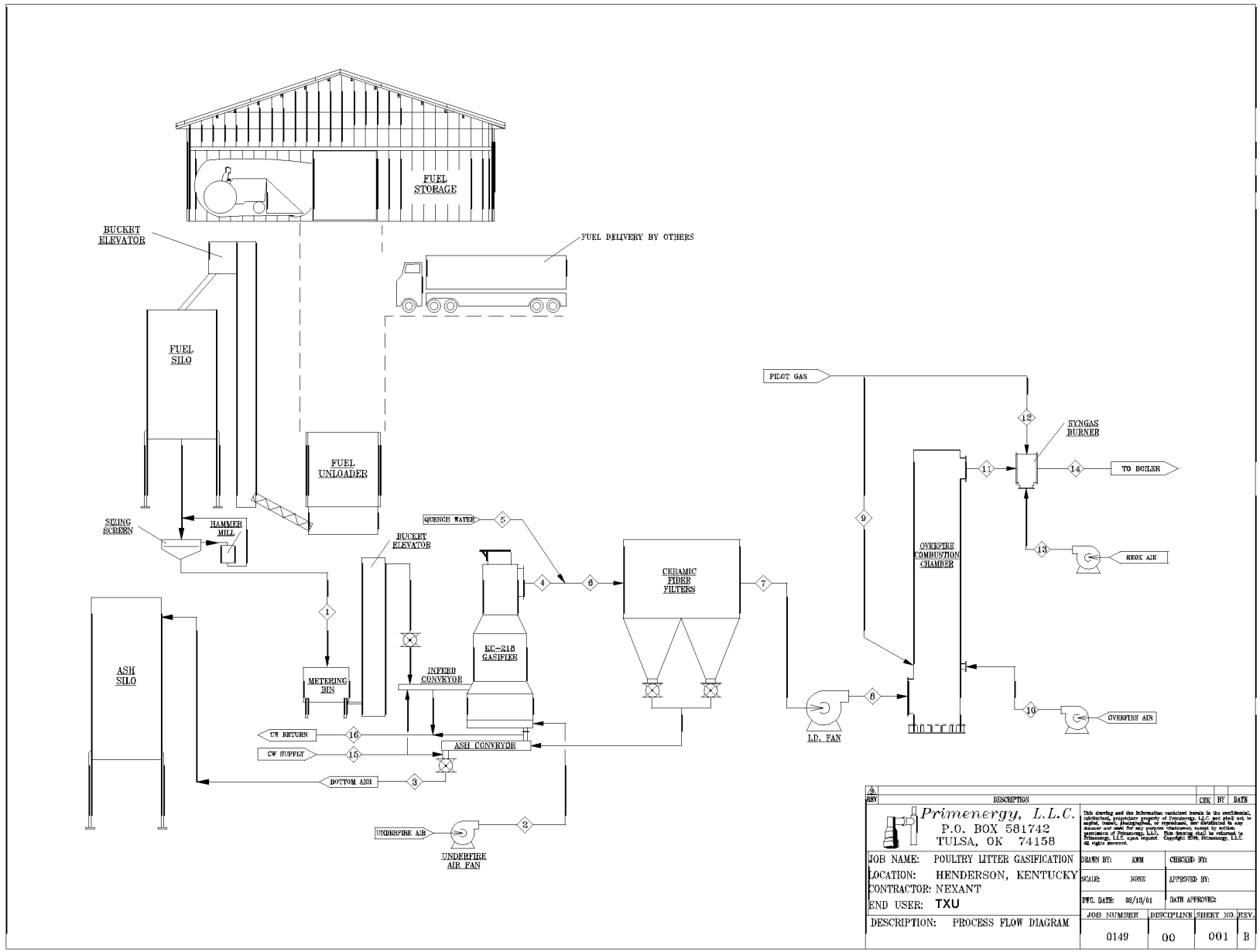

FUEL STORAGE
BUCKET ELEVATOR
FUEL DELIVERY BY OTHERS
FUEL SILO
FUEL UNLOADER
SIZING SCREEN
HAMMER MILL
BUCKET ELEVATOR
QUENCH WATER
5
4
6
CERAMIC FIBER FILTERS
7
PILOT GAS
12
SYNGAS BURNER
11
14
TO BOILER
9
OVERFIRE COMBUSTION CHAMBER
13
REDX AIR
ASH SILO
1
METERING BIN
INFEED CONVEYOR
KC-21S GASIFIER
I.D. FAN
8
10
OVERFIRE AIR
CW RETURN
16
CW SUPPLY
15
ASH CONVEYOR
BOTTOM ASH
3
UNDERFIRE AIR
2
UNDERFIRE AIR FAN
REV
DESCRIPTION
CHK
BY
DATE
Primenergy, L.L.C.
P.O. BOX 581742
TULSA, OK 74158
JOB NAME: POULTRY LITTER GASIFICATION
LOCATION: HENDERSON, KENTUCKY
CONTRACTOR: NEXANT
END USER: TXU
DESCRIPTION: PROCESS FLOW DIAGRAM
DRAWN BY: KWM
CHECKED BY:
SCALE: NONE
APPROVED BY:
PTG. DATE: 02/13/01
DATE APPROVED:
JOB NUMBER
DISCIPLINE
SHEET NO.
REV.
0149
00
001
B

Table B-1 Material and Energy Balance for Monticello Case

Stream ID	1	2A	3	4	5	6	7	8	8A	9	10	11
Stream	BROILER	HEATED	GASIFIER	QUENCH	SYNGAS	HEAT	ID	OVERFIRE	HEATED	OVERFIRE	HEATED	COMB
Name	LITTER	GASIFIER	BOTTOM	WATER	SCRUBBER	EXCH	FAN	& REOX	OVERFIRE	SYNGAS	REOX	PROD TO
		AIR	ASH		EXHAUST	EXHAUST	EXHAUST	AIR	AIR		AIR	BOILER
Pressure, psig ("w.c.-g)	----	(20.0)	----	50	(-10.0)	(-13.0)	(8.0)	(15.0)	(12.0)	(7.0)	(12.0)	(6.0)
Temperature, °F	77	650	300	77	1400	662	662	77	650	2400	650	2379
Molecular Weight (lb/lbmole)	---	28.68	75.25	18.02	24.39	24.39	24.39	28.68	28.68	27.56	28.68	28.33
Component	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Carbon	10,151		927									
Hydrogen	1,019											
Nitrogen	1,041											
Oxygen	7,135											
Sulfur	221		111									
Chlorine												
Carbon Monoxide					10,293	10,293	10,293			1,200		
Carbon Dioxide					17,628	17,628	17,628			31,914		33,799
Hydrogen					971	971	971			329		
Water (v)		510			10,795	10,795	10,795	435	435	16,966	480	20,386
Nitrogen		39,813			40,854	40,854	40,854	33,982	33,982	74,836	37,490	112,326
Oxygen		12,053						10,287	10,287		11,349	8,053
Sulfur Dioxide					221	221	221					
Ash	4,216		4,110									
Water (l)	7,927			1,928								
TOTAL	31,710	52,376	5,147	1,928	80,761	80,761	80,761	44,704	44,704	125,245	49,319	174,564

Table B-1 Material and Energy Balance for Monticello Case (contd.)

Stream ID	1	2A	3	4	5	6	7	8	8A	9	10	11
Stream	BROILER	HEATED	GASIFIER	QUENCH	SYNGAS	HEAT	ID	OVERFIRE	HEATED	OVERFIRE	HEATED	COMB
Name	LITTER	GASIFIER	BOTTOM	WATER	SCRUBBER	EXCH	FAN	& REOX	OVERFIRE	SYNGAS	REOX	PROD TO
		AIR	ASH		EXHAUST	EXHAUST	EXHAUST	AIR	AIR		AIR	BOILER
Pressure, psig ("w.c.-g)	----	(20.0)	----	50	(-10.0)	(-13.0)	(8.0)	(15.0)	(12.0)	(7.0)	(12.0)	(6.0)
Temperature, °F	77	650	300	77	1400	662	662	77	650	2400	650	2379
Molecular Weight (lb/lbmole)	---	28.68	75.25	18.02	24.39	24.39	24.39	28.68	28.68	27.56	28.68	28.33
Component	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
TOTAL	31,710	52,376	5,147	1,928	80,761	80,761	80,761	44,704	44,704	125,245	49,319	174,564
AVAIL ENERGY VALUE (LHV-Hv), Btu/lb	4,537				1,181	1,181	1,181			178		
AVAILABLE ENERGY MMBtu/hr	143.85		13.06		95.35	95.35	95.35			22.32		
SENSIBLE ENERGY MMBtu/hr		7.47			35.43	14.90	14.90		6.37	93.47	7.03	122.86
FLOW RATE, scfm (gpm)		11,551		(3.86)	20,940	20,940	20,940	9,859	9,859	28,743	10,877	38,968
FLOW RATE, acfm		24,656			74,899	45,190	45,190	10,181	21,045	158,087	23,217	212,766

Table B-2 Electrical Usage for Monticello Case

SYSTEM MOTOR LIST & ELECTRICAL REQUIREMENT					
ITEM	MOTOR SIZE Hp	QTY SUPLD	QTY OPRTG	OPRTG FACTOR	ELCTL USAGE Kw
Fuel Receiving Hopper	15	1	1	0.40	4.5
Fuel Receiving Hopper Discharge Conveyor	15	1	1	0.40	4.5
Storage Silo Bucket Elevator	20	1	1	0.40	6.0
Separation Screen	5	1	1	0.40	1.5
Hammer mill	50	1	1	0.40	14.9
Hammer mill Air System	15	1	1	0.40	4.5
Silo Unloader	15	2	2	0.40	9.0
Silo Discharge Conveyor	10	2	2	0.40	6.0
Metering Bin Discharge Screw	5	2	2	0.50	3.7
Bucket Elevator	5	2	2	0.50	3.7
Fuel Feed Rotary Valve	5	2	2	0.50	3.7
Fuel Infeed Auger	5	2	2	0.50	3.7
Agitator	5	2	2	0.50	3.7
Ash Cooling Auger	5	2	2	0.50	3.7
Underfire Air Fan	50	2	2	0.79	58.9
Cooling Water Pump	15	2	1	0.70	7.9
Syngaas Compressor	150	1	1	0.75	84.0
Fly Ash Discharge Valve	1	4	4	0.50	1.5
Final Ash Conveyor	10	1	1	0.50	3.7
Ash Bucket Elevator	10	1	1	0.50	3.7
ID Fan	250	2	2	0.69	256.1
Reox / Overfire Air Fan	60	2	2	0.73	65.6
Air Compressor	25	1	1	0.75	14.0
Miscellaneous Electrical Usage	----	----	----	----	5.0
Total					**573.7**

Table B-2 Texas Lignite Analysis (Monticello Boiler Fuel)

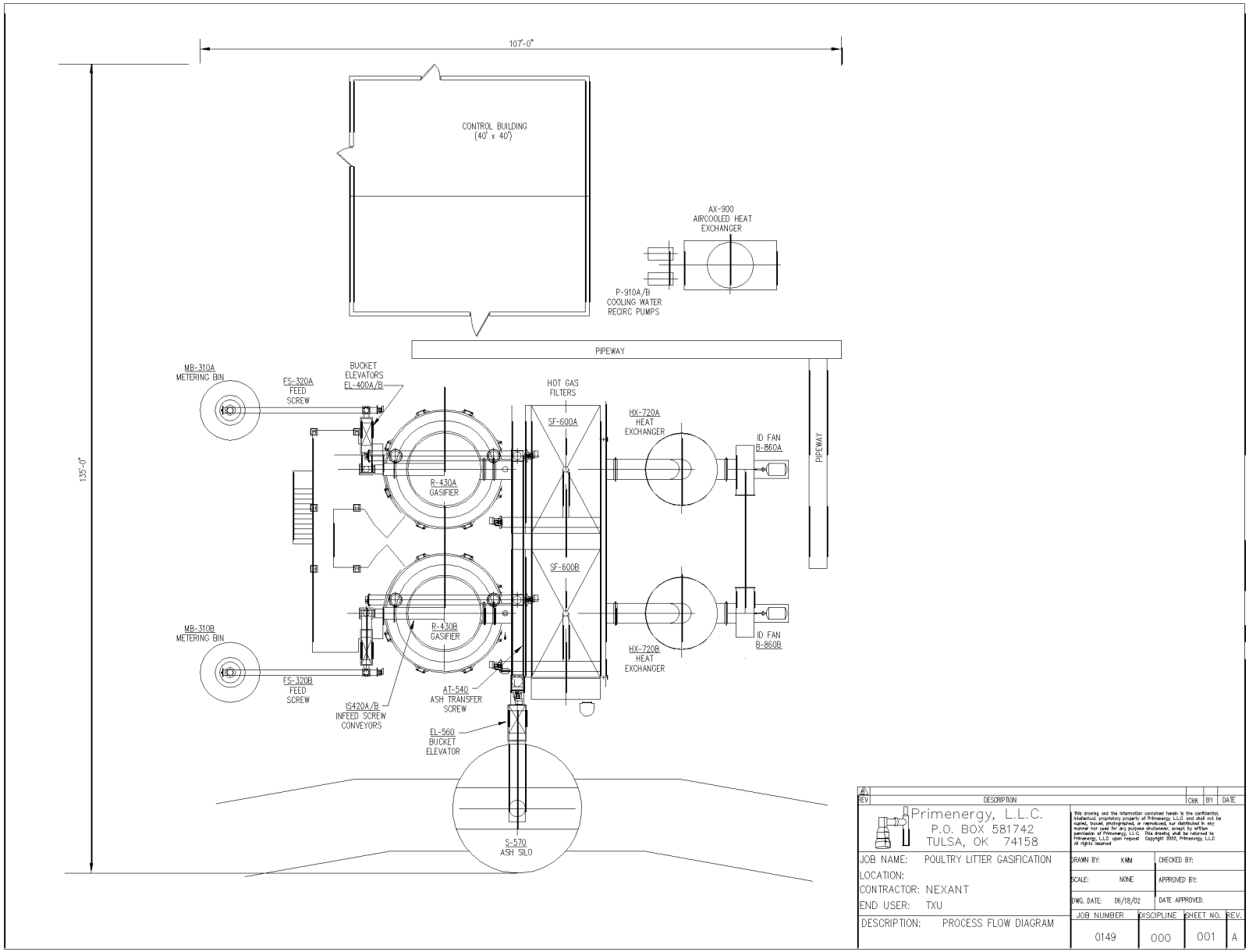
Texas Lignite	Value	Units
Fuel HHV	15 738 (6,767)	kJ/kg (Btu/lb)
C	39.20	%
H	2.99	
O	11.04	
N	0.58	
S	0.61	
Ash	14.31	
Moisture	31.27	
Total	100.00	

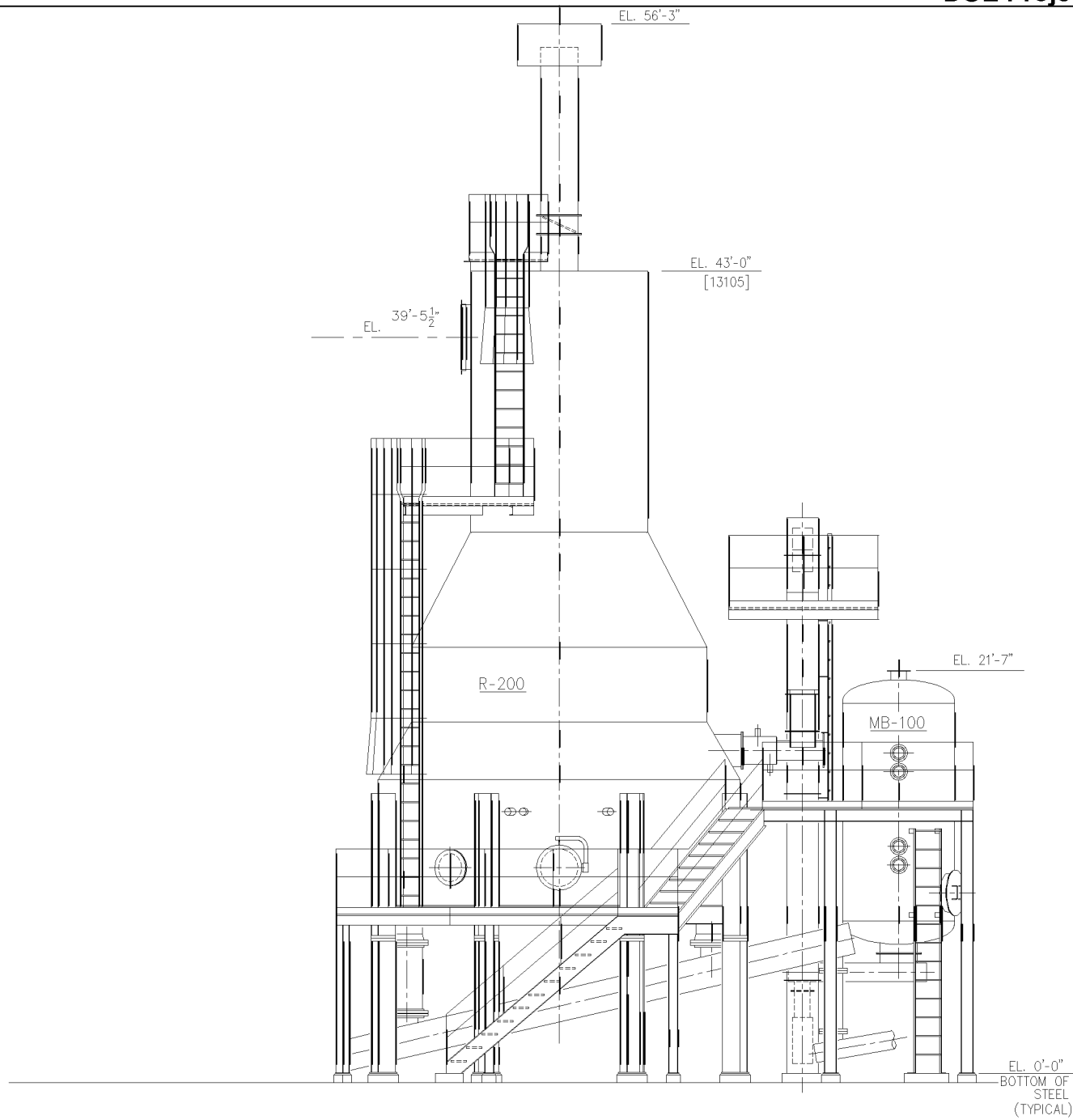
Table B-3 Monticello Boiler Design Data

Monticello Unit 1 & 2	Units	Control Point	MCR
Fuel		Texas Lignite	Texas Lignite
Evaporation	lbs/h	3,200,000	4,025,000
FW Temp	F	478	501
FW Pressure (calc)	psig	3,750	4,068
SH Outlet Temp	F	1,005	1,005
SH Outlet Press	psig	3,595	3,825
SH Pressure Drop	psig	141	222
Reheat Flow	lbs/h	2,814,000	3,520,000
Reheat inlet Temp	F	550	572
Reheat Inlet Press	psig	542	682
Reheat Outlet Temp	F	1,005	1,005
Reheater Press Drop	psig	28	35
Econmizer Press Drop	psi	14	21
Gas Drop - Furnace to Econ	"wg	2.45	3.65
Gas Drop Econ Outlet to AH Outlet	"wg	4.80	6.85
Gas Temp Entering AH	F	805	860
Gas Temp Leaving AH	F	327	351
Gas Temp Leaving AH	F	311	336
Air Temp Air Heater	F	85	85
Air Temp Leaving	F	701	730
Air Press Air Heater	"wg	7.90	10.35
Amb. Air Temp	F	80	80
Excess Air Econ	%	20	20
Fuel Fired	lbs/h	681,000	836,000
Efficiency	%	82.69	82.06

Table B-4 Monticello Plant Sensitivity Case

Case	Litter Cost	Ash Credits	Capital Cost	TXU Cost Share	Interest	Period	Fuel	O&M	Capital	Total
	$/ton	$/Ton			%	Years	c/kWh	c/kwh	c/kwh	c/kwh
Base Case	8	0	$14,882,622	$14,882,622	7.5%	10	1.00	0.78	2.69	4.47
2	8	(6)	$ 4,882,622	$14,882,622	7.5%	10	0.83	0.78	2.69	4.30
3	8	0	$14,882,622	$ 7,441,311	7.5%	10	1.00	0.78	1.34	3.13
4	6	(6)	$14,882,622	$14,882,622	7.5%	10	0.58	0.78	2.69	4.05
5	6	(6)	$14,882,622	$ 7,441,311	7.5%	10	0.58	0.78	1.34	2.71
6	4	0	$14,882,622	$14,882,622	7.5%	10	0.50	0.78	2.69	3.97
7	4	0	$14,882,622	$ 7,441,311	7.5%	10	0.50	0.78	1.34	2.63
8	0	(6)	$14,882,622	$14,882,622	7.5%	10	-0.17	0.78	2.69	3.30


107'-0"
135'-0"
CONTROL BUILDING
(40' x 40')
AX-900
AIRCOOLED HEAT
EXCHANGER
P-910A/B
COOLING WATER
RECIRC PUMPS
PIPEWAY
MB-310A
METERING BIN
FS-320A
FEED
SCREW
BUCKET
ELEVATORS
EL-400A/B
HOT GAS
FILTERS
SF-600A
HX-720A
HEAT
EXCHANGER
ID FAN
B-860A
R-430A
GASIFIER
PIPEWAY
SF-600B
MB-310B
METERING BIN
R-430B
GASIFIER
HX-720B
HEAT
EXCHANGER
ID FAN
B-860B
FS-320B
FEED
SCREW
IS420A/B
INFEED SCREW
CONVEYORS
AT-540
ASH TRANSFER
SCREW
EL-560
BUCKET
ELEVATOR
S-570
ASH SILO
REV
DESCRIPTION
CHK
BY
DATE
Primenergy, L.L.C.
P.O. BOX 581742
TULSA, OK 74158
JOB NAME: POULTRY LITTER GASIFICATION
LOCATION:
CONTRACTOR: NEXANT
END USER: TXU
DESCRIPTION: PROCESS FLOW DIAGRAM
DRAWN BY: KWM
CHECKED BY:
SCALE: NONE
APPROVED BY:
DWG. DATE: 06/18/02
DATE APPROVED:
JOB NUMBER
DISCIPLINE
SHEET NO.
REV.
0149
000
001
A

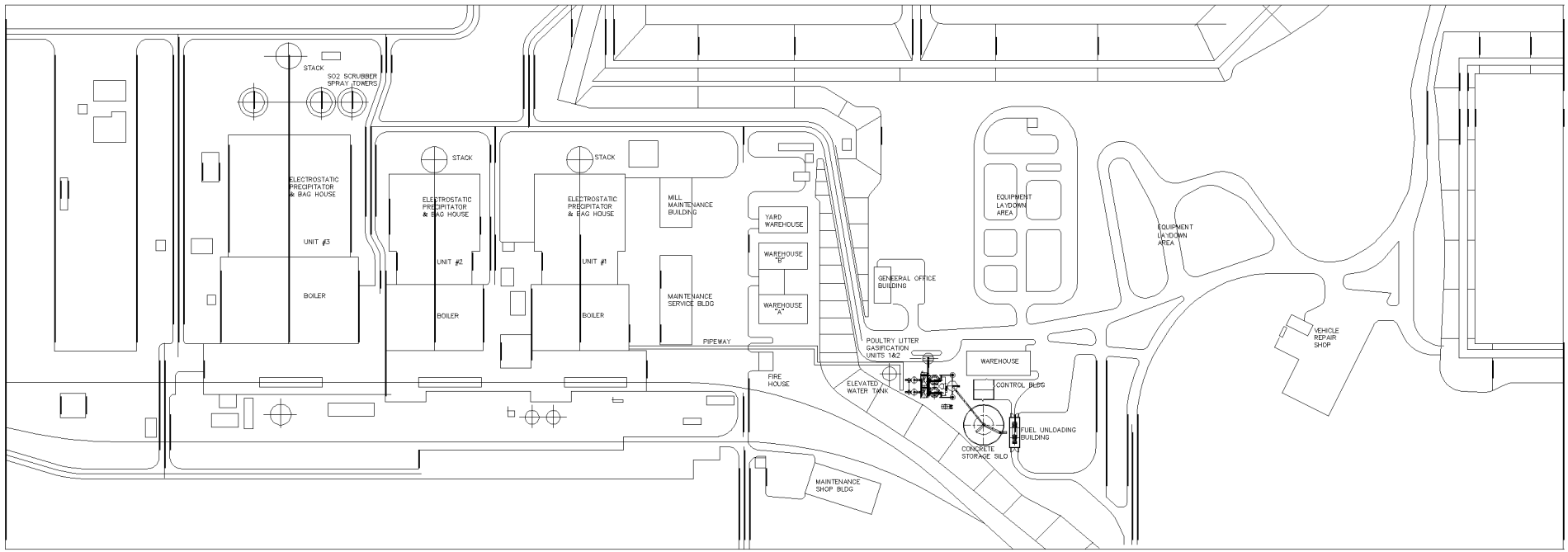


Primenery Gasifier Elevation


Producer gas to boiler


Monticello
Unit 1
Gasifier Island Location

REFERENCE	
SK-C-501	LOCAL SITE PLAN FULLY AUTOMATED
SK-P-700	FUEL STORAGE BLDG FULLY AUTOMATED EQUIPMENT LOCATION PLAN BELOW EL 20'-0"
0149-000-001	PRIMENERGY,LLC. P.O. BOX 581742, TULSA OK. POULTRY LITTER GASIFICATION PROCESS FLOW DIAGRAM



No	DATE	REVISIONS	DRAWN	ENGR	CHKD	PROJ ENGR	LMAES
A		ISSUED FOR INFORMATION					

SCALE 1"=100' CAGE No

Bechtel

San Francisco

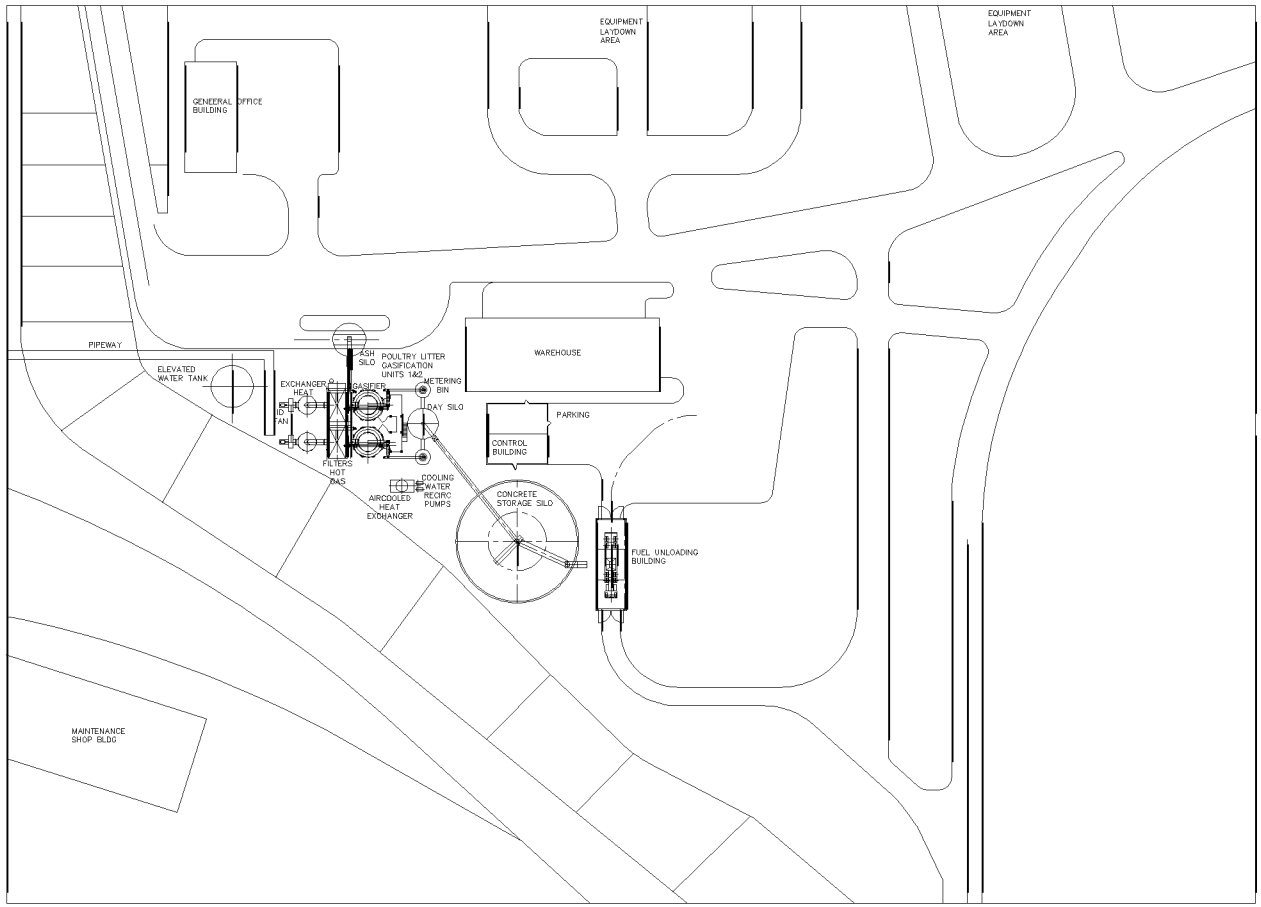
MONTICELLO PLANT
POULTRY LITTER GASIFICATION

OVERALL
SITE PLAN
FULLY AUTOMATED

JOB No	DRAWING No	REV
24355	SK-C-500	A

34x22 'D' SIZE

SK-C-500.DWG



NOTES:
1. FOR NOTES AND REFERENCE SEE DWG SK-C-500

No.	DATE	REVISIONS	DRAWN	ENGR	CHK'D	PROJ ENGR
0		ISSUED FOR INFORMATION				

SCALE 1"=40'-0" CAGE No.

Bechtel San Francis

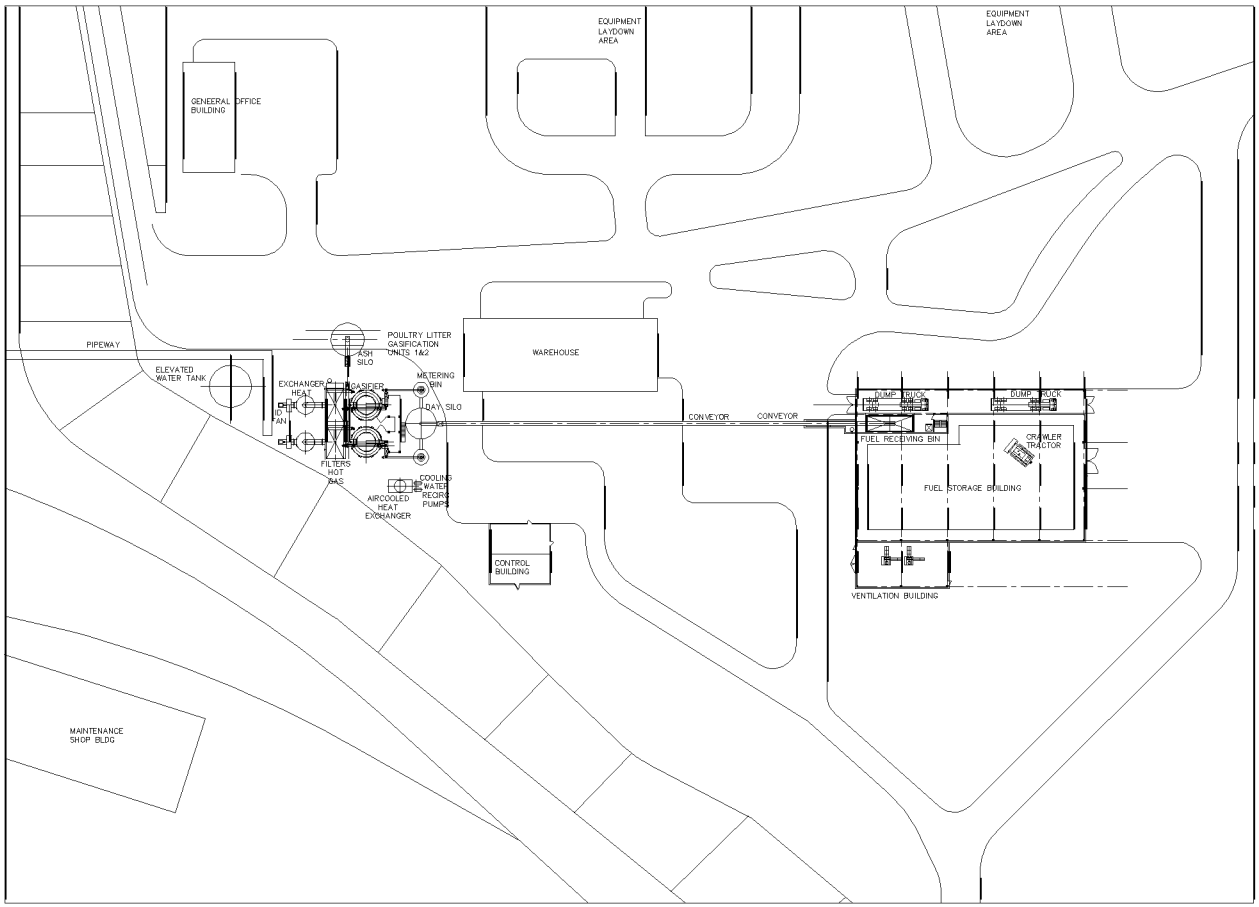
MONTICELLO PLANT
POULTRY LITTER GASIFICATION

LOCAL SITE
PLAN
FULLY AUTOMATED

JOB No. 24355 DRAWING No. SK-C-501

34x22 'D' SIZE

SK-C-501.DWG



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1. FOR NOTES AND REFERENCE SEE DWG SK-C-100

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1		ISSUED FOR INFORMATION					

SCALE 1"=40'-0" CADD No.

Bechtel

San Francisco

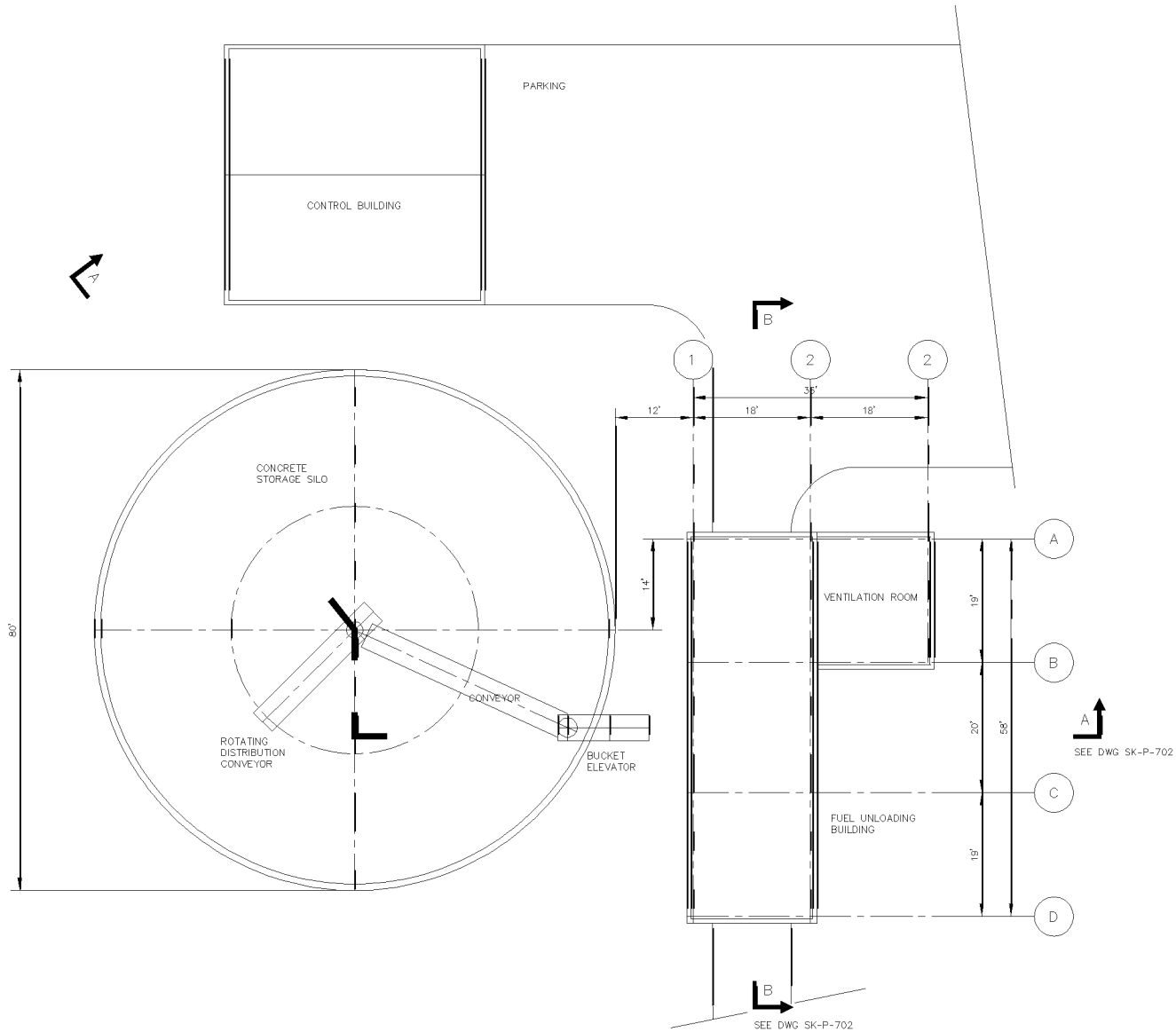
MONTICELLO PLANT
POULTRY LITTER GASIFICATION

LOCAL SITE
PLAN
PARTIALLY AUTOMATED

JOB No. 24355 DRAWING No. SK-C-101 REV A

34x22 'D' SIZE

SK-C-101.DWG



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SK-P-701	FUEL STORAGE BLDG FULLY AUTOMATED EQUIPMENT LOCATION PLAN BELOW ELEV. 19'-0"
SK-P-702	FUEL STORAGE BLDG FULLY AUTOMATED EQUIPMENT LOCATION SECTION A-A, B-B
SK-C-500	OVERALL SITE PLAN FULLY AUTOMATED
SK-C-501	LOCAL SITE PLAN FULLY AUTOMATED
SK-M-002	PROCESS FLOW DIAGRAM FULLY AUTOMATED

No.	DATE	REVISIONS	DRAWN	ENGR	CHKD	PROJ ENGR	LMAES
4		ISSUED FOR INFORMATION					

SCALE 1/8"=1'-0" CAGE No.

Bechtel San Francisco

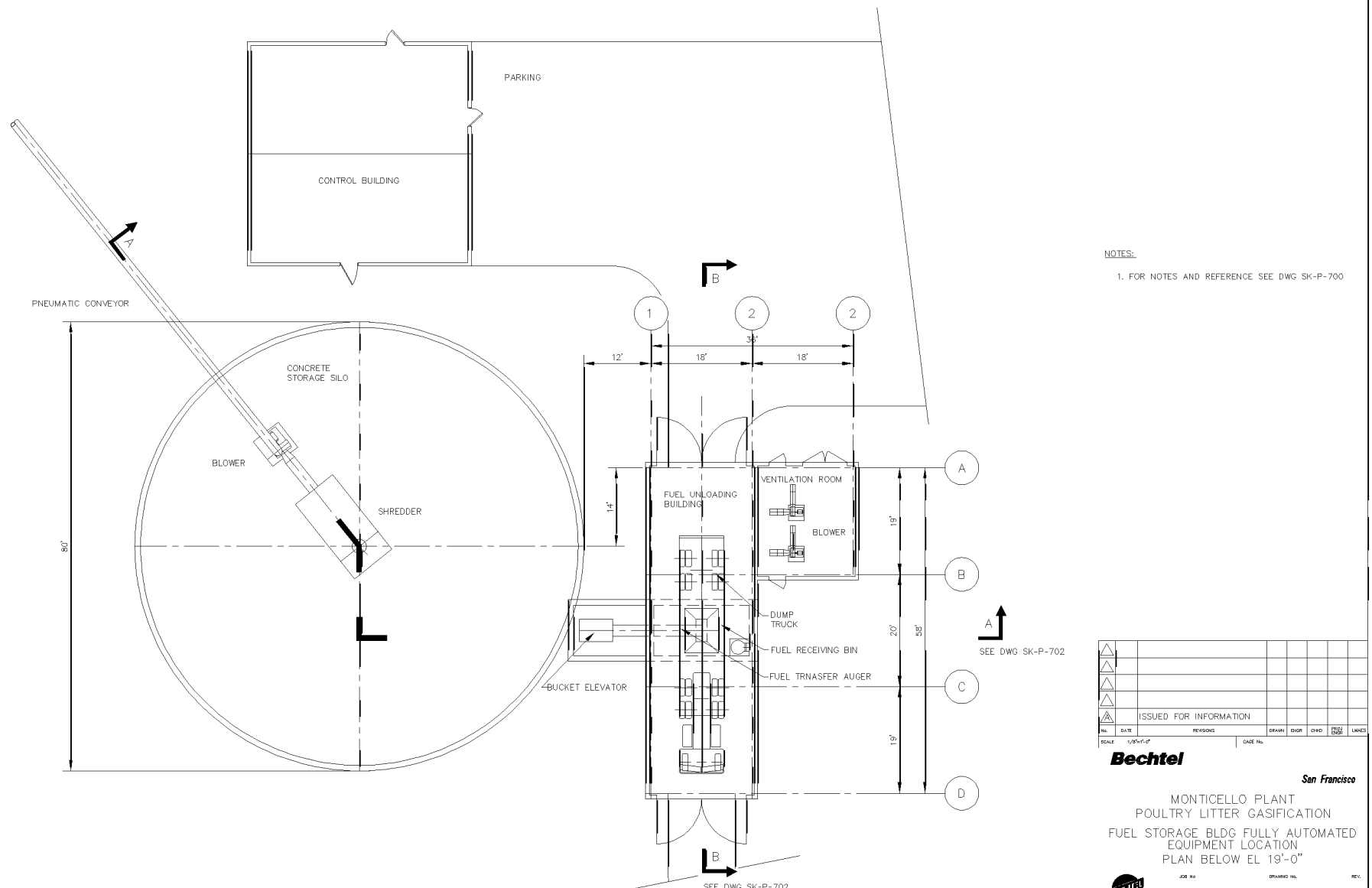
MONTICELLO PLANT
POULTRY LITTER GASIFICATION

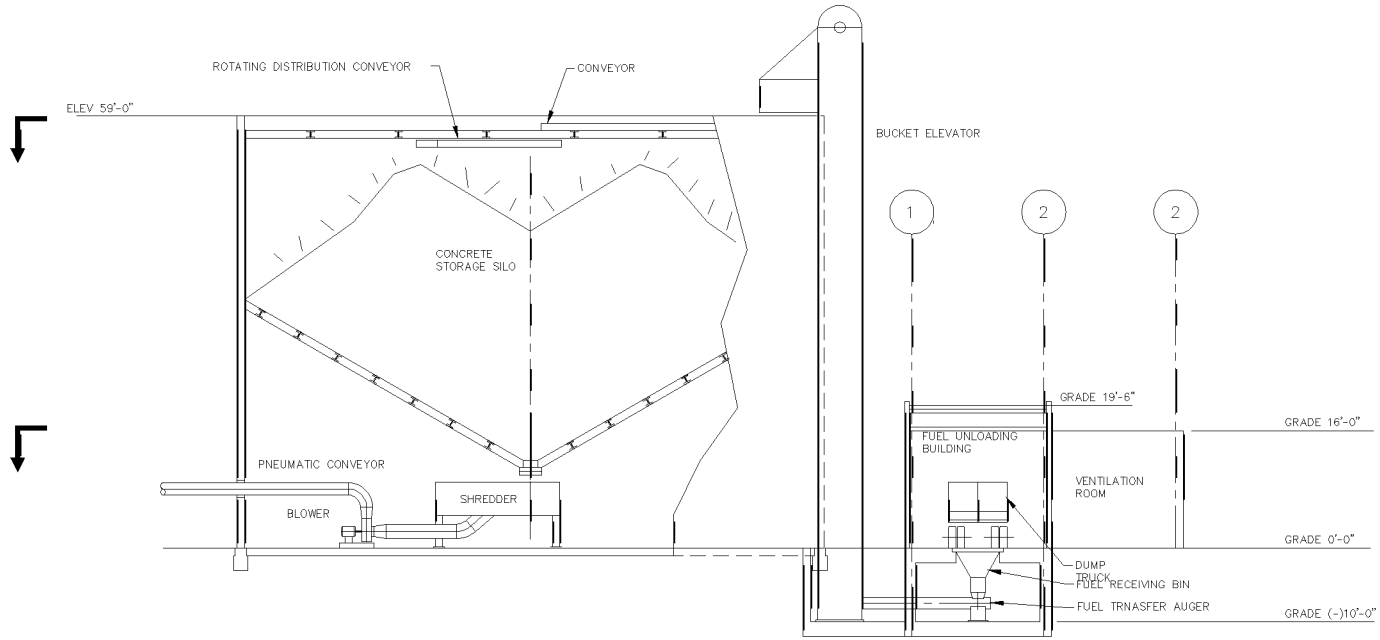
FUEL STORAGE BLDG FULLY AUTOMATED EQUIPMENT LOCATION
PLAN BELOW EL 50'-0"

JOB No.	DRAWING No.	REV.
24355	SK-P-700	A

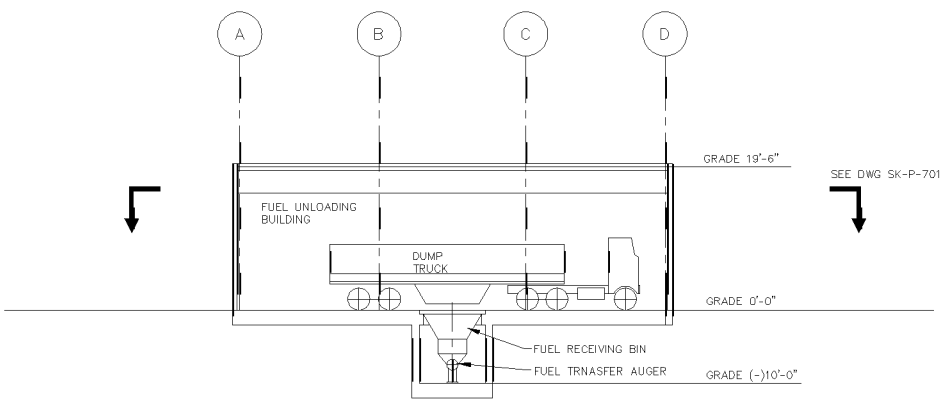
34x22 "D" SIZE

SK-P-700.DWG


PARKING
CONTROL BUILDING
PNEUMATIC CONVEYOR
CONCRETE STORAGE SILO
BLOWER
SHREDDER
80'
FUEL UNLOADING BUILDING
VENTILATION ROOM
BLOWER
DUMP TRUCK
FUEL RECEIVING BIN
FUEL TRNASFER AUGER
BUCKET ELEVATOR
SEE DWG SK-P-702
SEE DWG SK-P-702
12'
18'
18'
36'
14'
19'
20'
58'
19'
1
2
2
A
B
C
D
NOTES:
1. FOR NOTES AND REFERENCE SEE DWG SK-P-700
ISSUED FOR INFORMATION
Bechtel
San Francisco
MONTICELLO PLANT
POULTRY LITTER GASIFICATION
FUEL STORAGE BLDG FULLY AUTOMATED EQUIPMENT LOCATION
PLAN BELOW EL 19'-0"
24355
SK-P-701
A
SK-P-701.DWG



SECTION A-A



SECTION B-B

NOTES:

1. FOR NOTES AND REFERENCE SEE DWG SK-P-700

No.	DATE	REVISIONS	DRAWN	ENGR	CHKD	PROJ ENGR	LM/ES
A		ISSUED FOR INFORMATION					

SCALE 1/8"=1'-0" CAGE No

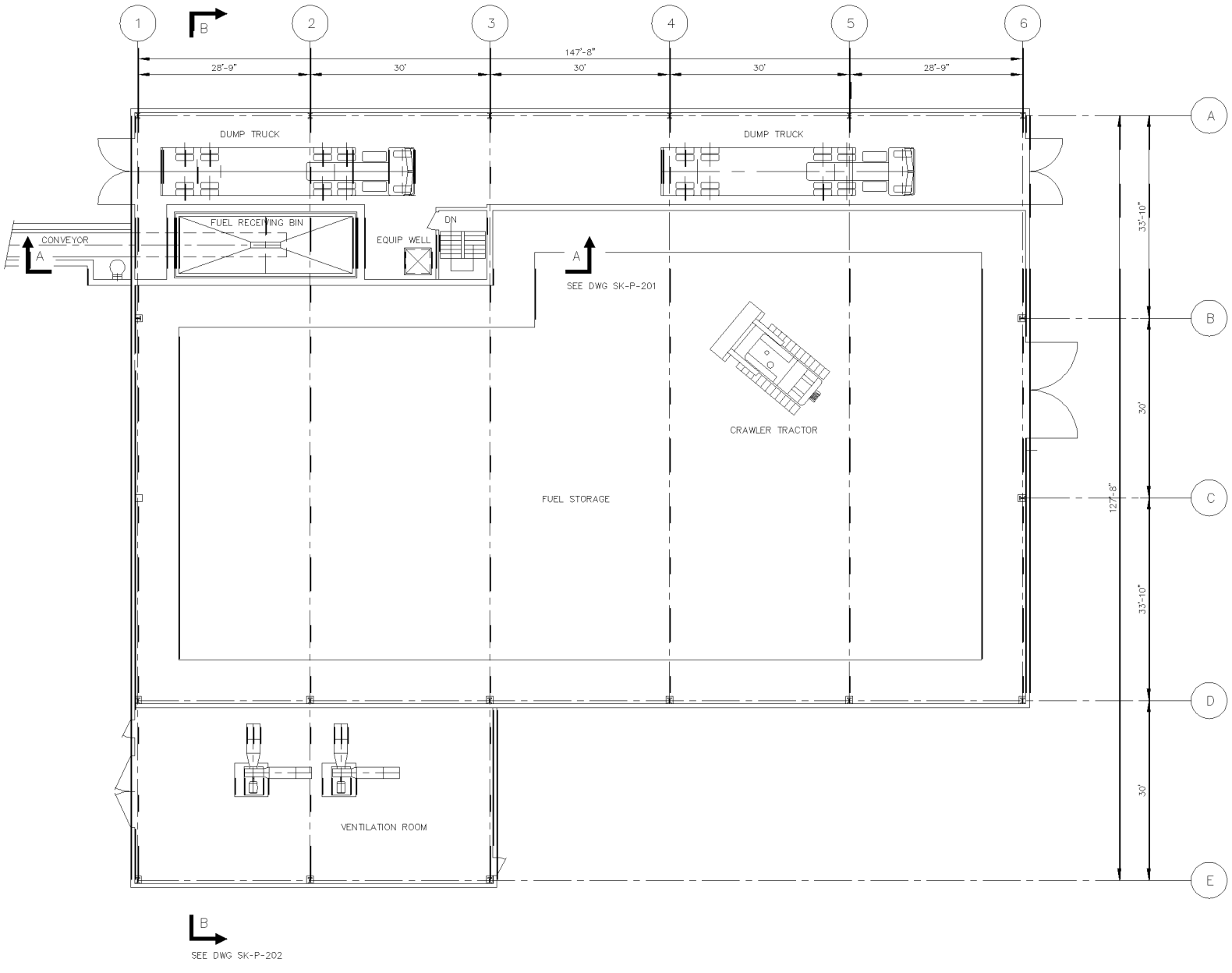
Bechtel San Francisco

MONTICELLO PLANT
POULTRY LITTER GASIFICATION
FUEL STORAGE BLDG FULLY AUTOMATED EQUIPMENT LOCATION
SECTION A-A & B-B

JOB No.	DRAWING No.	REV.
24355	SK-P-702	A

34x22 'D' SIZE

SK-P-702.DWG



REFERENCE	
SK-P-201	FUEL STG BLDG PARTIALLY AUTOMATED EQUIPMENT LOCATION PARTIAL PLAN & SECTION A-A
SK-P-202	FUEL STG BLDG PARTIALLY AUTOMATED EQUIPMENT LOCATION SECTION B-B
SK-C-100	OVERALL SITE PLAN PARTIALLY AUTOMATED
SK-C-101	LOCAL SITE PLAN PARTIALLY AUTOMATED
SK-M-001	PROCESS FLOW DIAGRAM PARTIALLY AUTOMATED

No	DATE	REVISIONS	DRAWN	ENGR	CHKD	PROJ ENGR	LMA
4							
3							
2							
1							
A		ISSUED FOR INFORMATION					

SCALE 1/8"=1'-0" CAGE No.

Bechtel

San Francisco

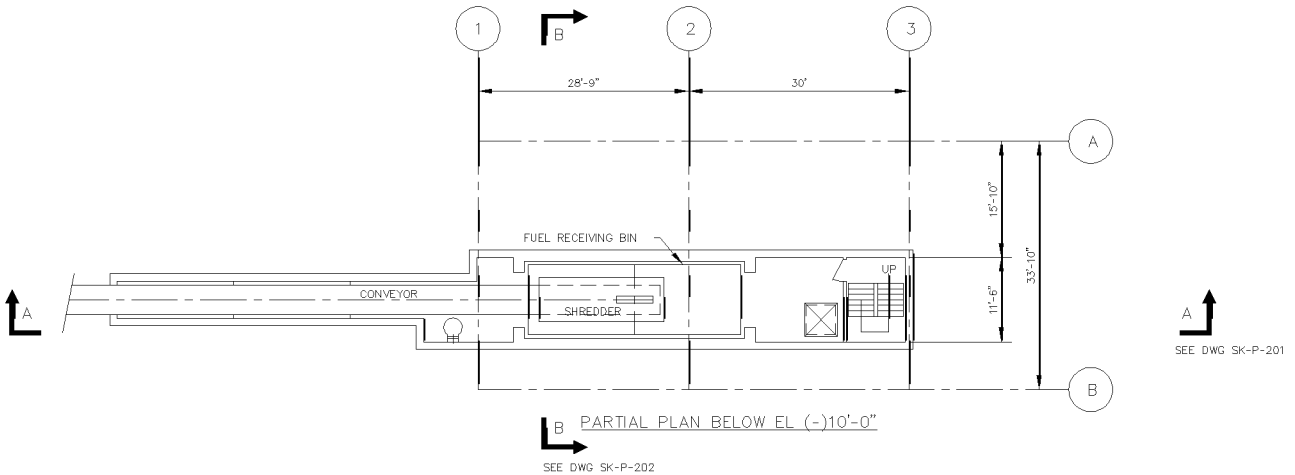
MONTICELLO PLANT
POULTRY LITTER GASIFICATION

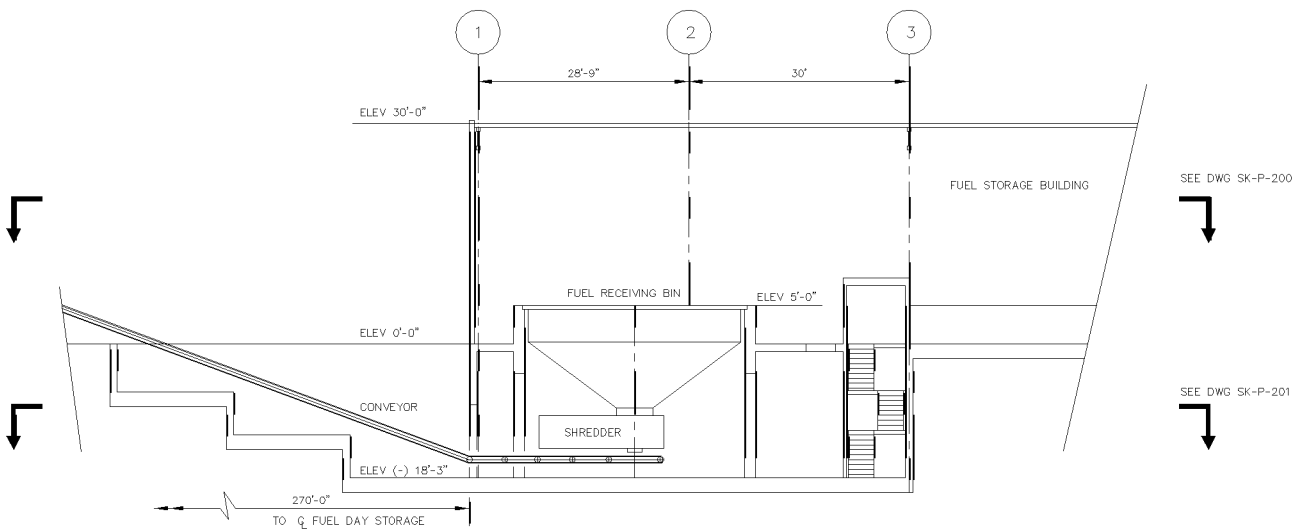
FUEL STG BLDG PARTIALLY AUTOMATED EQUIPMENT LOCATION
PLAN BELOW EL 20'-0"

JOB No.	DRAWING No	REV
24355	SK-P-200	A

34x22 'D' SIZE

SK-P-200.DWG





SECTION A-A

SEE DWG SK-P-201

SEE DWG SK-P-200

SEE DWG SK-P-201

NOTES:

1. FOR NOTES AND REFERENCE SEE DWG SK-P-200

No.	DATE	REVISIONS	DRAWN	ENGR	CHKD	PROJ ENGR	LMAER
1		ISSUED FOR INFORMATION					

SCALE 1/8"=1'-0" CAGE No.

Bechtel San Francisco

MONTICELLO PLANT
POULTRY LITTER GASIFICATION
FUEL STG BLDG PARTIALLY AUTOMATED EQUIPMENT LOCATION
PARTIAL PLAN & SECTION A-A

JOB No	DRAWING No	REV
24355	SK-P-201	A

34x22 'D' SIZE

SK-P-201.DWG