APPENDIX IX

HAZARDOUS WASTE TANK SYSTEM ASSESSMENT, DESIGN DRAWINGS, AND CONTAINMENT CALCULATIONS

FOR

SIEMENS WATER TECHNOLOGIES CORP.

PARKER REACTIVATION FACILITY

PARKER, ARIZONA

Revision 0
February 2007

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APPENDIX IX

TAB 1

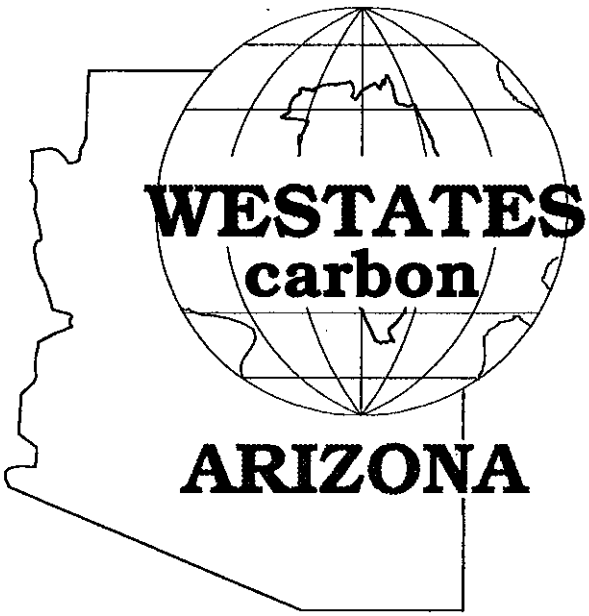
Assessment of Tank Systems T-1, T-2, T-5, T-6, and T-8

Revision 0
February 2007

MONTE McCUE

[redacted]

COPY



ASSESSMENT
of
TANK SYSTEMS
T-1, T-2, T-5, T-6, and T-8
(40 CFR 265.190)

for

Westates Carbon-Arizona, Inc.

A Wheelabrator Technologies Company

Parker, Arizona

RUST

RUST ENGINEERING COMPANY
Portland, Oregon
Contract 21-4872
November 1993

ORIGINAL

Attachment For Tank Volume Calculations

Calculation - Tank Volume - T1, T2, T5 & T6

VOLUME OF A CYLINDER	$= \pi \times (r)^2 \times h$
	$= \pi \times (5)^2 \times 11.5$
	$= 903\ ft^3$
$903\ ft^3 \times 7.48\ gallons/ft^3$	**= 6,753 gallons**
VOLUME OF A CONE	$= \frac{1}{3} \times \pi \times (r)^2 \times h$
	$= \frac{1}{3} \times \pi \times (5)^2 \times 8$
	$= 209\ ft^3$
$209\ ft^3 \times 7.48\ gallons/ft^3$	**= 1,566 gallons**

TOTAL VOLUME EACH TANK = 8,319 GALLONS

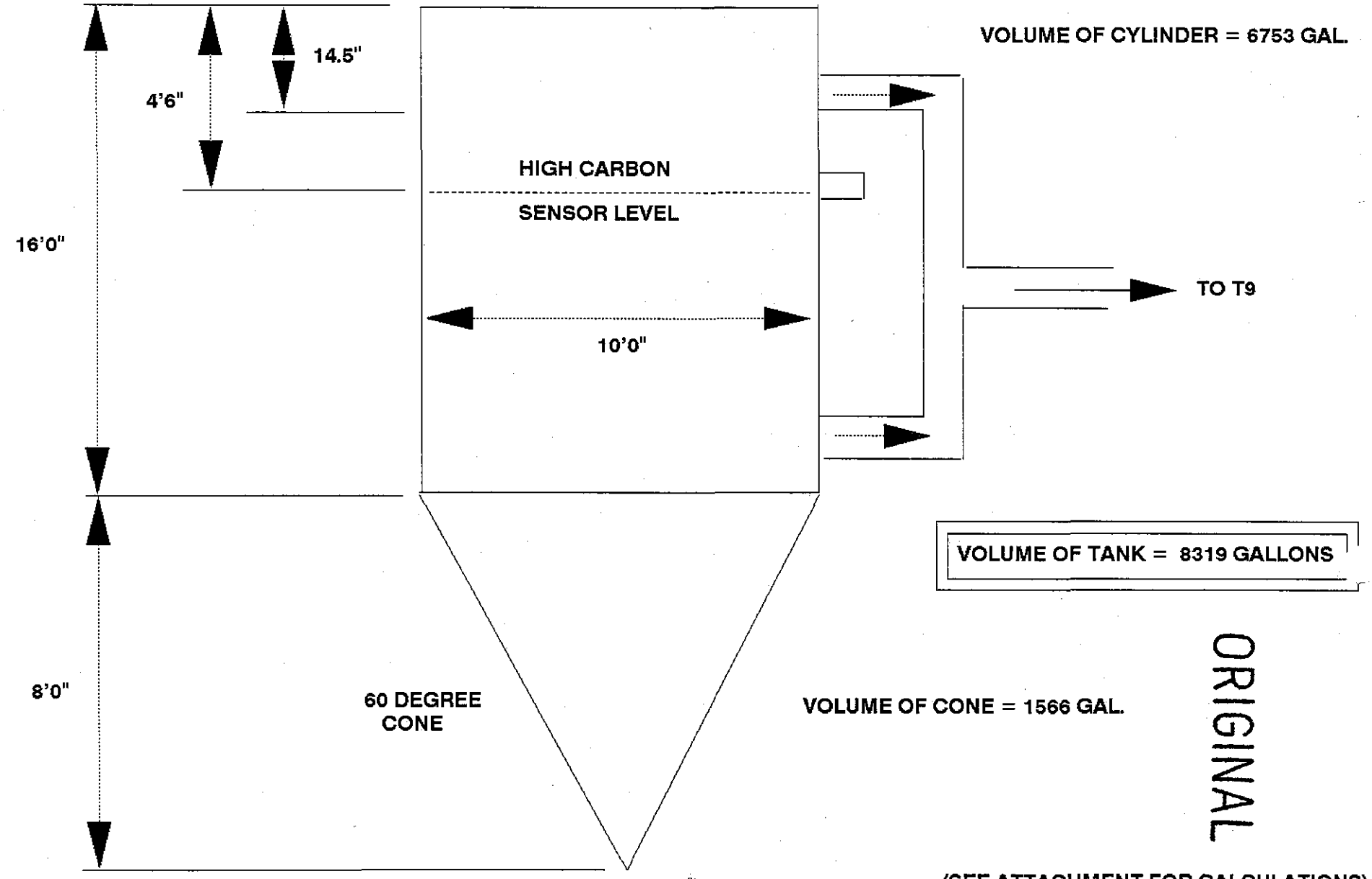
Calculation - Tank Volume - T8

VOLUME OF A CYLINDER	$= \pi \times (r)^2 \times h$
	$= \pi \times (2.5)^2 \times 5.5$
	$= 108\ ft^3$
$108\ ft^3 \times 7.48\ gallons/ft^3$	**= 808 gallons**
VOLUME OF A CONE	$= \frac{1}{3} \times \pi \times (r)^2 \times h$
	$= \frac{1}{3} \times \pi \times (2.5)^2 \times 2.0$
	$= 13\ ft^3$
$13\ ft^3 \times 7.48\ gallons/ft^3$	**= 97 gallons**

TOTAL VOLUME FOR TANK T8 = 905 GALLONS

TOTAL TANK VOLUME = (4)(8,319) + 905 = 34,181 GALLONS

VOLUME OF TANKS T1,T2,T,5 & T6



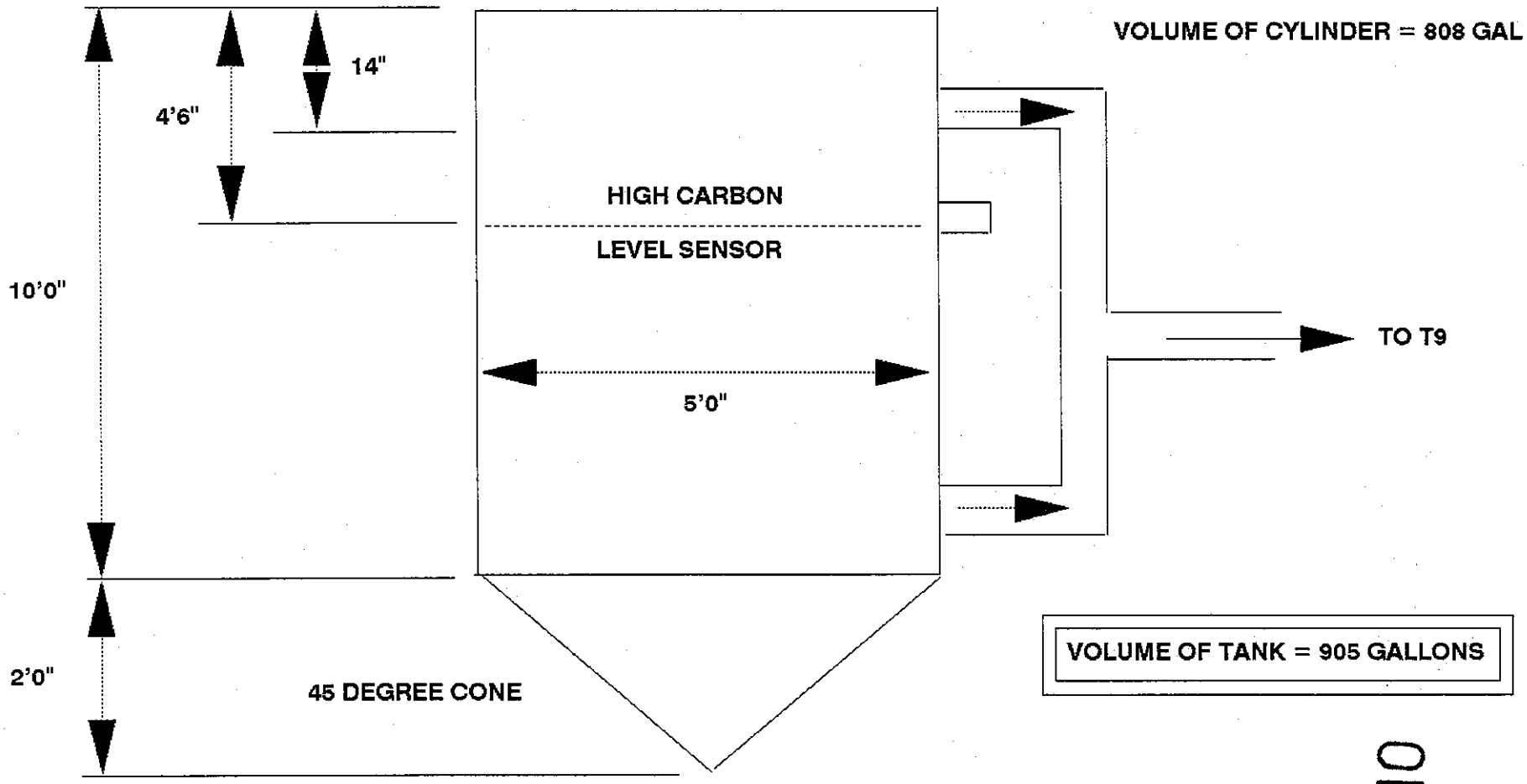
ORIGINAL

(SEE ATTACHMENT FOR CALCULATIONS)

A WHEELABRATOR TECHNOLOGIES COMPANY

PRINTED ON RECYCLED PAPER

VOLUME OF TANK T8



ORIGINAL

(SEE ATTACHMENT FOR CALCULATIONS)

A WHEELABRATOR TECHNOLOGIES COMPANY

PRINTED ON RECYCLED PAPER

To: **TANK CALCULATION FILE**

From: Monte McCue

RE: TANK CALCULATION CERTIFICATION

The presence of two valves, one on the inside hopper and one on the outside hopper, cut off the feed to the eductor system upon a tank hitting the high level probe.

This provides insurance the tanks cannot be filled above the high level probe.

TO: FILE

FROM: ERIC SELYA 

RE: APPLICABILITY OF 40 CFR 60.110b - VOC STORAGE VESSEL REGS

DATE: 3/1/95

40 CFR 60.110b (a) APPLIES ONLY TO STORAGE VESSELS WITH A CAPACITY OF 40 CUBIC METERS OR GREATER THAT ARE USED TO STORE VOLATILE ORGANIC LIQUIDS. A REVIEW OF STORAGE VESSEL VOLUMES AT WCAI INDICATED THAT THERE WERE NO STORAGE VESSELS ON SITE THAT EXCEEDED THE VOLUME REQUIREMENT FOR RULE APPLICABILITY.

(40 METERS CUBED)x264.17(GALLONS PER CUBIC METER)=10,566GALLONS

ASSESSMENT
OF
TANK SYSTEMS
T-1, T-2, T-5, T-6, AND T-8

40 CFR 265.190

for

WESTSTATES CARBON-ARIZONA, INC.

PARKER, ARIZONA

Revision No. 1
February 24, 1994

by
RUST ENGINEERING COMPANY
Portland, Oregon
21-4872
November 1993

ASSESSMENT OF TANK SYSTEMS
T-1, T-2, T-5, T-6, and T-8

In order to comply with the requirements of EPA 40 CFR, Subpart J, paragraph 265.190, the outside visual inspections, ultrasonic testing, and static leak tests were performed on the subject tanks September 15, 1993 through September 18, 1993. All ancillary equipment (pipelines, fittings, flanges, valves, pumps, supports, etc.) were visually inspected and witnessed for static leak test on February 21, 1994. The results of the ultrasonic thickness readings taken are shown in Exhibit A, attached. The following comments are made in conjunction with the EPA requirements.

1. Data for Tank Systems

A. The Westates Carbon identificaiton numbers for the tanks are T-1, T-2, T-5, T-6, and T-8. All tank configurations, with dimensions, are shown in Exhibit A.

B. All tanks are located outside on the east side of the control room and warehouse building. All tanks are supported on structures located within a common secondary containment that has U-drains routed to the rain water storage tanks. Piping systems and pumps are also located within this secondary containment.

C. The material of construction for all tanks is 300 series stainless steel, specific grade unknown. The internal surfaces of all tanks are lined with Plasite 7122HAR lining.

The material of construction for pipelines is carbon steel, specific grade unknown. The pipelines are not lined internally.

The material for all valves is stainless steel, grade 316L.

D. All five tanks were internally lined with Plasite during the construction phase of this plant before they went into service in August of 1992. Tanks T-1, T-2, T-5, and T-6 were fabricated by Wyatt M&B Works, Inc. in 1956. The fabricator for tank T-8 is not known. It is estimated that this tank was built in 1992.

E. All tanks operate at atmospheric pressure and at a maximum temperature of 95°F; therefore, the ASME code stamp is not required. An overflow nozzle is installed on all tanks. A 3-inch diameter pressure safety valve with vacuum breaker is installed on tanks T-1, T-2, T-5, and T-6. All of these valves are set at 8 ounces for pressure relief and at 6 ounces to break the vacuum.

F. The design standards and drawings for all of the tanks and ancillary equipment are not available.

2. Characteristics of Stored Chemicals and Compatibility with Tank Materials

A. The spent carbon storage tanks (T-1, T-2, T-5, and T-6) are used to store spent activated carbon in slurry form. The material is drawn out of the tanks by using eductors supplied with a pump capable of putting out discharge head of 35 feet. The furnace feed tank (T-8) is used for the storage of spent activated carbon as it is fed to the dewater screw that feeds the carbon into the reactivation furnace. The spent activated carbon stored in these tanks is contaminated with various chemicals in low concentrations, as listed in Exhibit B. The waste contaminants in carbon vary in the range of 100 to 150,000 ppm, which is treated at this plant, and the reactivated carbon is recycled.

B. Plasite 7122HAR tank lining is a cross-linked epoxy-phenolic cured with an alkaline curing agent. It is formulated with particular attention to achieve excellent abrasion and chemical (wide range of acids, alkalis, and solvents) resistance. In general, this lining is compatible with low concentrations of most chemicals. The lining, however, fails for chemical such as chloroform, methylene chloride, cyclohexanone, carbon disulfide, and ethylene dichloride in higher concentrations. Therefore, a routine internal inspection of lining surfaces is recommended.

C. Carbon steel pipelines without the internal lining are susceptible to corrosion. Therefore, the corrosion rate should be monitored.

3. Results of Ultrasonic and Leak Testing and Visual Inspection

A. To check the tank integrity, ultrasonic testing was performed on the shell, cone bottom, and roof of each tank. Shell and cone bottom thickness readings were taken at a height of every two feet on each 90° segment. The results of the thickness readings obtained by this test are tabulated in Exhibit A.

B. All of the subject tanks and their ancillary equipment underwent static leak testing during the operating condition. No leaks were found on the outside of these tanks, including at the nozzle connections.

C. All five tanks were visually inspected on the outside during operating conditions. The following observations were made during this inspection:

1) Tank T-1

The tank's outside surfaces and weld seams, in general, looked good. A dent, approximately 12" long x 8" wide x 1/4-3/8" deep, was found on the west side of the shell at the 2-foot elevation near the overflow/recirculation nozzle. Three carbon steel support brackets, used before, were cut off, but they were not completely removed by grinding. Carbon steel plates are used to blank off few unused nozzles. Two carbon steel vacuum stiffener angle rings (2-1/2" x 2-1/2" x 3/16") on the shell are badly corroded;

however, the calculations show that it has sufficient strength. The tank is not anchored to the support structure. The support skirt is painted on both sides. A caged ladder for access to the roof is installed.

2) Tank T-2

The tank's outside surfaces and weld seams, in general, look good, with the exception of slight corrosion attack in a few places. On the south side of the shell, at the 10-foot elevation, a 6-inch wide dent was found. Carbon steel plates are used to blank off three unused nozzles. Two carbon steel vacuum stiffener angle rings (2-1/2" x 2-1/2" x 3/16") on the shell are badly corroded; however, the calculations show that it has sufficient strength. The tank is not anchored to the support structure. The support skirt is painted on both sides. A caged ladder for access to the roof is installed.

3) Tank T-5

The tank's outside surfaces and weld seams, in general, looked good, with the exception of slight corrosion attack in a few places. Carbon steel plates are used to blank off three unused nozzles. Two carbon steel vacuum stiffener angle rings (2-1/2" x 2-1/2" x 3/16") on the shell are badly corroded; however, the calculations show that it has sufficient strength. The tank is not anchored to the support structure. The tank is not anchored to the support structure. The support skirt is painted on both sides. A caged ladder for access to the roof is installed.

4) Tank T-6

The tank's outside surfaces and weld seams, in general, looked good. Carbon steel plates are used to blank off a few unused nozzles. Two carbon steel vacuum stiffener angle rings (2-1/2" x 2-1/2" x 3/16") on the shell are badly corroded; however, the calculations show that it has sufficient strength. The tank is not anchored to the support structure. The support skirt is painted on both sides. A caged ladder for access to the roof is installed.

5) Tank T-8

The outside surfaces and weld seams of this tank looked good. The flat roof is stiffened by two rectangular stiffeners. The tank is supported by four brackets.

6) Additional Inspection Information

a. All tanks are supported on the elevated structure, but the structural columns do not appear to be properly grounded by means of underground grounding cable grids.

b. Additional corrosion protection devices were not found on the outside of the tanks.

D. Ancillary Equipment

1) All contaminated carbon pipelines (inlets, outlets, and overflows) and recycle water pipelines were witnessed for leak test during the operating condition. A close inspection of all pipelines indicated no leaks.

2) The recycle water pump located next to tank T-9 was found to be leaking at the packing, which seals the pump shaft. The leak was in the City water line used for cooling and flushing the seal gland.

3) A corrosion attack was found in only one location: on the outside at the tank T-2 2-inch diameter outlet flange connection to the pipeline.

4) Pipelines are not painted on the outside, but they were free from outside corrosion.

5) Pipelines are supported throughout by hanger supports and steel bridge supports, and they are guided using "U" bolts.

4. Structural Calculations

A. As stated previously, all tanks are supported on the elevated structure, which was designed by LuMar Engineering Co. of Pasadena, California. The structural and foundation drawings are not available. The original design calculation by LuMar assumed a tank load distributed over four points (legs) only. The lateral reactions on the beams were not considered. However, the skirt support, instead of legs, was used for tanks T-1, T-2, T-5, and T-6, which give uniform load distribution to the W12x26, W21x44, and W24x55 braced beams by means of eight point loads. All structural columns are supported on a mat foundation, which is 2.5 feet deep per LuMar calculations. Therefore, the tanks' structural support and foundation appears to be adequate for Seismic Zone 3 conditions.

B. The tank design calculations, based on the thinnest ultrasonic readings found (as shown in Exhibit C), were performed for the operating and seismic conditions. All subject tanks are still good for the intended service of 0.4 psig pressure and 0.4 psi vacuum. The corroded vacuum stiffening rings for tanks T-1, T-2, T-5, and T-

6 are adequate for the shell-to-cone junction reinforcement. The calculations were based on 2" x 1/4" flat bar in lieu of 2-1/2" x 2-1/2" x 3/16" angle.

C. Piping drawings showing the thicknesses, layout dimensions, and supports are not available, but, based on the visual inspection, excessive stresses due to thermal expansion, settlement, and vibrations were not observed. All pipelines appeared adequately supported and guided. Therefore, the piping systems do not appear to cause any threat of leakage.

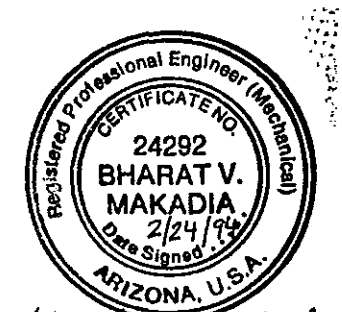
5. Deficiencies

The subject tanks are not anchored. Therefore, eight 1-inch diameter bolts should be installed on the skirt supports of tanks T-1, T-2, T-5, and T-6.

6. Certification

I hereby certify that the Spent Carbon Storage Tanks and Furnace Feed Tank and their ancillary equipment have been thoroughly inspected, and these tank systems have sufficient structural integrity and they are capable of storing and handling hazardous wastes without release for the intended service of the tanks.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. The visual inspection and testing were performed in accordance with Paragraph 3 of this document. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowning violations.



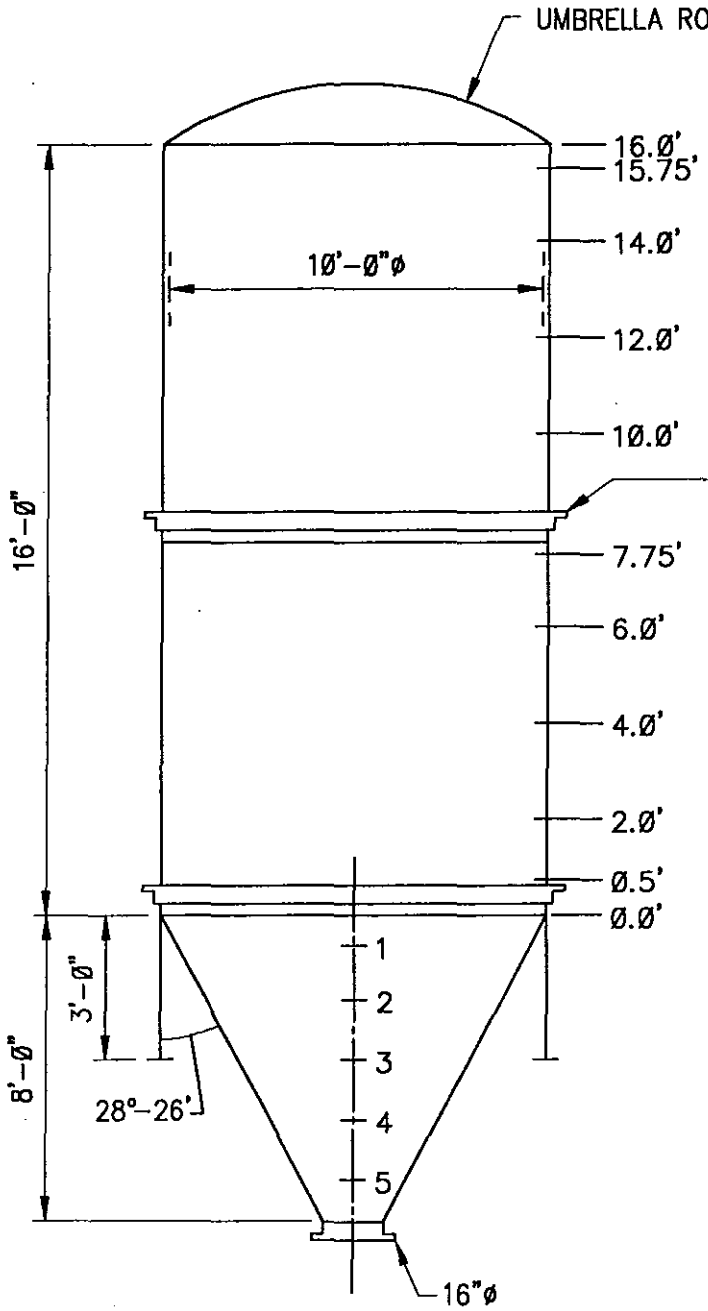
Bharat V. Makadia

REV'D ON
2/24/94

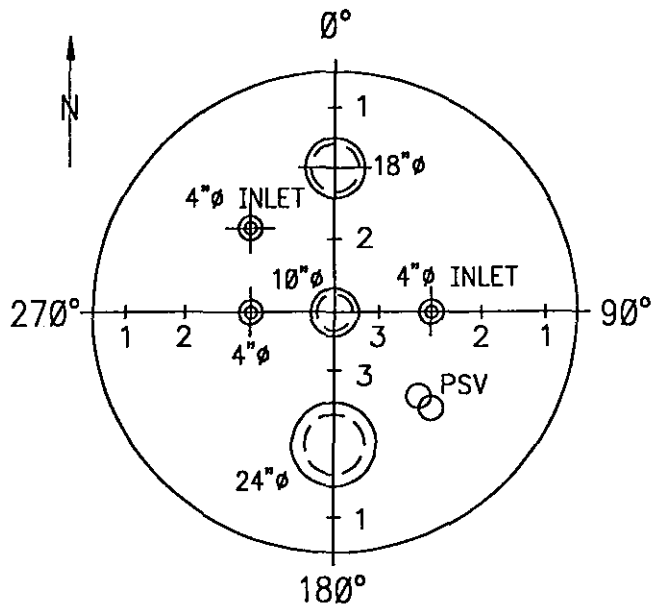
EXHIBIT A

ULTRASONIC TEST READINGS

TANK NO.: T-1



SHELL ELEV.



ROOF – TOP VIEW

NO.	REVISION	DRN BY: PSS
		CHK BY: .
		SUP BY: .
		SUB BY: .

RUST ENGINEERING COMPANY
Portland, Oregon

CONTRACT: 21-4872

4Ø CFR TANK INSPECTION

TANK ELEV. & ORIENT. FOR U/T READINGS

WESTATES CARBON-ARIZONA,INC.
PARKER, ARIZONA

DETAIL SK-V-1Ø3 | REV. Ø

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WESTATES CARBON — ARIZONA, INC.
PARKER, ARIZONA
TANK INSPECTION
RUST CONTRACT NO. 21-4872

TANK NO: T-1

SERVICE: Spent Carbon Storage Tank LOCATION: Outside on structure

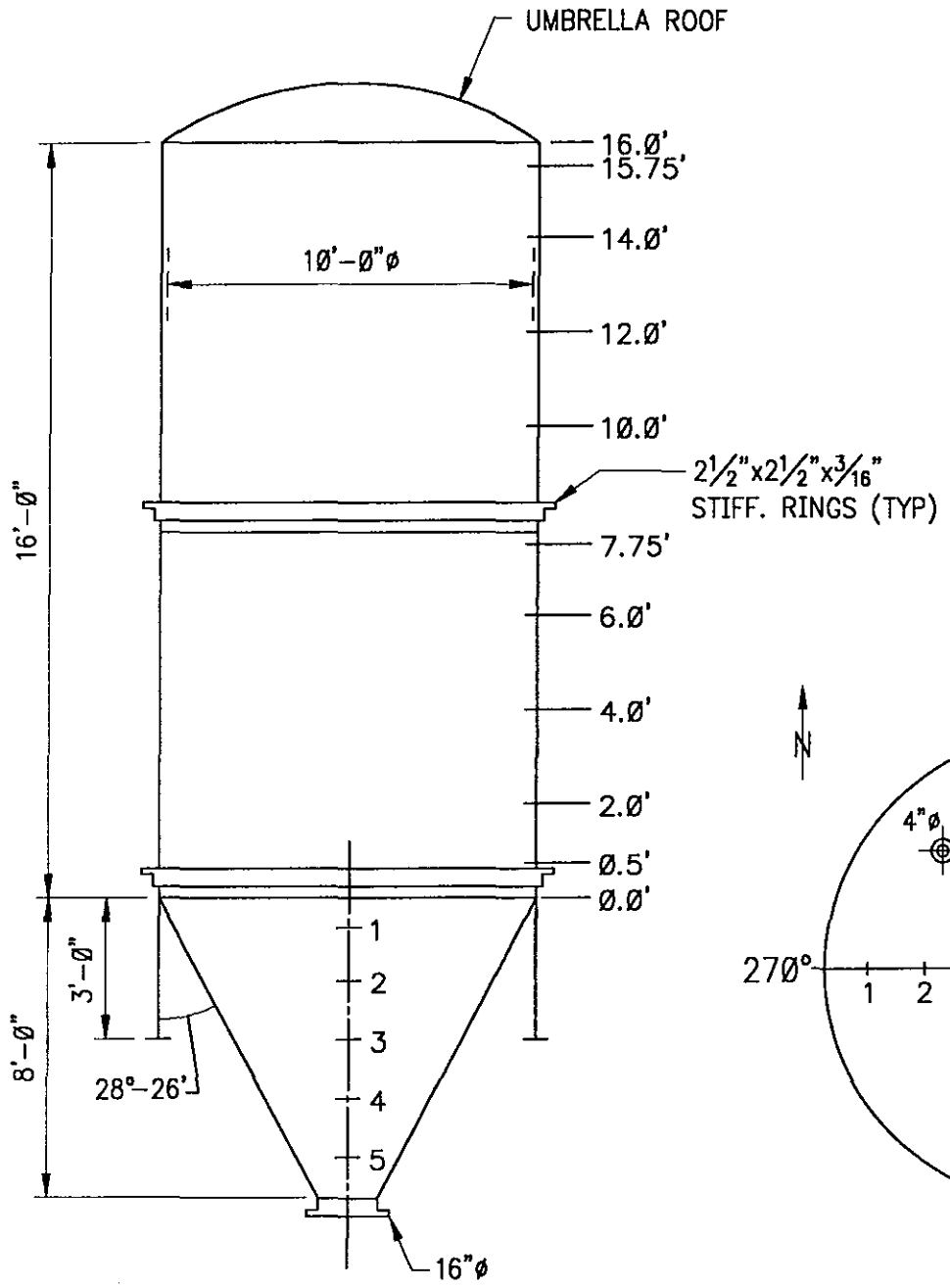
SHELL U/T READINGS TAKEN OUTSIDE (INCHES)				
ELEV. (FT)	0° (North)	90° (East)	180° (South)	270° (West)
0.5	.195	.188	.195	.179
0.5	.196	.189	.196	.180
2.0	.211	.198	.201	.182
2.0	.211	.199	.201	.182
4.0	.213	.199	.197	.184
4.0	.214	.200	.197	.184
6.0	.210	.200	.200	.197
6.0	.210	.201	.200	.198
7.75	.199	.188	.186	.194
7.75	.200	.188	.186	.195
10.0	.211	.205	.201	.201
10.0	.212	.206	.201	.199
12.0	.221	.196	.205	.206
12.0	.222	.196	.205	.207
14.0	.212	.193	.204	.193
14.0	.213	.194	.204	.194
15.75	.198	.193	.193	.182
15.75	.198	.194	.193	.182

CONICAL HEAD U/T READINGS TAKEN OUTSIDE (INCHES)				
LOCATION	0° (North)	90° (East)	180° (South)	270° (West)
1	.192/.192	.202/.202	.199/.199	.198/.198
2	.194/.194	.202/.202	.197/.198	.195/.195
3	.194/.194	.197/.197	.197/.197	.192/.193
4	.185/.186	.194/.194	.195/.195	.190/.191
5	.186/.186	.192/.192	.194/.195	.190/.191

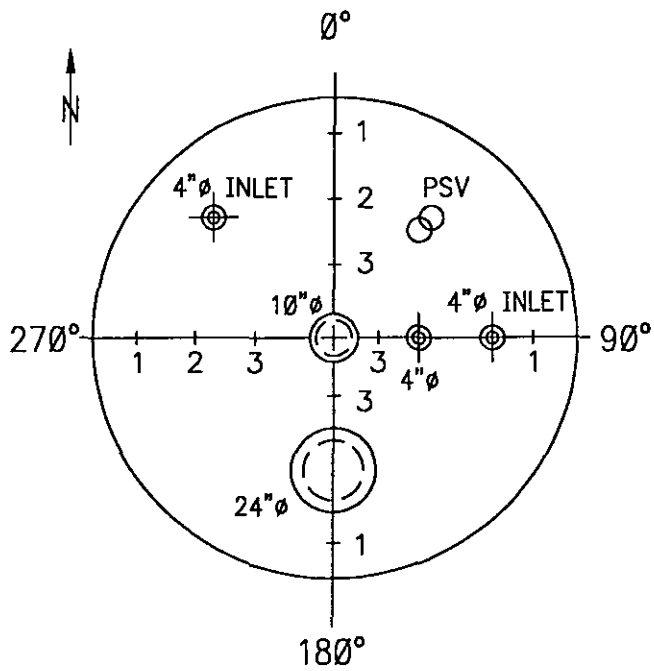
TOP ROOF UMBRELLA HEAD U/T READINGS TAKEN OUTSIDE (INCHES)				
LOCATION	0° (N)	90° (E)	180° (S)	270° (W)
1	.198/.199	.194/.194	.196/.197	.196/.196
2	—/—	.198/.199	—/—	.198/.198
3	.197/.197	.192/.192	.202/.203	—/—

U/T = ULTRASONIC TESTING

TANK NO.: T-2



SHELL ELEV.



ROOF – TOP VIEW

NO.	REVISION	DRN BY: PSS
		CHK BY: .
		SUP BY: .
		SUB BY: .

RUST ENGINEERING COMPANY
Portland, Oregon

CONTRACT: 21-4872

4Ø CFR TANK INSPECTION

TANK ELEV. & ORIENT. FOR U/T READINGS

WESTATES CARBON-ARIZONA, INC.
PARKER, ARIZONA

DETAIL SK-V-1Ø4 | REV. Ø

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WESTATES CARBON — ARIZONA, INC.
PARKER, ARIZONA
TANK INSPECTION
RUST CONTRACT NO. 21-4872

TANK NO: T-2

SERVICE: Spent Carbon Storage Tank LOCATION: Outside on structure

SHELL U/T READINGS TAKEN OUTSIDE (INCHES)				
ELEV. (FT)	0° (North)	90° (East)	180° (South)	270° (West)
0.5	.191	.194	.206	.213
0.5	.192	.195	.205	.214
2.0	.201	.212	.216	.221
2.0	.201	.213	.216	.222
4.0	.198	.208	.220	.222
4.0	.199	.209	.221	.222
6.0	.195	.206	.213	.222
6.0	.196	.206	.213	.222
7.75	.188	.210	.200	.209
7.75	.188	.211	.200	.210
10.0	.206	.216	.211*	.210
10.0	.207	.217	.212*	.211
12.0	.218	.216	.218	.224
12.0	.219	.217	.218	.225
14.0	.212	.215	.216	.209
14.0	.213	.216	.216	.210
15.75	.200	.206	.204	.210
15.75	.200	.207	.205	.211

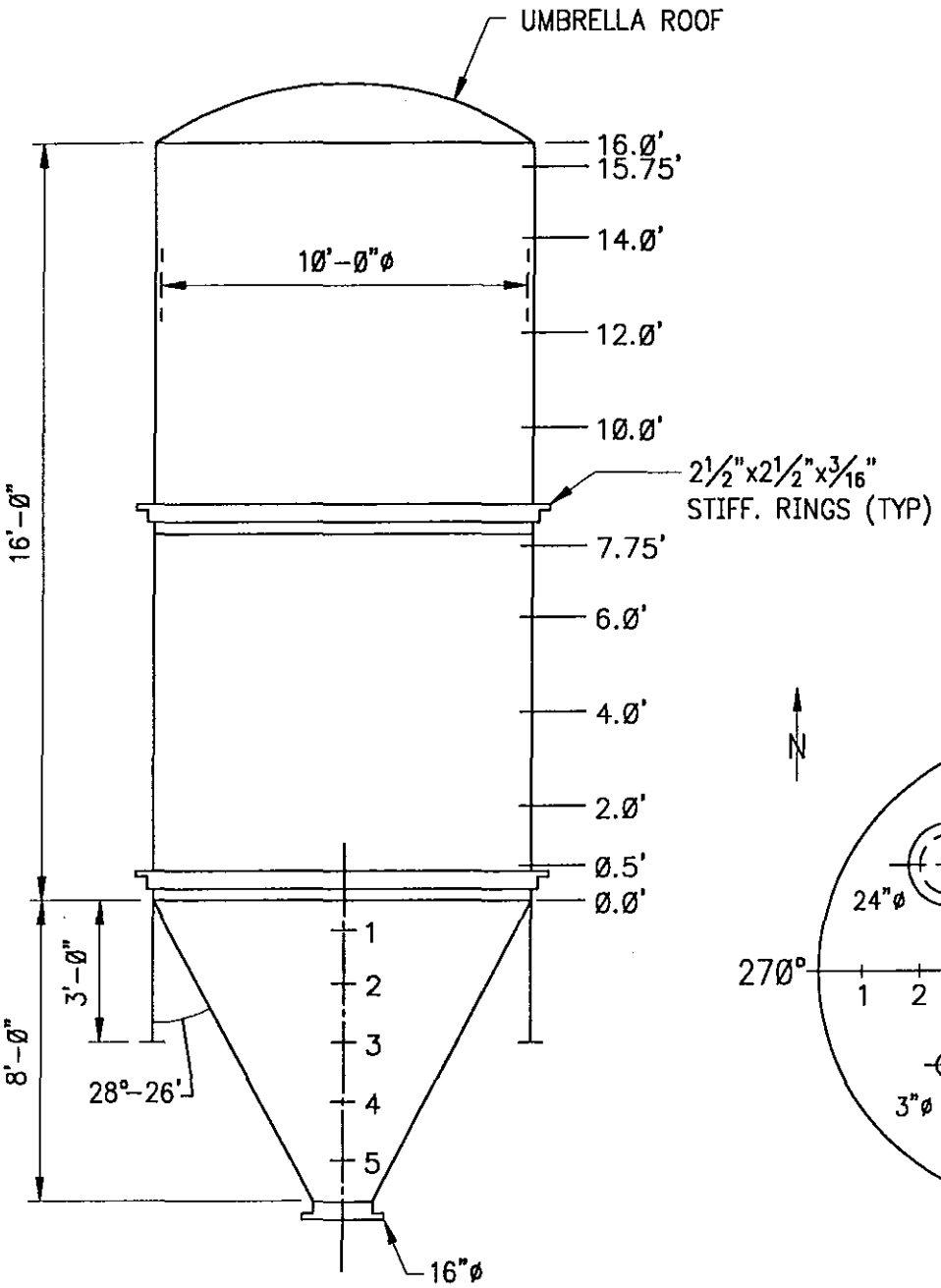
CONE BOTTOM HEAD U/T READINGS TAKEN OUTSIDE (INCHES)				
LOCATION	0° (North)	90° (East)	180° (South)	270° (West)
1	.200/.201	.207/.207	.215/.215	.202/.201
2	.201/.202	.202/.202	.206/.207	.201/.201
3	.200/.201	.202/.202	.199/.200	.197/.197
4	.195/.195	.203/.204	.194/.194	.194/.194
5	.194/.194	.195/.196	.195/.196	.189/.189

TOP ROOF UMBRELLA HEAD U/T READINGS TAKEN OUTSIDE (INCHES)				
LOCATION	0° (N)	90° (E)	180° (S)	270° (W)
1	.200/.201	.200/.201	.201/.201	.202/.202
2	.201/.202	—/—	—/—	.208/.209
3	.198/.199	.202/.203	.204/.205	.209/.210

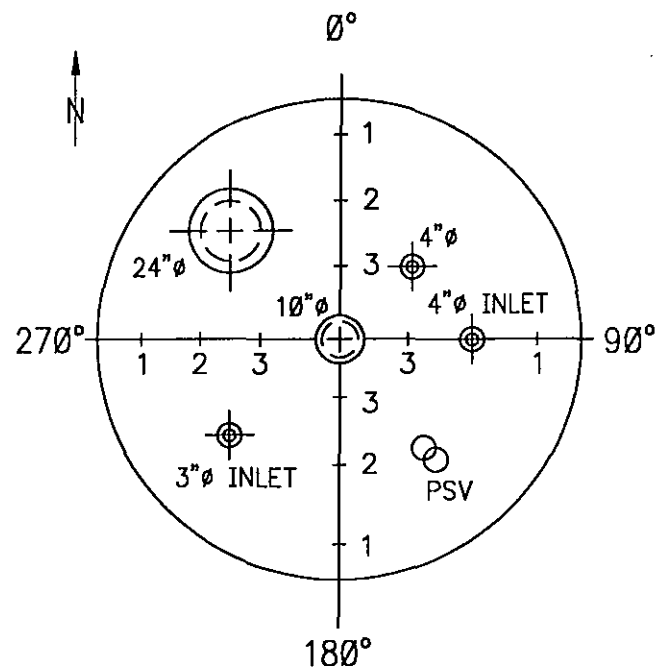
* Spot had a lot of trouble in stabilizing. The U/T reading .146? showed a few times.

U/T = ULTRASONIC TESTING

TANK NO.: T-5



SHELL ELEV.



ROOF - TOP VIEW

NO.	REVISION	DRN BY: PSS
		CHK BY: .
		SUP BY: .
		SUB BY: .

RUST ENGINEERING COMPANY
Portland, Oregon

CONTRACT: 21-4872

4Ø CFR TANK INSPECTION

TANK ELEV. & ORIENT. FOR U/T READINGS

WESTATES CARBON-ARIZONA,INC.
PARKER, ARIZONA

DETAIL SK-V-1Ø5 | REV. Ø

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WESTATES CARBON — ARIZONA, INC.
PARKER, ARIZONA
TANK INSPECTION
RUST CONTRACT NO. 21-4872

TANK NO: T-5

SERVICE: Spent Carbon Storage Tank LOCATION: Outside on structure

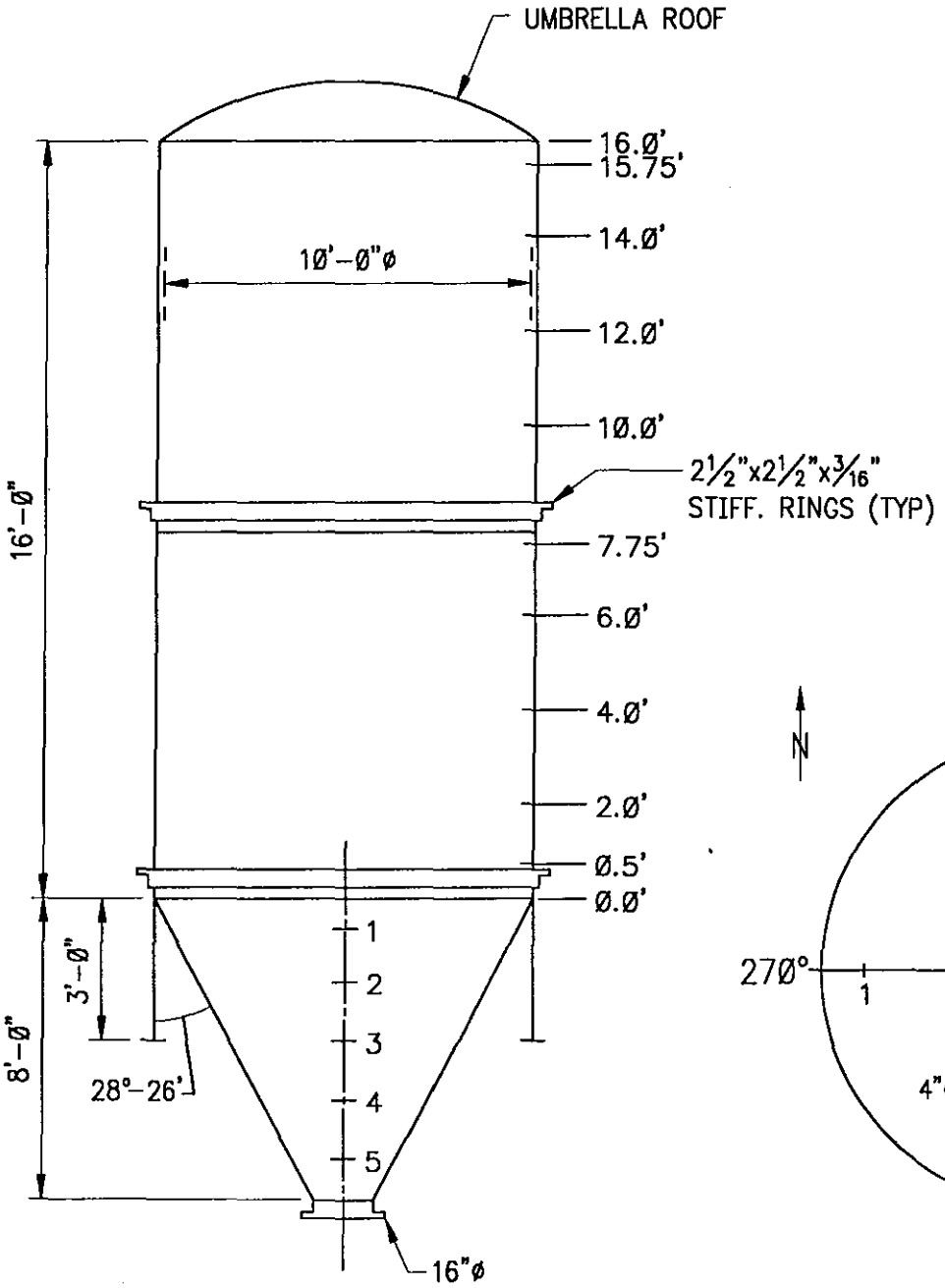
SHELL U/T READINGS TAKEN OUTSIDE (INCHES)				
ELEV. (FT)	0° (North)	90° (East)	180° (South)	270° (West)
0.5	.198	.197	.206	.196
0.5	.198	.197	.206	.197
2.0	.196	.200	.208	.198
2.0	.196	.200	.208	.198
4.0	.203	.210	.210	.203
4.0	.203	.210	.211	.204
6.0	.204	.207	—	.202
6.0	.204	.207	—	.202
7.75	.179	.182	—	.198
7.75	.179	.182	—	.198
10.0	.203	.194	.196	.187
10.0	.204	.194	.197	.187
12.0	.209	.197	.211	.194
12.0	.209	.198	.211	.194
14.0	.205	.188	.199	.197
14.0	.205	.188	.199	.198
15.75	.198	.187	.194	—
15.75	.198	.187	.194	—

LEFT HEAD U/T READINGS TAKEN OUTSIDE (INCHES)				
LOCATION	0° (North)	90° (East)	180° (South)	270° (West)
1	.191/.192	.192/.192	.194/.194	.190/.190
2	.189/.190	.191/.191	.189/.189	.193/.194
3	.191/.191	.189/.189	.189/.189	.192/.192
4	.191/.192	.189/.189	.190/.190	.193/.193
5	.188/.188	.189/.189	.188/.188	.192/.192

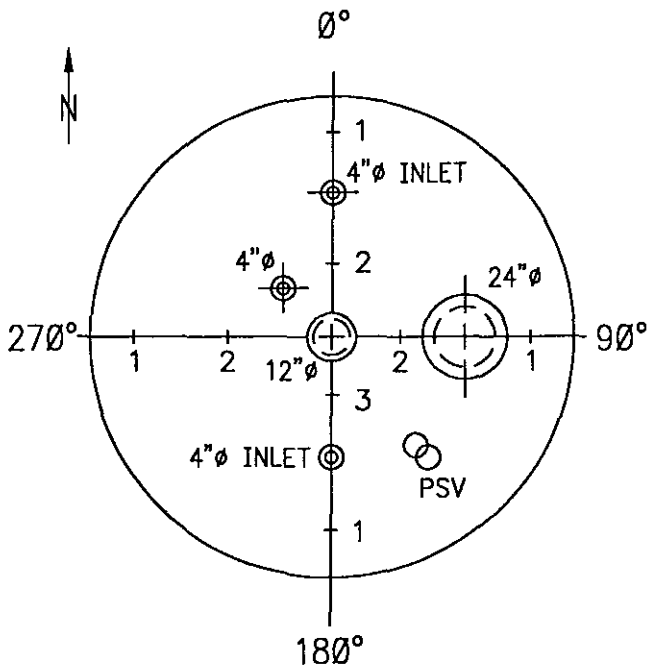
TOP ROOF UMBRELLA HEAD U/T READINGS TAKEN OUTSIDE (INCHES)				
LOCATION	0° (N)	90° (E)	180° (S)	270° (W)
1	.197/.197	.202/.202	.197/.198	.195/.195
2	.198/.199	—/—	.200/.200	.199/.199
3	.196/.196	.194/.194	.198/.198	.196/.197

U/T = ULTRASONIC TESTING

TANK NO.: T-6



SHELL ELEV.



ROOF - TOP VIEW

NO.	REVISION	DRN BY: PSS
		CHK BY: .
		SUP BY: .
		SUB BY: .

RUST ENGINEERING COMPANY
Portland, Oregon

CONTRACT: 21-4872

4Ø CFR TANK INSPECTION

TANK ELEV. & ORIENT. FOR U/T READINGS

WESTATES CARBON-ARIZONA,INC.
PARKER, ARIZONA

DETAIL SK-V-1Ø6 | REV. Ø

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WESTATES CARBON — ARIZONA, INC.
PARKER, ARIZONA
TANK INSPECTION
RUST CONTRACT NO. 21-4872

TANK NO: T-6

SERVICE: Spent Carbon Storage Tank LOCATION: Outside on structure

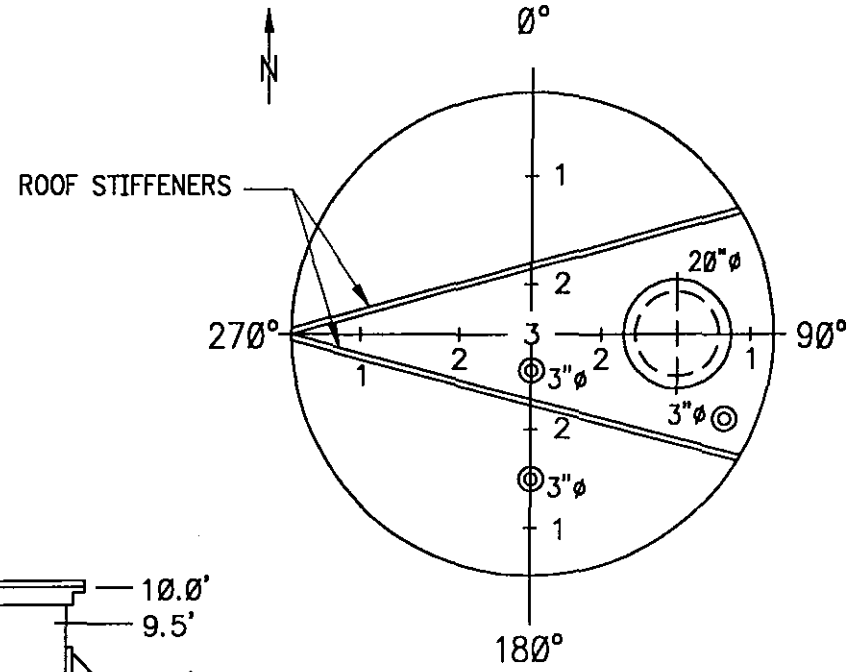
SHELL U/T READINGS TAKEN OUTSIDE (INCHES)				
ELEV. (FT)	0° (North)	90° (East)	180° (South)	270° (West)
0.5	.199	.195	.196	.195
0.5	.200	.195	.196	.195
2.0	.210	.197	.203	.210
2.0	.210	.198	.203	.210
4.0	.211	.194	.199	.215
4.0	.211	.195	.200	.215
6.0	.202	.207	.204	.198
6.0	.202	.207	.205	.199
7.75	.188	.196	.193	.201
7.75	.188	.197	.194	.202
10.0	.201	.206	.208	.201
10.0	.201	.206	.209	.201
12.0	.213	.212	.201	.201
12.0	.213	.213	.202	.202
14.0	.209	.205	.209	.203
14.0	.210	.205	.209	.203
15.75	.191	.188	.198	.197
15.75	.191	.188	.199	.198

CONICAL BTM HEAD U/T READINGS TAKEN OUTSIDE (INCHES)				
LOCATION	0° (North)	90° (East)	180° (South)	270° (West)
1	.205/.205	.203/.204	.206/.207	.198/.199
2	.202/.202	.200/.201	.204/.205	.199/.199
3	.200/.201	.201/.201	.204/.204	.198/.199
4	.207/.207	.200/.201	.202/.202	.198/.198
5	.199/.199	.200/.200	.200/.201	.198/.198

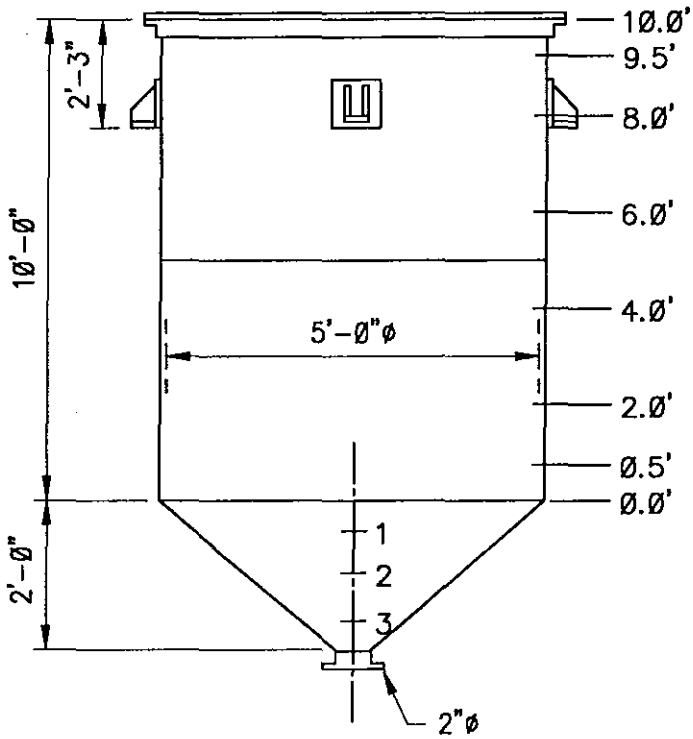
TOP ROOF UMBRELLA HEAD U/T READINGS TAKEN OUTSIDE (INCHES)				
LOCATION	0° (N)	90° (E)	180° (S)	270° (W)
1	.199/.199	.201/.202	.196/.197	.198/.199
2	.200/.201	.201/.202	—/—	.200/.200
3	—/—	—/—	.196/.195	—/—

U/T = ULTRASONIC TESTING

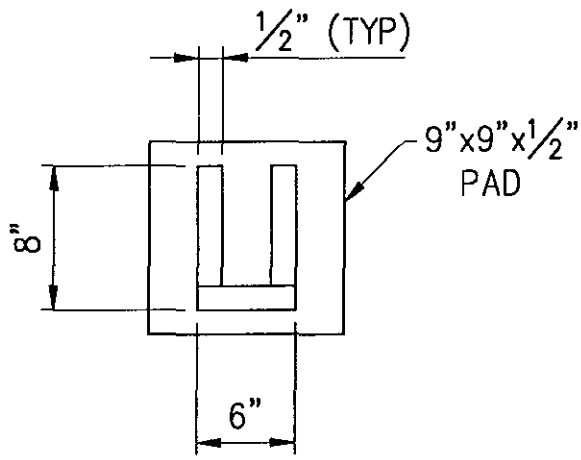
TANK NO.: T-8



ROOF – TOP VIEW



SHELL ELEV.



(4) SUPPORT BRK'TS

NO.	REVISION	DRN BY: PSS
		CHK BY: .
		SUP BY: .
		SUB BY: .

RUST ENGINEERING COMPANY
Portland, Oregon
CONTRACT: 21-4872

40 CFR TANK INSPECTION

TANK ELEV. & ORIENT. FOR U/T READINGS

WESTATES CARBON-ARIZONA, INC.
PARKER, ARIZONA

DETAIL SK-V-107 | REV. Ø

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WESTATES CARBON — ARIZONA, INC.
PARKER, ARIZONA
TANK INSPECTION
RUST CONTRACT NO. 21-4872

TANK NO: T-8

SERVICE: Furnace Feed Tank LOCATION: Top of structure

SHELL U/T READINGS TAKEN OUTSIDE (INCHES)				
ELEV. (FT)	0° (North)	90° (East)	180° (South)	270° (West)
0.5	.183	.188	.187	.183
0.5	.183	.188	.187	.183
2.0	.184	.190	.190	.185
2.0	.184	.190	.190	.185
4.0	.184	.191	.191	.185
4.0	.184	.191	.192	.185
6.0	.190	.188	.184	.185
6.0	.190	.189	.184	.186
8.0	.191	.191	.185	.185
8.0	.191	.191	.185	.185
9.5	.189	.189	.182	.182
9.5	.190	.189	.182	.183

CONICAL BTM HEAD U/T READINGS TAKEN OUTSIDE (INCHES)				
LOCATION	0° (North)	90° (East)	180° (South)	270° (West)
1	.189/.189	.191/.191	.186/.186	.182/.182
2	.184/.184	.185/.185	.185/.185	.184/.184
3	.185/.185	.184/.184	.185/.185	.184/.184

ROOF FLAT HEAD U/T READINGS TAKEN OUTSIDE (INCHES)				
LOCATION	0° (N)	90° (E)	180° (S)	270° (W)
1	.185/.185	.185/.185	.184/.184	.185/.186
2	.185/.185	.185/.185	—/—	.186/.185
3	.186/.186	.186/.186	.186/.186	.186/.186

U/T = ULTRASONIC TESTING

EXHIBIT B

LIST OF CHEMICALS

Following are the different waste streams that Westates Carbon Arizona, Inc has treated at our facility. These codes may be contained in the fines being shipped to Greenfield Environmental due to the "Derived From" rule

1. D001: Ignitability
2. D018: Benzene
3. D019: Carbon tetrachloride
4. D022: Chloroform
5. D027: 1,4 dichlorobenzene
6. D028: 1,2 dichlorethane
7. D029: 1,1 dichloroethylene
8. D039: Tetrachloroethylene
9. D040: Trichloroethylene
10. D043: Vinyl chloride
11. F001: Tetrachloroethylene
    Methylene chloride trichloroethylene
    1,1,1-trichloroethane
    Carbon tetrachloride
    Chlorinated fluorocarbons
12. F002: Tetrachloroethylene
    Methylene chloride
    Trichloroethylene
    1,1,1-trichloroethane
    1,1,2-trichloroethane
    Chlorobenzene
    1,1,2-trichloro-1,2,2-trichfluoroethane
    Ortho-dichlorobenzene
    Trichlorofluoromethane
13. F003: The following spent non-halogenated solvents: Xylenes, acetone, ethyl acetate, ethel benzene, ethel ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of ten percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.

Hazardous Constituents

14. F005: Toulene
Methyl ethyl etone
Carbon disulfide
Isobutanol
Pyridine
2-ethoxyethanol
Benzene
2-nitropropane
15. F006: Cadmium (complexed)
Hexavalent Chromium (complexed)
Nickel (complexed)
Cyanide (complexed)
16. F032: Benz(a)anthracene, benzo(a)pyrene, dibenz(a,h)-anthracene, indeno(1,2,3-cd) pyrene, pentachlorophenol, arsenic, chromium, tetra-, penta-, hexa-, heptachlorodibenzo-p-dioxions, tetra-, penta-, hexa-, heptachlorodibenzofurans
17. F039: All constituents for which treatment standards are specified for multi-source leachate (wastewaters and nonwastewaters) under 40 CFR 268.43(a), table CCW.
18. P037: Dieldrin
19. P069: 2-Methyllaactonitrile
20. P123: Toxaphene
21. U002: Acetone
22. U009: Acrylontrile
23. U012: Aniline
24. U019: Benzene
25. U031: 1-Butanol
26. U044: Chloroform
27. U056: Cyclohexane
28. U060: DDD
29. U061: DDT
30. U067: Ethylene dibromide
31. U070: o-Dichlorobenzene
32. U072: p-Dichlorobenzene
33. U076: Ethylidene dichloride
34. U077: Ethylene dichloride
35. U078: 1,1-Dichloroethylene
36. U079: 1,2-Dichloroethylene
37. U080: Methylene chloride
38. U083: Propylene dichloride
39. U084: 1,3-Dichloropropene
40. U129: Lead subacetate
41. U162: Methyl methacrylate
42. U209: 1,1,2,2-tetrachloroethane
43. U210: Tetrachloroethylene
44. U211: Carbon tetrachloride
45. U226: Methyl chloroform
46. U228: Ethene,trichloro
47. U239: Xylene(l)

WESTATES CARBON–ARIZONA, INC.

RCRA SPENT CARBON RECEIPTS – THROUGH DECEMBER 31, 1993

Waste Code Received	1993												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
D001	2,000	2,200		400	2,600	2,200	2,600		400		2,400		14,800
D018	96,000	125,600	108,800	32,400	158,400	129,800	180,400	43,600	82,200	218,800	196,950	179,800	1,531,950
D019													0
D022		2,800		400									3,200
D039				13,800		1,000					1,850		16,650
D040		400					200			800			1,400
F001	20,000			3,000							1,600		24,600
F002	2,200		14,000	2,000	600		800						19,600
F003	2,600		3,400					2,400					8,400
F005					1,200								1,200
F032						20,000	20,000						40,000
F039		20,000	2,000				20,000						42,000
P020													0
U083												600	600
U084	2,000												2,000
D001/D018	16,000	5,400	1,600	2,200	86,600	6,200	17,600	3,000	18,600	20,400	3,600	2,000	183,600
D005/D008													0
D018/D026						400	1,200						1,600
D029/D040							1,600						1,600
D039/D040			3,200		3,400	3,000	4,000	20,000		3,200			36,800
D040/F002													0
F001/F002		7,000		2,200			1,200						10,400
F002/F003							400						400
F003/F005									14,400				14,400
F003/F032				3,600									3,600
U079/U226					4,600								4,600
D001/F001					4,000								4,000
D029/F002	400												400
D018/U019										21,600			21,600
D028/U087										2,000			2,000
D005/D006/D007													0
D016/D039/D040													0
D018/F003/F005													0
D001/D018/D027	3,600					6,600							10,600
D019/D039/D040				1,200									1,200
D028/D039/D040										15,600	-		15,600
D029/D039/D040										21,600	18,000		39,600
F001/F003/F005					600								600
U078/U210/U226	20,000	20,000			30,000	20,000	20,000				20,000		130,000
D040/F001/F002				4,200	10,200								14,400
P123/U060/U061								20,000					20,000
D028/D029/D039/ D040				400		3,400							3,800
F001/F003/U210/ U239													0
U070/U072/U209/ U226			2,400										2,400
U078/U080/U210/ U226					2,000		1,600				3,200		6,800
D001/D018/F003/ F005					400								400
D018/D029/D039/ D040/D043		400											400
D022/D029/D040/ D043/F001						20,000							20,000
D022/D029/D040/ D043/F001							20,000	20,000					40,000
D022/D029/D043/ D044/F001						20,000							20,000
D022/D029/D043/ D044/F001													0
U044/U210/U211/ U226/U228												1650	1,650
P037/P123/U061/ U129/U239												20000	20,000
U113/U117/U154/ U188/U220/U229		400											400
D022/D029/D040/ F001/F002/F003							2,000						2,000
D029/D039/F001/ F002/F003/F005													0
U044/U076/U077/ U078/U079/U226/ U228							600						600
D022/D028/D029/ D040/F001/F003/ F005			40,000										40,000
D022/D029/D040/ D043/F001/F003/ F005				2,000									2,000
D022/D027/D029/ D039/D040/F001/ F003/F005				400									400
P089/P110/U002/ U009/U012/U019/ U031/U056/U077/ U162		4,600											4,600
TOTAL RECEIVED	165,000	186,600	173,600	86,200	302,600	232,600	274,400	115,000	115,600	302,200	247,800	203,050	2,389,250

TOTAL RECEIVED IN 1993 = 2,389,250 (RCRA) + 1,315,700 NONHAZ = 3,704,950 POUNDS

EXHIBIT C

DESIGN CALCULATIONS

WESTATES CARBON - ARIZONA, INC.
PARKER, ARIZONA
CALCULATIONS FOR TANKS T-1, T-2, T-5 & T-6

Pressure Summary

Pressure summary for pressure chamber 1

Identifier	Nozzle Status (UG-45)	T design (deg F)	MAWP (psi)	MAP (psi)	Pe external (psi)	UG-99 Ratio
TOP HEAD		150.0	22.9	23.5	4.3	1.027
CLY SHELL		150.0	31.9	32.9	0.6	1.027
CONICAL BOTTOM		150.0	12.3	12.8	2.4	1.027
Seismic Calculation			12.3		0.6	
SHELL CONE STIFF. R					0.6	
CYL SHELL @ CONE BT		150.0	287.0	295.1	48.4	1.027

Vessel MAWP hot & corroded is 12.35 psi @ 150 degrees F.

Vessel MAP new & cold is 12.82 psi @ 60 degrees F.

Vessel allowable external pressure is 0.63 psi @ 150 degrees F.

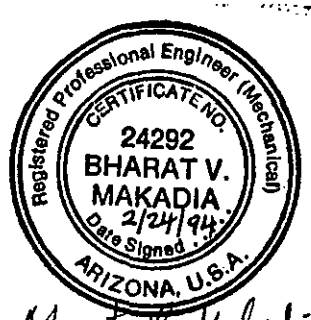
Hydrotest pressure calculation based on P

= 1.5*P*1.027 = 0.6 psi

Vessel hydrotest pressure is 0.6 psi.

Note: vessel MAWP rating not valid unless hydrotest pressure based on MAWP.

Note: vessel MAP rating not valid unless hydrotest pressure based on MAP.



REV'D ON
2/24/94

Weight Summary

Component	Weight (lbs) Contributed by Vessel Elements											
	Metal New	Metal Corr	Trays	Packed Beds	Insul	Lining	Piping	Ladder & plat	Rings & Misc	Oper Liquid	Test Liquid	Nozzle & flg
Top head	795	795	0	0	0	0	0	0	0	0	5664	0
Cly shell	3763	3763	0	0	0	0	0	0	109	70235	78402	0
Skirt support	1449	1449	0	0	0	0	0	0	55	0	0	0
Conical bottom	1255	1255	0	0	0	0	0	0	0	15042	15042	0
Cyl shell @ con	11	11	0	0	0	0	0	0	0	29	29	0
SKIRT BASE RING	320	320	0	0	0	0	0	0	0	0	0	0
	7593	7593	0	0	0	0	0	0	164	85306	99137	0

Vessel operating weight, corroded: 93,063 lbs
Vessel empty weight, corroded: 7,757 lbs
Vessel test weight, new: 106,894 lbs

Vessel center of gravity location (from base)

Vessel lift weight, new: 7,702 lbs
Center of gravity to base: 163.4 in

TOP HEAD

ASME Section VIII Division 1, 1992 Edition, A92 Addenda

Component: F&D head
Material specification: SA 240 304 HIGH

Corrosion allowance: Inner C = 0 Outer= 0 in

PWHT is not performed

Radiography: Category A joints - None UW-11(c) type 1
Head to shell seam - None UW-11(c) type 2

Estimated weight: new = 794.7 corr = 794.7 lb
capacity: new = 679.05 corr = 679.05 US ga

ID = 120 crown L = 120 knuckle r = 7.5 t = .188 in (min)

Straight flange = 1.5 forming allowance = 0 in

MAP: (New & at 60 deg F) Appendix 1-4(d) Eq 3

P = 2*S*E*t/(L*M + 0.2*t) - Ps
= 2*18800*0.7*0.188/(120*1.75 + 0.2*0.188) - 0
= 23.55845 psi

MAWP: (Corroded & at 150 deg F) Appendix 1-4(d) Eq 3

P = 2*S*E*t/(L*M + 0.2*t) - Ps
= 2*18300*0.7*0.188/(120*1.75 + 0.2*0.188) - 0
= 22.93189 psi

Maximum Allowable External Pressure: (Corroded @ 150 deg F)

A = .125/(Ro/t)
= .125/(120.188/0.188)
= 0.000196

From table HA-1: B = 2750

Pa= B/(Ro/t)
= 2750/(120.188/0.188)
= 4.3016 psi

Check the Maximum External Pressure: UG-33(a)(1) & App. 1-4(d)

Pe= 2*S*E*t/((M*Lo - t*(M-0.2))*1.67)
= 2*18300*1*0.188/((1.75*120.188 - 0.188*(1.75-0.2))*1.67)
= 19.61667 psi

The maximum allowable external pressure is 4.3016 psi.

CLY SHELL

ASME Section VIII Division 1, 1992 Edition, A92 Addenda

Component: Cylinder
Material specification: SA 240 304 HIGH

Static liquid head: Ps= 6.209 psi (S.G.= 1, Hs= 172 in)

Corrosion allowance: Inner C = 0 Outer= 0 in

PWHT is not performed

Radiography: Category A joints - None UW-11(c) type 1
Category B joints - None UW-11(c) type 1

Estimated weight: new = 3763 corr = 3763 lb
capacity: new = 9400.29 corr = 9400.29 US ga

Operating liquid: 8421.09 US ga, weight: 70234.7 lb

ID = 120 length Lc= 192 t = 0.179 in (new)

MAP: (New & at 60 deg F) UG-27(c)(1)

P = S*E*t/(R + 0.6*t) - Ps
= 18800*0.7*0.179/(60 + 0.6*0.179) - 6.209
= 32.98152 psi

MAWP: (Corroded & at 150 deg F) UG-27(c)(1)

P = S*E*t/(R + 0.6*t) - Ps
= 18300*0.7*0.179/(60 + 0.6*0.179) - 6.209
= 31.93921 psi

Maximum Allowable External Pressure: (Corroded @ 150 deg F)

L/Do = 103.3337/120.358 =0.8586 Do/t = 120.358/0.179 = 672.3911
From table G: A = 0.000091
From table HA-1: B = 1254.1

Pa= 4*B/(3*Do/t)
= 4*1254.1/(3*120.358/0.179)
= 2.4868 psi

Vacuum + external loading check (Bergman, ASME paper 54-A-104)

Calculate the compressive loading due to weight + bending:

Pv = W / (pi*Dm) + 48 * M / (pi*Dm^2)
= 4666.484 / (pi*120.179) + 48 * 133448.7 / (pi*120.179^2)
= 153.5318 lb/in

Alpha = Pv / (Pe * Do)
= 153.5318 / (0.63 * 120.358) = 2.0248

From Fig. 1 of the Bergman paper # lobes @ collapse n = 9

m = 1.23 / (L / Do)^2
= 1.23 / (103.3337 / 120.358)^2 = 1.66867

P'o= Pe*(n^2 - 1 + m + m * Alpha) / (n^2 - 1 + m)
= 0.63*(9^2 - 1 + 1.66867 + 1.66867 * 2.0248) / (9^2 - 1 + 1.66867)
= .6560638 psi

As P'o < Pa (2.4868) interaction stresses are ok.

SKIRT SUPPORT

Material:	SA 285C
Left end inner diameter:	120.375 in
Right end inner diameter:	120.375 in
Overall length:	36 in
Corrosion inside:	0 in
Corrosion outside:	0 in
Weld joint efficiency top:	E = 0.55
Weld joint efficiency bottom:	Eb = 0.55
Nominal thickness:	0.375 in
Estimated skirt weight, new:	1449.3 lb
Estimated skirt weight, corroded:	1449.3 lb

Skirt Allowable Stresses, Corroded

Allowable tensile stress St = 13800*1.2 = 16560 psi

Factor A = 0.125/(60.5625/0.375) = 7.739938E-04
From table CS-2: B = 11160.4
Allowable buckling stress Sb = 11160.4*1.2 = 13392.48 psi

Allowable compression Sc =lesser of St, Sb = 13392.48 psi

Skirt required thickness, tensile stress at base

Governing loading is seismic in the empty condition

t = -W/(pi*D*St*E) + 48*M/(pi*D^2*St*E)
= -7702.186/(pi*120.75*16560*0.55) + 48*15452.99/(pi*120.75^2*16560*0.55)
= 0.0005 in [compressive stress]

Skirt required thickness, tensile stress at top

t = -W/(pi*D*St*E) + 48*M/(pi*D^2*St*E)
= -6252.886/(pi*120.75*16560*0.55) + 48*10404.36/(pi*120.75^2*16560*0.55)
= 0.0006 in [compressive stress]

Skirt required thickness, compressive stress at base

Governing loading is seismic in the vacuum condition

t = W/(pi*D*Sc) + 48*M/(pi*D^2*Sc)
= 93007.39/(pi*120.75*13392.48) + 48*196215.9/(pi*120.75^2*13392.48)
= 0.0337 in

Skirt required thickness, compressive stress at top

t = W/(pi*D*Sc) + 48*M/(pi*D^2*Sc)
= 91558.09/(pi*120.75*13392.48) + 48*133448.7/(pi*120.75^2*13392.48)
= 0.0285 in

Skirt required thickness, largest of the above + corrosion

= 0.0337 in

The skirt thickness is adequate.

CONICAL BOTTOM

ASME Section VIII Division 1, 1992 Edition, A92 Addenda

Component: Transition
Material specification: SA 240 304 HIGH

Static liquid head: Ps= 6.209 psi (S.G.= 1, Hs= 172 in)

Corrosion allowance: Inner C = 0 Outer= 0 in

PWHT is not performed

Radiography: Category A joints - None UW-11(c) type 1
Category B joints - None UW-11(c) type 1

Estimated weight: new = 1255.2 corr = 1255.2 lb
capacity: new = 1803.5 corr = 1803.5 US ga

Operating liquid: 1803.46 US ga, weight: 15041.5 lb

Axial Lc= 96 big end ID = 120 small end ID = 16 in
Cone tc = 0.185 in (min)

MAP: (New & at 60 deg F) UG-32(g)

P = 2*S*E*t*cos(alpha)/(Di + 1.2*t*cos(alpha)) - Ps
= 2*18800*0.7*0.185*cos(28.4429)/(120 + 1.2*0.185*cos(28.4429)) - 6.209
= 29.41179 psi

MAWP: (Corroded & at 150 deg F) UG-32(g)

P = 2*S*E*t*cos(alpha)/(Di + 1.2*t*cos(alpha)) - Ps
= 2*18300*0.7*0.185*cos(28.4429)/(120 + 1.2*0.185*cos(28.4429)) - 6.209
= 28.46443 psi

Le= (L/2)*(1 + Ds/DL)
= (96/2)*(1 + 16.42079/120.4208)
= 54.54536 in

Maximum Allowable External Pressure: (Corroded @ 150 deg F)

te = t*cos(alpha) = .162669
Le/DL = 54.54536/120.4208 = .453 DL/te = 120.4208/0.162669 = 740.2811

From table G: A = 0.000152
From table HA-1: B = 2141.7

Pa= 4*B/(3*DL/te)
= 4*2141.7/(3*120.4208/0.162669)
= 3.8575 psi

MAWP check of the cone large end per Appendix 1-5

Static head on juncture: Ph= 6.209 psi
Total pressure on juncture: P = 18.55824 psi
Modulus of elasticity, cylinder: Es= 27850000 psi
Modulus of elasticity, cone: Ec= 27850000 psi
Allowable stress, cylinder: Ss= 18300 psi
Allowable stress, cone: Sc= 18300 psi
Joint efficiency, cylinder: E1= 0.7
Joint efficiency, cone: E2= 0.7
Cylinder thickness: ts= 0.179 in
Cone thickness: tc= 0.185 in
Cylinder required thickness: t = 0.087 in

CONICAL BOTTOM

Cone required thickness: tr= 0.09894 in
Inside radius, cylinder: RL= 60 in

Weight acting on large end: Wl= 0 lb
Moment acting on large end: Ml= 0 lb-ft

P/(Ss*E1) = 18.55824/(18300*1) = 1.014112E-03

From table 1-5.1 delta = 11.06 degrees

AS delta is less than alpha an area check is required.

f1= -Wl/(pi*2*RL) + 12*Ml/(pi*RL^2)
= -0/(pi*2*60) + 12*0/(pi*60^2)
= 0 lb/in

QL= P*RL/2 + f1
= 18.55824*60/2 + 0
= 556.7473 lb/in

ArL= (k*QL*RL/(Ss*E1))*(1 - delta/alpha)*tan(alpha)
= (1*556.7473*60/(18300*1))*(1 - 11.06/28.443)*tan(28.443)
= .6043 in^2

AeL= (ts - t)*Sqr(RL*ts) + (tc - tr)*Sqr(RL*tc/Cos(alpha))
= (0.179 - 0.087)*Sqr(60*0.179) + (0.185 -
0.09894)*Sqr(60*0.185/Cos(28.443))
= .6073 in^2

AeL >= ArL so no additional area is required per App. 1-5

MAWP check of the cone small end per Appendix 1-5

Static head on juncture: Ph= 9.674 psi
Total pressure on juncture: P = 22.02324 psi
Modulus of elasticity, cylinder: Es= 27850000 psi
Modulus of elasticity, cone: Ec= 27850000 psi
Allowable stress, cylinder: Ss= 18300 psi
Allowable stress, cone: Sc= 18300 psi
Joint efficiency, cylinder: E1= 0.7
Joint efficiency, cone: E2= 0.7
Cylinder thickness: ts= 0.188 in
Cone thickness: tc= 0.185 in
Cylinder required thickness: t = 0.01377 in
Cone required thickness: tr= 0.01566 in
Inside radius, cylinder: Rs= 8 in

Weight acting on small end: Ws= 0 lb
Moment acting on small end: Ms= 0 lb-ft

P/(Ss*E1) = 22.02324/(18300*0.7) = 1.719223E-03

From table 1-5.2 delta = 3.690252 degrees

AS delta is less than alpha an area check is required.

f2= -Ws/(pi*2*Rs) + 12*Ms/(pi*Rs^2)
= -0/(pi*2*8) + 12*0/(pi*8^2)
= 0 lb/in

Qs= P*Rs/2 + f2
= 22.02324*8/2 + 0

CONICAL BOTTOM

= 88.09296 lb/in

ArS= (k*Qs*Rs/(Ss*E1))*(1 - delta/alpha)*tan(alpha)
= (1*88.09296*8/(18300*0.7))*(1 - 3.690252/28.443)*tan(28.443)
= .0259 in^2

AeS= .78*Sqr(Rs*ts)*((ts-t) + (tc-tr)/Cos(alpha))
= .78*Sqr(8*0.188)*((0.188-0.01377) + (0.185-0.01566)/Cos(28.443))
= .3509 in^2

AeS >= ArS so no additional area is required per App. 1-5

MAP check of the cone large end per Appendix 1-5

Static head on juncture:	Ph= 6.209 psi
Total pressure on juncture:	P = 19.02578 psi
Modulus of elasticity, cylinder:	Es= 28100000 psi
Modulus of elasticity, cone:	Ec= 28100000 psi
Allowable stress, cylinder:	Ss= 18800 psi
Allowable stress, cone:	Sc= 18800 psi
Joint efficiency, cylinder:	E1= 0.7
Joint efficiency, cone:	E2= 0.7
Cylinder thickness:	ts= 0.179 in
Cone thickness:	tc= 0.185 in
Cylinder required thickness:	t = 0.08682 in
Cone required thickness:	tr= 0.09874 in
Inside radius, cylinder:	RL= 60 in
Weight acting on large end:	Wl= 0 lb
Moment acting on large end:	Ml= 0 lb-ft

P/(Ss*E1) = 19.02578/(18800*1) = 1.012009E-03

From table 1-5.1 delta = 11.05 degrees

AS delta is less than alpha an area check is required.

f1= -Wl/(pi*2*RL) + 12*Ml/(pi*RL^2)
= -0/(pi*2*60) + 12*0/(pi*60^2)
= 0 lb/in

QL= P*RL/2 + f1
= 19.02578*60/2 + 0
= 570.7733 lb/in

ArL= (k*QL*RL/(Ss*E1))*(1 - delta/alpha)*tan(alpha)
= (1*570.7733*60/(18800*1))*(1 - 11.05/28.443)*tan(28.443)
= .6034 in^2

AeL= (ts - t)*Sqr(RL*ts) + (tc - tr)*Sqr(RL*tc/Cos(alpha))
= (0.179 - 0.08682)*Sqr(60*0.179) + (0.185 -
0.09874)*Sqr(60*0.185/Cos(28.443))
= .6086 in^2

AeL >= ArL so no additional area is required per App. 1-5

MAP check of the cone small end per Appendix 1-5

Static head on juncture:	Ph= 9.674 psi
Total pressure on juncture:	P = 22.49078 psi
Modulus of elasticity, cylinder:	Es= 28100000 psi

Seismic Calculations

Combined stresses due to Earthquake, Corroded Empty Condition

Elevation above base (in.)	Type	Minimum thickness corroded (in.)	Circ joint eff.	Required thickness (in.)	Overhead weight (lbs)	Bending moment (lb-ft)
36.00	cyl	0.1790	0.65	0.0036	4666.4	10404.3
0.00	skirt	0.3750	0.55	0.0027	7702.1	15452.9

Table Continues

Maximum tensile stress (psi)	Allowable tensile stress (psi)	Maximum compress stress E=1 (psi)	Allowable compressive stress (psi)	Pressure (psi)
-11.6c	18800.0*1.2	130.5	5305.2*1.2	0.0
-19.9c	13800.0*1.2	97.3	11160.4*1.2	

Seismic Calculations

Seismic deflection report, empty & corroded

Elevation start above base (in.)	Elastic Modulus psi x10^6	Inertia (I, ft^4)	Seismic & other shear (lbs)	Bending (platform & other) (lb-ft)	Deflection section top (in.)
36.00	28.1	5.884	1600.6	0.0	0.0003
0.00	29.0	12.503	1765.0	0.0	0.0000

SHELL CONE STIFF. RING

Stiffening Ring Calculations Per UG-29

ASME Section VIII Division 1, 1992 Edition, A92 Addenda

Identifier:		SHELL CONE STIFF. RING
Ring material specification:		SA 36
Number of rings in this group:		2
Distance first ring to datum line:		-1 in
Ring spacing:		-96 in
Ring description:		1/4x2 Flat Bar
Ring cross sectional area:	As =	0.5 in^2
Ring moment of inertia:	Ir =	0.1667 in^4

Maximum external pressure for this ring group is 0.63 psi

Calculations for ring -1 in from datum

Shell material specification:		SA 240 304 HIGH
Required shell thickness:	t =	0.08918 in
Corroded shell thickness:	ts =	0.179 in
Shell outer diameter:	Do =	120.358 in
Design temperature:	=	150 deg F
External design pressure:	P =	0.64 psi
Stiffener supported length:	Ls =	98.5 in

B = .75*(P*Do/(t + As/Ls))
= .75*(0.64*120.358/(0.08918 + 0.5/98.5))
= 612.9239

A = larger of the following = 4.439366E-05

From table CS-2 (ring) A = 4.22917E-05
From table HA-1 (shell) A = 4.439366E-05

Required moment of inertia of the combined ring-shell section

Is= (Do^2*Ls*(t + As/Ls)*A)/10.9
= (120.358^2*98.5*(0.08918 + 0.5/98.5)*4.439366E-05)/10.9
= .5477599 in^4

Available moment of inertia of the combined ring-shell section

Shell width contributing smaller of = 5.105717

W = 1.1*Sqr(Do*ts)
= 1.1*Sqr(120.358*0.179)
= 5.105717 in

W = Ls/2 = 98.5/2 = 49.25 in

Shell area A1 = W*ts = 0.9139233 in^2

Distance to the ring neutral axis

Y2 = Ring NA + ts/2
= 1 + 0.179/2

SHELL CONE STIFF. RING

= 1.0895 in

Neutral axis of combined section

NA = As*Y2/(A1 + As)
= 0.5*1.0895/(0.9139233 + 0.5)
= .3852755 in

Inertia of the shell about the combined section NA

I1 = W*ts^3/12 + A1*NA^2
= 5.105717*0.179^3/12 + 0.9139233*0.3852755^2
= .1381005 in^4

Inertia of the ring about the combined section NA

I2 = Ir + As*(NA - Y2)^2
= 0.1667 + 0.5*(0.3852755 - 1.0895)^2
= .4146661 in^4

Total available I = I1 + I2 = 0.5527666 in^4

The 1/4x2 Flat Bar vacuum stiffener is satisfactory.

Calculations for ring -97 in from datum

Shell material specification:		SA 240 304 HIGH
Required shell thickness:	t =	0.08784 in
Corroded shell thickness:	ts =	0.179 in
Shell outer diameter:	Do =	120.358 in
Design temperature:	=	150 deg F
External design pressure:	P =	0.63 psi
Stiffener supported length:	Ls =	99.66687 in

B = .75*(P*Do/(t + As/Ls))
= .75*(0.63*120.358/(0.08784 + 0.5/99.66687))
= 612.4399

A = larger of the following = 4.43586E-05

From table CS-2 (ring) A = 4.225829E-05
From table HA-1 (shell) A = 4.43586E-05

Required moment of inertia of the combined ring-shell section

Is= (Do^2*Ls*(t + As/Ls)*A)/10.9
= (120.358^2*99.66687*(0.08784 + 0.5/99.66687)*4.43586E-05)/10.9
= .5455888 in^4

Available moment of inertia of the combined ring-shell section

Shell width contributing smaller of = 5.105717

W = 1.1*Sqr(Do*ts)
= 1.1*Sqr(120.358*0.179)
= 5.105717 in

W = Ls/2 = 99.66687/2 = 49.83344 in

Shell area A1 = W*ts = 0.9139233 in^2

Distance to the ring neutral axis

SHELL CONE STIFF. RING

Y2 = Ring NA + ts/2
= 1 + 0.179/2
= 1.0895 in

Neutral axis of combined section

NA = As*Y2/(A1 + As)
= 0.5*1.0895/(0.9139233 + 0.5)
= .3852755 in

Inertia of the shell about the combined section NA

I1 = W*ts^3/12 + A1*NA^2
= 5.105717*0.179^3/12 + 0.9139233*0.3852755^2
= .1381005 in^4

Inertia of the ring about the combined section NA

I2 = Ir + As*(NA - Y2)^2
= 0.1667 + 0.5*(0.3852755 - 1.0895)^2
= .4146661 in^4

Total available I = I1 + I2 = 0.5527666 in^4

The 1/4x2 Flat Bar vacuum stiffener is satisfactory.

CYL SHELL @ CONE BTM

ASME Section VIII Division 1, 1992 Edition, A92 Addenda

Component: Cylinder
Material specification: SA 240 304 HIGH

Static liquid head: Ps= 9.818 psi (S.G.= 1, Hs= 272 in)

Corrosion allowance: Inner C = 0 Outer= 0 in

PWHT is not performed

Radiography: Category A joints - None UW-11(c) type 1
Category B joints - None UW-11(c) type 1

Estimated weight: new = 11.1 corr = 11.1 lb
capacity: new = 3.482 corr = 3.482 US ga

Operating liquid: 3.48 US ga, weight: 29 lb

ID = 16 length Lc= 4 t = 0.188 in (new)

MAP: (New & at 60 deg F) UG-27(c)(1)

P = S*E*t/(R + 0.6*t) - Ps
= 18800*0.7*0.188/(8 + 0.6*0.188) - 9.818
= 295.1421 psi

MAWP: (Corroded & at 150 deg F) UG-27(c)(1)

P = S*E*t/(R + 0.6*t) - Ps
= 18300*0.7*0.188/(8 + 0.6*0.188) - 9.818
= 287.0314 psi

Maximum Allowable External Pressure: (Corroded @ 150 deg F)

L/Do = 101/16.376 =6.1676 Do/t = 16.376/0.185 = 88.5189
From table G: A = 0.00023
From table HA-1: B = 3218.3

Pa= 4*B/(3*Do/t)
= 4*3218.3/(3*16.376/0.185)
= 48.4763 psi

SKIRT BASE RING

Base configuration:	Single Base Plate Without Gussets
Foundation allowable stress:	Sc= 1000 psi
Anchor bolt material:	A 307B
Anchor bolt allowable stress:	Sb= 20000 psi
Bolt circle:	BC= 124 in
Anchor bolt corrosion allowance:	0.125 in
Anchor bolt clearance:	0.125 in
Base plate material:	A 36
Base plate allowable stress:	Sp= 15000 psi
Base plate inner diameter:	Di= 114 in
Base plate outer diameter:	Do= 126 in
Base plate thickness:	tb= 0.5 in
Estimated base ring weight:	Wr= 320.1 lb
Initial bolt preload:	0 % (0 psi)
Number of bolts:	N = 8
Bolt size & type:	1 inch series 8 threads
Diameter of anchor bolt holes:	db= 1.125 in

Calculate the load per anchor bolt

Governing vessel weight:	W = 7702.186 lb
Governing overturning moment:	M = 15452.99 lb-ft
Bolt root area (corroded):	Ab= 0.271167 in^2

```
P = -W / N + 48 * M / (N*BC)
  = -7702.186 / 8 + 48 * 15452.99 / (8*124)
  =-215.048 lb
```

The anchor bolts are satisfactory (no overturning moment)

Foundation bearing stress (Operating)

```
Ac= pi*(Do^2 - Di^2)/4 - N*pi*db^2/4
  = pi*(126^2 - 114^2)/4 - 8*pi*1.125^2/4
  = 2253.995 in^2

Ic= pi*(Do^4 - Di^4)/64
  = pi*(126^4 - 114^4)/64
  = 4081683 in^4

fc= N*Ab*PreLoad/Ac + W/Ac + 6*M*Do/Ic
  = 8*0.271167*0/2253.995 + 93007.39/2253.995 + 6*196215.9*126/4081683
  = 77.60601 psi
```

As fc <= Sc the base plate width is satisfactory.

Foundation bearing stress, hydro test condition

```
fc= N*Ab*PreLoad/Ac + W/Ac + 6*M*Do/Ic
  = 8*0.271167*0/2253.995 + 106838.1/2253.995 + 6*0*126/4081683
  = 47.39945 psi
```

As fc <= Sc the base plate width is satisfactory.

Check the base plate for foundation bearing load

```
tr= Sqr(3*fc*L^2 / Sp)
  = Sqr(3*77.60601*3.1875^2 / 15000)
  = .3971119 in
```

The base plate thickness is satisfactory.

Nozzle Summary

Nozzle mark	OD (in)	tn (in)	Req tn (in)	A1?	A2?	Nom t (in)	Req t (in)	User t (in)	Corr (in)	As/Ar (%)

tn - nozzle thickness
Req tn - nozzle thickness required per UG-45/16
Nom t - vessel wall thickness
Req t - required vessel wall thickness due to pressure + corrosion
User t - local vessel wall thickness (near opening)
As - area available per UG-37, governing condition
Ar - area required per UG-37, governing condition
Corr - corrosion allowance on nozzle id.

Nozzle Schedule

Nozzle mark	Service	Size	Materials					
			Nozzle	Impact?	Norm?	Pad	Impact?	Norm?	Flange

Thickness Summary

Component Identifier	ID (in)	Nom t (in)	Req t (in)	Joint E	Governing Load	Governing Status	Governing Stress	Deflect (in)
Top head	120.00	0.1880	0.1880	0.7	external			
Cly shell	120.00	0.1790	0.1790	0.7	external			0.004
Skirt support	120.37	0.3750	0.0337	0.55	seismic	op/ext	compres	0.000
Conical bottom	120.00	0.1850	0.1850	0.7	external			
Cyl shell @ cone bt	16.00	0.1880	0.1850	0.7	external			

Nom t - vessel wall thickness
Req t - required vessel wall thickness due to governing loading
E - longitudinal seam joint efficiency

Load:
internal - circ stress due to internal pressure governs
external - external pressure governs
wind - combined long stress due to STATUS + wind governs
seismic - combined long stress due to STATUS + seismic governs

CONICAL BOTTOM

Modulus of elasticity, cone:	Ec= 28100000 psi
Allowable stress, cylinder:	Ss= 18800 psi
Allowable stress, cone:	Sc= 18800 psi
Joint efficiency, cylinder:	E1= 0.7
Joint efficiency, cone:	E2= 0.7
Cylinder thickness:	ts= 0.188 in
Cone thickness:	tc= 0.185 in
Cylinder required thickness:	t = 0.01369 in
Cone required thickness:	tr= 0.01557 in
Inside radius, cylinder:	Rs= 8 in
Weight acting on small end:	Ws= 0 lb
Moment acting on small end:	Ms= 0 lb-ft

P/(Ss*E1) = 22.49078/(18800*0.7) = 1.709026E-03

From table 1-5.2 delta = 3.679292 degrees

AS delta is less than alpha an area check is required.

f2= -Ws/(pi*2*Rs) + 12*Ms/(pi*Rs^2)
= -0/(pi*2*8) + 12*0/(pi*8^2)
= 0 lb/in

Qs= P*Rs/2 + f2
= 22.49078*8/2 + 0
= 89.96311 lb/in

ArS= (k*Qs*Rs/(Ss*E1))*(1 - delta/alpha)*tan(alpha)
= (1*89.96311*8/(18800*0.7))*(1 - 3.679292/28.443)*tan(28.443)
= .0258 in^2

AeS= .78*Sqr(Rs*ts)*((ts-t) + (tc-tr)/Cos(alpha))
= .78*Sqr(8*0.188)*((0.188-0.01369) + (0.185-0.01557)/Cos(28.443))
= .3511 in^2

AeS >= ArS so no additional area is required per App. 1-5

Pe check of the cone large end per Appendix 1-8

Total pressure on juncture:	P = 2.4868 psi
Modulus of elasticity, cylinder:	Es= 27850000 psi
Modulus of elasticity, cone:	Ec= 27850000 psi
Allowable stress, cylinder:	Ss= 18300 psi
Allowable stress, cone:	Sc= 18300 psi
Joint efficiency, cylinder:	E1= 0.7
Joint efficiency, cone:	E2= 0.7
Cylinder thickness:	ts= 0.179 in
Cone thickness:	tc= 0.185 in
Cylinder required thickness:	t = 0.17915 in
Cone required thickness:	tr= 0.15748 in
Outside radius, cylinder:	RL= 60.179 in
Weight acting on large end:	Wl= 0 lb
Moment acting on large end:	Ml= 0 lb-ft

P/(Ss*E1) = 2.4868/(18300*0.7) = 1.941296E-04

From table 1-8.1 delta = .49 degrees

AS delta is less than alpha an area check is required.

CONICAL BOTTOM

f1= Wl/(pi*2*RL) + 12*Ml/(pi*RL^2)
= 0/(pi*2*60.179) + 12*0/(pi*60.179^2)
= 0 lb/in

QL= P*RL/2 + f1
= 2.4868*60.179/2 + 0
= 74.82657 lb/in

ArL= (k*QL*RL*tan(alpha)/(Ss*E1))*(1- .25*((P*RL-QL)/QL)*delta/alpha)
= (1*74.82657*60.179*tan(28.443)/(18300*0.7))*(1-
.25*((2.4868*60.179-74.82657)/74.82657)*0.49/28.443)
= .1896 in^2

AeL= .55*Sqr(DL*ts)*(ts + tc/Cos(alpha))
= .55*Sqr(120.358*0.179)*(0.179 + 0.185/Cos(28.443))
= .9941 in^2

AeL >= ArL so no additional area is required per App. 1-8

Pe check of the cone small end per Appendix 1-8

Total pressure on juncture:	P = 2.4868 psi
Modulus of elasticity, cylinder:	Es= 27850000 psi
Modulus of elasticity, cone:	Ec= 27850000 psi
Allowable stress, cylinder:	Ss= 18300 psi
Allowable stress, cone:	Sc= 18300 psi
Joint efficiency, cylinder:	E1= 1
Joint efficiency, cone:	E2= 0.7
Cylinder thickness:	ts= 0.188 in
Cone thickness:	tc= 0.185 in
Cylinder required thickness:	t = 0.05517 in
Cone required thickness:	tr= 0.04869 in
Outside radius, cylinder:	Rs= 8.188 in
Weight acting on small end:	Ws= 0 lb
Moment acting on small end:	Ms= 0 lb-ft

f2= Ws/(pi*2*Rs) + 12*Ms/(pi*Rs^2)
= 0/(pi*2*8.188) + 12*0/(pi*8.188^2)
= 0 lb/in

Qs= P*Rs/2 + f2
= 2.4868*8.188/2 + 0
= 10.18096 lb/in

ArS= k*Qs*Rs*tan(alpha)/(Ss*E1)
= 1*10.18096*8.188*tan(28.443)/(18300*1)
= .0025 in^2

AeS= .55*Sqr(Ds*ts)*((ts-t) + (tc-tr)/Cos(alpha))
= .55*Sqr(16.376*0.188)*((0.188-0.05517) + (0.185-0.04869)/Cos(28.443))
= .2778 in^2

AeS >= ArS so no additional area is required per App. 1-8

TANK LIQ. LOAD

Liquid level from datum:	-172 in
Liquid specific gravity:	1

Liquid acts vertically

Seismic Calculations

Method of seismic analysis:	UBC 91
Seismic zone:	2B
Importance factor, I:	1.25
Soil profile:	S3
Site coefficient, S:	1.5
Coefficient Rw:	3

Period of vibration calculation

The fundamental period of vibration is calculated using the Rayleigh method of approximation by the numerical integration of the following formulae:

$$T = 2*Pi*Sqr[\ Sum\ W*y^2\ /\ g(Sum\ W*y)\ ]$$

T(operating) = .03 seconds
T(empty) = .01 seconds

Seismic Calculations

Combined stresses due to Earthquake + External pressure, Corroded

Elevation above base (in.)	Type	Minimum thickness corroded (in.)	Circ joint eff.	Required thickness (in.)	Overhead weight (lbs)	Bending moment (lb-ft)
36.00	cyl	0.1790	0.65	0.0274	4666.4	133448.7
0.00	skirt	0.3750	0.55	0.0336	93007.3	196215.9

Table Continues

Maximum tensile stress (psi)	Allowable tensile stress (psi)	Maximum compress stress E=1 (psi)	Allowable compressive stress (psi)	Rated Vacuum (psi)
944.8	18300.0*1.2	963.1	5235.1*1.2	0.6
-191.8c	13800.0*1.2	1202.1	11160.4*1.2	

Seismic Calculations

Combined stresses due to Earthquake + Internal pressure, Operating & Co

Elevation above base (in.)	Type	Minimum thickness corroded (in.)	Circ joint eff.	Required thickness (in.)	Overhead weight (lbs)	Bending moment (lb-ft)
36.00	cyl	0.1790	0.65	0.0349	4666.4	133448.7
0.00	skirt	0.3750	0.55	0.0336	93007.3	196215.9

Table Continues

Maximum tensile stress (psi)	Allowable tensile stress (psi)	Maximum compress stress E=1 (psi)	Allowable compressive stress (psi)	Rated Pressure (psi)
4287.4	18300.0*1.2	857.7	5235.1*1.2	12.3
-191.8c	13800.0*1.2	1202.1	11160.4*1.2	

Seismic Calculations

Seismic deflection report, operating & corroded

Elevation start above base (in.)	Elastic Modulus psi x10^6	Inertia (I, ft^4)	Seismic & other shear (lbs)	Bending (platform & other) (lb-ft)	Deflection section top (in.)
36.00	27.8	5.884	20530.5	0.0	0.0045
0.00	29.0	12.503	21314.2	0.0	0.0001

WESTATES CARBON - ARIZONA, INC.
PARKER, ARIZONA
CALCULATIONS FOR TANK T-8

Pressure Summary

Pressure summary for pressure chamber 1

Identifier	P design (psi)	T design (deg F)	MAWP (psi)	MAP (psi)	Pe external (psi)	UG-99 Ratio
T-8 TOP HEAD	0.5	150.0	45.7	46.9	17.0	1.027
T-8 SHELL	0.5	150.0	73.4	75.6	4.6	1.027
T-8 CONICAL BOTTOM	0.5	150.0	0.5	0.5	18.2	1.027
CYL SHELL & CONE BT	0.5	150.0	1671.8	1717.6	1125.8	1.027

Vessel MAWP hot & corroded is 0.5 psi @ 150 degrees F.

Vessel MAP new & cold is 0.5 psi @ 60 degrees F.

Vessel allowable external pressure is 4.67 psi @ 150 degrees F.

Hydrotest pressure calculation based on P

= 1.5*P*1.027 = 0.8 psi

Vessel hydrotest pressure is 0.8 psi.

Note: vessel MAWP rating not valid unless hydrotest pressure based on MAWP.

Note: vessel MAP rating not valid unless hydrotest pressure based on MAP.

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
24292
BHARAT V.
MAKADIA
Date Signed 2/24/94
ARIZONA, U.S.A.

Bharat V. Makadia

REV'D ON
2/24/94

WESTATES CARBON - ARIZONA, INC.
PARKER, ARIZONA
CALCULATIONS FOR TANK T-8

Weight Summary

Component	Weight (lbs) Contributed by Vessel Elements											
	Metal New	Metal Corr	Trays	Packed Beds	Insul	Lining	Piping	Ladder & plat	Rings & Misc	Oper Liquid	Test Liquid	Nozzle & flg
T-8 top head	208	208	0	0	0	0	0	0	0	0	784	0
T-8 shell	1198	1198	0	0	0	0	0	0	0	11127	12250	0
T-8 conical bot	192	192	0	0	0	0	0	0	0	826	827	0
Cyl shell & con	2	2	0	0	0	0	0	0	0	1	1	0
	1600	1600	0	0	0	0	0	0	0	11954	13862	0

Vessel operating weight, corroded: 13,554 lbs
Vessel empty weight, corroded: 1,600 lbs
Vessel test weight, new: 15,462 lbs

Vessel center of gravity location (from right weld seam)

Vessel lift weight, new: 1,600 lbs
Center of gravity to seam: 90.7 in

T-8 TOP HEAD

ASME Section VIII Division 1, 1992 Edition, A92 Addenda

Component: F&D head
Material specification: SA 240 304 HIGH

Internal design pressure: P = .5 psi @ 150 deg F
External design pressure: Pe= .5 psi @ 150 deg F

Corrosion allowance: Inner C = 0 Outer= 0 in

PWHT is not performed

Radiography: Category A joints - None UW-11(c) type 1
Head to shell seam - None UW-11(c) type 2

Estimated weight: new = 208.2 corr = 208.2 lb
capacity: new = 94.06 corr = 94.06 US ga

ID = 60 crown L = 60 knuckle r = 3.75 t = .1875 in (min)

Straight flange = 1.5 forming allowance = 0 in

Design thickness: (At 150 deg F) Appendix 1-4(d) Eq 3

M = .25*(3 + (L/r)^.5)
= .25*(3 + (60/3.75)^.5)
= 1.75

t = P*L*M/(2*S*E - 0.2*P) + Corrosion + fa
= 0.5*60*1.75/(2*18300*0.7 - 0.2*0.5) + 0 + 0
= 0.002 in

MAP: (New & at 60 deg F) Appendix 1-4(d) Eq 3

P = 2*S*E*t/(L*M + 0.2*t) - Ps
= 2*18800*0.7*0.1875/(60*1.75 + 0.2*0.1875) - 0
= 46.98322 psi

MAWP: (Corroded & at 150 deg F) Appendix 1-4(d) Eq 3

P = 2*S*E*t/(L*M + 0.2*t) - Ps
= 2*18300*0.7*0.1875/(60*1.75 + 0.2*0.1875) - 0
= 45.73367 psi

External Pressure: (Corroded & at 150 deg F) UG-33(e)

A = .125/(Ro/t)
= .125/(60.1875/0.03244)
= 0.000067

From table HA-1: B = 927.7

Pa= B/(Ro/t)
= 927.7/(60.1875/0.03244)
= .5 psi

Check the external pressure per UG-33(a)(1)

t = 1.67*Pa*Lo*M/(2*S*E + 1.67*Pa*(M-0.2))
= 1.67*0.5*60.1875*1.75/(2*18300*1 + 1.67*0.5*(1.75-0.2))
= 0.002403 in

Design thickness for external pressure Pa = 0.5 psi:

T-8 TOP HEAD

= t + Corrosion + fa
= 0.03244 + 0 + 0
= 0.03244 in

Maximum Allowable External Pressure: (Corroded @ 150 deg F)

A = .125/(Ro/t)
= .125/(60.1875/0.1875)
= 0.000389

From table HA-1: B = 5464.7

Pa= B/(Ro/t)
= 5464.7/(60.1875/0.1875)
= 17.024 psi

Check the Maximum External Pressure: UG-33(a)(1) & App. 1-4(d)

Pe= 2*S*E*t/((M*Lo - t*(M-0.2))*1.67)
= 2*18300*1*0.1875/((1.75*60.1875 - 0.1875*(1.75-0.2))*1.67)
= 39.12204 psi

The maximum allowable external pressure is 17.024 psi.

T-8 SHELL

ASME Section VIII Division 1, 1992 Edition, A92 Addenda

Component: Cylinder
Material specification: SA 240 304 HIGH

Internal design pressure: P = .5 psi @ 150 deg F
External design pressure: Pe= .5 psi @ 150 deg F

Static liquid head: Ps= 3.935 psi (S.G.= 1, Hs= 109 in)

Corrosion allowance: Inner C = 0 Outer= 0 in

PWHT is not performed

Radiography: Category A joints - None UW-11(c) type 1
Category B joints - None UW-11(c) type 1

Estimated weight: new = 1197.5 corr = 1197.5 lb
capacity: new = 1468.795 corr = 1468.795 US ga

Operating liquid: 1334.16 US ga, weight: 11127.3 lb

ID = 60 length Lc= 120 t = 0.182 in (new)

Design thickness: UG-27(c)(1) Circ. stress

t = P*R/(S*E - 0.6*P) + Corrosion
= 4.435*30/(18300*0.7 - 0.6*4.435) + 0
= 0.0104 in

MAP: (New & at 60 deg F) UG-27(c)(1)

P = S*E*t/(R + 0.6*t) - Ps
= 18800*0.7*0.182/(30 + 0.6*0.182) - 3.935
= 75.61278 psi

MAWP: (Corroded & at 150 deg F) UG-27(c)(1)

P = S*E*t/(R + 0.6*t) - Ps
= 18300*0.7*0.182/(30 + 0.6*0.182) - 3.935
= 73.49715 psi

External Pressure: (Corroded & at 150 deg F) UG-28

L/Do = 154.9169/60.364 =2.5664 Do/t = 60.364/0.07383 = 817.608
From table G: A = 0.000022
From table HA-1: B = 323.2

Pa= 4*B/(3*Do/t)
= 4*323.2/(3*60.364/0.07383)
= .5271 psi

Design thickness for external pressure Pa = 0.5271 psi:

= t + Corrosion
= 0.07383 + 0
= 0.07383 in

Maximum Allowable External Pressure: (Corroded @ 150 deg F)

L/Do = 154.9169/60.364 =2.5664 Do/t = 60.364/0.182 = 331.6703
From table G: A = 0.000085
From table HA-1: B = 1160.8

WESTATES CARBON - ARIZONA, INC.
PARKER, ARIZONA
CALCULATIONS FOR TANK T-8

T-8 SHELL

Pa= 4*B/(3*Do/t)
= 4*1160.8/(3*60.364/0.182)
= 4.6665 psi

T-8 CONICAL BOTTOM

ASME Section VIII Division 1, 1992 Edition, A92 Addenda

Component: Transition
Material specification: SA 240 304 HIGH

Internal design pressure: P = .5 psi @ 150 deg F
External design pressure: Pe= .5 psi @ 150 deg F

Static liquid head: Ps= 3.935 psi (S.G.= 1, Hs= 109 in)

Corrosion allowance: Inner C = 0 Outer= 0 in

PWHT is not performed

Radiography: Category A joints - None UW-11(c) type 1
Category B joints - None UW-11(c) type 1

Estimated weight: new = 192.1 corr = 192.1 lb
capacity: new = 99.1 corr = 99.1 US ga

Operating liquid: 99.08 US ga, weight: 826.4 lb

Axial Lc= 24 big end OD = 60 small end OD = 2.375 in
Cone tc = 0.182 in (min)

Design thickness: (At 150 deg F) Appendix 1-4(e)

t = P*Do/(2*cos(alpha)*(S*E + 0.4*P)) + Corrosion
= 4.435*60/(2*cos(50.2066)*(18300*0.7 + 0.4*4.435)) + 0
= 0.0162 in

MAP: (New & at 60 deg F) Appendix 1-4(e)

P = 2*S*E*t*cos(alpha)/(Do - 0.8*t*cos(alpha)) - Ps
= 2*18800*0.7*0.182*cos(50.2066)/(60 - 0.8*0.182*cos(50.2066)) - 3.935
= 47.24201 psi

MAWP: (Corroded & at 150 deg F) Appendix 1-4(e)

P = 2*S*E*t*cos(alpha)/(Do - 0.8*t*cos(alpha)) - Ps
= 2*18300*0.7*0.182*cos(50.2066)/(60 - 0.8*0.182*cos(50.2066)) - 3.935
= 45.88092 psi

Le= (L/2)*(1 + Ds/DL)
= (24/2)*(1 + 2.375/60)
= 12.475 in

External Pressure: (Corroded & at 150 deg F) UG-33(f)

te = t*cos(alpha) = 7.545841E-03
Le/DL = 12.475/60 = .2079 DL/te = 60/7.545841E-03 = 7951.399

From table G: A = 0.000212
From table HA-1: B = 2984.1

Pa= 4*B/(3*DL/te)
= 4*2984.1/(3*60/7.545841E-03)
= .5004 psi

Design thickness for external pressure Pa = 0.5004 psi:

= t + Corrosion
= 0.01179 + 0

T-8 CONICAL BOTTOM

= 0.01179 in

Maximum Allowable External Pressure: (Corroded @ 150 deg F)

te = t*cos(alpha) = .1164837
Le/DL = 12.475/60 = .2079 DL/te = 60/0.1164837 = 515.0934

From table G: A = 0.000596
From table HA-1: B = 7043.5

Pa= 4*B/(3*DL/te)
= 4*7043.5/(3*60/0.1164837)
= 18.2323 psi

Juncture discontinuity stresses (Bednar), vessel MAP condition:

Cylinder large end:

Static head of liquid: Ph= 3.935 psi
Juncture calculated at: P = 4.43 psi

Equivalent pressure for longitudinal stress, Pe:

l(+) = 48*M/(pi*D^2) - W/(pi*D)
= 48*0/(pi*60.182^2) - 0/(pi*60.182)
l(+) = 0

l(-) = - 48*M/(pi*D^2) - W/(pi*D)
= - 48*0/(pi*60.182^2) - 0/(pi*60.182)
l(-) = 0

Pe(+) = P + 4*l(+)/D = 4.43 + 4*0/60.182
= 4.43

Pe(-) = P + 4*l(-)/D = 4.43 + 4*0/60.182
= 4.43

fL= (Pe*R/t)*(0.5 - X*Sqr(R/t))
= (4.43*30.091/0.182)*(0.5 - 0.623*Sqr(30.091/0.182))
=-5501.101 psi [longitudinal stress, outside surface]

fL= (Pe*R/t)*(0.5 + X*Sqr(R/t))
= (4.43*30.091/0.182)*(0.5 + 0.623*Sqr(30.091/0.182))
= 6233.536 psi [longitudinal stress, inside surface]

ft= (P*R/t)*(1 - (Pe/P)*Y*Sqr(R/t))
= (4.43*30.091/0.182)*(1 - (4.43/4.43)*0.343*Sqr(30.091/0.182))
=-2497.886 psi [membrane hoop stress]

Cone large end:

fL= (Pe*R/t)*(0.5/(n*cos(alpha)) - U*Sqr(R/t))
= (4.43*30.091/0.182)*(0.5/(1*cos(50.2066)) - 0.623*Sqr(30.091/0.182))
=-5295.122 psi [longitudinal stress, outside surface]

fL= (Pe*R/t)*(0.5/(n*cos(alpha)) + U*Sqr(R/t))
= (4.43*30.091/0.182)*(0.5/(1*cos(50.2066)) + 0.623*Sqr(30.091/0.182))
= 6439.515 psi [longitudinal stress, inside surface]

ft= (P*R/t)*(1/(n*cos(alpha)) - (Pe/P)*Y*Sqr(R/t))
= (4.43*30.091/0.182)*(1/(1*cos(50.2066)) -
(4.43/4.43)*0.343*Sqr(30.091/0.182))

T-8 CONICAL BOTTOM

=-2085.928 psi [membrane hoop stress]

Cylinder small end:

Static head of liquid: Ph= 4.801 psi
Juncture calculated at: P = 5.3 psi

Equivalent pressure for longitudinal stress, Pe:

l(+) = 48*M/(pi*D^2) - W/(pi*D)
= 48*0/(pi*2.154^2) - 0/(pi*2.154)
l(+) = 0

l(-) = - 48*M/(pi*D^2) - W/(pi*D)
= - 48*0/(pi*2.154^2) - 0/(pi*2.154)
l(-) = 0

Pe(+) = P + 4*l(+)/D = 5.3 + 4*0/2.154
= 5.3

Pe(-) = P + 4*l(-)/D = 5.3 + 4*0/2.154
= 5.3

fL= (Pe*Rs/ts)*(0.5 + X*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(0.5 + 0.643*Sqr(1.077/0.154))
= 81.56019 psi [longitudinal stress, outside surface]

fL= (Pe*Rs/ts)*(0.5 - X*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(0.5 - 0.643*Sqr(1.077/0.154))
=-44.4946 psi [longitudinal stress, inside surface]

ft= (P*Rs/ts)*(1 + (Pe/P)*Y*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(1 + (5.3/5.3)*0.3*Sqr(1.077/0.154))
= 66.47183 psi [membrane hoop stress]

Cone small end:

fL= (Pe*Rs/ts)*(0.5/(n*cos(alpha)) + U*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(0.5/(1.182*cos(50.2066)) + 0.46*Sqr(1.077/0.154))
= 69.58752 psi [longitudinal stress, outside surface]

fL= (Pe*Rs/ts)*(0.5/(n*cos(alpha)) - U*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(0.5/(1.182*cos(50.2066)) - 0.46*Sqr(1.077/0.154))
=-20.59164 psi [longitudinal stress, inside surface]

ft= (P*Rs/ts)*(1/(n*cos(alpha)) + (Pe/P)*Y*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(1/(1.182*cos(50.2066)) +
(5.3/5.3)*0.3*Sqr(1.077/0.154))
= 78.40212 psi [membrane hoop stress]

Juncture discontinuity stresses (Bednar), vessel MAWP condition:

Cylinder large end:

Static head of liquid: Ph= 3.935 psi
Juncture calculated at: P = 4.43 psi

Equivalent pressure for longitudinal stress, Pe:

T-8 CONICAL BOTTOM

l(+) = 48*M/(pi*D^2) - W/(pi*D)
= 48*0/(pi*60.182^2) - 0/(pi*60.182)
l(+) = 0

l(-) = - 48*M/(pi*D^2) - W/(pi*D)
= - 48*0/(pi*60.182^2) - 0/(pi*60.182)
l(-) = 0

Pe(+) = P + 4*l(+)/D = 4.43 + 4*0/60.182
= 4.43

Pe(-) = P + 4*l(-)/D = 4.43 + 4*0/60.182
= 4.43

fL= (Pe*R/t)*(0.5 - X*Sqr(R/t))
= (4.43*30.091/0.182)*(0.5 - 0.623*Sqr(30.091/0.182))
=-5501.101 psi [longitudinal stress, outside surface]

fL= (Pe*R/t)*(0.5 + X*Sqr(R/t))
= (4.43*30.091/0.182)*(0.5 + 0.623*Sqr(30.091/0.182))
= 6233.536 psi [longitudinal stress, inside surface]

ft= (P*R/t)*(1 - (Pe/P)*Y*Sqr(R/t))
= (4.43*30.091/0.182)*(1 - (4.43/4.43)*0.343*Sqr(30.091/0.182))
=-2497.886 psi [membrane hoop stress]

Cone large end:

fL= (Pe*R/t)*(0.5/(n*cos(alpha)) - U*Sqr(R/t))
= (4.43*30.091/0.182)*(0.5/(1*cos(50.2066)) - 0.623*Sqr(30.091/0.182))
=-5295.122 psi [longitudinal stress, outside surface]

fL= (Pe*R/t)*(0.5/(n*cos(alpha)) + U*Sqr(R/t))
= (4.43*30.091/0.182)*(0.5/(1*cos(50.2066)) + 0.623*Sqr(30.091/0.182))
= 6439.515 psi [longitudinal stress, inside surface]

ft= (P*R/t)*(1/(n*cos(alpha)) - (Pe/P)*Y*Sqr(R/t))
= (4.43*30.091/0.182)*(1/(1*cos(50.2066)) -
(4.43/4.43)*0.343*Sqr(30.091/0.182))
=-2085.928 psi [membrane hoop stress]

Cylinder small end:

Static head of liquid: Ph= 4.801 psi
Juncture calculated at: P = 5.3 psi

Equivalent pressure for longitudinal stress, Pe:

l(+) = 48*M/(pi*D^2) - W/(pi*D)
= 48*0/(pi*2.154^2) - 0/(pi*2.154)
l(+) = 0

l(-) = - 48*M/(pi*D^2) - W/(pi*D)
= - 48*0/(pi*2.154^2) - 0/(pi*2.154)
l(-) = 0

Pe(+) = P + 4*l(+)/D = 5.3 + 4*0/2.154
= 5.3

Pe(-) = P + 4*l(-)/D = 5.3 + 4*0/2.154
= 5.3

T-8 CONICAL BOTTOM

fL= (Pe*Rs/ts)*(0.5 + X*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(0.5 + 0.643*Sqr(1.077/0.154))
= 81.56019 psi [longitudinal stress, outside surface]

fL= (Pe*Rs/ts)*(0.5 - X*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(0.5 - 0.643*Sqr(1.077/0.154))
=-44.4946 psi [longitudinal stress, inside surface]

ft= (P*Rs/ts)*(1 + (Pe/P)*Y*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(1 + (5.3/5.3)*0.3*Sqr(1.077/0.154))
= 66.47183 psi [membrane hoop stress]

Cone small end:

fL= (Pe*Rs/ts)*(0.5/(n*cos(alpha)) + U*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(0.5/(1.182*cos(50.2066)) + 0.46*Sqr(1.077/0.154))
= 69.58752 psi [longitudinal stress, outside surface]

fL= (Pe*Rs/ts)*(0.5/(n*cos(alpha)) - U*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(0.5/(1.182*cos(50.2066)) - 0.46*Sqr(1.077/0.154))
=-20.59164 psi [longitudinal stress, inside surface]

ft= (P*Rs/ts)*(1/(n*cos(alpha)) + (Pe/P)*Y*Sqr(Rs/ts))
= (5.3*1.077/0.154)*(1/(1.182*cos(50.2066)) +
(5.3/5.3)*0.3*Sqr(1.077/0.154))
= 78.40212 psi [membrane hoop stress]

T-8 LIQ. LOAD

Liquid level from datum:	139 in
Liquid specific gravity:	1

Liquid acts vertically

CYL SHELL & CONE BTM

ASME Section VIII Division 1, 1992 Edition, A92 Addenda

Component: Cylinder
Material specification: SA 240 304 HIGH

Internal design pressure: P = .5 psi @ 150 deg F
External design pressure: Pe= .5 psi @ 150 deg F

Static liquid head: Ps= 5.017 psi (S.G.= 1, Hs= 139 in)

Corrosion allowance: Inner C = 0 Outer= 0 in

PWHT is not performed

Radiography: Category A joints - None UW-11(c) type 2
Category B joints - None UW-11(c) type 2

Estimated weight: new = 1.8 corr = 1.8 lb
capacity: new = .082 corr = .082 US ga

Operating liquid: 0.08 US ga, weight: 0.7 lb

ID = 2 length Lc= 6 t = 0.154 in (new)

Design thickness: UG-27(c)(1) Circ. stress

t = P*R/(S*E - 0.6*P) + Corrosion
= 5.517*1/(18300*0.65 - 0.6*5.517) + 0
= 0.0005 in

MAP: (New & at 60 deg F) UG-27(c)(1)

P = S*E*t/(R + 0.6*t) - Ps
= 18800*0.65*0.154/(1 + 0.6*0.154) - 5.017
= 1717.685 psi

MAWP: (Corroded & at 150 deg F) UG-27(c)(1)

P = S*E*t/(R + 0.6*t) - Ps
= 18300*0.65*0.154/(1 + 0.6*0.154) - 5.017
= 1671.869 psi

External Pressure: (Corroded & at 150 deg F) UG-28

L/Do = 154.9169/2.308 =67.1217 Do/t = 2.308/0.00629 = 366.9316
From table G: A = 0.00001
From table HA-1: B = 138

Pa= 4*B/(3*Do/t)
= 4*138/(3*2.308/0.00629)
= .5015 psi

Design thickness for external pressure Pa = 0.5015 psi:

= t + Corrosion
= 0.00629 + 0
= 0.00629 in

Maximum Allowable External Pressure: (Corroded @ 150 deg F)

L/Do = 154.9169/2.308 =67.1217 Do/t = 2.308/0.154 = 14.987
From table G: A = 0.004916
From table HA-1: B = 12654.3

WESTATES CARBON - ARIZONA, INC.
PARKER, ARIZONA
CALCULATIONS FOR TANK T-8

CYL SHELL & CONE BTM

Pa= 4*B/(3*Do/t)
= 4*12654.3/(3*2.308/0.154)
= 1125.801 psi

Nozzle Summary

Nozzle mark	OD (in)	tn (in)	Req tn (in)	A1?	A2?	Nom t (in)	Req t (in)	User t (in)	Corr (in)	Aa/Ar (%)

tn - nozzle thickness
Req tn - nozzle thickness required per UG-45/16
Nom t - vessel wall thickness
Req t - required vessel wall thickness due to pressure + corrosion
User t - local vessel wall thickness (near opening)
Aa - area available per UG-37, governing condition
Ar - area required per UG-37, governing condition
Corr - corrosion allowance on nozzle id.

Nozzle Schedule

Nozzle mark	Service	Size	Materials					
			Nozzle	Impact?	Norm?	Pad	Impact?	Norm?	Flange

Thickness Summary

Component Identifier	ID (in)	Nom t (in)	Req t (in)	Joint E	Load	Governing Status	Stress	Deflect (in)
T-8 top head	60.00	0.1875	0.0324	0.7	external			
T-8 shell	60.00	0.1820	0.0738	0.7	external			
T-8 conical bottom	59.63	0.1820	0.0162	0.7	internal			
Cyl shell & cone bt	2.00	0.1540	0.0062	0.65	external			

Nom t - vessel wall thickness
Req t - required vessel wall thickness due to governing loading
E - longitudinal seam joint efficiency

Load:
internal - circ stress due to internal pressure governs
external - external pressure governs
wind - combined long stress due to STATUS + wind governs
seismic - combined long stress due to STATUS + seismic governs

APPENDIX IX

TAB 2

Assessment of Tank System T-18

Revision 0
February 2007

NEW TANK SYSTEM ENGINEERING ASSESMENT
FOR
FURNACE FEED TANK T-18

LOCATED AT

SIEMENS WATER TECHNOLOGIES CORP.
25323 MUTAHAR ST.
PARKER, ARIZONA 85344

CBE CHAVOND-BARRY ENGINEERING CORP.

400 County Route 518 • P.O. Box 205
Blawenburg, New Jersey 08504-0205

Tel:(609)466-4900
Fax: (609)466-1231

New Tank System Engineering Assessment

I have reviewed design information relating to the new above ground tank system shown as Furnace Feed Tank T-18 on the plans attached as Exhibit A, which is to be installed at the Siemens facility in Parker, Arizona, and my assessment allows me to draw the following conclusions in accordance with 40 CFR 264.192(a):

1. The tank system has sufficient structural integrity and is acceptable for the storing and treating of hazardous waste.

2. The tank system foundation, structural support, seams, connections and pressure controls (where applicable) are adequately designed.

3. The tank system has sufficient structural strength, compatibility with the wastes to be stored or treated, and corrosion protection, to ensure that it will not collapse, rupture or fail.

My assessment has been based, in part, on my review of the following information, which is attached as noted:

A. Design standards for tank system construction (Exhibit B).

B. Hazardous characteristics of the wastes to be handled in the tank system (Exhibit C).

C. Information that there will be no external metal component of the tank system that will be in contact with the soil or with water (Exhibit D).

D. Design considerations to ensure that (i) tank foundations will maintain the load of a full tank, (ii) anchoring will prevent flotation or dislodgment where the tank system is placed in a saturated zone or in a seismic fault zone subject to the standards of 40 CFR 264.18(a), and (iii) the tank system will withstand the effects of frost heave.

In accordance with 40 CFR 264.192(a) and 40 CFR 270.11(d), I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or

persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Louis T. Barry, P.E.

February 27, 2007



Attachments:

Exhibit A - Plans
Exhibit B - Design Standards
Exhibit C - Hazardous Waste Characteristics
Exhibit D - Information on Metal Components

SIEMENS WATER TECHNOLOGIES CORP.
PARKER, ARIZONA

NEW TANK SYSTEM ENGINEERING ASSESMENT FOR FURNACE FEED TANK T-18

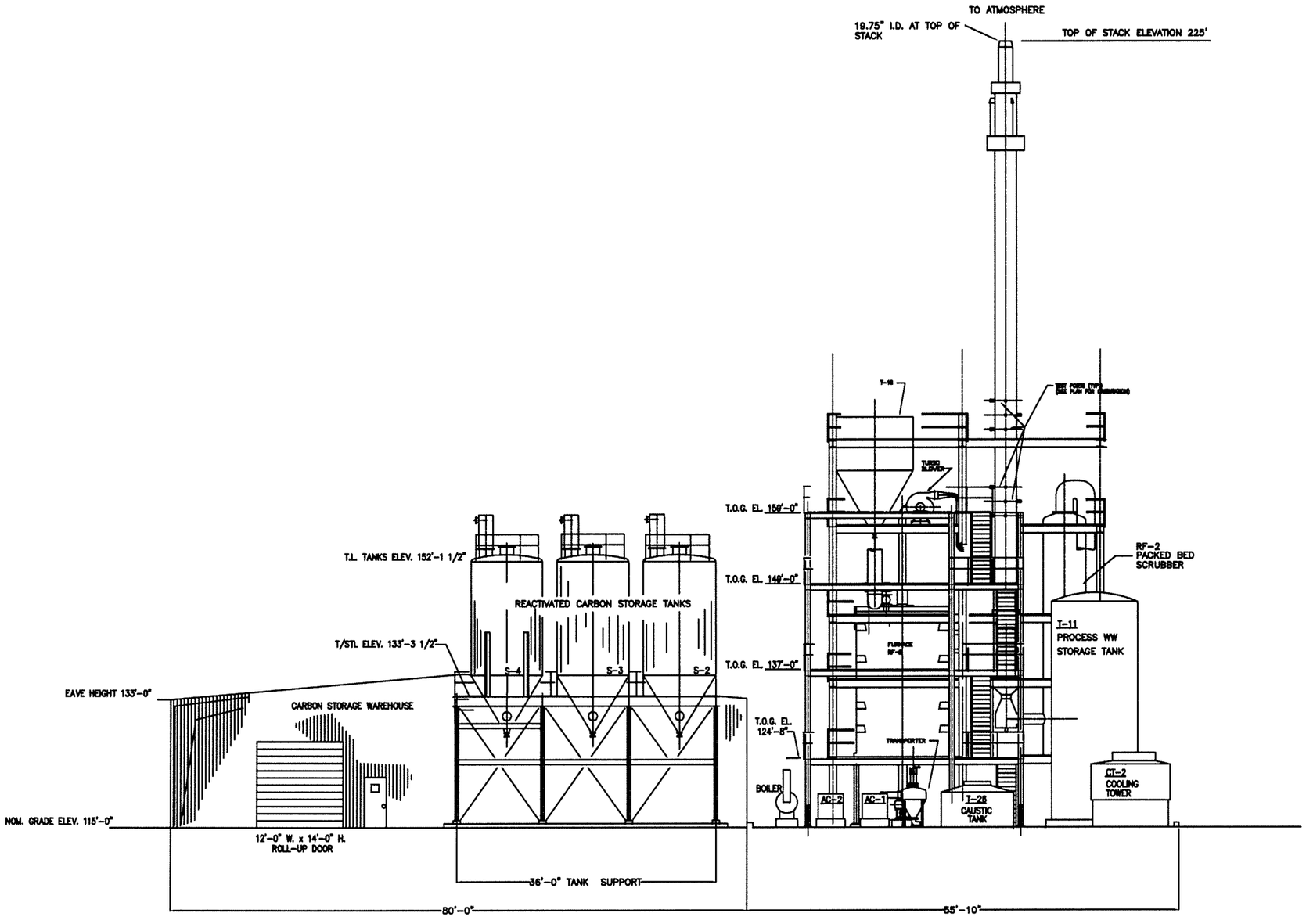
Attachments

1. Exhibit A - Plans
    - A. T-18 Plan and Elevation Drawings
    - B. T-18 Fabrication Drawings
    - C. T-18 Support Steel Drawings
2. Exhibit B - Design Standards
    - A. Structural Calculations for T-18
    - B. Structural Calculations for T-18 Support Steel
3. Exhibit C - Hazardous Waste Characteristics
    - A. Table 1 - EPA Listed Hazardous Wastes
    - B. Table 2 – Spent Activated Carbon Organic Constituents
    - C. Table 3 - Spent Activated Carbon Characterization
4. Exhibit D – Information on Metal Components

Exhibit A - Plans

T-18 Plan and Elevation Drawings

DWG: D14789-04



OVERALL SITE VIEW LOOKING NORTHWEST

NOTES:

1. THIS DRAWING INCLUDES COMPONENTS OF THE FACILITY THAT ARE EXEMPT FROM PERMITTING UNDER VARIOUS PROVISIONS OF RCRA. DATA RELATED TO THESE COMPONENTS IS PROVIDED FOR INFORMATIONAL PURPOSES AND EASE OF REVIEW ONLY, AND THEY ARE NOT INTENDED TO BECOME REGULATED COMPONENTS OF THE HAZARDOUS WASTE FACILITY.
2. FOR ACTUAL ELEVATIONS ADD 327 FEET TO THE ELEVATIONS SHOWN.

REV.	DATE	REVISION DESCRIPTION	DRAWN	CHK'D	ENG'R
2	1/18/07	UPDATED FOR PERMIT SUBMITTAL	JBE	KEM	
1	7/16/02	REVISED FOR RCRA PART B PERMIT APPLICATION	STA	KEM	

CUSTOMER: SIEMENS WATER TECHNOLOGIES CORP

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

SIEMENS WATER TEHNOLOGIES CORP.
Parker, AZ

TITLE:
REACTIVATION FACILITY
OVERALL ARRANGEMENTS

PLOT SCALE: NONE

DO NOT SCALE DRAWING

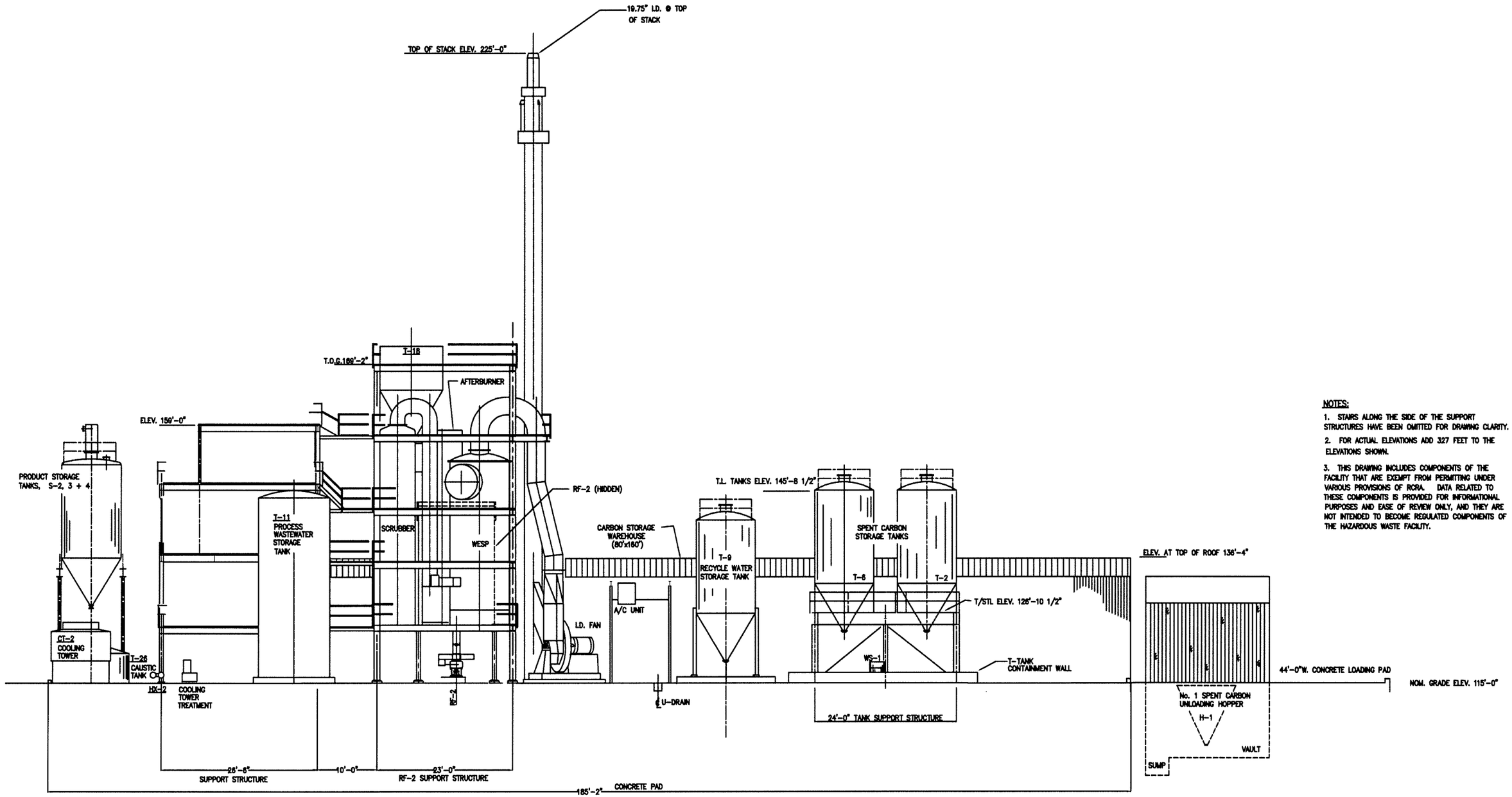
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PROJECT No.	11135	
DRAWN:	CPG	4/21/94
CHK'D:		
ENG'R:		

PART No. | DWG No. D14789-04 | REV. 2

PRINT DATE: 2/15/07

DWG: D14789-03



OVERALL SITE VIEW LOOKING SOUTHWEST

NOTES:

1. STAIRS ALONG THE SIDE OF THE SUPPORT STRUCTURES HAVE BEEN OMITTED FOR DRAWING CLARITY.
2. FOR ACTUAL ELEVATIONS ADD 327 FEET TO THE ELEVATIONS SHOWN.
3. THIS DRAWING INCLUDES COMPONENTS OF THE FACILITY THAT ARE EXEMPT FROM PERMITTING UNDER VARIOUS PROVISIONS OF RCRA. DATA RELATED TO THESE COMPONENTS IS PROVIDED FOR INFORMATIONAL PURPOSES AND EASE OF REVIEW ONLY, AND THEY ARE NOT INTENDED TO BECOME REGULATED COMPONENTS OF THE HAZARDOUS WASTE FACILITY.

REV.	DATE	REVISION DESCRIPTION	DRAWN	CHK'D	ENG'R
2	1/18/07	UPDATED FOR PERMIT SUBMITTAL	JBE	KEM	
1	7/24/02	REVISED FOR RCRA PART B PERMIT APPLICATION	CPG	KEM	

CUSTOMER: SIEMENS WATER TECHNOLOGIES CORP.

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

SIEMENS WATER TECHNOLOGIES CORP.
Parker, AZ

TITLE: REACTIVATION FACILITY SITE VIEW OVERALL ARRANGEMENTS

PLOT SCALE: NONE

DO NOT SCALE DRAWING

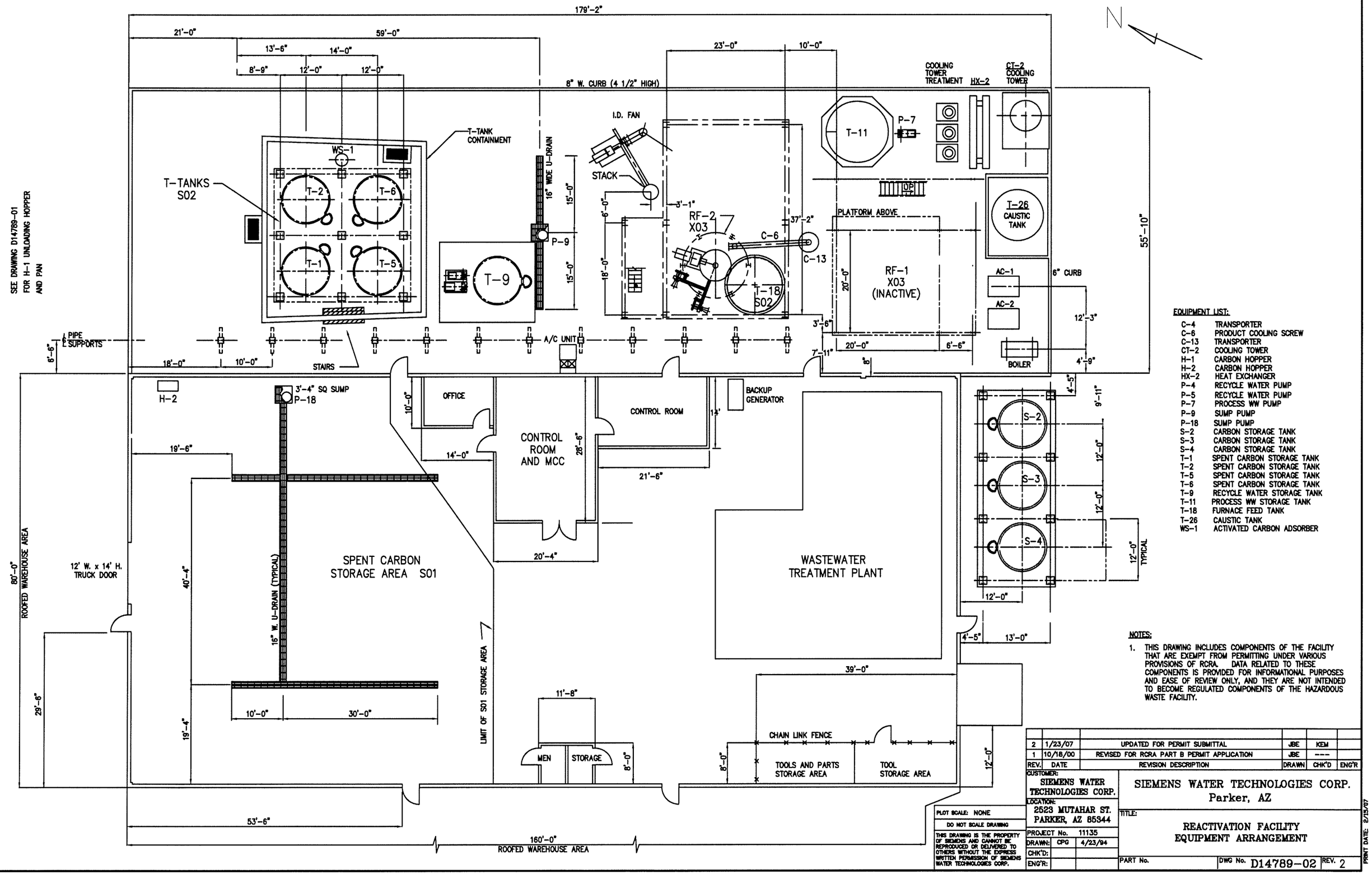
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PROJECT No.		
DRAWN:	CPG	4/21/94
CHK'D:		
ENG'R:		

PART No. | DWG No. D14789-03 | REV. 2

PRINT DATE: 2/15/07

DWG: D14789-02



EQUIPMENT LIST:

C-4	TRANSPORTER
C-6	PRODUCT COOLING SCREW
C-13	TRANSPORTER
CT-2	COOLING TOWER
H-1	CARBON HOPPER
H-2	CARBON HOPPER
HX-2	HEAT EXCHANGER
P-4	RECYCLE WATER PUMP
P-5	RECYCLE WATER PUMP
P-7	PROCESS WW PUMP
P-9	SUMP PUMP
P-18	SUMP PUMP
S-2	CARBON STORAGE TANK
S-3	CARBON STORAGE TANK
S-4	CARBON STORAGE TANK
T-1	SPENT CARBON STORAGE TANK
T-2	SPENT CARBON STORAGE TANK
T-5	SPENT CARBON STORAGE TANK
T-6	SPENT CARBON STORAGE TANK
T-9	RECYCLE WATER STORAGE TANK
T-11	PROCESS WW STORAGE TANK
T-18	FURNACE FEED TANK
T-26	CAUSTIC TANK
WS-1	ACTIVATED CARBON ADSORBER

NOTES:

1. THIS DRAWING INCLUDES COMPONENTS OF THE FACILITY THAT ARE EXEMPT FROM PERMITTING UNDER VARIOUS PROVISIONS OF RCRA. DATA RELATED TO THESE COMPONENTS IS PROVIDED FOR INFORMATIONAL PURPOSES AND EASE OF REVIEW ONLY, AND THEY ARE NOT INTENDED TO BECOME REGULATED COMPONENTS OF THE HAZARDOUS WASTE FACILITY.

REV.	DATE	REVISION DESCRIPTION	DRAWN	CHK'D	ENG'R
2	1/23/07	UPDATED FOR PERMIT SUBMITTAL	JBE	KEM	
1	10/18/00	REVISED FOR RCRA PART B PERMIT APPLICATION	JBE	---	

CUSTOMER: SIEMENS WATER TECHNOLOGIES CORP.

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

PLOT SCALE: NONE

DO NOT SCALE DRAWING

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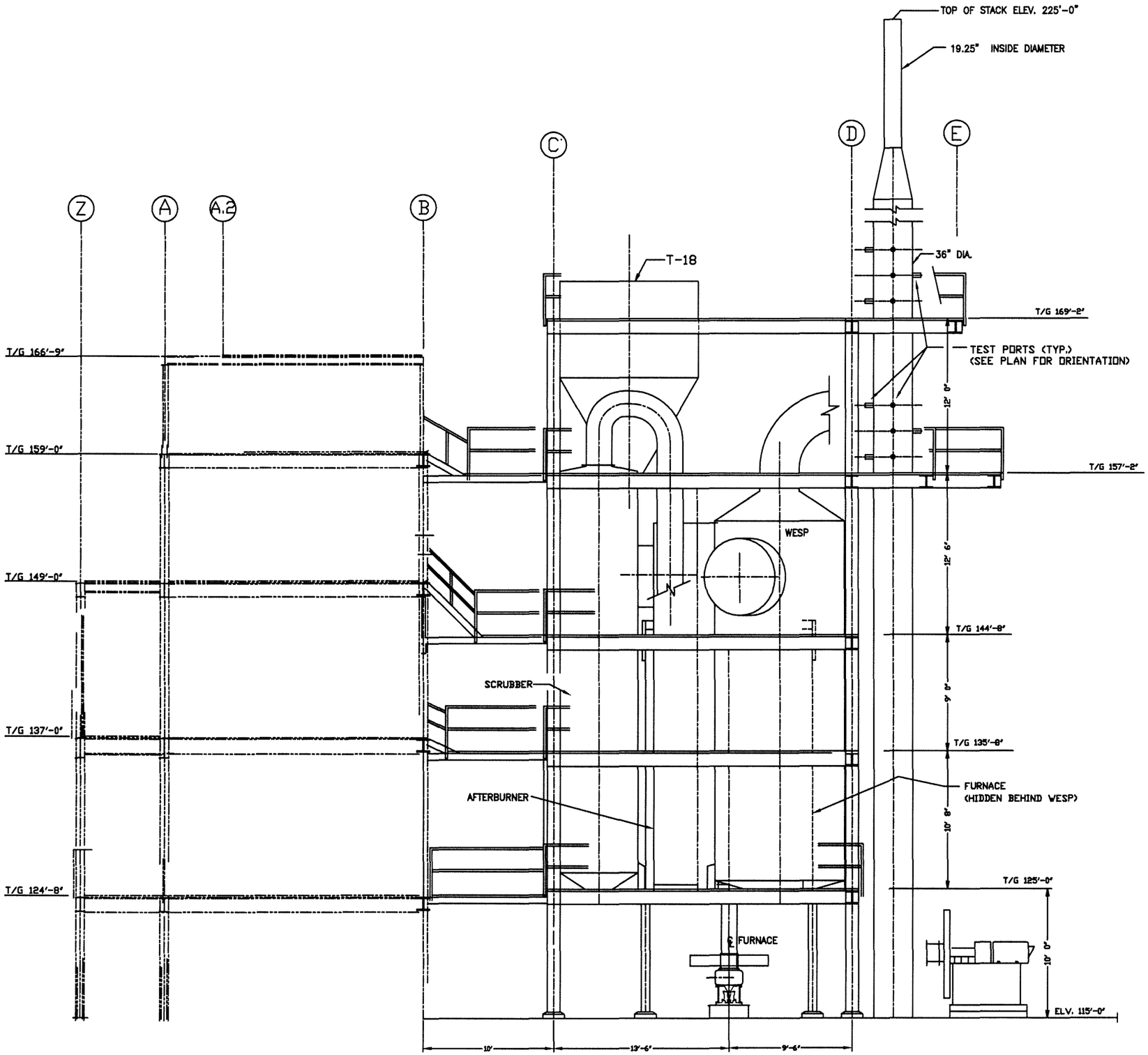
PROJECT No.	11135	
DRAWN:	CPG	4/23/94
CHK'D:		
ENG'R:		

SIEMENS WATER TECHNOLOGIES CORP.
Parker, AZ

TITLE:
REACTIVATION FACILITY
EQUIPMENT ARRANGEMENT

PART No. | DWG No. D14789-02 | REV. 2

PRINT DATE: 2/15/07



NOTES:

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2. STAIRS ALONG THE SIDE OF THE SUPPORT STRUCTURES HAVE BEEN OMITTED FOR DRAWING CLARITY.
3. FOR ACTUAL ELEVATIONS ADD 327 FEET TO THE ELEVATIONS SHOWN.

NO	DWN	CK'D	APP	REVISIONS	DATE

CBE CHAVOND-BARRY ENGINEERING CORP.
400 Route 518 • P.O. Box 205 • Blawenburg, New Jersey 08504

SIEMENS WATER TECHNOLOGIES CORP.
2523 MUTAHAR STREET, PARKER, AZ 85344
CARBON REGENERATION SYSTEM

ELEVATION LOOKING WEST

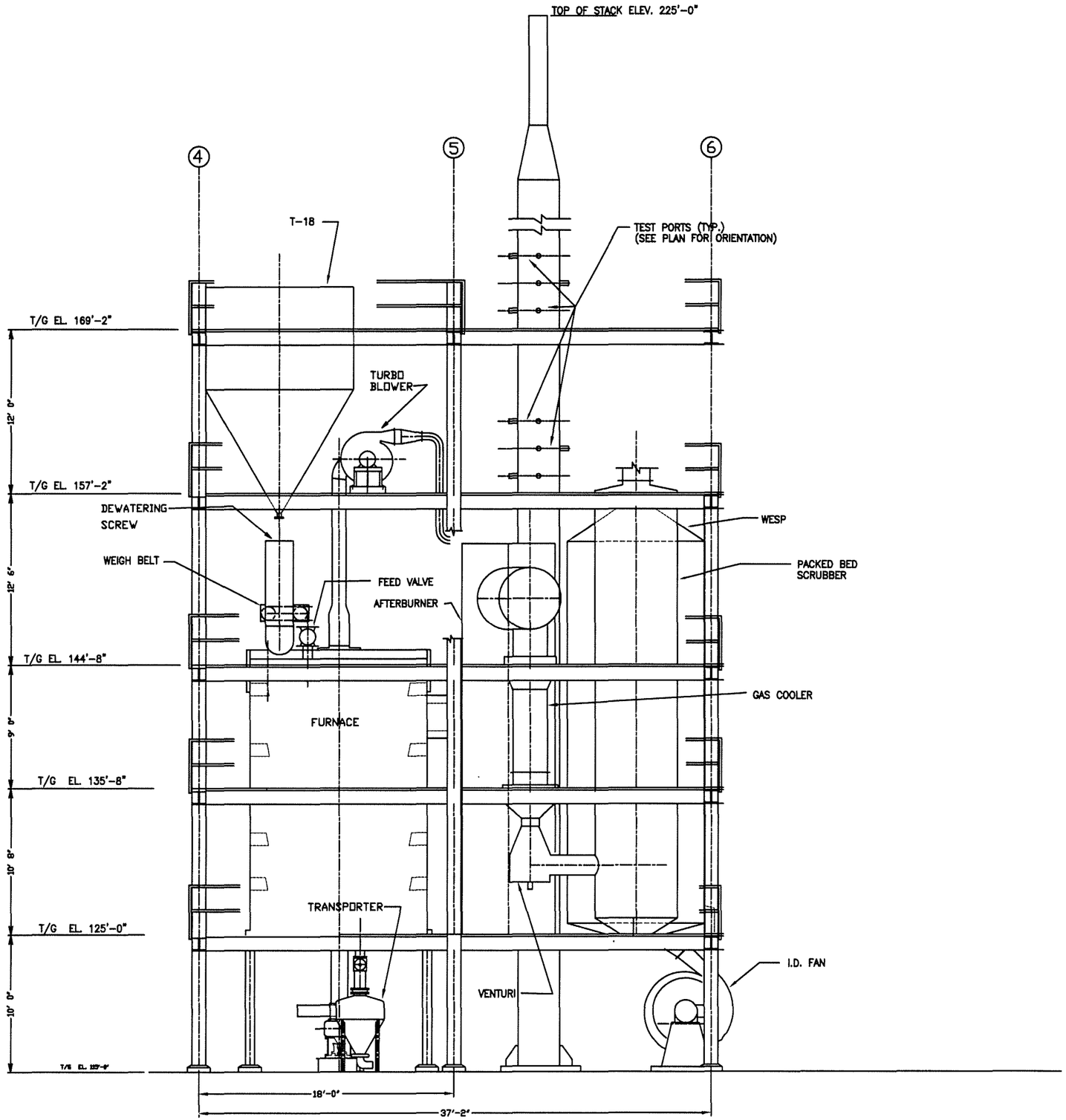
DRAWN	DATE	CHECKED	DATE	APPROVED	DATE
CPG	5/12/94	KEM	5/13/94		

SCALE	DWG. NO.	REV.
1/4"= 1'-0"	1478-P-005	0

4'-0"

PRINT DATE: 2/15/07

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NOTES:

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2. FOR ACTUAL ELEVATIONS ADD 327 FEET TO THE ELEVATIONS SHOWN.

4'-0"

NO	DWN	CK'D	APP	REVISIONS	DATE

CBE CHAVOND-BARRY ENGINEERING CORP.
400 Route 518 • P.O. Box 205 • Blawenburg, New Jersey 08504

SIEMENS WATER TECHNOLOGIES CORP.
2523 MUTAHAR STREET, PARKER, AZ 85344
CARBON REGENERATION SYSTEM

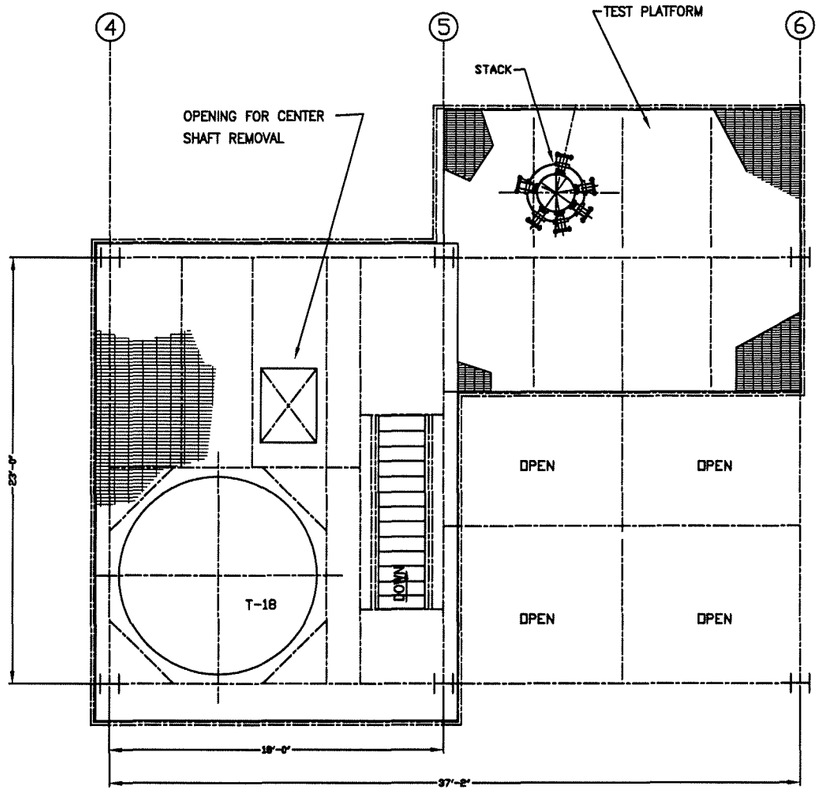
ELEVATION LOOKING NORTH

DRAWN	DATE	CHECKED	DATE	APPROVED	DATE
CPG	5/12/94	KEM	5/13/94		

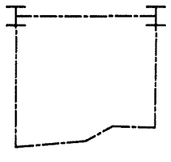
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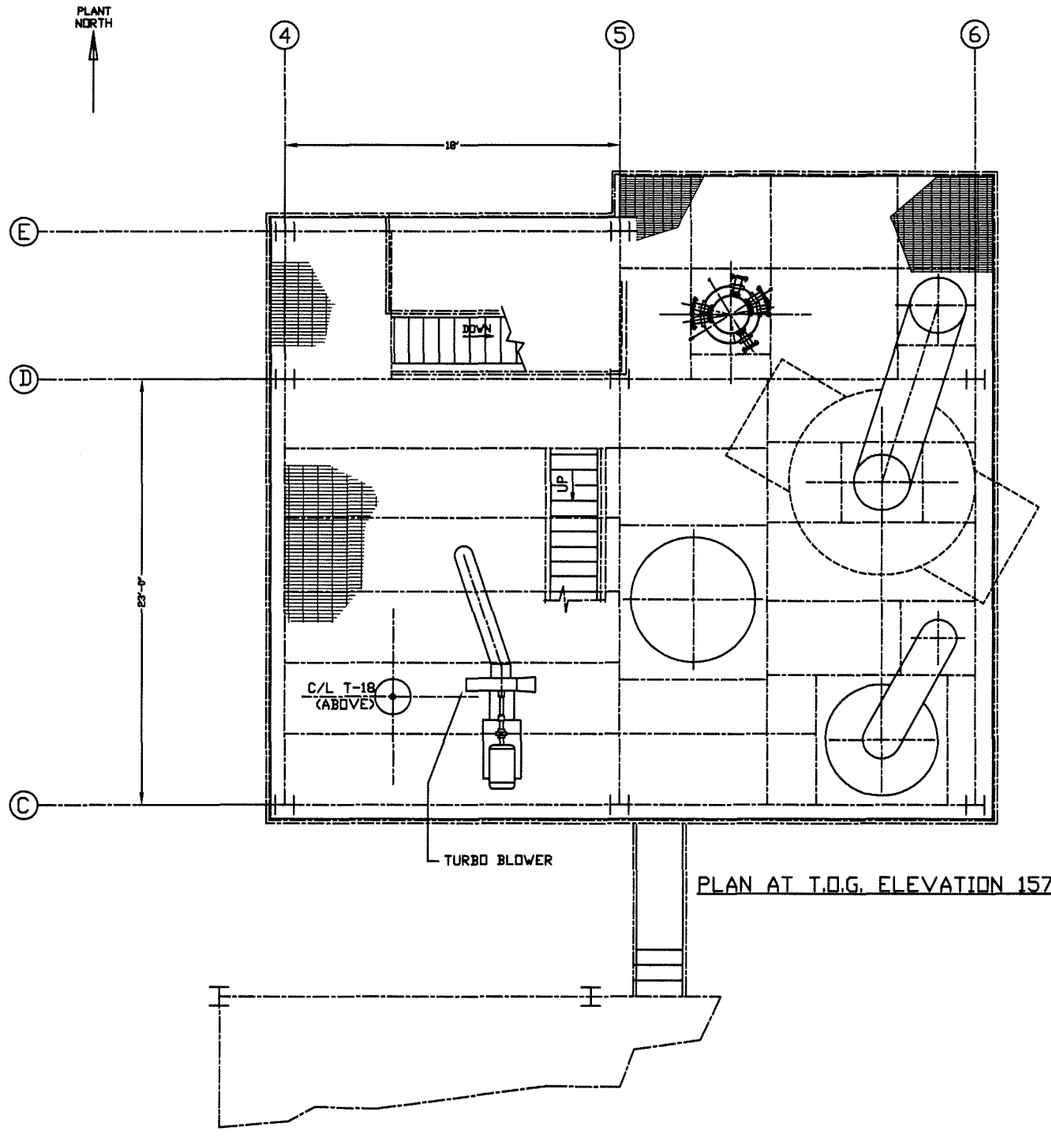
PRINT DATE: 2/15/07

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PLAN AT T.O.G. ELEVATION 169'-2"





PLAN AT T.O.G. ELEVATION 157'-2"

NOTES:

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4'-0"

NO	DWN	CK'D	APP	REVISIONS	DATE

CBE CHAVOND-BARRY ENGINEERING CORP.
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SIEMENS WATER TECHNOLOGIES CORP.
2523 MUTAHAR STREET, PARKER, AZ 85344
CARBON REGENERATION SYSTEM

PLAN VIEWS

DRAWN	CHECKED	APPROVED
CPG 5/12/94 DATE	KEM 5/13/94 DATE	DATE

SCALE	DWG. NO.	REV.
1/4"=1'-0"	1478-P-003	0

PRINT DATE: 2/15/07

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Exhibit A - Plans

T-18 Fabrication Drawings

GENERAL INFORMATION

		VESSEL EXTERIOR	VESSEL INTERIOR
SURFACE FINISH	SANDBLAST	BLAST TO CLEAN	CLEAN ONLY
	PRIMER	–	–
	MILS COAT	–	–
	TOTAL D.F.T.	–	–
	PAINT	–	–
	MILS COAT	–	–
	TOTAL D.F.T.	–	–
	COLOR	–	–

MISCELLANEOUS				
	ESTIMATED EMPTY WEIGHT	12,700 lbs.	APPROX. CAP.	6,400 GAL.
	EST. WT. FULL OF WATER	66,082 lbs.		
	INSULATION	NONE		
	REFERENCE DRAWINGS	–		
	CUSTOMER STANDARDS	–		
	SHIPPING FOOTPRINT	(LxWxH) 17'–6", 12'–6", 12'–6"		

DESIGN CODE		HOLD POINTS
	PER BH TANK DWG. P–060–P4 REV.3	1. –
	–	2. –
		3. –
	–	4. –
	–	5. –

ADDITIONAL DESIGN CONDITIONS

–	–	–	
RADIOGRAPHY	PER AWWA D–100		
STRESS RELIEVE	NOT REQUIRED	IMPACT TESTING NOT REQUIRED	
SPECIFIC GRAVITY	–		
SEISMIC ZONE	–	IMPORTANCE FACTOR	–
INSPECTED BY: MODERN CUSTOM FABRICATION			
SHOP TEST	FILL WITH WATER		

NON–CODE

NAT'L BD. NO.

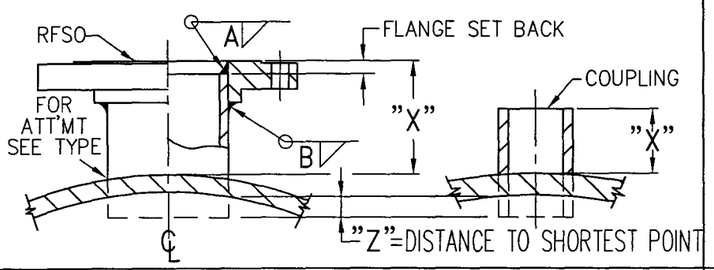
CERTIFIED BY

Modern Custom Fabrication, Inc. (modern)

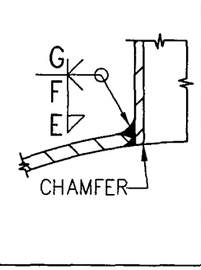
FRESNO, CA

MAWP	ATMOS.	PSI AT	AMBT.	°F	
MAEWP	–	PSI AT	–	°F	
MDMT	AMBT.	°F AT	ATMOS.	PSI	
MFG'S S/N	1601794	YEAR	2006		

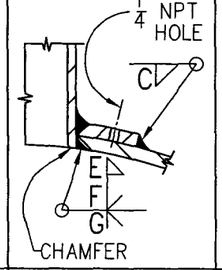
"X"=DISTANCE FROM CENTERLINE OF NOZZLE TO FACE OF FLANGE OR END OF COUPLING OR PIPE.



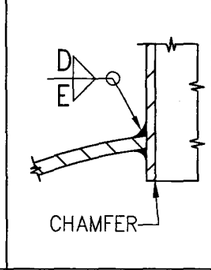
VARIOUS TYPES OF OPENINGS



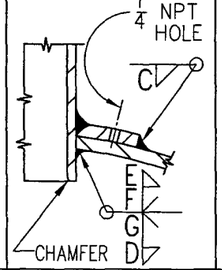
TYPE 1



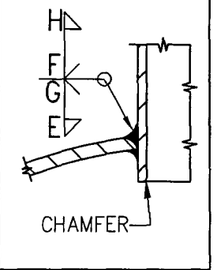
TYPE 2



TYPE 3



TYPE 4



TYPE 5

Registered Professional Engineer (Structural) CERTIFICATE NO 36412 JOHN F. BRADLEY Date Signed 7-21-06 ARIZONA U.S.A.

WELD PROCEDURES	
A	1.05
B	2.03
C	3.06
D	4.03
E	5.03
F	–
–	–

NOZZLE MARK	QUANT. REQ'D.	FLANGE OR COUPLING SIZE	FLANGE OR COUPLING SERIES	FLANGE OR COUPLING DESCRIPTION	NOZZLE NECK DESCRIPTION	REINF. PAD THK.	REINF. PAD REPAD WIDTH	ATTACHMENTS TYPE	COPED TO INTERIOR	DIM "X"	DIM "Z"	WELD A	WELD B	WELD C	WELD D	WELD E	WELD F	WELD G	WELD H	FLANGE SET BACK	NOZZLE SERVICE
K1–K4	4	4"	CL150	RFSO	SCH 40			1	YES	SEE DWG	SEE DWG					3/16		1/8"			SWIRL NOZZLES
J	1	3"	CL150	RFSO	SCH 40			1	NO	SEE DWG	SEE DWG					3/16		1/8"			DRAIN
I	1	1"	CL 3000	FULL COUPLING	SA105			1	YES	BAL	0"					3/16"		1/8"			LEAK TEST
H	1	1"	CL 3000	HALF COUPLING	SA105			1	NO	BAL	0"					3/16"		1/8"			LEAK TEST
G	1	1 1/2"	CL3000	HALF COUPLING	SCH 40			1	YES	BAL	0"		1/8"			3/16"		1/8"			LEVEL PROBE
F	1	1"	CL3000	HALF COUPLING	SCH 40			1	YES	BAL	0"		1/8"			3/16"		1/8"			
E	1	6"	CL150	RFSO	SCH 40			1	YES	SEE DWG.	0"	1/4"	1/4"			1/4"		3/16"		1/4"	OUTLET
D	1	8"	PLATE	1/4"	SCH 10			1	NO	6"	0"	3/16"	3/16"			3/16"		1/8"		3/16	WEIR INSPECTION PORT
C1–C2	2	4"	CL150	RFSO	SCH 40			3	NO	6"	6"	1/4"	1/4"			1/4"		1/8"		1/4"	FILL
B1–B2	2	4"	CL150	RFSO	SCH 40			1	NO	6"	0"	1/4"	1/4"			1/4"		1/8"		1/4"	VENT/SPARE W/BLIND
A	1	20"X20"	HINGED LID	SQUARE MANWAY	1/4" PLATE			1	NO	6"	0"					3/16		1/8"			ACCESS

SHOP NOTES

1. COVER ALL OPENINGS BEFORE SHIPPING.
2. STRADDLE CENTER LINES OF ALL FLANGES UNLESS OTHERWISE SPECIFIED.
3. GRIND & DEBURR ALL EDGES.

NO.	REVISION	DATE	BY
0	–	–	–

NO. REQUIRED (1) ONE ITEM NO. NONE

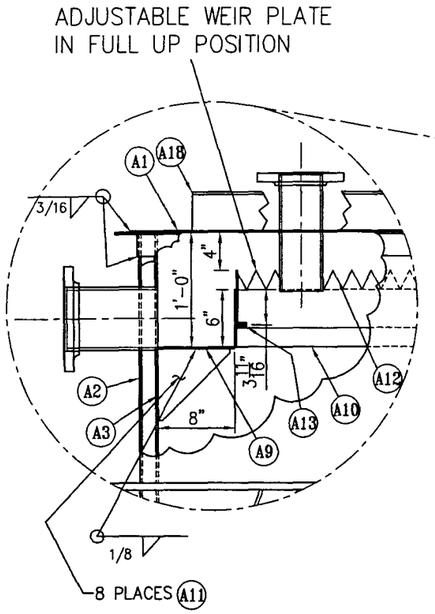
modern custom fabrication
fresno california
P.O. Box 11925 • 2421 E. California Ave. • Fresno, California 93721
Ph: (559) 264–4741 OR 800–800–TANK • Fax: (559) 237–3413

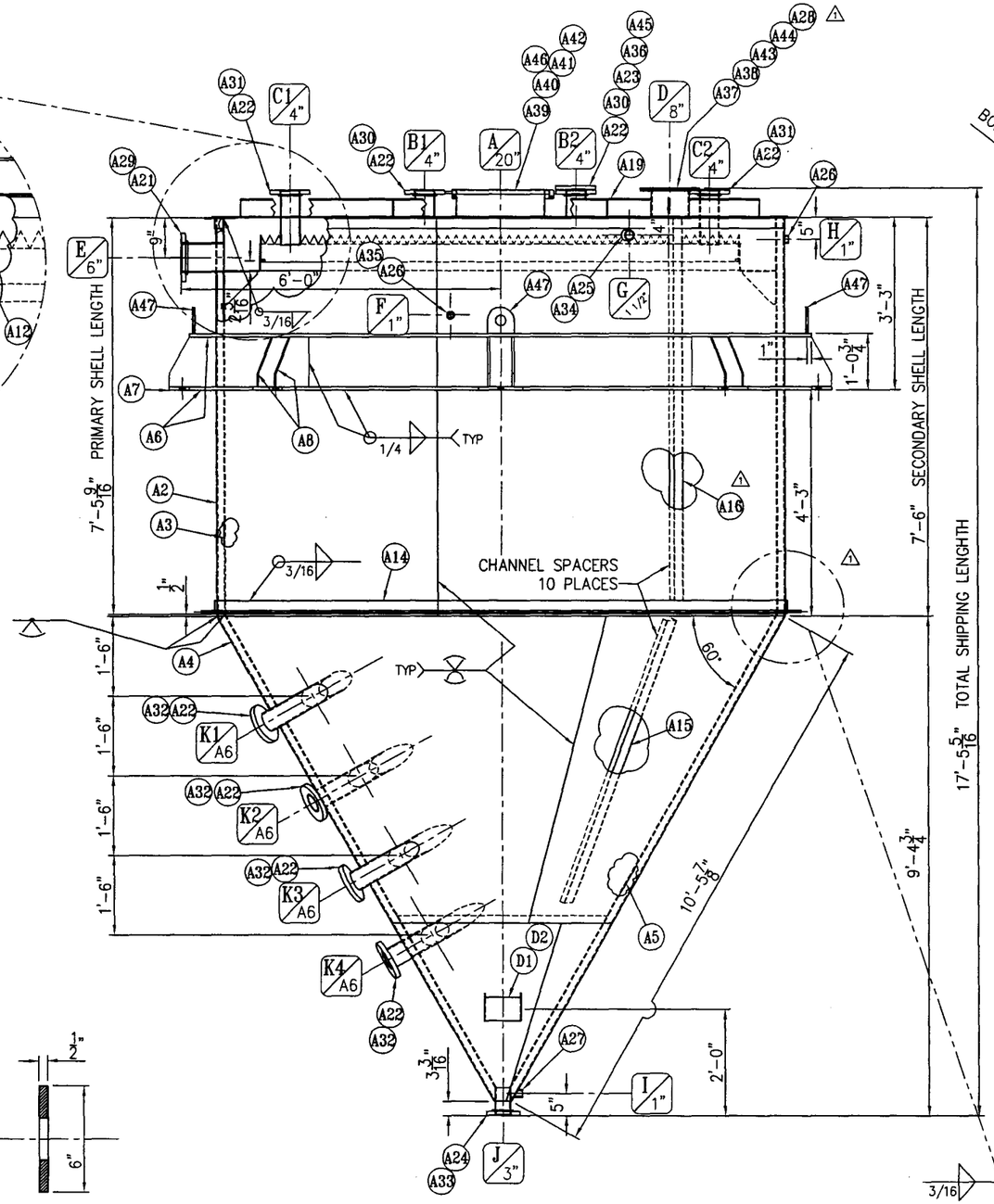
Prepared for

SIEMENS WATER TREATMENT TECH. CORP.

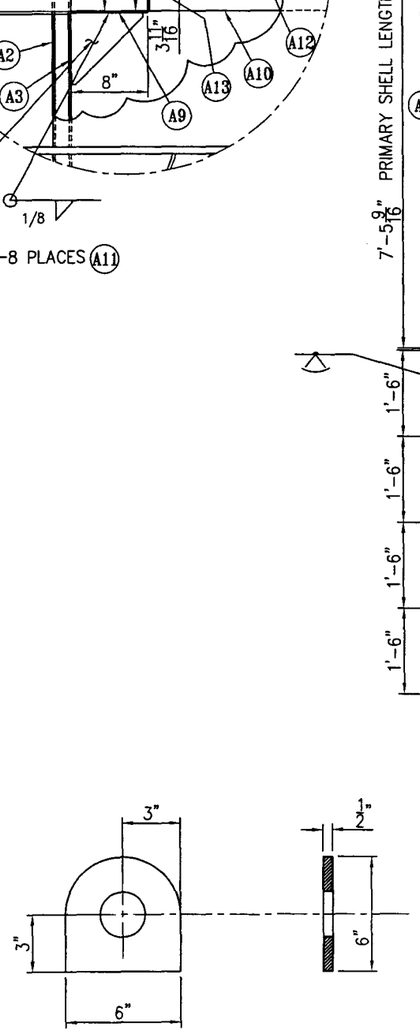
DOUBLE WALL STAINLESS FEED TANK
FLAT TOP CONE BOTTOM 7'–6" SIDE SHELL

DRAWN BY: RC	SCALE: NTS
CHECKED BY:	DATE: 12/7/06
DWG/JOB NO.: 1601794	SHT. 1 OF 5

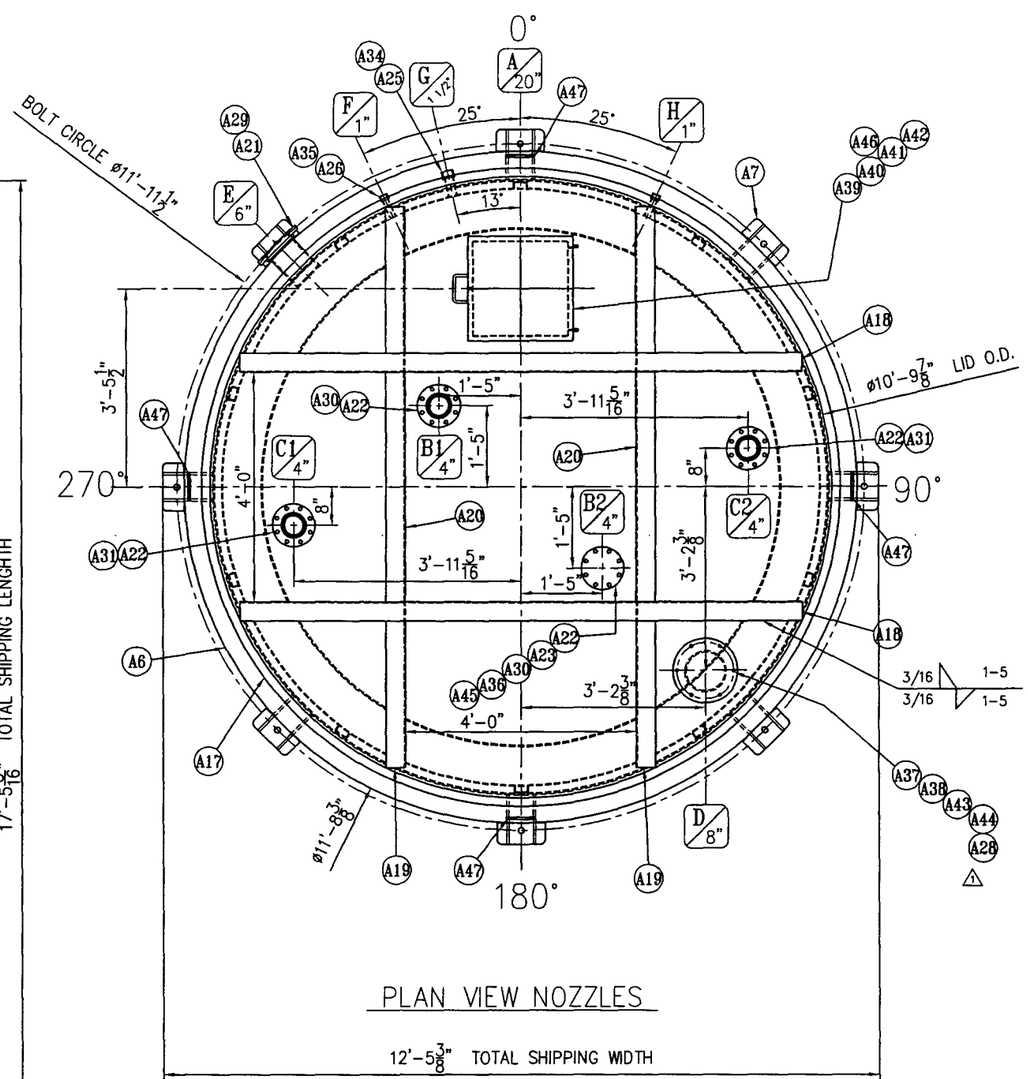




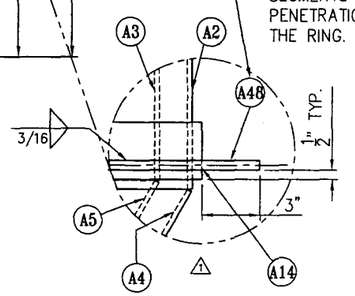
ELEVATION VIEW



LIFT LUG



PLAN VIEW NOZZLES



STIFFENER RING FABRICATED FROM SEGMENTS THAT WILL BE FULL PENETRATION WELDED TOGETHER TO FORM THE RING.

Registered Professional Engineer (Structural)
CERTIFICATE NO
36412
JOHN F. BRADLEY
Date Signed 2/21/07
ARIZONA U.S.A

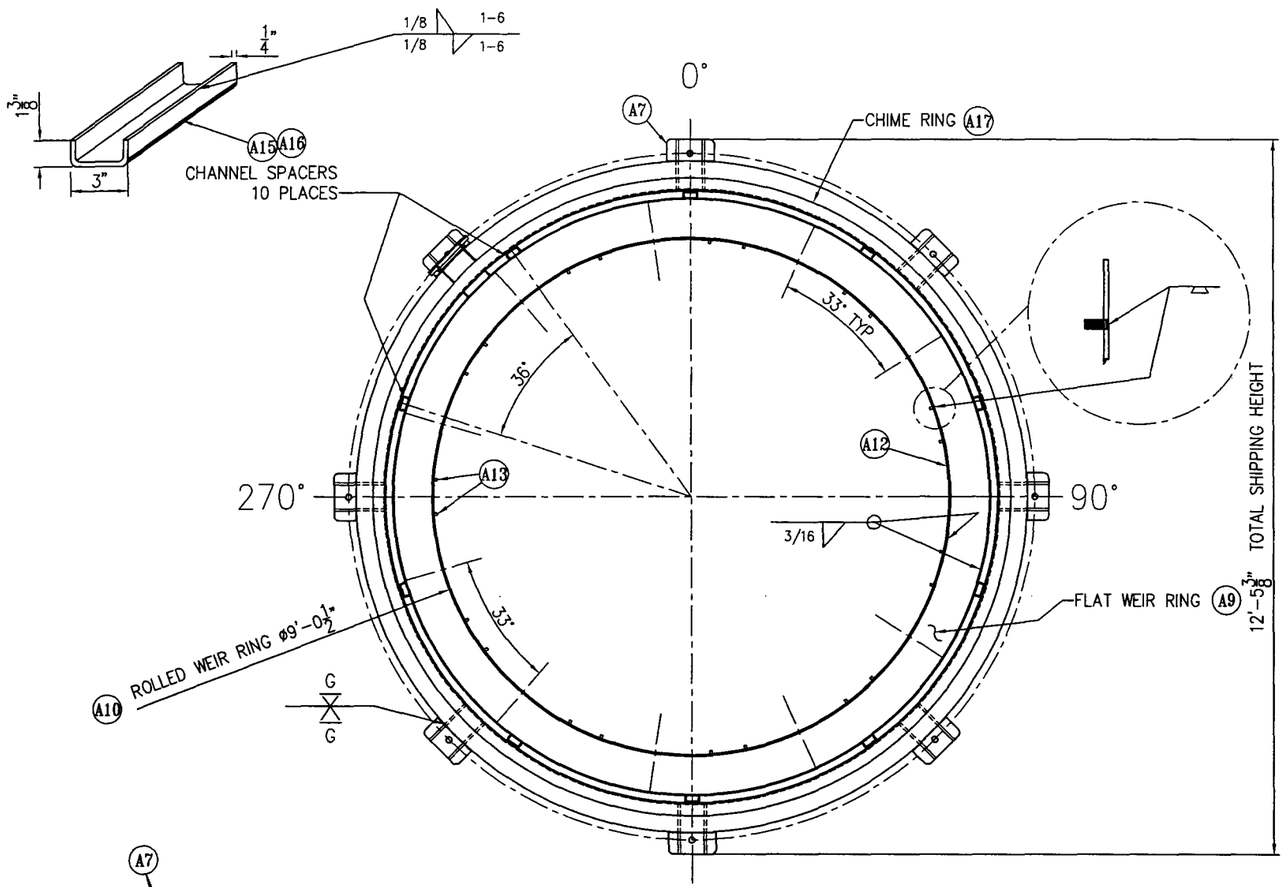
NO.	REVISION	DATE	BY
1	ADDED STIFFENING RING CORRECTIONS	2-9-07	TCY

modern custom fabrication
fresno california

P.O. Box 11925 • 2421 E. California Ave. • Fresno, California 93721
Ph: (559) 264-4741 OR 800-800-TANK • Fax: (559) 237-3413

Prepared for
SIEMENS WATER TREATMENT TECH. CORP.
DOUBLE WALL STAINLESS FEED TANK
FLAT TOP CONE BOTTOM 7'-6" SIDE SHELL

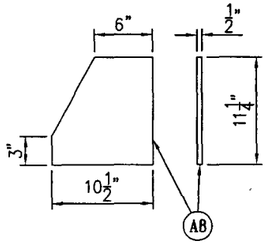
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CHECKED BY:	DATE: 12/7/06
DWG/JOB NO.: 1601794	SHT. 2 OF 5



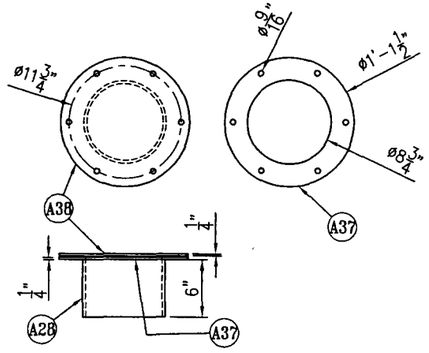
PLAN VIEW

ADJUSTABLE WEIR AND STUDS

BASE RING EXTENSION

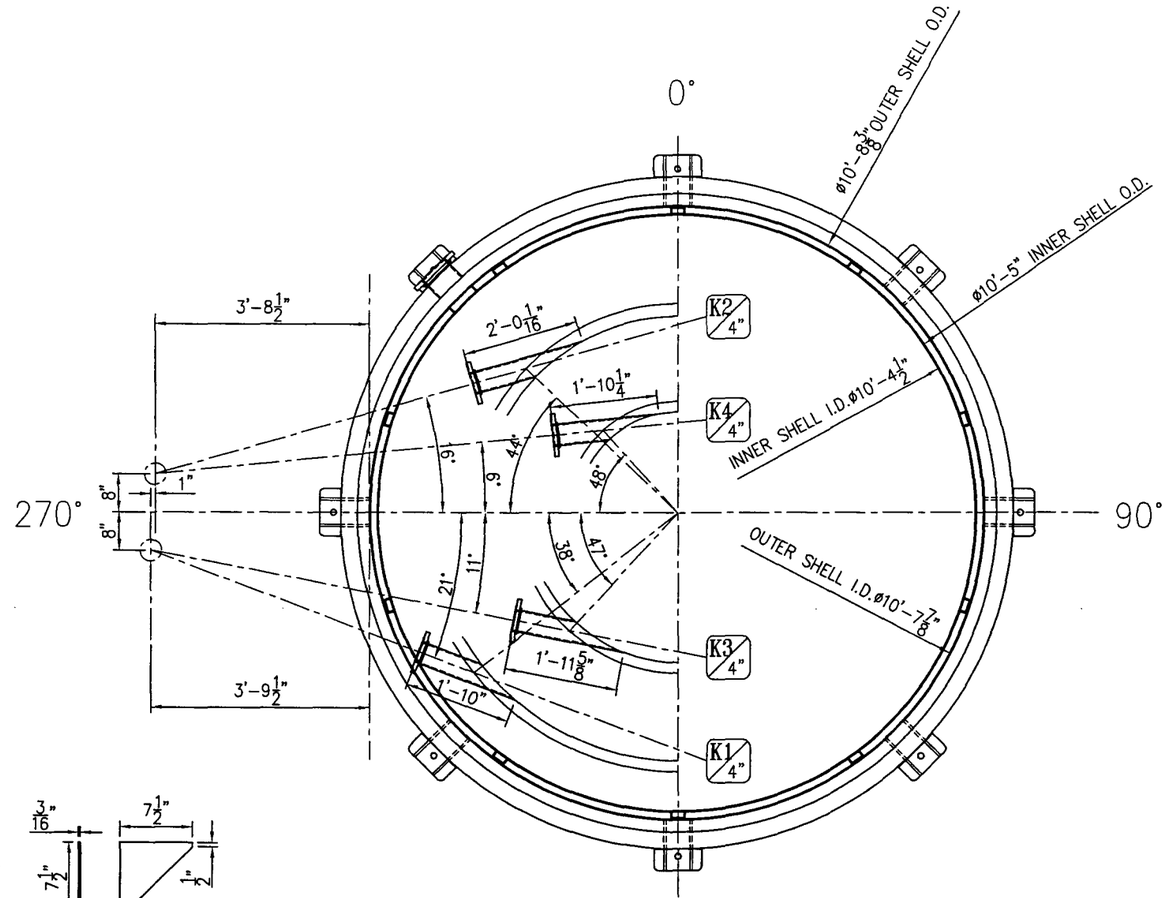


BASE RING GUSSET



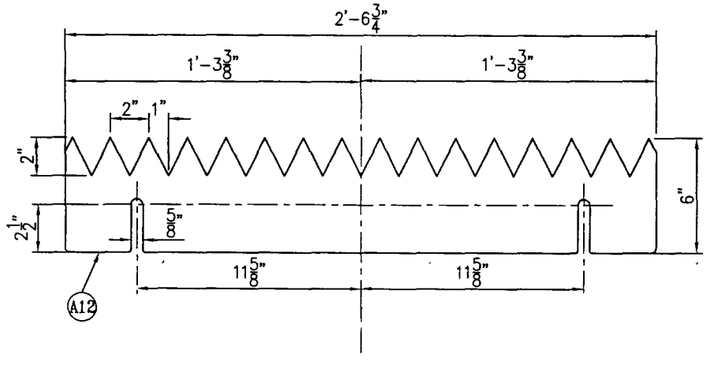
INSPECTION PORT NOZZLE

⚠ WEIR RING GUSSET



ROTATION AND ANGLE OF

NOZZLES K1–K4



AJUSTABLE WEIR PLATE

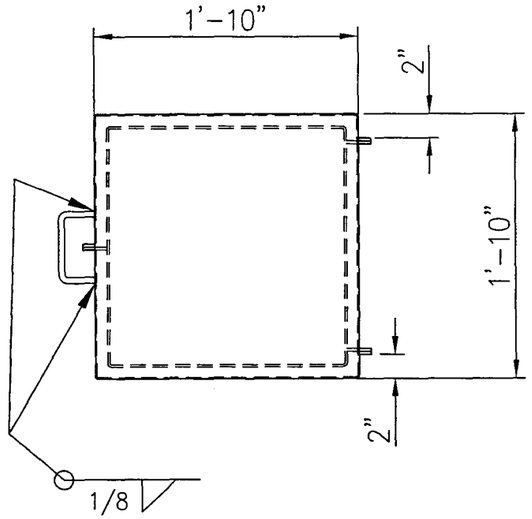
Registered Professional Engineer (Structural)
CERTIFICATE NO
36412
JOHN F.
BRADLEY
Signed 2/21/07
ARIZONA U.S.A

NO.	REVISION	DATE	BY
⚠	CORRECTIONS	2-9-07	TCY

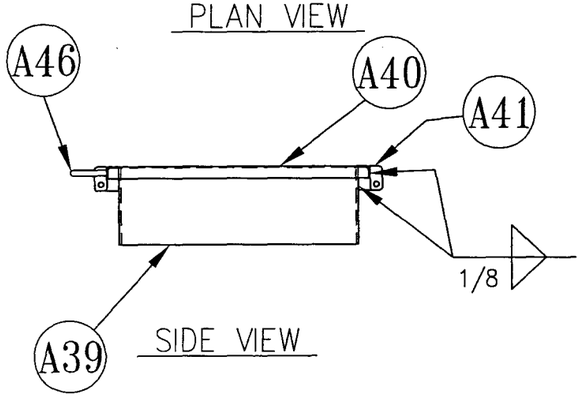
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Prepared for
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DOUBLE WALL STAINLESS FEED TANK
FLAT TOP CONE BOTTOM 7'-6" SIDE SHELL

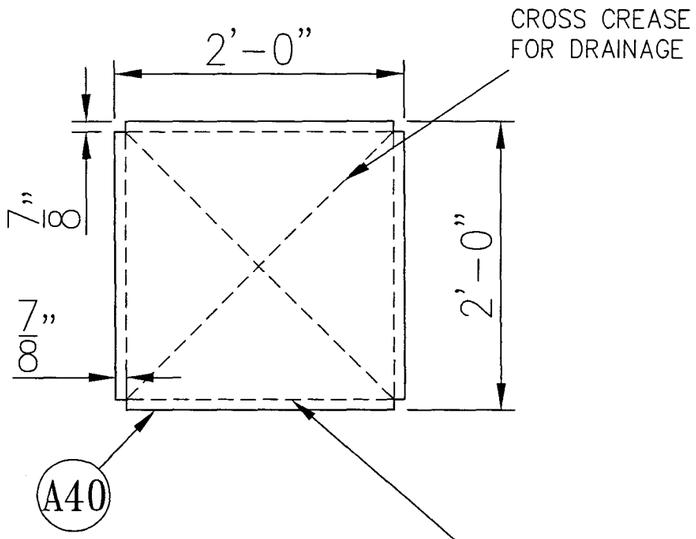
DRAWN BY: RC	SCALE: NTS
CHECKED BY:	DATE: 12/7/06
DWG/JOB NO.: 1601794	SHT. 3 OF 5



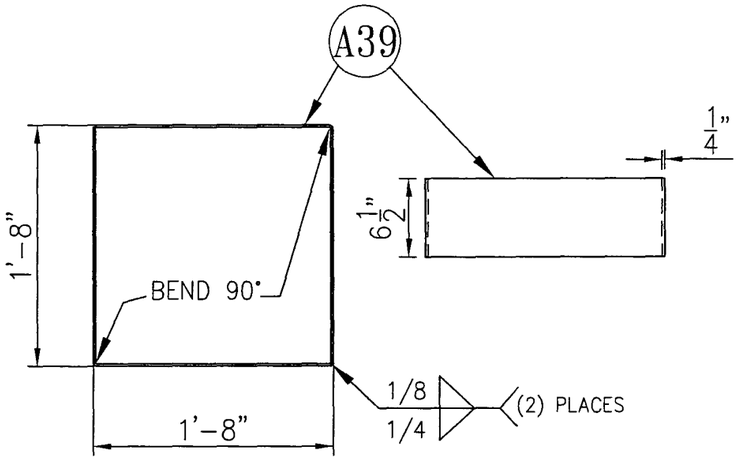
PLAN VIEW



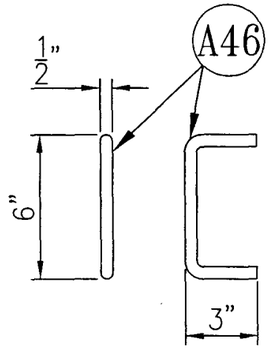
SIDE VIEW



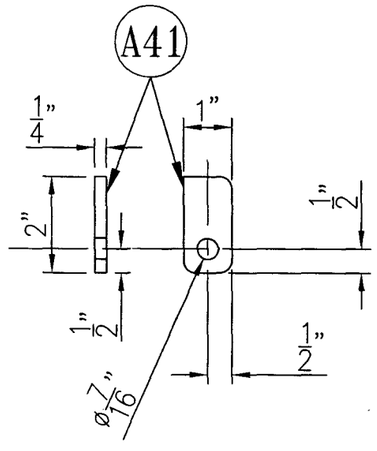
LID BLANK



PLAN VIEW BOX



HANDLE



HINGE AND HASP PARTS

Registered Professional Engineer (Structural)
CERTIFICATE NO
36412
JOHN F.
BRADLEY
Date Signed 12-21-06
ARIZONA U.S.A

NO.	REVISION	DATE	BY
0	-	-	-

modern custom fabrication
fresno california

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Prepared for
SIEMENS WATER TREATMENT TECH. CORP.
DOUBLE WALL STAINLESS FEED TANK
FLAT TOP CONE BOTTOM 7'-6" SIDE SHELL

DRAWN BY: RC	SCALE: NTS	SHT. 4 OF 5
CHECKED BY:	DATE: 12/7/06	
DWG/JOB NO.: 1601794		

ITEM	DESCRIPTION 1601794	PART NO.	MATERIAL SPEC.	SEE DETAIL	MTR'S REQ'D	PRE ORDERED	WEIGHT PER PIECE IN LBS	SQ. FT.	QTY	TOTAL QTY
	CUSTOM BUYOUT MATERIAL									
A1	ROOF, PL 3/16" X 129 7/8" O.D.		SA240-TP304				705	92	1	1
A2	SHELL (OUTER), PL 1/4" X 90" X 33'-6 1/2"		SA240-TP304				2,568	253	1	1
A3	SHELL (INNER), PL 1/4" X 89 9/16" X 32'-7 15/16"		SA240-TP304				2,489	245	1	1
A4	CONE (OUTER), PL 1/4" X 259 1/4" O.D. X 178°		SA240-TP304				1,850	182	1	1
A5	CONE (INNER), PL 1/4" X 252 3/8" O.D. X 178°		SA240-TP304				1,754	172	1	1
A6	BASE RING, PL 3/4" X 140 3/8" O.D. X 128 3/8" I.D.		SA240-TP304				539	37	2	2
A7	BASE RING EXTENSION, PL 3/4" X 4 1/2" X 0'-10"		SA240-TP304				10	.5	8	8
A8	BASE RING GUSSET, PL 1/2" X 10 1/2" X 0'-11 1/4"		SA240-TP304				16	1	16	16
A9	WEIR RING (FLAT), PL 3/16" X 124 1/2" O.D. X 108 1/2" I.D.		SA240-TP304				156	21	1	1
A10	WEIR RING (ROLLED), PL 3/16" X 6" X 28'-4 1/2"		SA240-TP304				108	29	1	1
A11	WEIR RING GUSSET, PL 3/16" X 7 1/2" X 0'-7 1/2"		SA240-TP304				3	1	8	8
A12	ADJUSTABLE WEIR PLATE, PL 3/16" X 6" X 2'-6 3/4"		SA240-TP304				10	2	11	11
A13	WEIR PLATE STUDS, 1/2" X NC X 0'-1"		304 SS						22	22
A14	PERIMETER BAND, PL 1/2" X 3" X 23'-8 7/8"		SA240-TP304				280	6	1	1
A15	CHANNEL SPACER, PL 1/4" X 4 3/4" X 5'-9" (CONE)		SA240-TP304				24	2	10	10
A16	CHANNEL SPACER, PL 1/4" X 4 3/4" X 7'-2" (SHELL)		SA240-TP304				29	2	10	10
A17	CHIME RING, L 2 1/2" X 2 1/2" X 3/16" X 34'-3 1/8"		SA479-TP304				120		1	1
A18	ROOF STIFFENER, L 4" X 4" X 1/4" X 9'-9 1/4"		SA479-TP304				66		2	2
A19	ROOF STIFFENER, L 4" X 4" X 1/4" X 2'-10 1/4"		SA479-TP304				12		4	4
A20	ROOF STIFFENER, L 4" X 4" X 1/4" X 4'-0"		SA479-TP304				25		2	2
A21	FLANGE, 6" X CL150 X RFSO (E)		SA182-TP304				19		1	1
A22	FLANGE, 4" X CL150 X RFSO (B1,B2,C1,C2,K1-K4)		SA182-TP304				13		8	8
A23	BLIND FLANGE, 4" X CL150 X RF (B2)		SA182-TP304				17		1	1
A24	FLANGE, 3" X CL150 X RFSO		SA182-TP304				8		1	1
A25	HALF COUPLING, 1 1/2" X CL3000		SA182-TP304				1		1	1
A26	HALF COUPLING, 1" X CL3000		SA182-TP304				1		2	2
A27	FULL COUPLING, 1" X CL3000		SA182-TP304				1		1	1
A28	PIPE, 8" X SCH 10 X 0'-6 1/4" (D) ⚠		SA312-TP304				7		1	1
A29	PIPE, 6" X SCH 40 X 0'-9 1/4" (E)		SA312-TP304				10		1	1
A30	PIPE, 4" X SCH 40 X 0'-6" (B1,B2)		SA312-TP304				6		2	2
A31	PIPE, 4" X SCH 40 X 1'-0" (C1,C2)		SA312-TP304				11		2	2
A32	PIPE, 4" X SCH 40 X 2'-0" (K1-K4)		SA312-TP304				11		4	4
A33	PIPE, 3" X SCH 40 X 0'-6 1/4" (J)		SA312-TP304				4		1	1
A34	PIPE, 1 1/2" X SCH 40 X 0'-4" (G)		SA312-TP304				1		1	1
A35	PIPE, 1" X SCH 40 X 0'-4" (F,H)		SA312-TP304				1		2	2
A36	HEX BOLTS, 5/8" X NC X 3 1/2" W/ NUTS (B2)	A193-B8-TP304	A194-B8-TP304				3		8	8
A37	PLATE FLANGE, PL 1/4" X 13 1/2" O.D. X 8 3/4" I.D. (D)		SA240-TP304				4	1	1	1
A38	PLATE BLIND FLANGE, PL 1/4" X 13 1/2" O.D. (D)		SA240-TP304				11	1	1	1
A39	MANWAY BOX, PL 1/4" X 6 1/2" X 6'8" (A)		SA240-TP304				36	4	1	1
A40	MANWAY LID, PL 14 GA. X 24" X 2-'0"		SA240-TP304				12	4	1	1
A41	HINGE & HASP PARTS, PL 1/4" X 1" X 0'-2" (A)		SA240-TP304						6	6
A42	HEX BOLTS, 3/8" X NC X 1" W/LOCK NUTS (A)	A193-B8-TP304	A194-B8-TP304						2	2
A43	HEX BOLTS, 3/8" X NC X 1 1/4" W/NUTS (D)	A193-B8-TP304	A194-B8-TP304						6	6
A44	GASKET, TO FIT 8" PLATE FLANGE (D)		NEOPRENE						1	1
A45	GASKET, TO FIT 4" CL150 (B2)		NEOPRENE						1	1
A46	MANWAY HANDLE, BAR 1/2" ø X 0'-11"		SA479-TP304				1		1	1
A47	LIFT LUG, PL 1/2" X 6" X 0'-6"	⚠	SA240-TP304				5		4	4
A48	STIFFENEING RING, PL 1/2" X 129 3/8" I.D . X 135 3/8" O.D.	⚠	SA240-TP304				177		1	1
	STOCK SHELF MATERIAL									
D1	NAMEPLATE BRACKET	16MS04000	SA240-TP304				4	1	1	1
D2	NAMEPLATE		STAINLESS				2		1	1
			TOTAL WEIGHT				12,700 LBS.			

Registered Professional Engineer (Structural)
CERTIFICATE NO 36412
JOHN F. BRADLEY
Date Signed 2/24/07
ARIZONA U.S.A.

NO.	REVISION	DATE	BY
⚠	ADDED STIFFENING RING CORRECTIONS	2-9-07	TCY

NO. REQUIRED (1) ONE | ITEM NO. NONE

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fresno california

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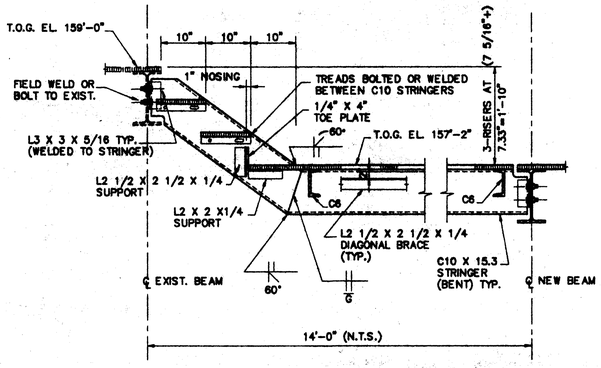
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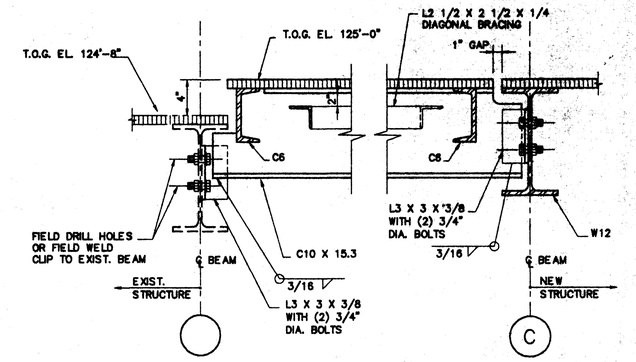
SIEMENS WATER TREATMENT TECH. CORP.
DOUBLE WALL STAINLESS FEED TANK
FLAT TOP CONE BOTTOM 7'-6" SIDE SHELL

DRAWN BY: RC	SCALE: NTS
CHECKED BY:	DATE: 12/7/06
DWG/JOB NO.: 1601794	SHT. 5 OF 5

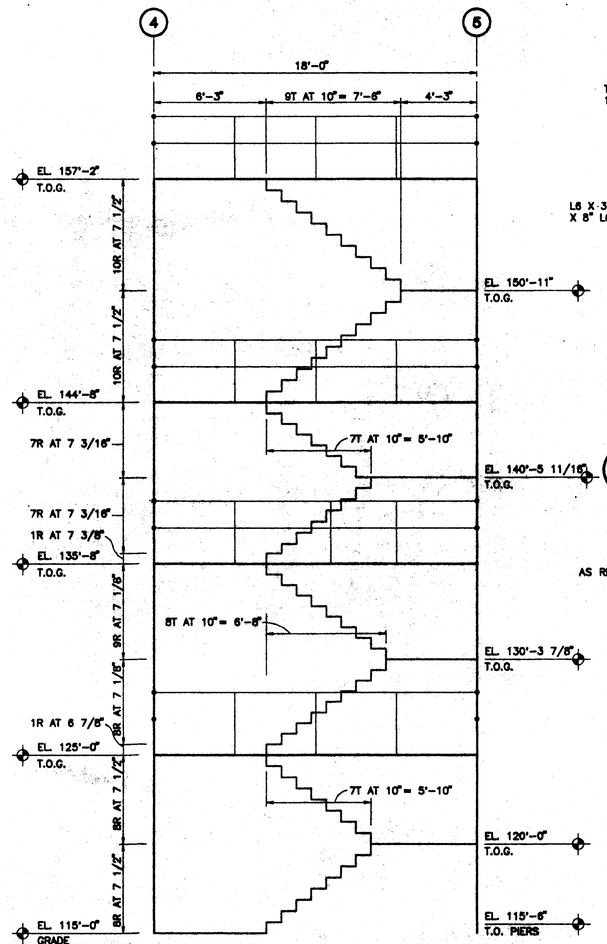
Exhibit A - Plans

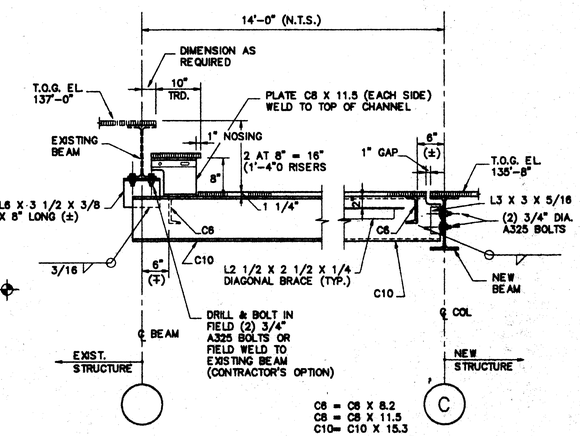
T-18 Support Steel Drawings



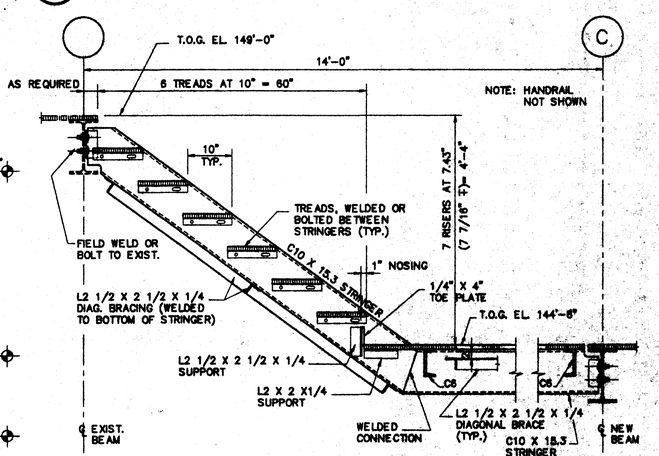


10 7 4 1





11 8 2



12 9 6 3

FEB - 9 1996

FEB 1 2 1996
CHAVOND-BARRY

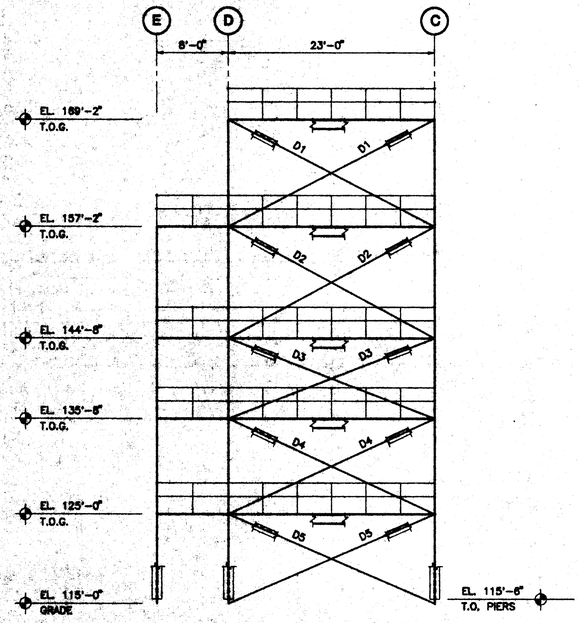
FEB 9 1996

A.V.SCHWAN & ASSOC.,Inc.
CONSULTING ENGINEERS
7000 E. CAMELBACK RD. STE. 220
SCOTTSDALE, ARIZONA 85251
(602) 945-4531 970-0468 (FAX)

HAWKINSCHOLS CARBON REACTIVATION FURNACE
STAIR\BRIDGE DETAILS
FOR
HAWKINS CHEMICAL STORAGE, INC.

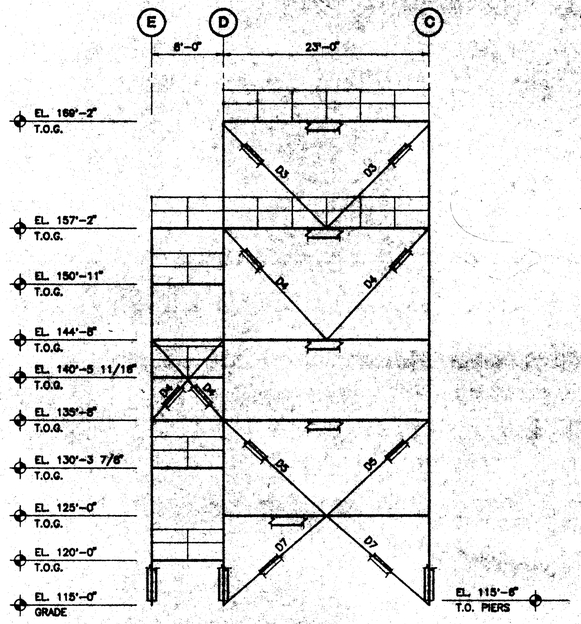
JOB NO. 9500
DRAWN: CMM/CDS
DESIGNED: FCH
APPROVED: AVS
DATE: 2/8/96
SHEET TITLE: FRAMING DETAILS

SHEET NUMBER S6



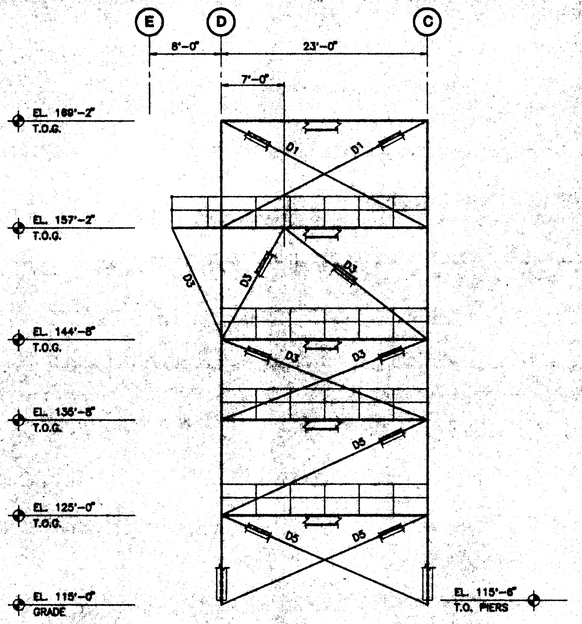
ELEV. ALONG GRID (4)

(LOOKING EAST) 1/8"=1'-0"



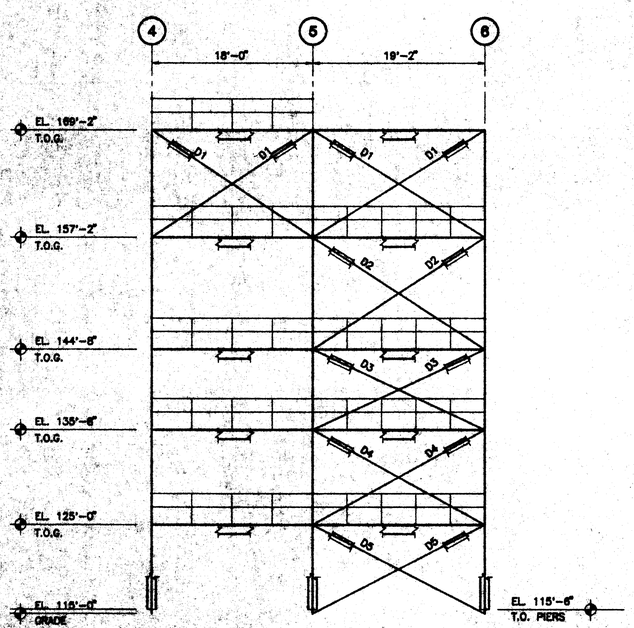
ELEV. ALONG GRID (5)

(LOOKING EAST) 1/8"=1'-0"



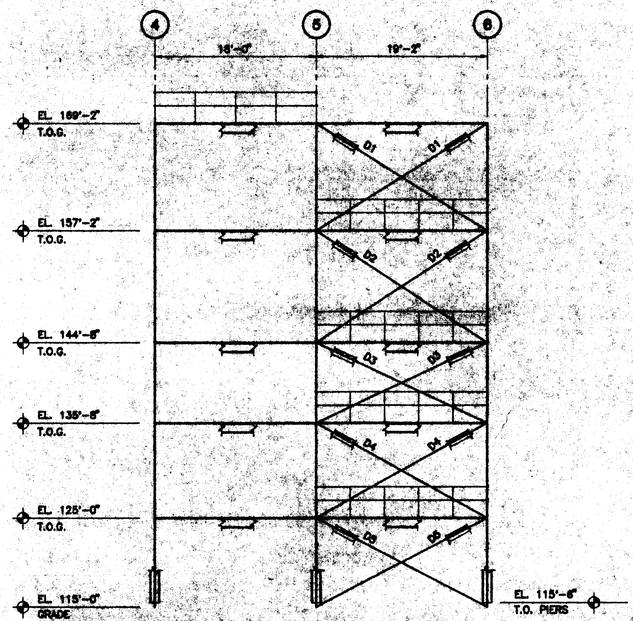
ELEV. ALONG GRID (6)

(LOOKING EAST) 1/8"=1'-0"



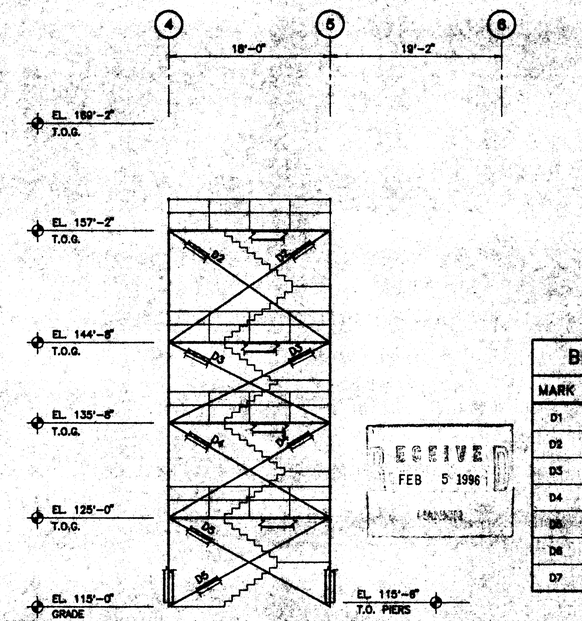
ELEV. ALONG GRID (C)

(LOOKING NORTH) 1/8"=1'-0"



ELEV. ALONG GRID (D)

(LOOKING NORTH) 1/8"=1'-0"



ELEV. ALONG GRID (E)

(LOOKING NORTH) 1/8"=1'-0"

BRACE SCHEDULE	
MARK	SIZE
D1	(2) L3 1/2 X 2 1/2 X 1/4
D2	(2) L3 1/2 X 3 X 1/4
D3	(2) L4 X 3 X 1/4
D4	(2) L4 X 3 1/2 X 1/4
D5	(2) L5 X 3 X 5/16
D6	NOT USED
D7	(2) L5 X 3 1/2 X 3/8

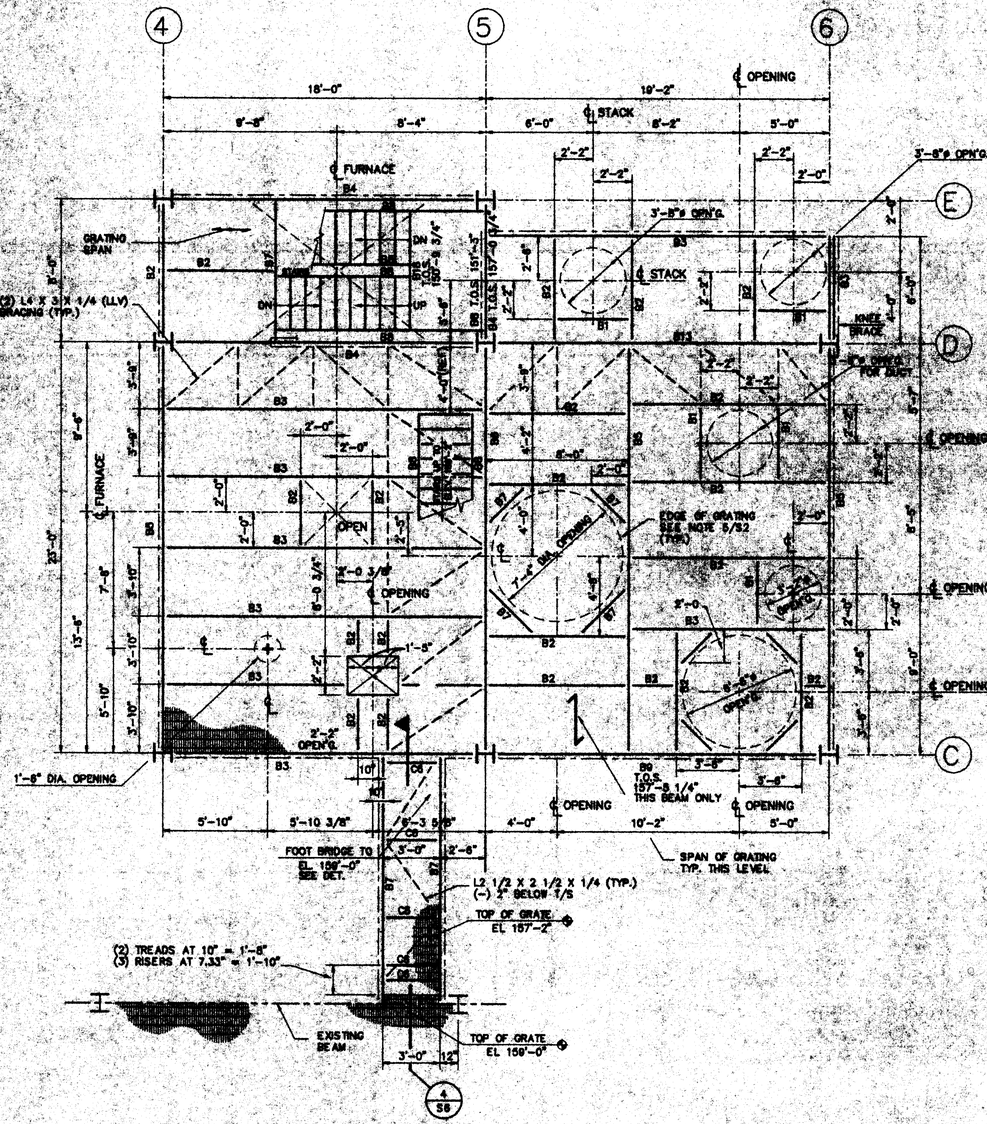
ISSUED
ENGINEERING DEPT.
FEB 5 1996
HANKIN ENVIRONMENTAL SYSTEMS INC.

RECEIVED
FEB 5 1996

SCHEMATIC
NOT FOR CONSTRUCTION USE

S5

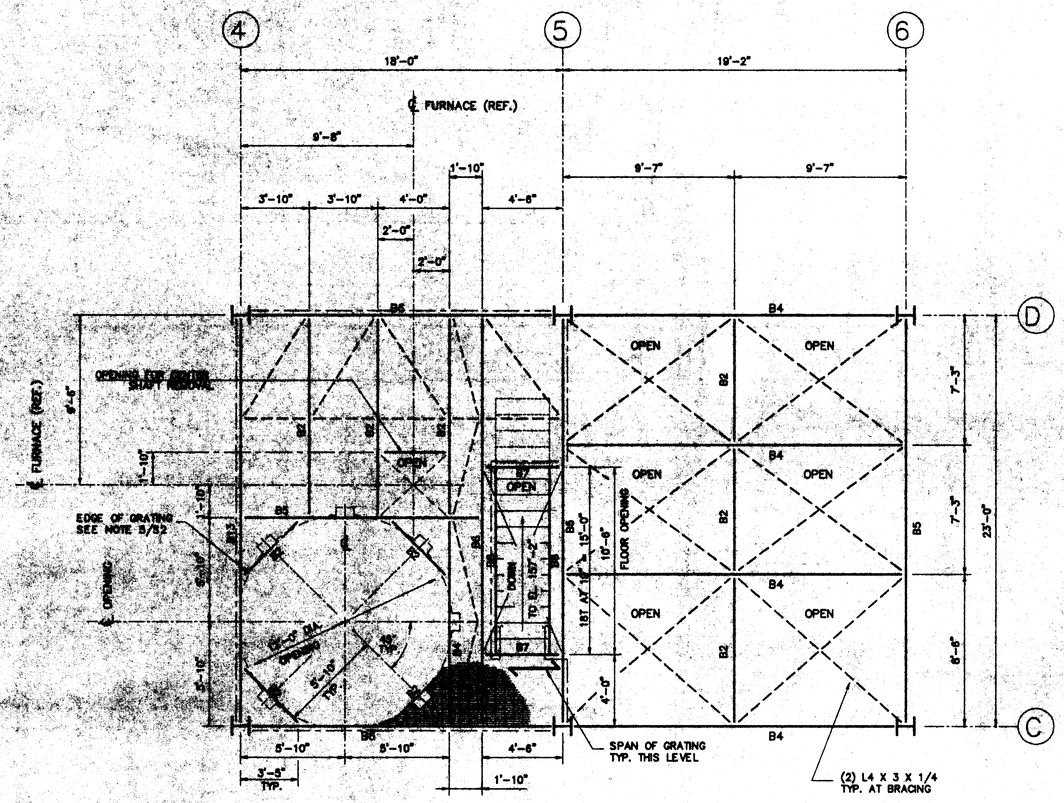
AVSCHWAN & ASSOC., Inc.
CONSULTING ENGINEERS



FRAMING PLAN AT T.O.G. EL 157'-2"

T.O.S. AT -1 1/4" U.N.O.

1/4"=1'-0"



FRAMING PLAN AT T.O.G. EL 169'-2"

T.O.S. AT -1 1/4" U.N.O.

1/4"=1'-0"

BEAM SCHEDULE		BEAM SCHEDULE	
MARK	SIZE	MARK	SIZE
B1	W8 X 10	B10	NOT USED
B2	W10 X 12	B11	W12 X 26
B3	W12 X 14	B12	W12 X 35
B4	W14 X 22	B13	W21 X 44
B5	W16 X 26	B14	W24 X 68
B6	W18 X 35	B15	W24 X 76
B7	C10 X 15.3	B16	NOT USED
B8	MC12 X 10.6	B17	C8 X 10.5
B9	W16 X 40	B18	C8 X 11.5

FEB - 5 1996
CHAVOND-BARRY

ISSUED
ENGINEERING DEPT.
FEB 5 1996
HANKIN ENVIRONMENTAL SYSTEMS INC.

RECEIVED
FEB 5 1996
HANKIN

REVISIONS	
△	-

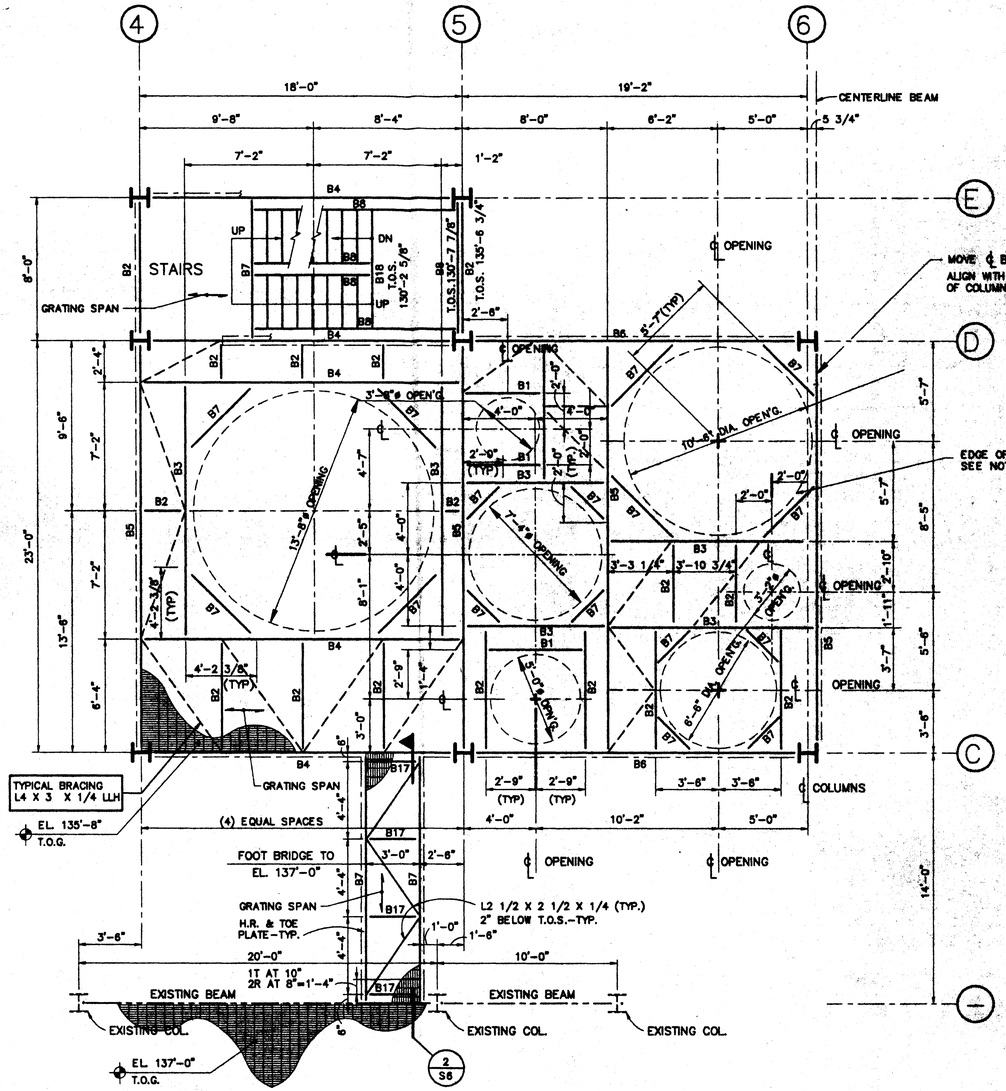
A.V.SCHWAN & ASSOC.,inc.
CONSULTING ENGINEERS
7000 E. CAMELBACK RD. STE. 220
SCOTTSDALE, ARIZONA 85251
(602) 368-4331 970-0493 (FAX)

HANKIN-NICHOLS CARBON REACTIVATION FURNACE
STEEL FRAMING PLANS
AT EL 157'-2" & 169'-2"
FOR
HANKIN ENVIRONMENTAL SYSTEMS, INC.

JOB NO.:	9660
DRAWN:	DMW
DESIGNED:	RDS
APPROVED:	AVS
DATE:	2/2/96

SHEET TITLE:
FRAMING PLANS

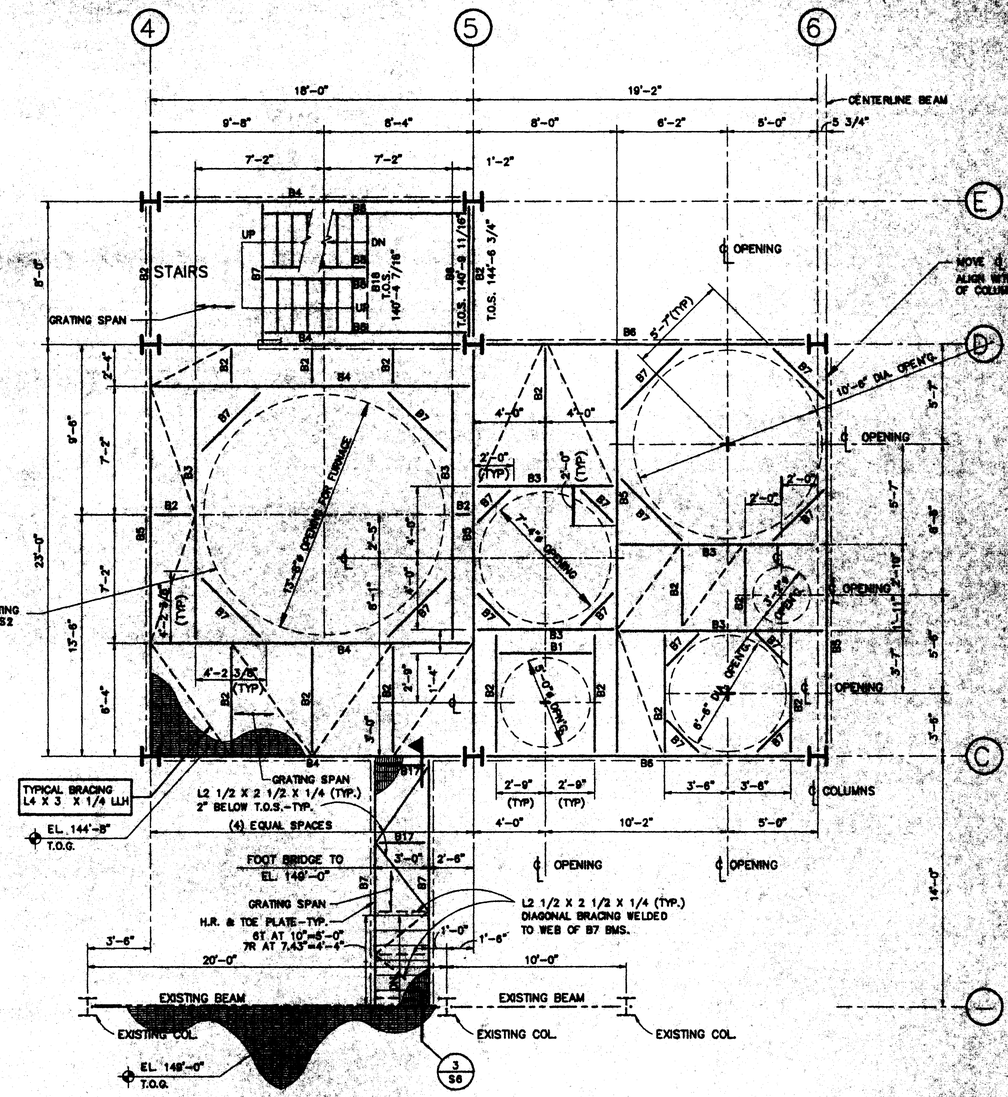
SHEET NUMBER:
S4



FRAMING PLAN AT T.O.G. EL 135'-8"

T.O.S. AT -1 1/4" U.N.O.

1/4"=1'-0"



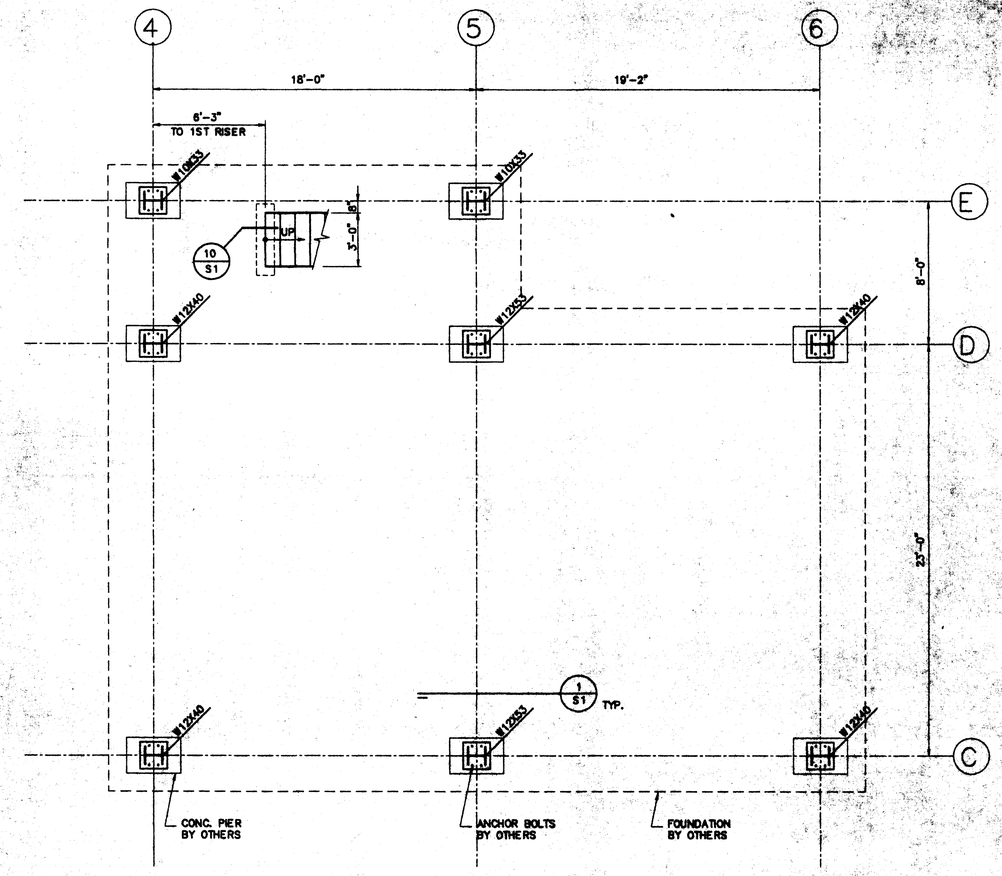
FRAMING PLAN AT T.O.G. EL 144'-8"

T.O.S. AT -1 1/4" U.N.O.

1/4"=1'-0"

BEAM SCHEDULE			
MARK	SIZE	MARK	SIZE
B1	W8 X 10	B10	NOT USED
B2	W10 X 12	B11	W12 X 26
B3	W12 X 14	B12	W12 X 35
B4	W14 X 22	B13	W21 X 44
B5	W16 X 26	B14	W24 X 68
B6	W18 X 35	B15	W24 X 76
B7	C10 X 15.3	B16	NOT USED
B8	MC12 X 10.6	B17	C6 X 10.5
B9	W16 X 40	B18	C8 X 11.2

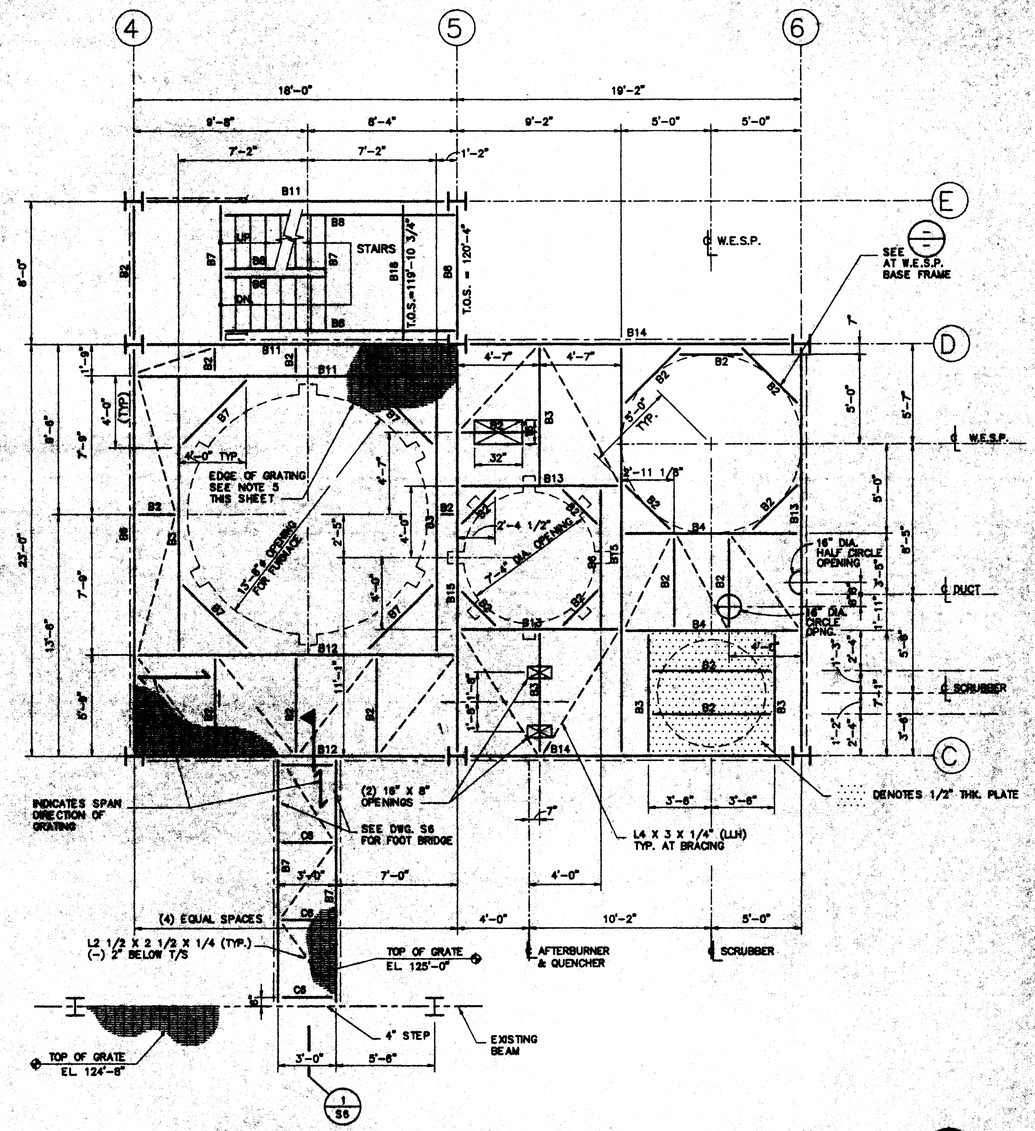
FEB 1 2 1996
CHAVONS-BARRY
RECEIVED
FEB 8 1996
FEB - 9 1996



FOUNDATION PLAN AT ELEV. 115'-0"

BOT. BASE PLATES AT ELEV. 115'-7 1/2"

1/4"=1'-0"



FRAMING PLAN AT EL. T/G EL. 125'-0"

T/S (-) 1 1/4" U.N.O.

1/4"=1'-0"

NOTES:

STRUCTURAL STEEL:

1. ALL STRUCTURAL STEEL TO BE ASTM A-36.
2. ALL GRATING TO BE RECTANGULAR STL. 1 1/4" X 3/16" X 1 3/16" O.C. BEARING BARS.
3. ALL BOLTS TO BE HIGH STRENGTH ASTM A-325 STEEL.
4. ALL WELDING TO CONFORM TO LATEST A.W.S. SPECS.
5. ALL OPENINGS IN GRATING SHALL BE BANDED.

PAINTING:

1. PRIOR TO APPLICATION OF ANY COATINGS, STEEL PARTS SHALL BE SANDBLASTED TO SSPC-6, COMMERCIAL BLAST CLEANING.
2. IMMEDIATELY THEREAFTER PARTS SHALL BE GIVEN (1) PRIME COAT OF VALSPER CORP. EPOXY PRIMER NO. 13F62, SHOP APPLIED, TO PREVENT RUST.
3. AN INTERMEDIATE COAT OF VALSPER CORP. HI-BUILD OPOXY 89 SERIES SHALL BE APPLIED AFTER PRIMER HAS DRYED FOR 24 HOURS. TINT COATING TP APPROXIMATE COLOR OF FINISH COAT.
4. ONE (1) FINISH COAT OF VALSPAR CORP. URETHANE ENAMEL V40 SERIES SHALL BE FIELD APPLIED AFTER ERECTION OF PARTS. COLOR SHALL BE IN ACCORDANCE WITH COLOR CODE AS APPROVED BY OWNER.

BEAM SCHEDULE		BEAM SCHEDULE	
MARK	SIZE	MARK	SIZE
B1	W8 X 10	B10	NOT USED
B2	W10 X 12	B11	W12 X 26
B3	W12 X 14	B12	W12 X 35
B4	W14 X 22	B13	W21 X 44
B5	W16 X 26	B14	W24 X 68
B6	W18 X 35	B15	W24 X 76
B7	C10 X 15.3	B16	NOT USED
B8	MC12 X 10.6	B17	C8 X 10.5
B9	NOT USED	B18	C8 X 11.5

FEB 12 1996
CHAVOND-BARRY
RECEIVED
FEB 9 1996
FEB - 9 1996

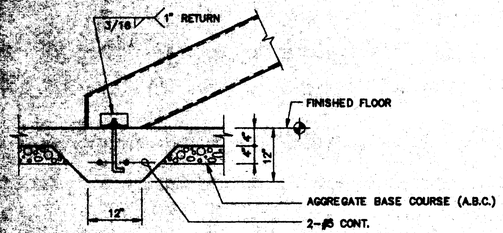
A.V.SCHWAN & ASSOC.,Inc.
CONSULTING ENGINEERS
7009 E. CAMELBACK RD. STE. 220
SCOTTSDALE, ARIZONA 85251
(602) 946-9511 FAX (602) 941-1240

REACTIVATION SURVICE
FOUNDATION PLAN
FRAMING PLAN
HAYDEN-MORENCI STOCKPILE

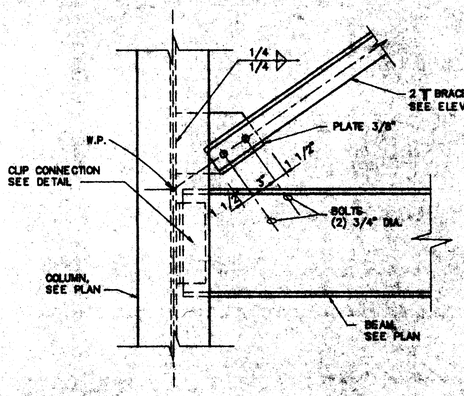
JOB NO.
DRAWN
REVISED
APPROVED
DATE

SHEET TITLE
FOUNDATION & FRAMING PLANS

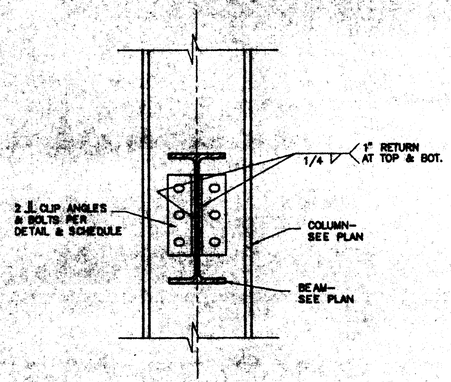
SHEET NUMBER
S2



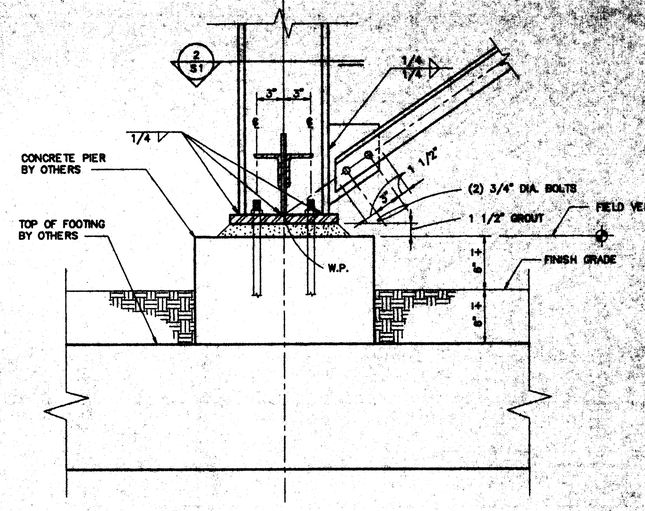
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7 BRACE BOT. AT COLUMN WEB

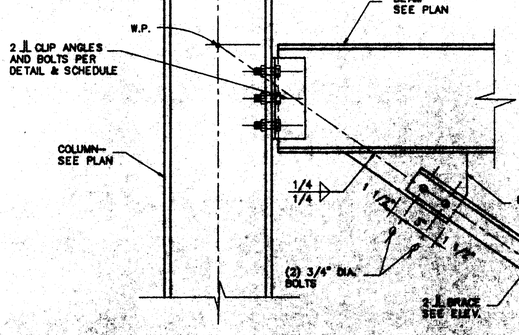


4 BEAM TO COLUMN WEB

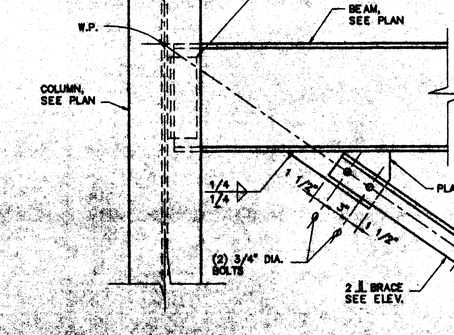


1 COLUMN BASE DETAIL

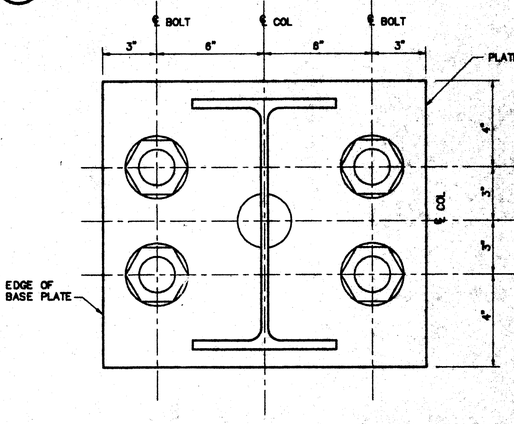
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8 BRACE BOT. AT COLUMN FLANGE



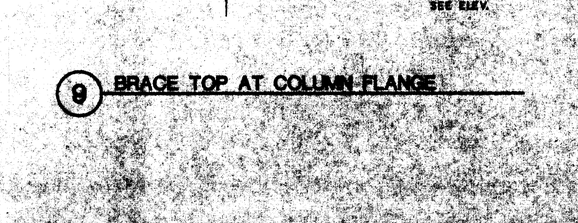
5 BEAM TO COLUMN FLANGE



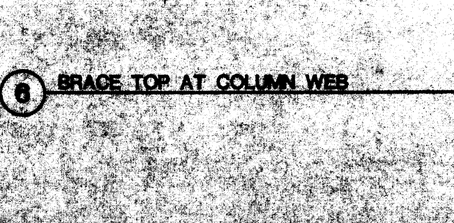
(BOLT DIAMETER & PLATE THICKNESS VARIES SEE PLAN VIEW FOR SIZES)

2 COLUMN BASE PLATE

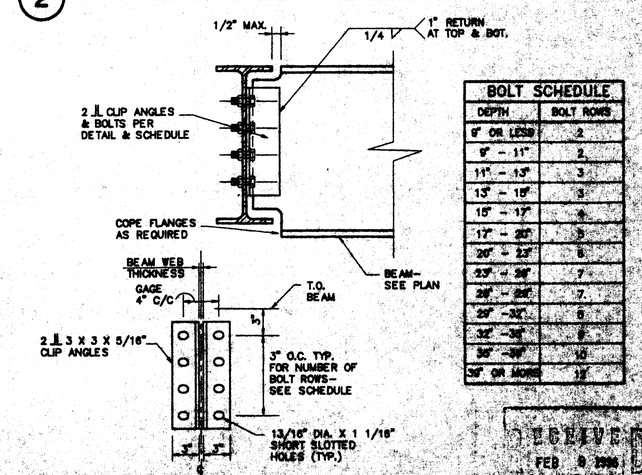
12



9 BRACE TOP AT COLUMN FLANGE



6 BRACE TOP AT COLUMN WEB



BOLT SCHEDULE	
DEPTH	BOLT ROWS
9" OR LESS	2
9" – 11"	2
11" – 13"	3
13" – 15"	3
15" – 17"	4
17" – 20"	5
20" – 23"	6
23" – 26"	7
26" – 29"	7
29" – 32"	8
32" – 35"	9
35" – 38"	10
38" OR MORE	11*

3 BEAM TO BEAM CONN.

RECEIVED
FEB 9 1996
PM

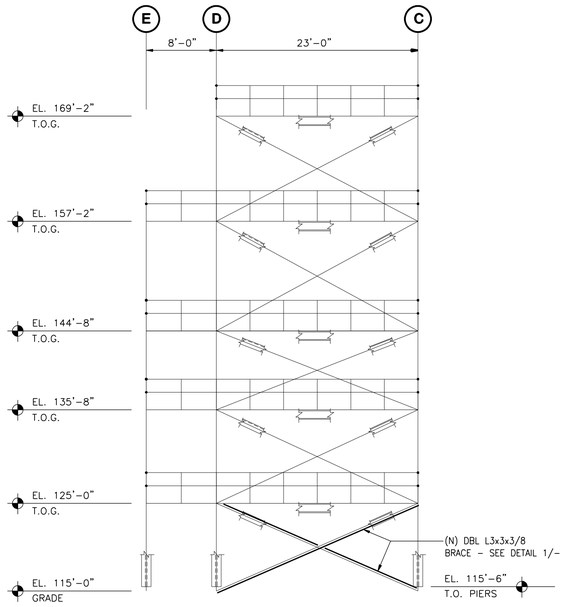
FEB 12 1996
CHAVOND-BARRY

FEB -9 1996

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CONSULTING ENGINEERS

FENNER-NICHOLS CARBON REACTIVATION FURNACE
TYPICAL DETAILS

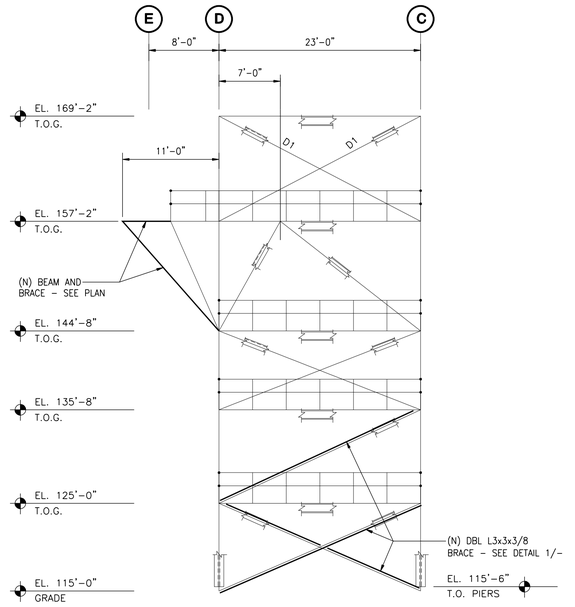
S1



EXISTING ELEV. ALONG GRID (4)

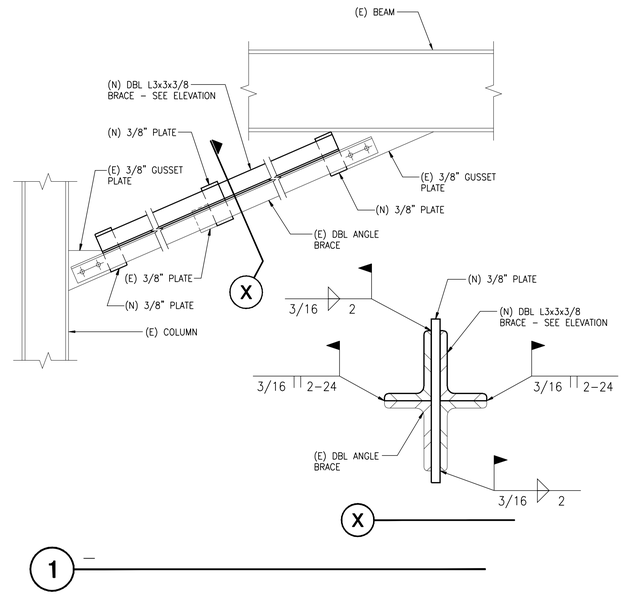
(LOOKING EAST) SCALE: 1/8"=1'-0"

NOTE: CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO FABRICATION AND ERECTION



EXISTING - ELEV. ALONG GRID (6)

(LOOKING EAST) SCALE: 1/8"=1'-0"



REVISIONS

1	-

A.V.SCHWAN & ASSOC., Inc.
CONSULTING ENGINEERS
4700 E. THOMAS ROAD, STE. 100
PHOENIX, ARIZONA 85018
(602) 265-4331 522-1788 (FAX)

CARBON REACTIVATION FURNACE

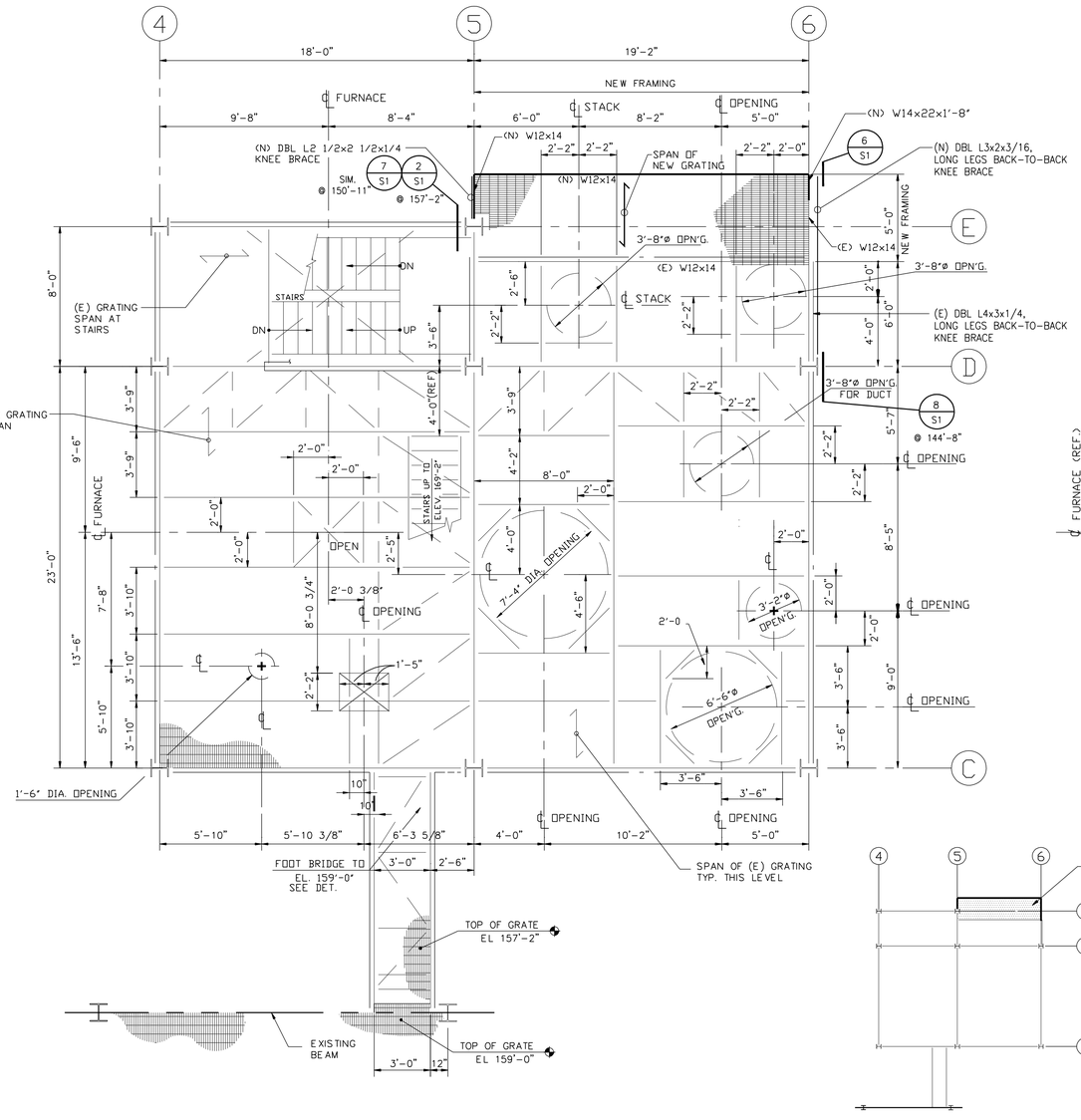
STEEL BRACING ELEVATIONS

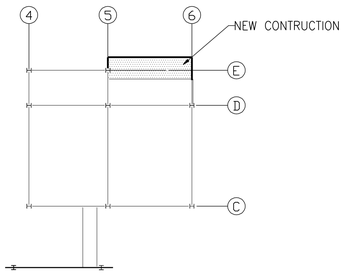
US FILTER WESTATES
P.O. BOX 3308
2523 MUTAHAR STREET
PARKER, AZ 85344

JOB NO.:	5094
DRAWN:	AKT
DESIGNED:	JG
APPROVED:	SAS
DATE:	8/28/02

SHEET TITLE:
BRACING ELEVATIONS

SHEET NUMBER:
S3





KEY PLAN

ELEV. 157'-2"

FRAMING PLAN AT T.O.G. EL 157'-2"

T.O.S. AT −1 1/4" U.N.O.

1/4"=1'-0"

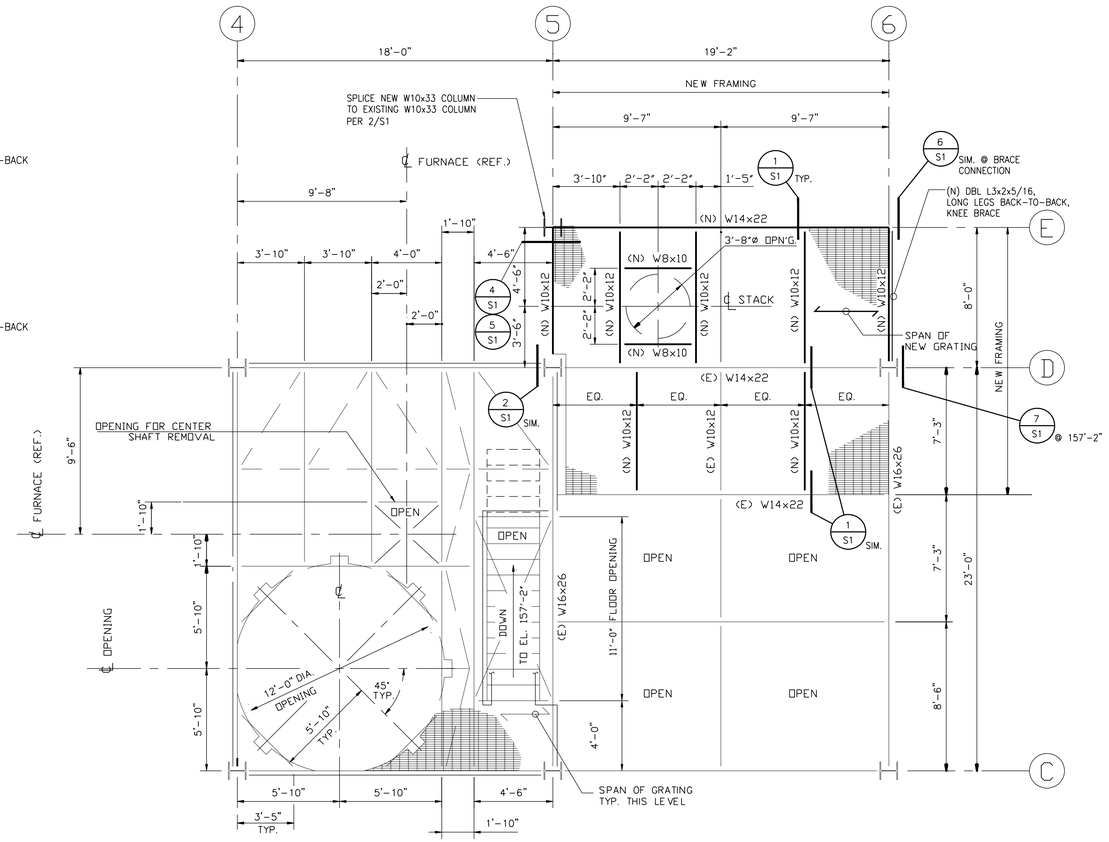
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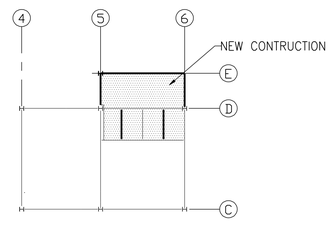
STRUCTURAL STEEL:

1. ALL GRATING TO BE RECTANGULAR STL. 1 1/4" X 3/16" X 1 3/16" O.C. BEARING BARS.
2. ALL OPENINGS IN GRATING SHALL BE BANDED.

PAINTING:

1. PRIOR TO APPLICATION OF ANY COATINGS, STEEL PARTS SHALL BE SANDBLASTED TO SSPC-6, COMMERCIAL BLAST CLEANING.
2. IMMEDIATELY THEREAFTER PARTS SHALL BE GIVEN (1) PRIME COAT OF VALSPER CORP. EPOXY PRIMER NO. 13F62, SHOP APPLIED, TO PREVENT RUST.
3. AN INTERMEDIATE COAT OF VALSPER CORP. HI-BUILD OPOXY 89 SERIES SHALL BE APPLIED AFTER PRIMER HAS DRYED FOR 24 HOURS. TINT COATING TP APPROXIMATE COLOR OF FINISH COAT.
4. ONE (1) FINISH COAT OF VALSPAR CORP. URETHANE ENAMEL V40 SERIES SHALL BE FIELD APPLIED AFTER ERECTION OF PARTS. COLOR SHALL BE IN ACCORDANCE WITH COLOR CODE AS APPROVED BY OWNER.





KEY PLAN

ELEV. 169'-2"

FRAMING PLAN AT T.O.G. EL 169'-2"

T.O.S. AT −1 1/4" U.N.O.

1/4"=1'-0"

NOTE: CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO FABRICATION AND ERECTION

REVISIONS	
1	-

A.V.SCHWAN & ASSOC., Inc.
CONSULTING ENGINEERS
4700 E. THOMAS ROAD, STE. 100
PHOENIX, ARIZONA 85018
(602) 265-4331 522-1788 (FAX)

CARBON REACTIVATION FURNACE
STEEL FRAMING PLANS
AT EL. 157'-2" & 169'-2"
US FILTER WESTATES
P.O. BOX 3308
2523 MUTAHAR STREET
PARKER, AZ 86344

JOB NO.:	5094
DRAWN:	AKT
DESIGNED:	JG
APPROVED:	SAS
DATE:	8/28/02

SHEET TITLE: **FRAMING PLAN**

SHEET NUMBER: **S2**

GENERAL STRUCTURAL NOTES

I. DESIGN CRITERIA

A. BUILDING CODE:

1. CITY OF PARKER : UNIFORM BUILDING CODE, 1994

B. LOADINGS:

1. TYPICAL FLOOR LIVE LOAD = 100 PSF
2. SEISMIC - CITY OF PHOENIX, "Z" FACTOR = 0.25
3. WIND LOAD - 100 MPH ZONE - EXPOSURE C
4. SEISMIC ZONE 3: Z=0.30

II. MATERIALS:

A. STRUCTURAL AND MISCELLANEOUS STEEL:

1. MATERIAL PROPERTIES:

a. TO BE ASTM A 36 UNLESS NOTED OTHERWISE.
b. ALL STEEL TO BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH A.I.S.C. SPECIFICATIONS, LATEST ADOPTION.

2. WELDING: FOR STRUCTURAL STEEL TO BE IN ACCORDANCE WITH A.W.S. REQUIREMENTS FOR E70XX ELECTRODES.

3. BOLTS:
a. ALL BOLTS TO BE 3/4" DIAMETER ASTM A 325-N T.C. UNLESS NOTED OTHERWISE.

III. EXECUTION:

A. GENERAL:

1. STRUCTURAL NOTES SHALL BE USED ALONG WITH THE SPECIFICATIONS. WHERE THE STRUCTURAL NOTES, DRAWINGS OR SPECIFICATIONS DISAGREE, THE CONTRACTOR MAY REQUEST A CLARIFI-

CATION DURING THE BIDDING PERIOD. OTHERWISE THE MORE STRINGENT REQUIREMENTS SHALL CONTROL.

2. PROVIDE ALL TEMPORARY BRACING, SHORING, GUYING OR OTHER MEANS TO AVOID EXCESSIVE STRESSES AND TO HOLD STRUCTURAL ELEMENTS IN PLACE DURING CONSTRUCTION. ESTABLISH AND VERIFY ALL OPENINGS AND INSERTS FOR MECHANICAL, ELECTRICAL AND PLUMBING WITH THE APPROPRIATE TRADES, DRAWINGS AND SUBCONTRACTORS PRIOR TO CONSTRUCTION.

3. STRUCTURAL DETAILS: DETAILS ARE APPLICABLE WHERE INDICATED BY SECTION CUT, BY NOTE OR BY DETAIL TITLE. PROVIDE SIMILAR DETAILS AT SIMILAR CONDITIONS UNLESS NOTED OTHERWISE. THE CONTRACTOR MAY REQUEST A CLARIFI-

CATION DURING THE BIDDING PERIOD OTHERWISE THE MORE STRINGENT REQUIREMENTS SHALL CONTROL.

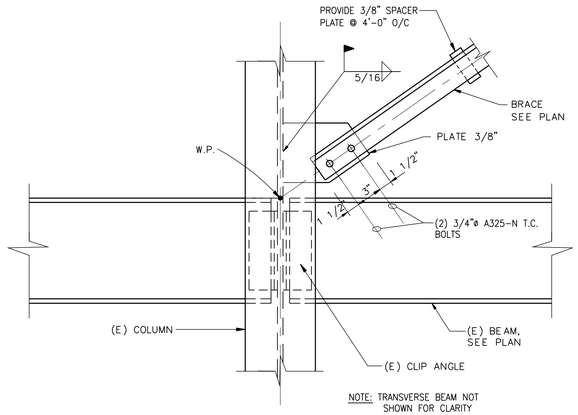
4. EXISTING CONDITIONS: CONTRACTOR SHALL VERIFY IN THE FIELD ALL DIMENSIONS AND CONDITIONS OF THE EXISTING STRUCTURE PRIOR TO BEGINNING ANY PERTINENT WORK. NOTIFY THE ARCHITECT/ENGINEER OF ANY DISCREPANCIES BETWEEN THE DRAWINGS AND ACTUAL CONDITIONS.

5. DEMOLITION:

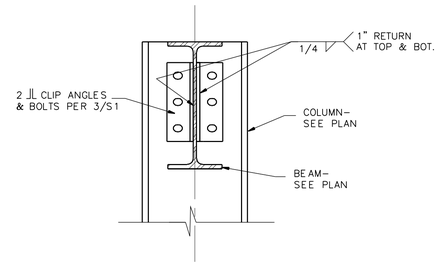
a. CONTRACTOR SHALL VERIFY IN THE FIELD ALL EXISTING CONDITIONS. ANY DISCREPANCIES BETWEEN THE DRAWINGS AND THE ACTUAL FIELD CONDITIONS SHALL BE REPORTED TO THE ARCHITECT/ENGINEER PRIOR TO CONTINUING ANY WORK.

b. CONTRACTOR SHALL EXERCISE EXTREME CARE DURING DEMOLITION TO AVOID DAMAGING THOSE PORTIONS OF THE STRUCTURE TO REMAIN. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER IMMEDIATELY OF ANY DAMAGE TO THE STRUCTURE TO REMAIN.

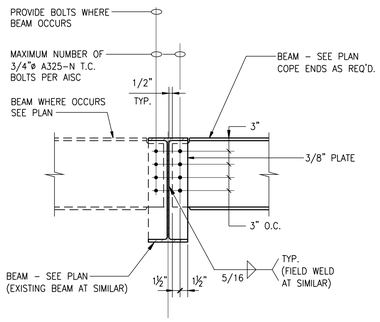
c. ALL METHODS USED SHALL BE CAREFULLY PLANNED AND SHALL BE APPROPRIATE TO THE WORK TO BE DONE. THE EXISTING STRUCTURE TO REMAIN SHALL NOT BE SUBJECTED TO ANY SUDDEN OR EXCESSIVE FORCES WHICH MIGHT ADVERSELY AFFECT THE INTEGRITY OF THE STRUCTURE.



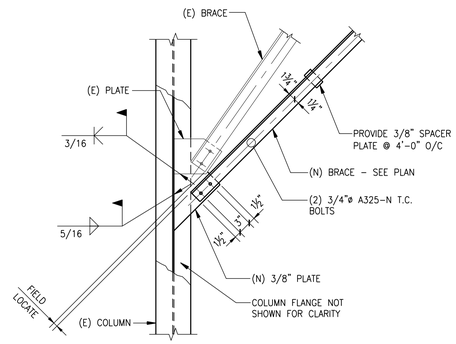
7 BRACE BOT. AT COLUMN WEB



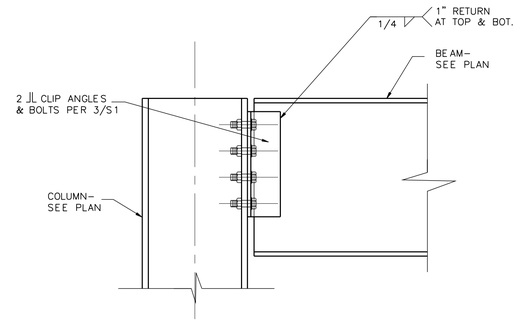
4 BEAM TO COLUMN WEB



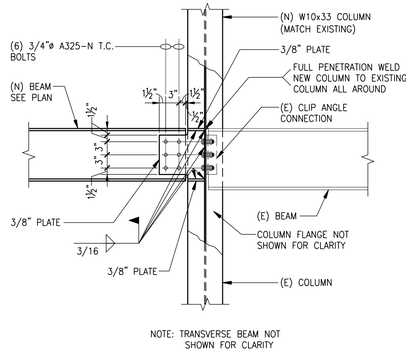
1 —



8 BRACE BOT. AT COLUMN FLANGE

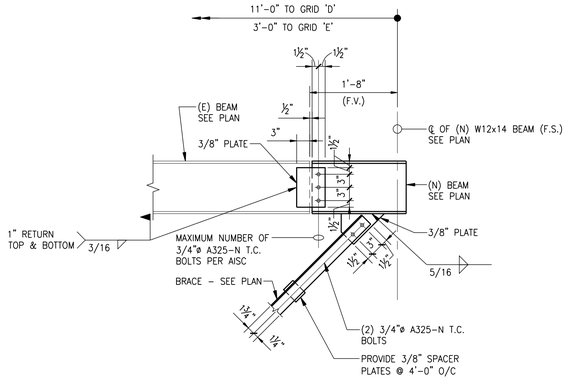


5 BEAM TO COLUMN FLANGE

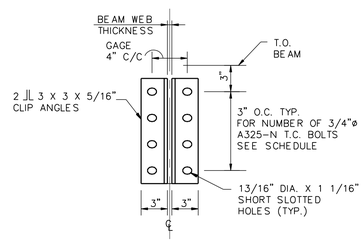


NOTE: TRANSVERSE BEAM NOT SHOWN FOR CLARITY

2 —



6 BRACE TOP AT COLUMN WEB



BOLT SCHEDULE	
DEPTH	BOLT ROWS
9" - 11"	2
11" - 13"	3
13" - 15"	3

3 TYPICAL CLIP-ANGLE CONNECTION

REVISIONS	
1	-

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CONSULTING ENGINEERS
4700 E. THOMAS ROAD, STE. 100
PHOENIX, ARIZONA 85018
(602) 265-4331 522-1788 (FAX)

CARBON REACTIVATION FURNACE
TYPICAL DETAILS

US FILTER WESTATES
P.O. BOX 3308
2523 MUTAHAR STREET
PARKER, AZ 85344

JOB NO.:	5094
DRAWN:	AKT
DESIGNED:	JG
APPROVED:	SAS
DATE:	8/28/02

SHEET TITLE: TYPICAL DETAILS

SHEET NUMBER: S1

Exhibit B - Design Standards

Structural Calculations for T-18

Rev	Date	Description
0	2/9/07	Orig

prepared by:

John F. Bradley, S.E.

Arizona Registered Structural Engineer

Lic. #31856 Atascadero, California

		JOB NO.	1601794
		SHT 1 OF	28
		DATE	2/9/2007
FOR	Siemens Water Treatment Tech. Corp.	DES. BY	JFB
DESCRIPTION	Double Wall SS304 Carbon Filter Tank	REV	0

STRUCTURAL CALCULATIONS FOR

Siemens Water Treatment Tech. Corp.

Double Wall SS304 Carbon Filter Tank

10.67 ft Dia x 7.5 ft Cylindrical Shell Ht x 9.25 ft Tall Cone Bottom

6,400 Gallons

ELEVATED CONE BOTTOM w/ FLAT ROOF

REVISION 0

Dated February 09, 2007

(Original Calc Package)

LOCATED AT

Parker, Arizona



Vessel Manufactured By:

Modern Custom Fabrication

2421 E. California Avenue

Fresno, CA 93721

Ph (559) 264-4741, Fax (559) 237-3413

THESE CALCULATIONS HAVE BEEN PREPARED FOR AND ARE THE PROPERTY OF MODERN CUSTOM FABRICATION (MCF).
THEY MAY CONTAIN INFORMATION DESCRIBING TECHNOLOGY OWNED BY MCF AND DEEMED TO BE COMMERCIALLY SENSITIVE. THEY ARE ONLY TO BE USED IN CONNECTION WITH PERFORMANCE OF WORK BY MCF AND ARE TO BE SAFEGUARDED AGAINST BOTH DELIBERATE AND INADVERTENT DISCLOSURE TO ANY THIRD PARTY.
REPRODUCTION IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN WORK BY MCF IS EXPRESSLY FORBIDDEN.

Modern Custom Fabrication, Inc.
Fresno, California
By: John F. Bradley, S.E.
February 9, 2007

Customer: Siemens Water Technologies Corp.
Location: Parker, Arizona
Double Wall SS304 Carbon Filter Tank
AWWA D100-05, IBC 2003

Table of Contents

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I	Design Summary	3
II	Design Criteria & Sketch	4
III	Cylindrical Shell	5
IV	Cone Bottom & Compression Ring	7
V	Wind Design	11
VI	Seismic Design	14
VII	Stiffened Roof	20
VIII	Anchor Support Ring	22
IX	Reinforcement of Shell Penetrations	26
X	Lift Lugs	27
XI	Support Structure Design Loads	28

Modern Custom Fabrication, Inc.
Fresno, California
By: John F. Bradley, S.E.
February 9, 2007

Customer: Siemens Water Technologies Corp.
Location: Parker, Arizona
Double Wall SS304 Carbon Filter Tank
AWWA D100-05, IBC 2003

Design Summary

Product Stored:	Spent Activated Carbon Slurry
Specific Gravity:	1.50
Max Temperature:	150° F
Design Pressure:	Atmospheric
Design Codes:	1) AWWA D100-05 2) IBC 2003 for Wind & Seismic
Wind Design:	IBC 2003 & AWWA: Basic Wind Speed = 90 mph (3-second gust), Exposure C, I_w = 1.15
Seismic Design:	IBC 2003 & AWWA: S_S = 0.23g, S_1 = 0.15g, I_e = 1.5, Site Class D

Description

This tank is a double-wall cylindrical upper tank with a double-wall conical bottom for use inside a water treatment plant near Parker, Arizona. Product is spent activated carbon slurry, i.e. a mix of granular carbon material and water. Material used for the tank construction is SS304 stainless steel. Inner shell is separated from outer shell by (10) evenly spaced bent plate channel spacers @ 1 3/8" tall. These spacers are attached to outside of inner shell. Both inner and outer shells are 1/4" plate.

Design Criteria

Specific gravity of slurry mix is provided by customer at 1.50 (conservative). Tank is designed for atmospheric pressure (no internal pressure of vacuum) and ambient temperature. Design codes specified for this tank are AWWA D100-05 and IBC 2003. There are no American codes that specifically address all components for elevated cone bottom tanks, so other codes & design procedures will be used as appropriate (e.g. API 620 for the cone bottom & compression girder). Allowable steel stresses are taken per AWWA D100-05. Wind and seismic loads are calculated both per AWWA and IBC, and governing cases are used for design. Load combinations are taken per IBC 2003. Seismic design values above are governing values from those provided by customer and those from USGS website for Parker, AZ.

Design Methodology

The Inner tank shell is the normal pressure boundary; the outer tank is used for leak containment. Under normal loading, inner tank transfers loads to the outer tank at discreet locations of spacers. In event of leak in inner tank, space between the two tanks may fill up, subjecting the outer shell to uniform product pressure. Tank load is supported at a continuous anchor ring about 4'-3" up from cone-cylinder junction.

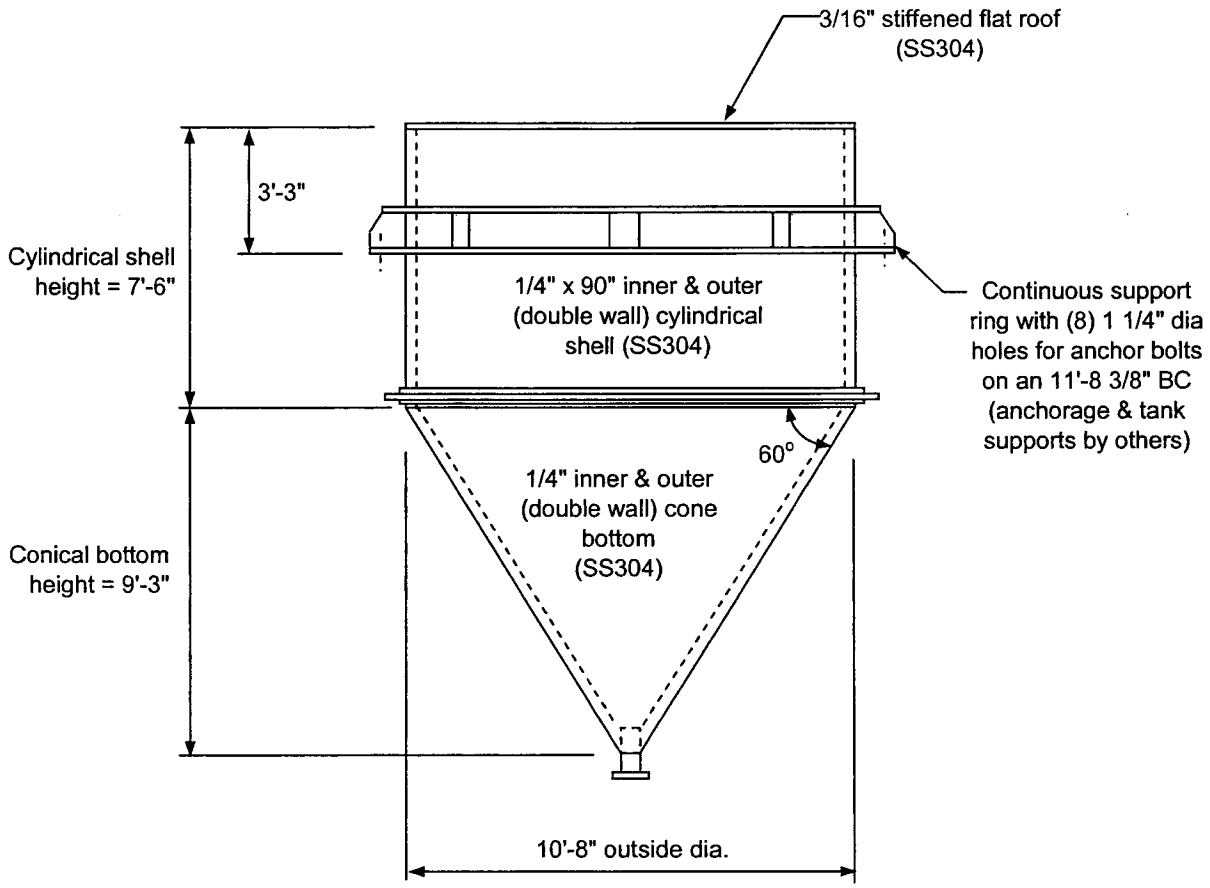
Support structure and anchorage/attachment to supports are by others and are not included in these calculations. It is assumed that wind pressure can act on entire tank shell. For lateral load calculations, it is assumed that tank is a pendulum-type structure rigidly supported at anchor bolt circle. For seismic & wind OTM calculations, lateral resisting loads due to structure & contents above the anchor bolt circle are conservatively ignored. Design loads at anchorage locations for use by others to design tank support structure are provided as the last sheet in this calculation package.

Modern Custom Fabrication, Inc.
Fresno, California
By: John F. Bradley, S.E.
February 9, 2007

Customer: Siemens Water Technologies Corp.
Location: Parker, Arizona
Double Wall SS304 Carbon Filter Tank
AWWA D100-05, IBC 2003

Design Criteria & Sketch

Product Stored:	Spent Activated Carbon Slurry
Specific Gravity:	1.50
Max Temperature:	200° F
Design Pressure:	Atmospheric
Design Codes:	1) AWWA D100-05 2) IBC 2003 for Wind & Seismic
Wind Design:	IBC 2003 & AWWA: Basic Wind Speed = 90 mph (3-second gust), Exposure C, I_w = 1.15
Seismic Design:	IBC 2003 & AWWA: S_S = 0.23g, S_1 = 0.15g, I_e = 1.5, Site Class D



Weights: Empty Vessel = W_{empty} =	14.0	k
Product (full to top of outer tank) =	88.5	k
Tank + full product = W_{full} =	102.5	k
Outside Shell Diameter = Do =	128	in
Cylindrical Shell Thickness (inner & outer) = t_c =	0.25	in
Conical Bottom Thickness (inner & outer) = t_b =	0.25	in
Internal pressure =	0	psig
Internal vacuum =	0	psig

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Hydrostatic Design of Cylindrical Shell

Required shell plate thickness: (Per AWWA D100)

$t = [2.6HDG]/(sE) + CA$

Where: H = Height of liquid from top capacity level to bottom of shell course (= "Design Depth" below)
D = 10.7 ft (tank dia)
G = 1.50 (specific gravity tank contents)
s = 15000 psi
E = 0.85 (joint efficiency)
CA = 0 in

Factored hoop stress force = 42 pli/ft = 2.6DG = Hydrostatic hoop force in lbs/inch of shell circumference per ft of product depth

DESIGN FOR STATIC PRODUCT - ONE FOOT METHOD

	Ring No.	Ring Ht (in)	Material	Allowable Stress = sE (psi)	Design Depth (ft)	Design Pt Elevation (ft)	Hoop Force @ Des. Pt. (pli)	Min t req'd [incl. c.a.] (in)	Thickness Used (in)	Thk Status	Material Status
Top	1	90.0	SS304	12750	7.50	7.50	270	0.0245	0.25	OK	OK

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Location: Parker, Arizona
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AWWA D100-05, IBC 2003

Check Cylindrical Shell for Radial Load @ Channel Spacers

Analysis of Bracket Load on Cylindrical Tank

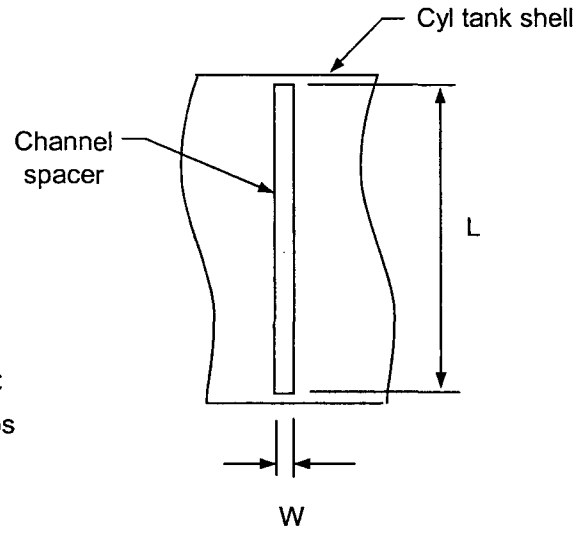
(Check radial thrust on outer shell due to load from inner shell concentrated @ channel spacer)

Tank Shell - Material & Dimensions

Tank Radius (R) =	64	in
Shell Thickness (t) =	0.250	in
Longitudinal Stress (S_L) =	50	psi
Hoop Stress (S_H) =	400	psi
Allowable Stress (S_m) =	12750	psi
Yield Stress (F_y) =	30000	psi
Alowable Stress Increase (k)=	1.00	
Tensile Stress =	75000	psi

Shell Bracket - Dimensions & Loads

Bracket Width (W) =	3.0	in
Bracket Length (L) =	86.0	in
Longitudinal Moment (M) =	0	in-lbs
Radial Load (Q) =	6270	lbs (Wt of 1/10th Vol of Cyl)



Allowable Loads

Max. allowable loading limiting longitudinal stress to $0.75F_y$:

$M_1 = (0.035WkF_yt^2)[6+6\beta L+(\beta L)^2] =$ 184087 in-lbs

$Q_1 = (0.208WkF_yt^2\beta)(2+\beta L) =$ 11136 lbs

Where: $\beta = 1.285/(Rt)^{1/2} =$ 0.3213

Max. allowable loading limiting circumferential stress to $0.75F_y$:

$M_2 = (0.063WkF_yt^2)[6+6\beta L+(\beta L)^2] =$ 331356 in-lbs

$Q_2 = (0.379WkFyt^2\beta)(2+\beta L) =$ 20291 lbs

Unity Checks

1) $M/M_1 + Q/Q_1 =$ 0.563 **< 1.0 OK!**

2) $M/M_2 + Q/Q_2 =$ 0.309 **< 1.0 OK!**

3) $(M/M_1 + Q/Q_1)(0.75F_y)(k) + S_L =$ 12719 **(psi) < 3 Sm OK!**

4) $(M/M_1)(0.75F_y)(k) + S_L =$ 50 **(psi) < 1.5 k Sm OK!**

5) $(M/M_2 + Q/Q_2)(0.75F_y)(k) + S_L =$ 7353 **(psi) < 3 Sm OK!**

6) $(M/M_2)(0.75F_y)(k) + S_L =$ 400 **(psi) < 1.5 k Sm OK!**

Where:

3 Sm = 38250 (psi) but not greater than 75000 (psi)
1.5 k Sm = 19125 (psi)

Therefore Outer Shell is OK for Radial Load Concentrated @ Channel Spacer

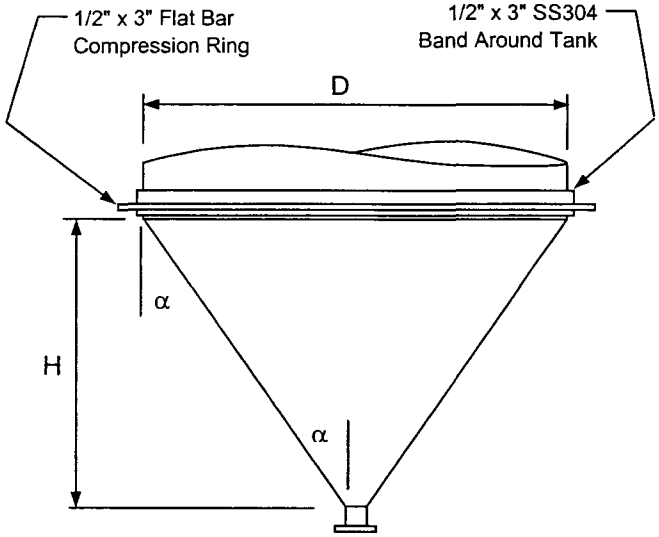
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February 9, 2007

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Double Wall SS304 Carbon Filter Tank
AWWA D100-05, IBC 2003

Cone Bottom & Compression Ring

Materials & Geometry

Cone Top Diameter (D) =	10.67 ft
Cone Height (H) =	9.25 ft
Cone Material =	SS304
Water depth above top of cone =	7.50 ft
Specific Gravity of contents =	1.50
Cone plate thickness = t_c =	0.250 in
Corrosion allowance (cone) = c_c =	0.000 in
Cylindrical shell thickness = t_s =	0.250 in
Corrosion allowance (shell) = c_s =	0.000 in



Allowable Stress (ref AWWA D100)

Allowable Stress (s) =	15,000 psi
Joint Efficiency (E) =	0.85
Reduced Allowable Stress (sE) =	12,750 psi

Actual Stresses (per API 620 Sect. 5.10.2.5)

Longitudinal Force = $T_1 = (R_s/2\cos\alpha)[P+W/A_t]$ =	267 lbs/in	
Hoop Force = $T_2 = (PR_s/\cos\alpha)$ =	360 lbs/in	
Where: R_3 = shell radius =	64.00 in	
α =	0.524 rad	
P =	4.88 psi	
W =	30190 lbs	(weight of cone & contents)
A_t =	12868 sq in	

Longitudinal stress = 1067 psi < Reduced Allowable Stress -- OK
Hoop Stress = 1441 psi < Reduced Allowable Stress -- OK

Compression Ring @ Cone to Shell Junction (per API 620 Sect. 5.12.4.2)
(This analysis assumes uniform inward radial load & compression around compression ring.)

Contributing length of shell = $w_s = 0.6[R_s(t_s-c_s)]^{0.5}$ =	2.40 in	
Contributing length of bottom cone = $w_c = 0.6[R_c(t_c-c_c)]^{0.5}$ =	2.58 in	
Where: R_s =	64.0 in	
R_c =	73.9 in	
Total circumferential force = $Q = T_2w_c + T_{2s}w_s - T_1R_s\sin\alpha$ =	-6860 lbs	(compression)
Where: T_{2s} =	312 lbs/in	
Required area of compression ring region = Q/(sE) =	0.54 sq in	
Actual area provided = $A_c = w_s(t_s-c_s)+w_c(t_c-c_c)+A_{comp\ band\ \&\ girder}$ =	4.24 sq in	

Area of compression girder is adequate

Req'd moment of inertia of compression girder = $3QR^2/4E$ =	0.77 in4	
Actual moment of inertia of comp ring region =	6.21 in4	

Moment of Inertia of compression girder is adequate

Required projection of compression girder = $0.015R_s$ =	0.96 in	(per API 620 Sect. 5.12.5.1)
Actual horz projection of compression ring region =	5.04 in	(horz proj of cone bottom + 1/2" thk ring)

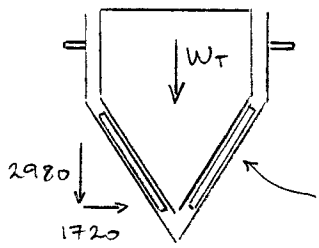
Projection of compression girder is adequate

COMPRESSION RING @ CONE-TO-SHELL JUNCTION

LOAD PATH: WEIGHT OF INNER TANK AND CONTENTS PASSES INTO THE OUTER BOTTOM CONE AT THE POINTS OF THE SPACERS BETWEEN THE TWO CONES. THEN THE LOAD IS CARRIED UP THROUGH THE OUTER TANK SHELL TO THE ANCHORAGE SUPPORT RING.

THIS CREATES DISCREET INWARD RADIAL THRUST LOADS ON THE OUTER TANK COMPRESSION RING AT EACH OF THE (10) SPACER LOCATIONS IN THE BOTTOM CONE.

CHECK COMPRESSION RING FOR THESE (10) EQUAL RADIAL LOADS EQUALLY SPACED



WT OF FULL INNER TANK SITS ON SPACERS. LOAD IS TRANSFERRED TO BOTTOM CONE AT THESE (10) LOCATIONS

W_T = WEIGHT OF TANK AND CONTENTS ≈ 100k

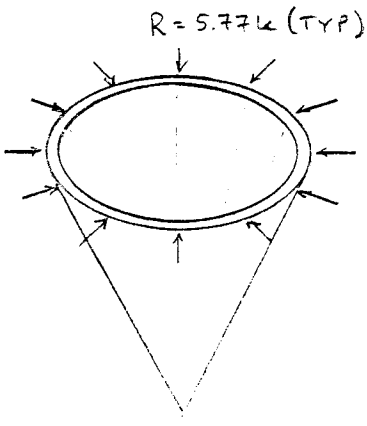
LOAD TRAVELLING UP THROUGH OUTER SHELL $= \frac{100k}{\pi(10.67')}$

$= 2980$ plf

RADIAL THRUST INWARD $= (2980\text{ plf})(\tan 30°) = 1720$ plf

RADIAL LOAD ON COMPRESSION RING @ EACH OF (10) POINTS:

$$R = \frac{(1720\text{ plf})(\pi)(10.67')}{10} = 5.77k$$

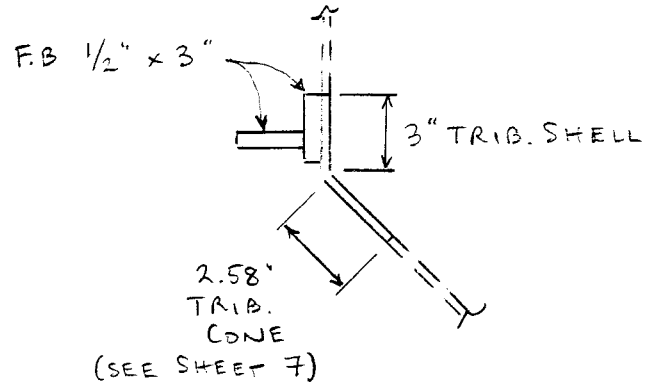


CHECK COMPRESSION RING FOR THIS LOAD CASE

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

COMPRESSION RING, CONT.

COMPRESSION RING REGION



SECTION PROPS (SEE NEXT SHEET)
$A = 4.395\ in^2$
$S = 2.15\ in^3$

THRUST/AXIAL STRESS IN RING:

$$f_a = \frac{T}{A} = \frac{(5.77k)(1.539)}{4.395\ in^2}$$

$= 2.0$ ksi (COMPRESSION)

BENDING (AT POINT OF LOAD):

$$f_b = \frac{M}{S} = \frac{(0.0527)(5.77)(64")}{2.15\ in^3} = 9.1\ ksi$$

FOR CLASS 1 STEEL:

F_a = ALLOWABLE AXIAL STRESS = 15 ksi (AWWA D100-05 TABLE 6)

F_b = ALLOWABLE BENDING STRESS = 15 ksi (AWWA D100-05 TABLE 7)

UNITY CHECK: $\frac{f_a}{F_a} + \frac{f_b}{F_b} = \frac{2.0}{15} + \frac{9.1}{15} = 0.74 < 1.0$

✓ OK

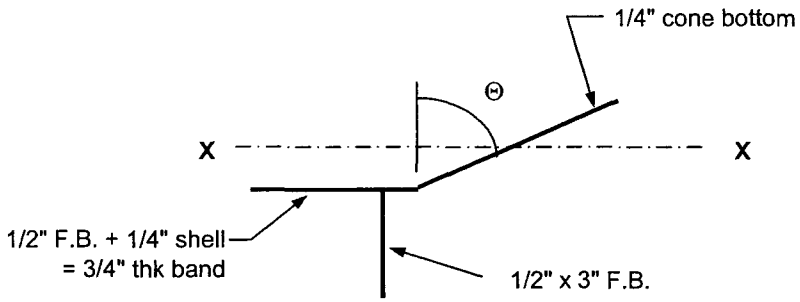
∴ COMPRESSION GIRDER IS OK FOR AXIAL LOAD & BENDING DUE TO INWARD THRUST LOADS CONCENTRATED AT SPACERS

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Double Wall SS304 Carbon Filter Tank
AWWA D100-05, IBC 2003

Section Properties of Cone-to-Shell Junction

Section Properties of Cone-to-Shell Junction



	Previous Area	b	d	Theta	a	h	AREA	Y	AY	AY^2	Io
1	-	0.5	3	0	0.000	3.000	1.500	1.500	2.25	3.4	1.13
2	1	3	0.75	0	3.000	3.750	2.250	3.375	7.59	25.6	0.11
3	2	0.25	2.58	60	3.750	5.040	0.645	4.395	2.83	12.5	0.09
4	3	0	0	0	5.040	5.040	0.000	5.040	0.00	0.0	0.00
5	4	0	0	0	5.040	5.040	0.000	5.040	0.00	0.0	0.00
6	5	0	0	0	5.040	5.040	0.000	5.040	0.00	0.0	0.00
7	6	0	0	0	5.040	5.040	0.000	5.040	0.00	0.0	0.00
8	7	0	0	0	5.040	5.040	0.000	5.040	0.00	0.0	0.00
9	8	0	0	0	5.040	5.040	0.000	5.040	0.00	0.0	0.00
10	9	0	0	0	5.040	5.040	0.000	5.040	0.00	0.0	0.00
					TOTAL AREA =		4.395 in^2		12.68		42.8

TOTAL DEPTH =	5.040 in
CENTROID (Y) = SUM(AY)/SUM(AREA) =	2.885 in
C1 = Y =	2.885 in
C2 = DEPTH - Ybar =	2.155 in
I(total)= [SUM(AY^2)+SUM(Io)]-(AREA)(Y)^2 =	6.211 in^4
Sx1 = I/C1 =	2.15 in^3
Sx2 = I/C2 =	2.88 in^3
Radius of gyration (r) = (I/A)^1/2=	1.189 in

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AWWA D100-05, IBC 2003

IBC Wind Design

IBC 2003 Wind Design Pressures

Per ASCE 7-02 Sect. 6.5.13

Lateral Wind Pressure: $P_{LAT} = q_z G C_f =$ **13.4 psf**

Where: Velocity Pressure (q_z) = $0.00256 K_z K_{zt} K_d V^2 I$ = 21.29 psf

Height to Top of Structure (h) =	20.0	ft
Basic Wind Speed (V) =	90	mph (3-second gust)
Exposure =	C	
Importance Factor (I) =	1.15	
K_z =	0.94	
$K_{zt} = (1+K_1K_2K_3)^2$ =	1.0	
K_1 =	1.0	
K_2 =	1.0	
K_3 =	1.0	
K_d =	0.95	

Gust Effect Factor (G) = $0.925[(1+1.7g_Q I_z Q)/(1+1.7g_v I_z)]$ = 0.896

g_Q =	3.4	
g_v =	3.4	
$I_z = c(33/z)^{1/6}$ =	0.228	
c =	0.2	
z =	15	
$Q = [1/(1+0.63[(B+h)/L_z]^{0.63})]^{1/2}$ =	0.945	
B =	10.67	ft (tank dia)
$L_z = l(z/33)^{\varepsilon}$ =	427	
l =	500	
ε =	0.2	

Force Coefficient (C_f) = 0.70 for round tanks

Governing design lateral wind pressure:

	P_w	
Calculated using AWWA D100-05	18.0 psf	(see next sheet)
Calculated per IBC 2003	13.4 psf	

Governing wind pressure: **18.0 psf**

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AWWA Wind Design

(ref AWWA D100-05 Sect. 3.1.4)

AWWA D100-05 Wind Design Pressures

Lateral Wind on Tank Shell:

Maximum of: q_zGC_{fs} = 15.6 psf
or $30C_{fs}$ = 18.0 psf
∴ Shell Wind Load (P_{ws}) = 18.0 psf

Lateral Wind on Cone Bottom:

Maximum of: q_zGC_{fr} = 13.0 psf
or $30C_{fr}$ = 15.0 psf
∴ Cone Bottom Wind Load (P_{wr}) = 15.0 psf

Where:

$q_z = 0.00256K_zIV^2$ = 26.0 psf
K_z = 1.09
I = 1.15
V = 90 mph (3-sec gust)
G = 1.0
C_{fs} = 0.6
C_{fr} = 0.5

Wind Base Shear: $V_{wind} = 1.1[P_{ws}DH_{cyl} + P_{wr}A_{xr}]$ = **2.4 k**

Where: A_{xr} = 49.3 ft²

Wind OTM:

Overturning moment from wind pressure (conservatively ignore portion of tank above anchor bolt circle):

$M_w = 1.1[(P_{ws})(DH'^2_{cyl}/2) + (P_{wr})(A_{xr})(1/3H_{cone}+H'_{cyl})]$ = **7.9 ft-k**

Where: P_{ws} = 18.0 psf
P_{wr} = 15.0 psf
D = 10.7 ft
H_{cyl} = 7.5 ft
H'_{cyl} = 4.3 ft
H_{cone} = 9.3 ft

Wind OTM stability check: $M_{resist} = (0.6)(W_t)(D/2)$ = **45 ft-k, Therefore tank is stable**

Where: W_t = 14.0 k (empty tank weight less uplift due to int. pressure)

Required shell plate thickness to avoid intermediate shell girders:

$t = (P_whD^{1.5}/10625000)^{0.4}$

h = Distance from top of shell down to point under consideration

h' = Max height of unstiff. shell = $(10625000t_{avg})/[(P_w)(D/t_{avg})^{1.5}]$ = 529.5 ft
Actual Unstiffened Shell Height = 7.50 ft
Shell is stable up to max wind speed of = 847 mph (sustained load)
or = 1017 mph (3-second gust)

Average thickness checks below are corroded thicknesses; thk req'd & thk used are uncorroded thicknesses.
"Min t req'd" takes into account excess material available in rings above to resist wind loads.

Required Shell Thickness

Ring No.	Ring Ht (inches)	Design Point from Top of Tank (h, ft)	Allow. Ht w/o Wind Girder (ft)	Req'd Avg. Thickness this Ht (in)	Actual Avg Thk this Ht (in)	Min t req'd [incl. c.a.] (in)	Thickness Used (in)
1	90	7.50	529.5	0.0455	0.2500	0.0455	0.2500

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Natural Period of Vessel

Natural Period of Vessel:

The natural period of vibration for the vessel structure is calculated as though vessel is a pendulum fixed at anchor bolt circle (distributed mass cantilever). The mass is assumed to be distributed uniformly from the top to the bottom of the vessel. This is a conservative assumption and actual vessel period is shorter than that calculated below. These calculations consider vessel only and do not address support structure.

$\delta = wL^4/(8EI) =$ 0.00344 in
Where: $w =$ 100 lbs/in (virtual load)
$L =$ 201 in
$I = \pi(D_o^4-D_i^4)/64 =$ 204684 in^4

$K = w/\delta =$ 29093 lbs/in/in

$m = (Wempty/L)/g =$ 0.1812 $lb\text{-}in/sec^2$

Circular natural frequency $= \omega = (K/m)^{1/2} =$ 400.70 sec^{-1}

Natural frequency $= f = \omega/2\pi =$ 63.77 Hz

Vessel natural period $= T = 1/f =$ 0.0157 sec

Since period is less than 0.06 sec, Rigid Structure formula ASCE 7-02 Eq. 9.14.5.2 applies

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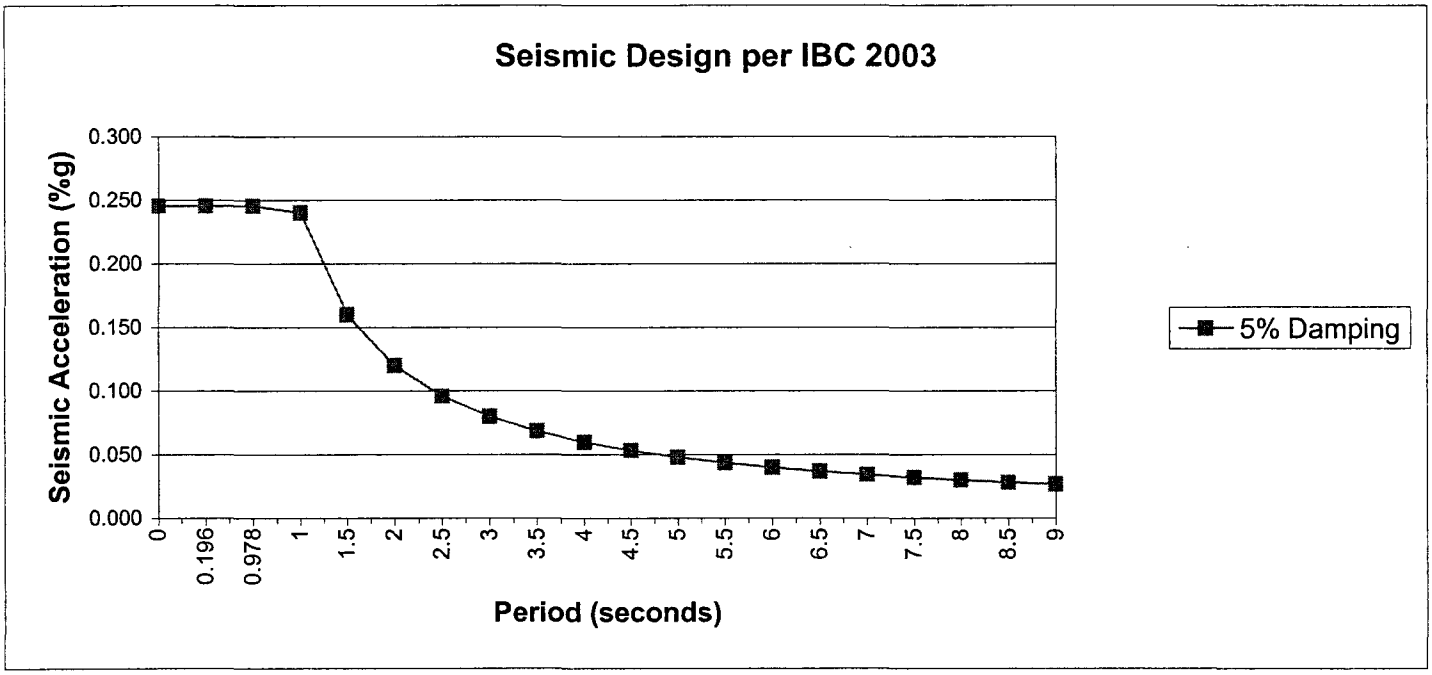
Customer: Siemens Water Technologies Corp.
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Double Wall SS304 Carbon Filter Tank
AWWA D100-05, IBC 2003

IBC 2003 Seismic Design Acceleration Values

Spent Activated Carbon Slurry Vessel for Siemens Water Treatment Tech. Corp.
(General Procedure)

IBC 2003 Seismic Design Parameters

S_S =	0.230 g	S_{DS} =	0.245 g
S_1 =	0.150 g	S_{D1} =	0.240 g
F_a =	1.60	T_O =	0.196 sec
F_v =	2.40	T_S =	0.978 sec
S_{MS} =	0.368 g		S_{DS} S_{D1}
S_{M1} =	0.360 g	5% damped	0.245 0.240



Tank Periods
Impulsive (T_i) = 0.0157 sec

IBC/ASCE 7-02 Design Values: $A_i = C_s = S_{DS}I_e/R$ = 0.123 g

Where: Reduction Factor for Inelastic Design (R) = 3 (at anchorage of tank-to-supports)
I_e = 1.5 (Seismic Use Group III)

Check min. req'd seismic impulsive accelerations:

ASCE 7-02 Eq 9.14.5.1-1:	$A_{i(min)} = 0.14S_{DS}I_e$ =	0.052 g	< 0.123g -- Does not govern
Eq 9.14.5.1-2:	$A_{i(min)} = 0.8S_1I_e/R$ =	0.060 g	< 0.123g -- Does not govern
Eq 9.14.5.2:	$A_{i(min)} = 0.3S_{DS}I_e$ =	0.110 g	< 0.123g -- Does not govern

IBC 2003: Ai (impulsive acceleration) = 0.123 g

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IBC 2003 Seismic Design Loads

IBC 2003 Seismic Design Loads: (ref ASCE 7-02 Sect. 9.14 - Nonbuilding Structures)

Base Shear: (ref ASCE 7-02 Eq. 9.5.5.2-1)

Vessel full:	$V_{s\text{-full}} = A_i W_{full}/1.4 =$	**9.0 k**	GOVERNS
	Where: Design acceleration = $A_i = C_s =$	0.123 g	
	$W_{full} =$	102.5 k	
Vessel empty:	$V_{s\text{-empty}} = A_i W_{empty}/1.4 =$	**1.2 k**	
	$W_{empty} =$	14.0 k	

Overturning Moments:

Vessel full:	$M_{s\text{-full}} = (V_{s\text{-full}})(CG_{full}) =$	**35.9 ft-k**	GOVERNS
	Where: $CG_{full} =$	4.0 ft	
Vessel empty:	$M_{s\text{-empty}} = (V_{s\text{-empty}})(CG_{empty}) =$	**6.9 ft-k**	
	Where: $CG_{empty} =$	5.6 ft	

Notes:
Centers of gravity are distances below bolt circle.
Roof, product, and shell above bolt circle are conservatively ignored in CG calculations.

Resisting Moments:

Vessel full:	$M_{resist} = (0.6)(W_{full})(D/2) =$	**328 ft-k,**	**Therefore tank is stable**
Vessel empty:	$M_{resist} = (0.6)(W_{empty})(D/2) =$	**45 ft-k,**	**Therefore tank is stable**

Modern Custom Fabrication, Inc.
Fresno, California
By: John F. Bradley, S.E.
February 9, 2007

Customer: Siemens Water Technologies Corp.
Location: Parker, Arizona
Double Wall SS304 Carbon Filter Tank
AWWA D100-05, IBC 2003

AWWA D100-05 Seismic Design Values

Tank Data	D =	10.7 ft	Tank diameter
	H =	16.75 ft	Design liquid level

General Procedure Response Spectrum

S_S =	0.230 g	Max spectral response acceleration @ short periods (from USGS maps)
S_1 =	0.150 g	Max spectral response acceleration @ 1-sec period (from USGS maps)
Site Class =	D	Use Site Class D unless specified otherwise
Seismic Use Group:	3	Use Seismic Use Group III unless specified otherwise
I_E =	1.50	Seismic importance factor

Is tank anchored? y

R_i =	3.0	Response modification factor, impulsive component
R_c =	1.5	Response modification factor, convective component

F_a =	1.6	Acceleration-based site coefficient
F_v =	2.2	Velocity-based site coefficient
$S_{MS} = F_aS_S$ =	0.368 g	Max spectral acceleration @ short periods, adjusted for site class effects
$S_{M1} = F_vS_1$ =	0.330 g	Max spectral response acceleration @ 1-sec period, adjusted for site class effects
$S_{DS} = US_{MS}$ =	0.245 g	Design response spectra value for short periods
$S_{D1} = US_{M1}$ =	0.220 g	Design response spectra value for 1-sec period
U =	0.667	Scaling factor

Design response value for impulsive components:

T_i =	N/A (< T_S)	Natural period of structure
T_L =	8.00	Region-dependent transition period for longer period ground motion (check maps)
$T_S = S_{D1}/S_{DS}$ =	0.897 s	
$S_{ai} = S_{DS}$ =	0.245 g	

Design response value for convective components:

T_c = 1.885 s = $2\pi\{D/[(3.68g)(\tanh(3.68H/D)]\}^{1/2}$

Design Accelerations

$A_i = S_{ai}I_E/1.4R_i$ =	**0.088 g**	
$A_v = 0.14S_{DS}$ =	**0.034 g**	ref Sect 13.3.3.6 or 13.5.4.3
$A_{i(min)} = 0.36S_1I_E/R_i$ =	0.027 g	OK -- Doesn't govern

Freeboard — Group 3

$T_c < T_L$, d =	**0.93 ft**	= $0.5DA_f$ REQUIRED
$A_f = KS_{D1}/T_c$ =	0.175 g	Convective design acceleration for sloshing
K =	1.5	

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AWWA D100-05 Seismic Design Loads

Seismic Base Shear (Shear at anchor bolt circle)

$V_{actual} = (A_i)(W_s+W_r+W_f+W_T) =$ **9.0 k**

Where: $A_i =$ 0.088 g (impulsive acceleration)
$W_s =$ 7.0 k (wt of double tank shell)
$W_r =$ 2.6 k (wt of tank roof & weir)
$W_f =$ 4.4 k (wt of tank double cone bottom)
$W_T =$ 89 k (wt of tank contents)

Seismic Overturning Moment: (OTM at anchor bolt circle)

Conservatively ignore roof and tank contents above anchor bolt circle.

$M_{actual} = (A_i)(W_sX_s+W_fX_f+W_TX_T) =$ **35.2 ft-k**

Where: $X_s =$ 2.13 ft
$X_f =$ 7.33 ft
$X_T =$ 4.00 ft

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AWWA D100-05, IBC 2003

Shell Tension Due to Wind & Seismic OTM per IBC 2003

(Load Combinations per IBC 2003, Allowable Stresses per AWWA)

Check Tension in Shell: Allowable Stress Design; gov. Load Combinations: 1) D + W
(ref IBC 2003 Sect. 1605.3.1) 2) D + L + 0.7E

Check tank shell for tension due to OTM:
Critical case is at underside of anchor bolt circle due to rocking of tank.

Allowable tensile stress = F_t = 15 ksi x 0.85 x 1.33 = 17.0 ksi for wind & seismic loading
(ref AWWA D100-05, Sect 13.5.4.2.4)

Case 1: Wind OTM on empty tank

$f_{tw} = (W_{tank\text{-}empty})/A + (M_w/S)$ = 0.17 ksi
Where: $A = \pi t(D_o - t_{corr})$ = 100.3 in^2
$S = \pi(D_o^4 - D_{i(corr)}^4)/(32D_o)$ = 3198 in^3
M_w = 7.9 ft-k
$W_{tank\text{-}empty}$ = 14 k

Since actual shell tensile stress < allowable, shell is OK for Case 1

Case 2: Seismic OTM on full tank

$f_{ts} = (W_{tank\text{-}full})/A + (M_{s\text{-}full})/S$ = 1.16 ksi
Where: M_s = 35.9 ft-k
$W_{tank\text{-}full}$ = 102.5 k

Since actual shell tensile stress < allowable, shell is OK for Case 2

Therefore Shell is OK for Tensile Loads due to Wind or Seismic

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February 9, 2007

Customer: Siemens Water Technologies Corp.
Location: Parker, Arizona
Double Wall SS304 Carbon Filter Tank
AWWA D100-05, IBC 2003

Shell Compression Due to Wind & Seismic OTM per IBC 2003

(Loads & Load Combinations per IBC 2003, Allowable Stresses per AWWA D100-05)

Check Compression in Shell: Allowable Stress Design; gov. Load Combinations: 1) D + W
(ref IBC 2003 Sect. 1605.3.1) 2) D + L + 0.7E

Check tank shell for compression due to OTM:

Critical case is at top side of anchor bolt ring due to rocking of tank.

Allowable Stress:

Material = SS304 F_a = 8.65 ksi x 1.33 = 10.38 ksi for A36, wind & seismic loading
(ref AWWA 13.5.4.2.4)

Actual Stresses:

Wind:	$f_{cw} = (W_{upper\ tank})/A + M_w/S$ =	0.089 ksi	**< F_a - Shell is OK**
Seismic:	$f_{cs} = (W_{upper\ tank})/A + M_s/S$ =	0.195 ksi	**< F_a - Shell is OK**
	Where: M_w =	7.9 ft-k	
	M_s =	35.9 ft-k	

Therefore Shell is OK for Wind & Seismic Overturning Compressive Loads

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Customer: Siemens Water Technologies Corp.
Location: Parker, Arizona
Double Wall SS304 Carbon Filter Tank
AWWA D100-05, IBC 2003

Stiffened Roof Design

Roof consists of 3/16" flat plate with L4x4x3/8 angles formed from SS304 plate.
Maximum actual stiffener spacing = 4'-0" o.c. Max allowable spacing = 7'-0" o.c. per AWWA D100-05 Sect. 3.6.1.7.

Roof Live Load (L) =	25	psf
Roof Plate Dead Load (D) =	8.42	psf
Self weight of angle (D) =	10.8	plf
Extra point load at center (P) =	200	lbs (nozzle, hatch, etc)
Length of stiffener (L_{raft}) =	9.25	ft

Allowable Bending Stress

Allowable bending stress (F_b) = **15000 psi** (ref. AWWA D100-05 Table 7, Class 1 material)

Actual Bending Stresses

Case 1: D + L

Allowable Stress Design; gov. Load Combination: 1) D + L (ref IBC 2003 Sect. 1605.3.1)

Maximum bending moment = $w_{(D+L)}L_{raft}^2/8 + PL_{raft}/4$ = 2008 ft-lbs
Where: $w_{(D+L)}$ = 144 plf

Actual bending stress (f_b) = M/S = **4678 psi -- OK**
Where: S = 5.15 in^3 (see sheet following)

Case 2: D + Ponding on Roof (Two 3/4" dia holes are drilled near bottom center sections of L4x4x3/8 rafters to prevent rain accumulation in 4' square center section of roof)

Actual rafter deflection per above loads = 0.072 in
Conservatively assume 1" of water on roof = 5.20 psf
Maximum bending moment = $w_{(D+Ponding)}L_{raft}^2/8 + PL_{raft}/4$ = 1161 ft-lbs
Where: $w_{(D+Ponding)}$ = 65 plf

Actual bending stress (f_b) = M/S = **2705 psi -- OK**

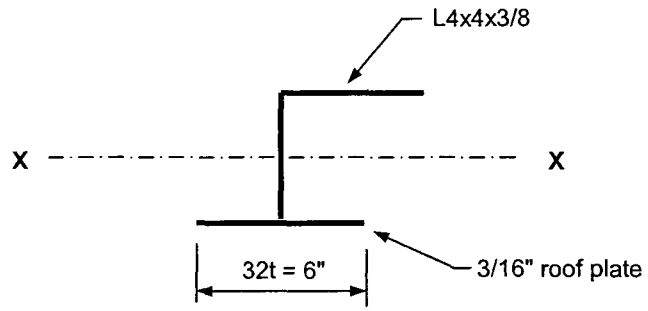
Since actual bending stress is less than allowable, roof & stiffeners are OK

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Section Properties of Composite Roof Stiffener

Section Properties of Stiffened Roof Section



	Previous Area	b	d	Theta	a	h	AREA	Y	AY	AY^2	Io
1	-	6	0.1875	0	0.000	0.188	1.125	0.094	0.11	0.0	0.00
2	1	0.375	3.625	0	0.188	3.813	1.359	2.000	2.72	5.4	1.49
3	2	4	0.375	0	3.813	4.188	1.500	4.000	6.00	24.0	0.02
4	3	0	0	0	4.188	4.188	0.000	4.188	0.00	0.0	0.00
5	4	0	0	0	4.188	4.188	0.000	4.188	0.00	0.0	0.00
6	5	0	0	0	4.188	4.188	0.000	4.188	0.00	0.0	0.00
7	6	0	0	0	4.188	4.188	0.000	4.188	0.00	0.0	0.00
8	7	0	0	0	4.188	4.188	0.000	4.188	0.00	0.0	0.00
9	8	0	0	0	4.188	4.188	0.000	4.188	0.00	0.0	0.00
10	9	0	0	0	4.188	4.188	0.000	4.188	0.00	0.0	0.00
					TOTAL AREA =		3.984 in^2		8.82		31.0

TOTAL DEPTH =	4.188 in
CENTROID (Y) = SUM(AY)/SUM(AREA) =	2.215 in
C1 = Y =	2.215 in
C2 = DEPTH - Ybar =	1.973 in
I(total)= [SUM(AY^2)+SUM(Io)]-(AREA)(Y)^2 =	11.41 in^4
Sx1 = I/C1 =	5.15 in^3
Sx2 = I/C2 =	5.79 in^3
Radius of gyration (r) = (I/A)^1/2=	1.693 in

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February 7, 2007

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Location: Parker, Arizona
Double Wall SS304 Carbon Filter Tank
AWWA D100-05, IBC 2003

Anchor Ring Design

Analysis of Bracket Load on Cylindrical Tank

Case 1: D + L

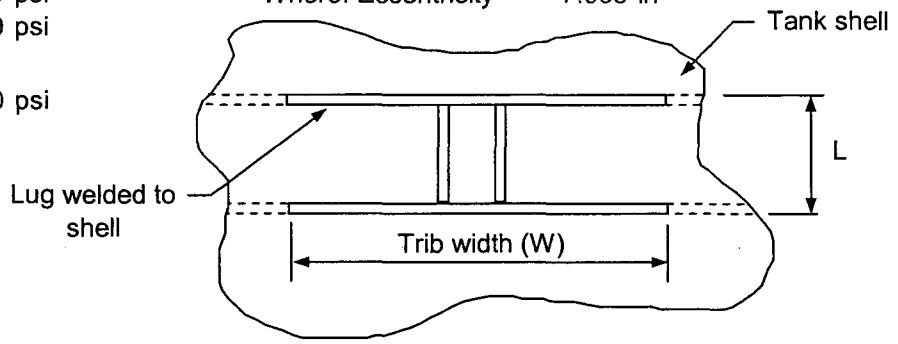
(Consider continuous anchorage ring as eight shell brackets of equivalent tributary width)

Tank Shell - Material & Dimensions

Tank Radius (R) =	64	in
Shell Thickness (t) =	0.250	in
Longitudinal Stress (S_L) =	50	psi
Hoop Stress (S_H) =	400	psi
Allowable Stress (S_m) =	12750	psi
Yield Stress (F_y) =	30000	psi
Alowable Stress Increase (k)=	1.00	
Tensile Stress =	75000	psi

Shell Bracket - Dimensions & Loads

Bracket Width (W) =	50.3	in (= 1/8 tank circ)
Bracket Length (L) =	12.75	in
Longitudinal Moment (M) =	95666	in-lbs = (W_{full})(eccent)/8
Radial Load (Q) =	0	lbs
Where: Eccentricity =	7.563	in



Allowable Loads

Max. allowable loading limiting longitudinal stress to $0.75F_y$:

$M_1 = (0.035WkF_yt^2)[6+6\beta L+(\beta L)^2]$ = 156200 in-lbs

$Q_1 = (0.208WkF_yt^2\beta)(2+\beta L)$ = 38390 lbs

Where: $\beta = 1.285/(Rt)^{1/2}$ = 0.3213

Max. allowable loading limiting circumferential stress to $0.75F_y$:

$M_2 = (0.063WkF_yt^2)[6+6\beta L+(\beta L)^2]$ = 281160 in-lbs

$Q_2 = (0.379WkFyt^2\beta)(2+\beta L)$ = 69951 lbs

Unity Checks

1)	$M/M_1 + Q/Q_1$ =	0.612	**< 1.0 OK!**
2)	$M/M_2 + Q/Q_2$ =	0.340	**< 1.0 OK!**
3)	$(M/M_1 + Q/Q_1)(0.75F_y)(k) + S_L$ =	13830 **(psi)**	**< 3 Sm OK!**
4)	$(M/M_1)(0.75F_y)(k) + S_L$ =	13830 **(psi)**	**< 1.5 k Sm OK!**
5)	$(M/M_2 + Q/Q_2)(0.75F_y)(k) + S_L$ =	8056 **(psi)**	**< 3 Sm OK!**
6)	$(M/M_2)(0.75F_y)(k) + S_L$ =	8056 **(psi)**	**< 1.5 k Sm OK!**

Where:

3 Sm =	38250 (psi)	but not greater than	75000 (psi)
1.5 k Sm =	19125 (psi)		

Therefore Anchor Bracket is OK for Case 1: D + L

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Double Wall SS304 Carbon Filter Tank
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Anchor Ring Design, cont

Analysis of Bracket Load on Cylindrical Tank

Case 2: D + L + 0.7E

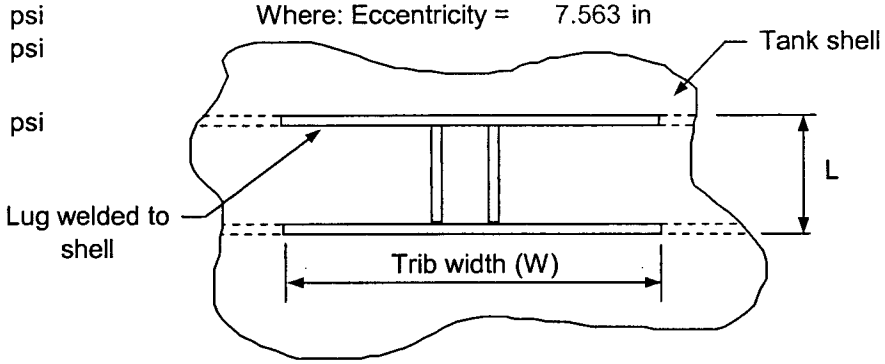
(Consider continuous anchorage ring as eight shell brackets of equivalent tributary width)

Tank Shell - Material & Dimensions

Tank Radius (R) =	64	in
Shell Thickness (t) =	0.250	in
Longitudinal Stress (S_L) =	1200	psi
Hoop Stress (S_H) =	400	psi
Allowable Stress (S_m) =	12750	psi
Yield Stress (F_y) =	30000	psi
Alowable Stress Increase (k)=	1.33	
Tensile Stress =	75000	psi

Shell Bracket - Dimensions & Loads

Bracket Width (W) =	50.3	in (= 1/8 tank circ)
Bracket Length (L) =	12.75	in
Longitudinal Moment (M) =	106666	in-lbs = (D+L+0.7E)(eccent)
Radial Load (Q) =	0	lbs
Where: Eccentricity =	7.563	in



Allowable Loads

Max. allowable loading limiting longitudinal stress to $0.75F_y$:

$M_1 = (0.035WkF_yt^2)[6+6\beta L+(\beta L)^2]$ = 207746 in-lbs

$Q_1 = (0.208WkF_yt^2\beta)(2+\beta L)$ = 51059 lbs

Where: $\beta = 1.285/(Rt)^{1/2}$ = 0.3213

Max. allowable loading limiting circumferential stress to $0.75F_y$:

$M_2 = (0.063WkF_yt^2)[6+6\beta L+(\beta L)^2]$ = 373942 in-lbs

$Q_2 = (0.379WkFyt^2\beta)(2+\beta L)$ = 93035 lbs

Unity Checks

1) $M/M_1 + Q/Q_1$ = 0.513 **< 1.0 OK!**

2) $M/M_2 + Q/Q_2$ = 0.285 **< 1.0 OK!**

3) $(M/M_1 + Q/Q_1)(0.75F_y)(k) + S_L$ = 16565 **(psi) < 3 Sm OK!**

4) $(M/M_1)(0.75F_y)(k) + S_L$ = 16565 **(psi) < 1.5 k Sm OK!**

5) $(M/M_2 + Q/Q_2)(0.75F_y)(k) + S_L$ = 8936 **(psi) < 3 Sm OK!**

6) $(M/M_2)(0.75F_y)(k) + S_L$ = 8936 **(psi) < 1.5 k Sm OK!**

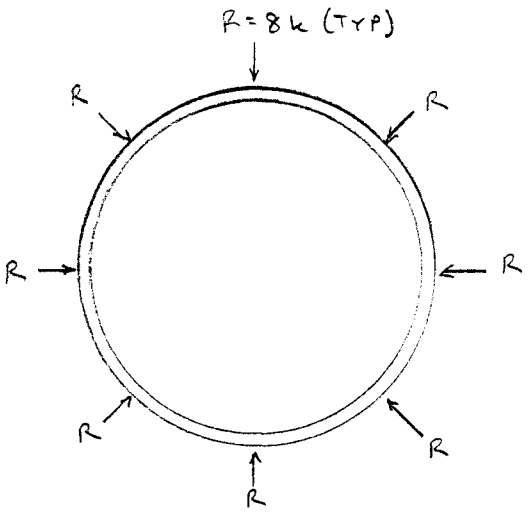
Where:

3 Sm = 38250 (psi) but not greater than 75000 (psi)
1.5 k Sm = 25436 (psi)

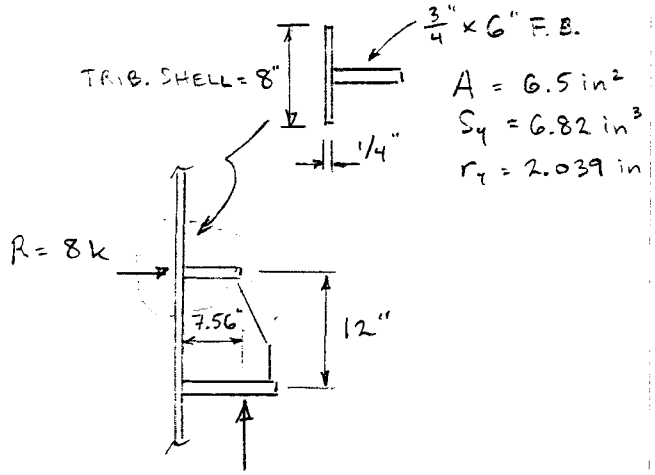
Therefore Anchor Bracket is OK for Case 2: D + L + 0.7E

ANCHOR RING, CONT.

CHECK TOP ℄ AS CONTINUOUS RING GIRDER SUBJECT TO (8) EQUIVALENT RADIAL POINT LOADS.



TOP BAR COMPOSITE SECTION



$P_{D+L} = \frac{102.5}{8} = 12.8k$

[REF. ONLY - SEISMIC CASE DOESN'T GOVERN: $P_{seis} = \frac{4M}{nd} = \frac{4(50.3)}{(8)(11.96')} = 2.1k$

MAX STRESS DUE TO THRUST/AXIAL LOAD = $\frac{R}{A}$

$= \frac{(1.207)(8k)}{6.5\,in^2}$

$= 1.49$ ksi

MAX STRESS DUE TO BENDING (@ PT. OF LOAD) = $\frac{M}{S} = \frac{(0.066)(8k)(64")}{6.82\,in^3}$

$= 4.95$ ksi

ALLOWABLE STRESSES:

$Kl/r = \frac{50.3"}{2.039"} = 25 \longrightarrow F_a = 15$ ksi

$F_b = 15$ ksi (AWWA D100-05 TABLE 7)

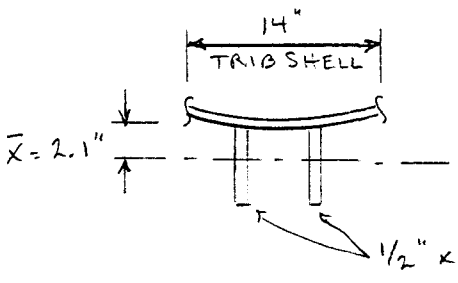
UNITY CHECK:

$\frac{f_a}{F_a} + \frac{f_b}{F_b} = \frac{1.49 + 4.95}{15} = 0.43 < 1.0$ ✓OK

∴ TOP ℄ IS OK FOR BENDING + THRUST DUE 8 EQUAL RADIAL LOADS AT ANCHOR CHAIRS

ANCHOR RING, CONT

CHECK BUCKLING OF GUSSET PL's:



$A_x = 9.5\ in^2$
$S_x = 9.54\ in^3$
$r = 2.04\ in$

$$\text{AXIAL STRESS} = \frac{P}{A} = \frac{12.8k}{9.5\ in^2} = 1.4\ ksi$$

$$\text{BENDING STRESS} = \frac{M}{S_x} = \frac{(12.8k)(7.56" - 2.1")}{9.54\ in^3} = 7.3\ ksi$$

ALLOWABLE STRESSES:

$$\frac{Kl}{r} = \frac{12"}{2.04"} = 6 \longrightarrow F_a = 15\ ksi$$

$F_b = 15\ ksi$ (AWWA D100-05, TABLE 7)

UNITY CHECK:

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} = \frac{1.4 + 7.3}{15} = 0.58 < 1.0 \quad \surd OK$$

∴ GUSSET PLATES IN ANCHOR RING ARE OK

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Customer: Siemens Water Technologies Corp.
Location: Parker, Arizona
Double Wall SS304 Carbon Filter Tank
AWWA D100-05, IBC 2003

Required Reinforcement @ Shell Penetration

Tank		
Tank Inside Diameter =	10.67	ft
Max liquid level in tank =	16.75	ft
Does hydrostatic load govern?	yes	

Shell		
Shell Plate Material =	SS304	
Allowable Stress =	15000	psi
Actual Shell Thickness @ Cutout =	0.25	in
Required Shell Thk @ Base of Ring =	0.025	in
Corrosion Allowance =	0	in

Nozzle			
Nozzle Description =	6" Weir Nozzle		
Type (manway = "M" or pipe = "P"):	p		
Outside Dia of Pipe =	6.625	in	
Nozzle elevation (above tank bott) =	195	in	
Nozzle Material =	SS304		
Allowable Stress =	15000	psi	
Corroded nozzle neck thickness =	0.28	in	Thickness to eliminate repad = 0 "
Design thk (reduced for underruns) =	0.2450	in	
Length of nozzle neck =	9.25	in	
Inside projection =	0	in	
Outside projection =	9	in	Use 0.98 in. = max allowed

Design

Method: Replace cross-sectional cutout area based on gross (g) or required (r) shell thickness? r

Required Shell Plate Area Cutout =	0.16	in^2
Excess shell area available =	1.49	in^2
Nozzle neck area available =	0.60	in^2
Total =	2.10	in^2
Area to be provided by repad =	0.00	

Replace this cutout area with an equal amount of steel In the nozzle neck, excess shell plate, or repad per AWWA (ref AWWA Sect. 3.13).

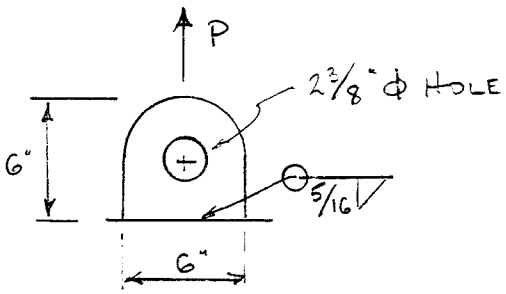
Repad Not Req'd

No Reinforcing Plate Required -- Sufficient Reinforcement Provided in Other Areas

Since nozzles in cone bottom are 4" or less, no additional reinforcing req'd per AWWA D100-05 Section 3.13

Drafting		
Weld of nozzle to shell =	1/4	" (min)

LIFT LUGS (½" PL)



ACTUAL LOAD PER LUG = $\frac{14k}{4}$ = 3.5 k/LUG

DESIGN FOR LIFT w/ FACTOR OF SAFETY = 5.0

LUG

CHECK ACTUAL VS. ASD ALLOWABLE:

$$f_v = \frac{3.5k}{(1/2")(1.81")} = 3.9 \text{ ksi} < F_v = 0.4(30) = 12 \text{ ksi}$$

√OK

CHECK LOAD × F.O.S. VS. YIELD:

$$f_v' = \frac{(3.5k)(5)}{(1/2")(1.81")} = 19.3 \text{ ksi} < F_y = 30 \text{ ksi}$$

√OK

ATTACHMENT WELD

STRESS IN WELD = $\frac{(3.5k)(5)}{(5/16")(0.707)(13")}$ (F.O.S.) = 6.1 ksi √OK

∴ LIFT LUGS & ATTACHMENT WELDS ARE OK. √

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Support Structure Design Loads

Design Criteria:

Tank Outside Diameter =	**10.67**	ft
Maximum Product & Hydrotest Height =	**16.50**	ft
Product Specific Gravity =	**1.50**	
Roof Live Load =	**25**	psf

Shear at Anchor Bolt Circle:

Wind =	**2.4**	k
Seismic =	**9.0**	k

Overturning Moments at Anchor Bolt Circle:

Wind Overturning Design Moment (Tank Empty) =	**7.9**	ft-k
Seismic Overturning Design Moment (Tank Full) =	**35.9**	ft-k

Weights of Tank & Contents:

Weight of Empty Tank =	**14**	k ↓
Total Weight of Product in Full Inner Tank =	**83**	k ↓
Total Weight of Product in Full Inner + Outer Tank =	**89**	k ↓
Total Weight of Tank + Inner Shell Full of Product =	**97**	k ↓
Total Weight of Tank + Inner & Outer Shells Full of Product =	**103**	k ↓
Weight of Water in Tank =	**59**	k ↓

Anchor Bolt Design Loads: **Use (8) Anchor Bolts Around (Design by Others)**

Max Uplift due to Seismic OTM on Full Tank =	**1.7**	k/bolt ↑
Max Uplift due to Wind OTM =	**0.4**	k/bolt ↑
Max Shear due to Seismic Loads =	**1.1**	k/bolt
Max Shear due to Wind Loads =	**0.3**	k/bolt
Tank Dead Load Resisting Uplift =	**1.8**	k/bolt ↓
Tank + Inner Shell Full of Product Load Resisting Seismic Uplift =	**12.1**	k/bolt ↓

Notes:

1) Above loads are unfactored, service level design loads.
2) Weights of tank contents above consider tank as full to top of shell.

Exhibit B - Design Standards

Structural Calculations for T-18 Support Steel

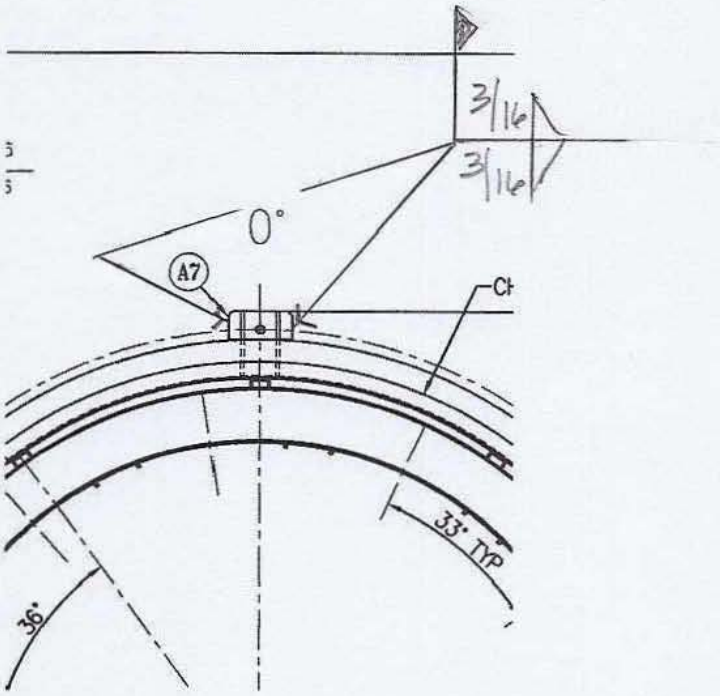
DESIGNED BY CD DATE 2/26/07
CHECKED BY _____ DATE _____

CLIENT: SIEMENS WATER TECHNOLOGIES

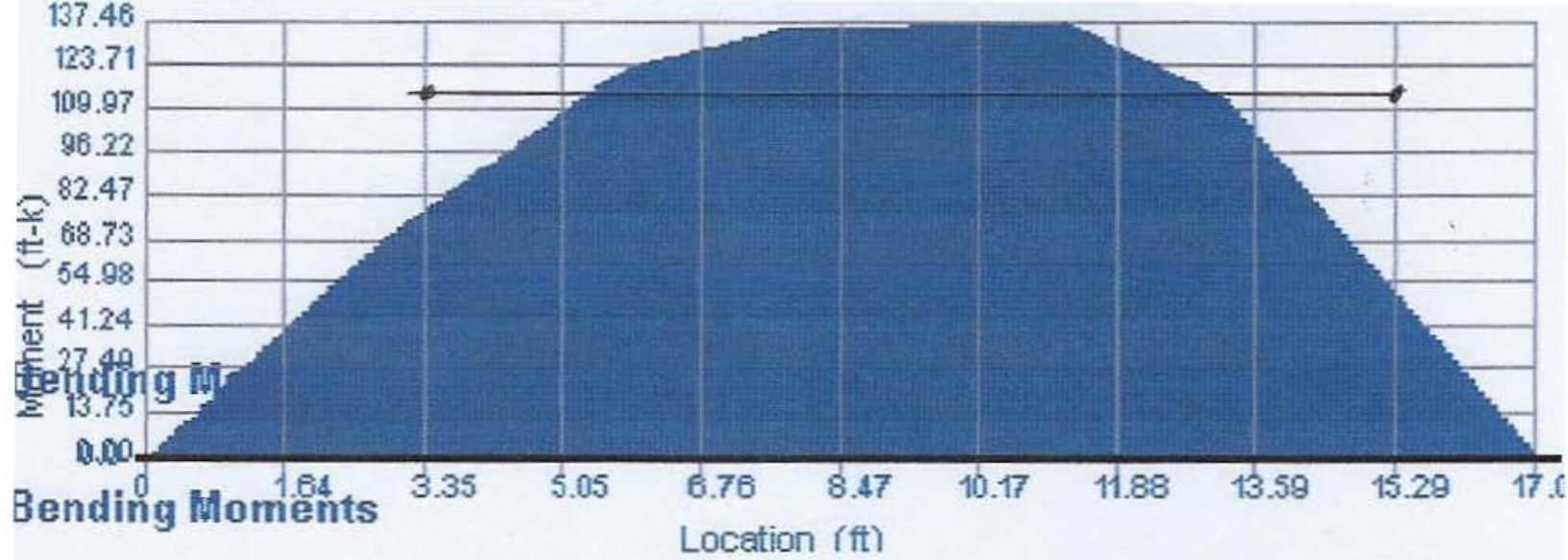
C.D.S.E.

CHARLES J. DOELL, P.E.
CONSULTING STRUCTURAL ENGINEER





PLAN OF TANK LUG



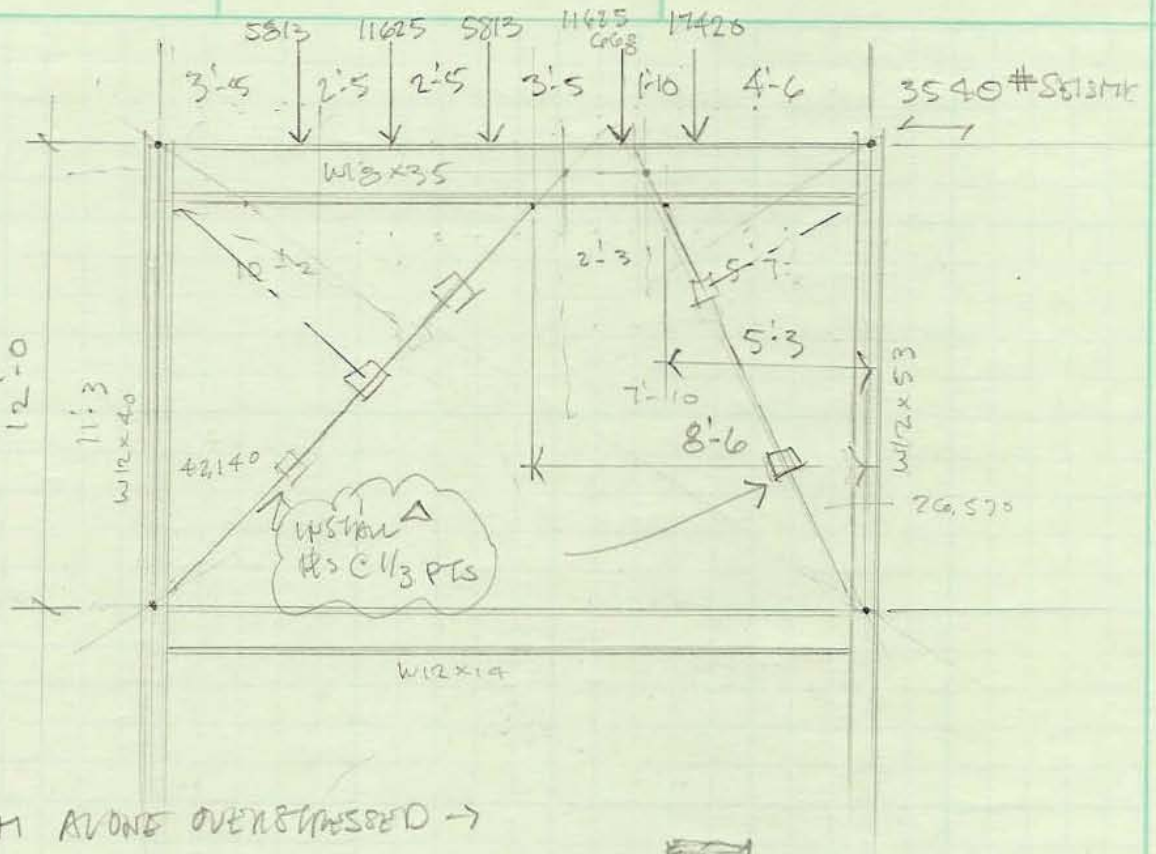
Bending Moments



Beam Shear



BCB
W18×35
L=18'



BEAM ALONE OVERSTRESSED →

$M = 141.7^{k-k}$ 137.5

$M_a = 57.6(2) = 115.2^{k-k}$

$\Delta M = 22.3^{k-k}$

$S = 11.2 = \frac{I}{8.85}$

$I = 98.7 in^4 - 2A(4.5)^2$ $A = 2.44 in^2$

BAR $1\frac{1}{2}$" ϕ × 15' LG CENTER BETW COLUMNS

1) Reinforce Beam with BAR $1\frac{1}{2}$" ϕ

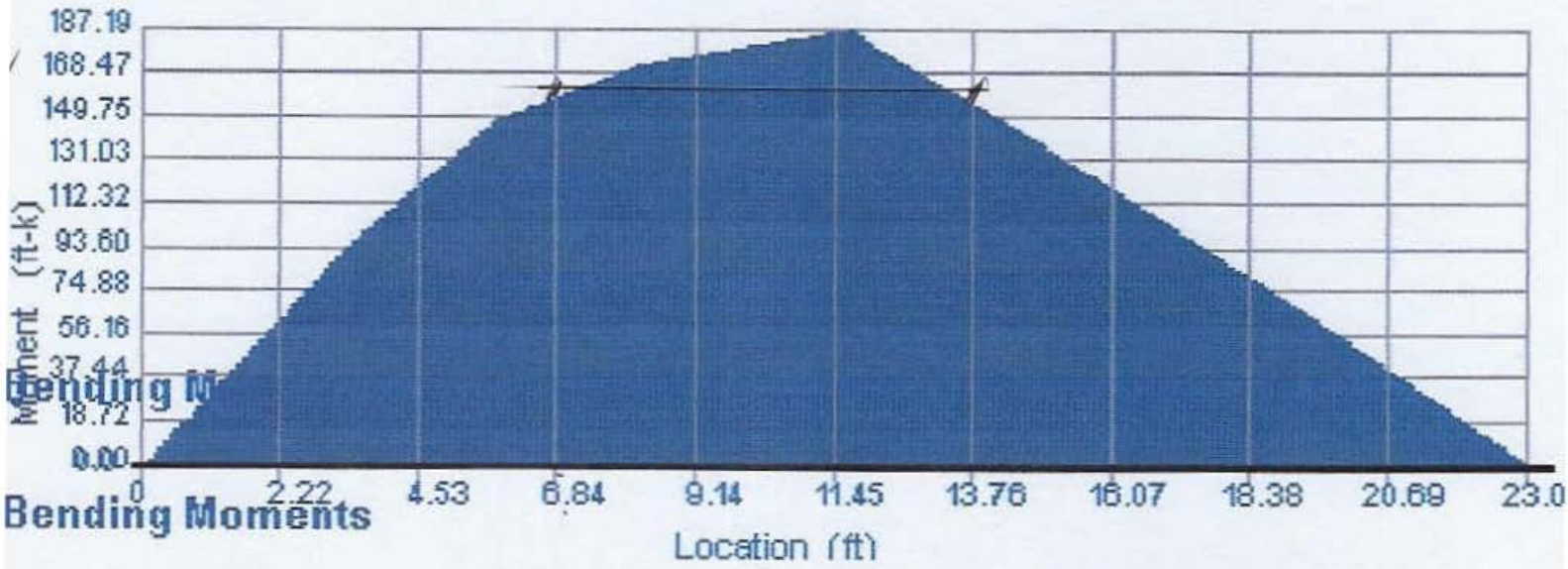
2) STRENGTHEN PURLINS WITH SECONDARY

$I = 510 + 2(2.25)(4.5)^2 = 601 in^4$

$f_b = \frac{137.5(12)\,8.85}{601} = 24.3 ksi$ OK

$f_{b\,BAR} = \frac{137.5(12)(5.25)}{601} = 14.4 ksi$

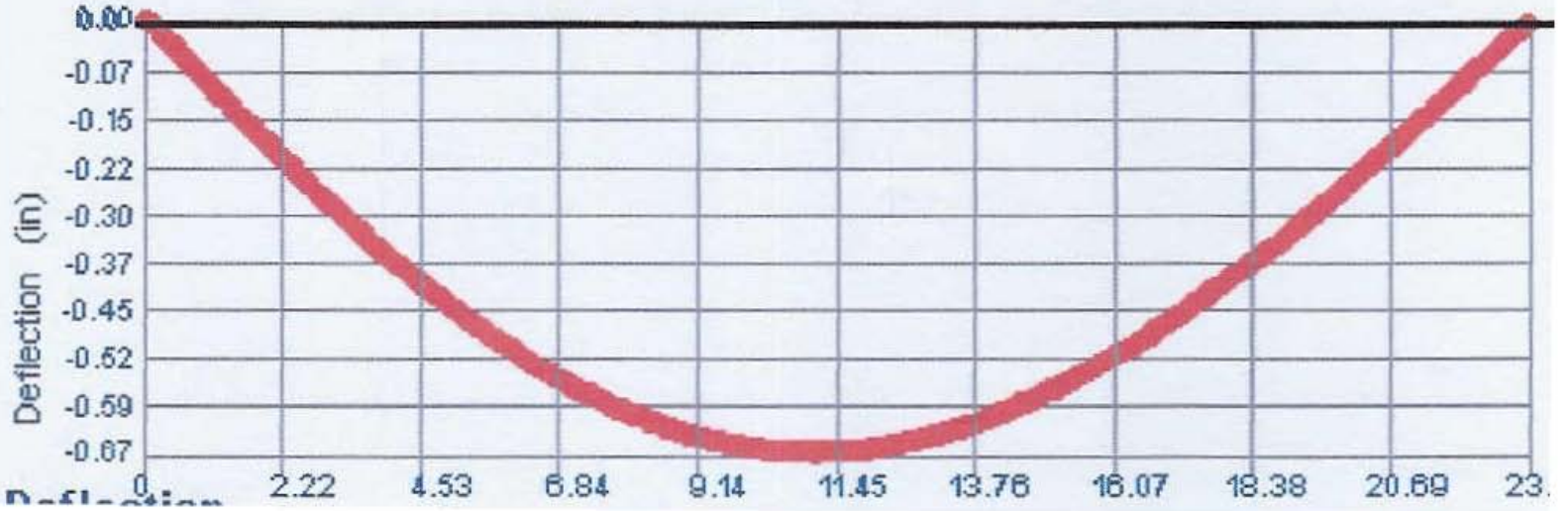
$F = 32.4^{k}$ $/2(.3)14.4 = 4"$ $2(.928)3 = 5.0$ — 6"



Bending Moments



Beam Shear

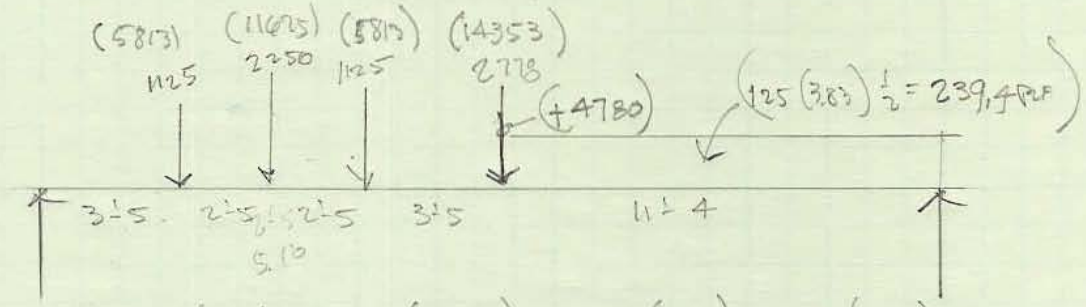


CHECK $M = 25283(11.17) - \frac{125(11.17)^2}{2} - 5813(8.25) - 11626(5.83) - 5813(3.42) = 138996$

$f_b = \frac{138996(12)}{57.6} = 28957 \text{ psi} \gg 24000$

$\therefore$ Reinforce — use WT9×17.5

B13
W21×44
L = 23
S = 81.6



$\Delta R = 2778(11.33) + 1125\left(\frac{14.75}{23}\right) + 2250\left(\frac{17.17}{23}\right) + 1125(19.58)$

$= 4727\#$

$\Delta M = 4727(11.67) - 1125(3.42) - 2250(5.93) - 1125(8.25)$

$= 28918 \text{ in-}\#$

$f_b = \frac{28918(12)}{81.6} = 4253 \text{ psi} \quad (+17.7\%)$



$R_L = 4727\left(\frac{11625}{2250}\right) + \frac{4780(11.33) + 239.4(11.33)5.67}{23}$

$= 24423 + 3023 = 27446\#$

$R_R = 17650\#$

$M = 27446(11.67) - 5813(3.42) - 11625(5.83) - 5813(8.25)$

$= 184,683 \text{ in-}\#$

CHECK $M = 17650(11.33) - 239.4(11.33)^2/2 = 184608$

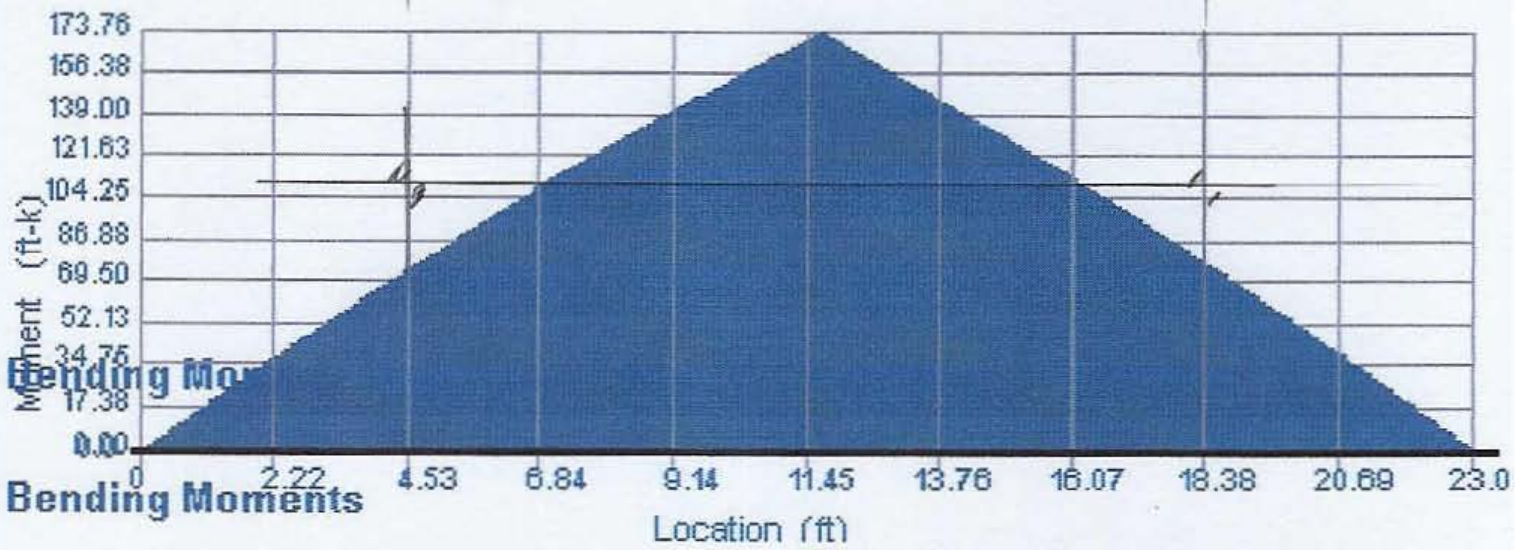
$f_b = \frac{184683(12)}{81.6} = 27148 \text{ psi} \quad (+13\%)$

$< .66F_y \rightarrow F_y = 41133 \text{ psi}$

$\therefore$ REINFORCE PER ABOVE

ADD WT 9 x 17.5 x

B6



Bending Moments

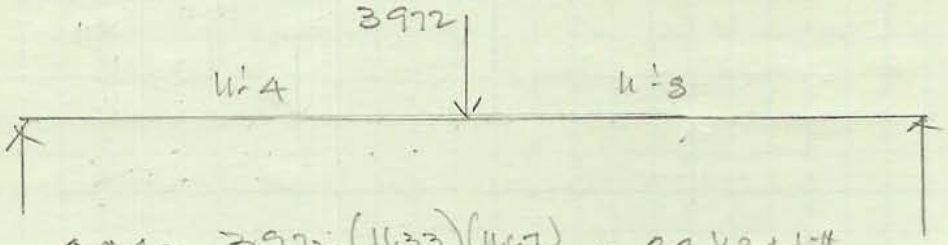


Beam Shear



Deflection

B6
W18x35
L = 23'
S = 57.6



$$\Delta M = \frac{3972(11.33)(11.67)}{23} = 22834'\text{-}\#$$

$$\Delta f_b = \frac{22834(12)}{57.6} = 4757 \text{ psi} \quad (+19.8\%)$$

$$M = \frac{11625}{2250}(22834) + 125\left(\frac{4.5+1.83}{2}\right)23.2$$

118 K TANK + 26.2 LOCAL GRATE

$$+ 125(11.33)\tfrac{1}{2}(13.5)\tfrac{1}{2}\frac{(11.33)(11.67)}{23} = 171{,}700\text{-}\#$$

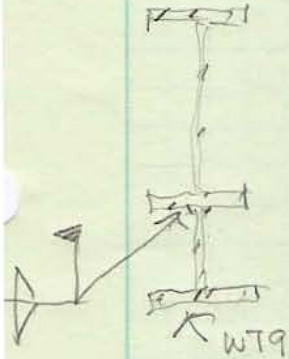
4780

B5 GRATE 27.5

$f_b = 35770$ psi – NG >>> 24000 psi

∴ REINFORCE B-6 x 23'LG

(Add WT 9x17.5 WELDED TO ~~BOTTOM~~ FLANG

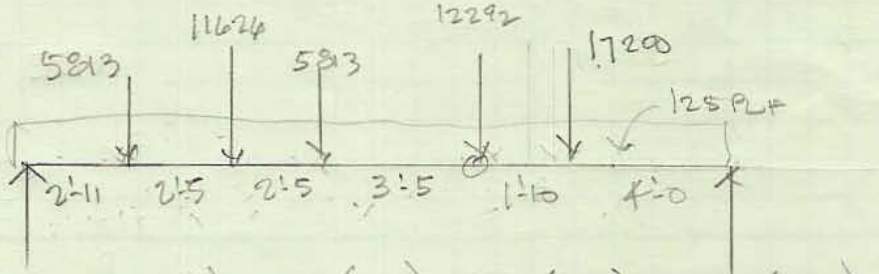


$$\underset{18+9}{I} = \frac{13.5^3}{9^2} I_{W18} = 2.25\, I_{W18} = 1148$$

$$S = \frac{1148}{13.5} = 85$$

$f_b = 24240$ psi ~ 24000 — (OK)

B6
W18x35
L = 17'
S = 57.6



$$R_L = 17200(4) + 12292(5.83) + 5813(9.25) + 11626(11.67) + 5813(14.08) + 125(17)\tfrac{1}{2} = 252823\tfrac{17}{3}\ \#$$

$R_R = 29586\#$

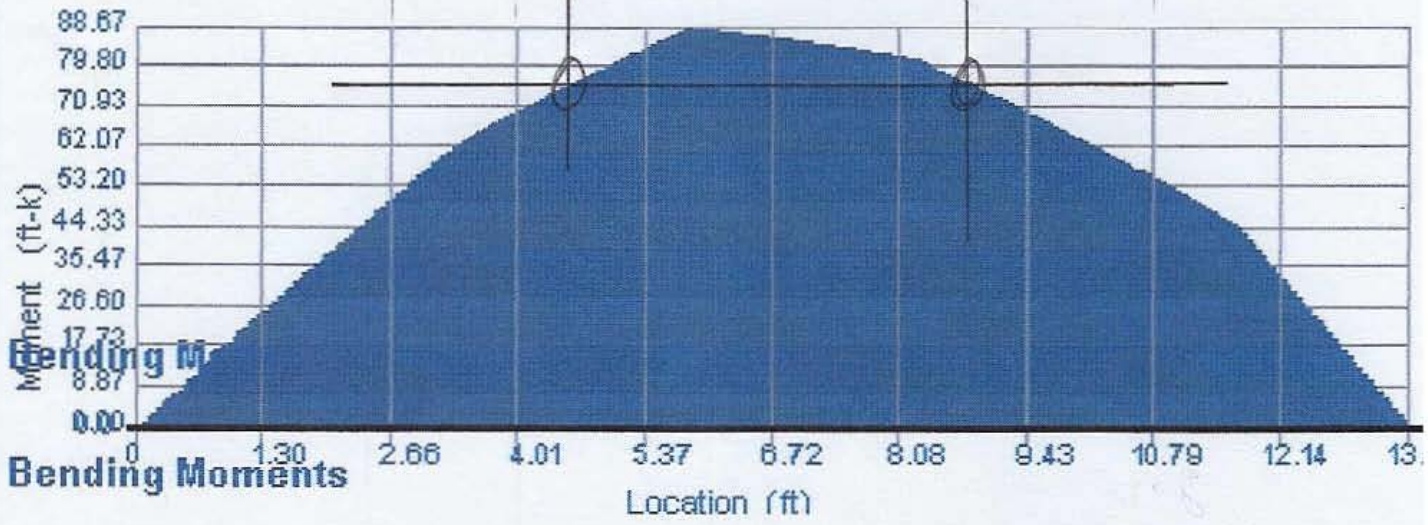
$$M = 29586(5.83) - 17200(1.83) - 125(5.83)^2/2$$

$$= 138{,}806\ \text{I-}\#$$

ADD WT 8X7.5

x 7'-2"

BS



Bending Moments



Beam Shear

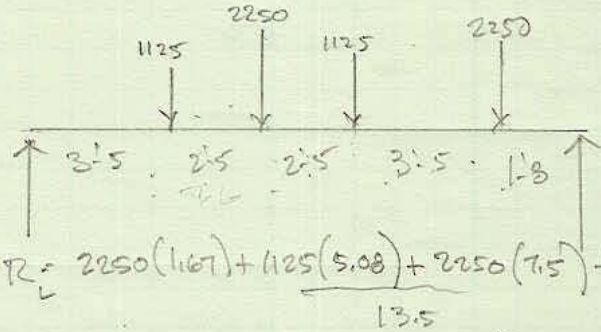


Deflection

$$M = \frac{11625}{2250}(10395) + 125\left(\frac{1.83}{8}\right)\tfrac{1}{2}(11.67)^2 = 55655 \text{ ft-k}$$

$f_b = 23029 \text{ psi} < 24000$ — (OK)

B5
W16x26
L = 13'-6
S = 384



$\Delta R_2 = 3972\#$

$\Delta R_L = \frac{2250(1.67) + 1125(5.08) + 2250(7.5) + 1125(9.92)}{13.5} = 2778\#$

$\Delta M = 2778(5.83) - 1125(2.42) = 13475 \text{ ft-}\#$

$\Delta f_b = \frac{13475(12)}{384} = 4211 \text{ psi} \quad (+17.6\%)$

$M = \frac{11625}{2250}(13475) + 125\left(\frac{11.33}{8}\right)\tfrac{1}{2}(13.5)^2 = 85753 \text{ ft-k}$

$f_b = 26798 \text{ psi} \quad +11.7\% \quad \div 1.6 \text{ for } F_y = 40 \text{ ksi}$

> 24000

DL + LL allowed $M = 1.05(384)\left(\frac{24000}{12}\right) = 80640 \text{ ft-}\#$

$- \quad 69621$

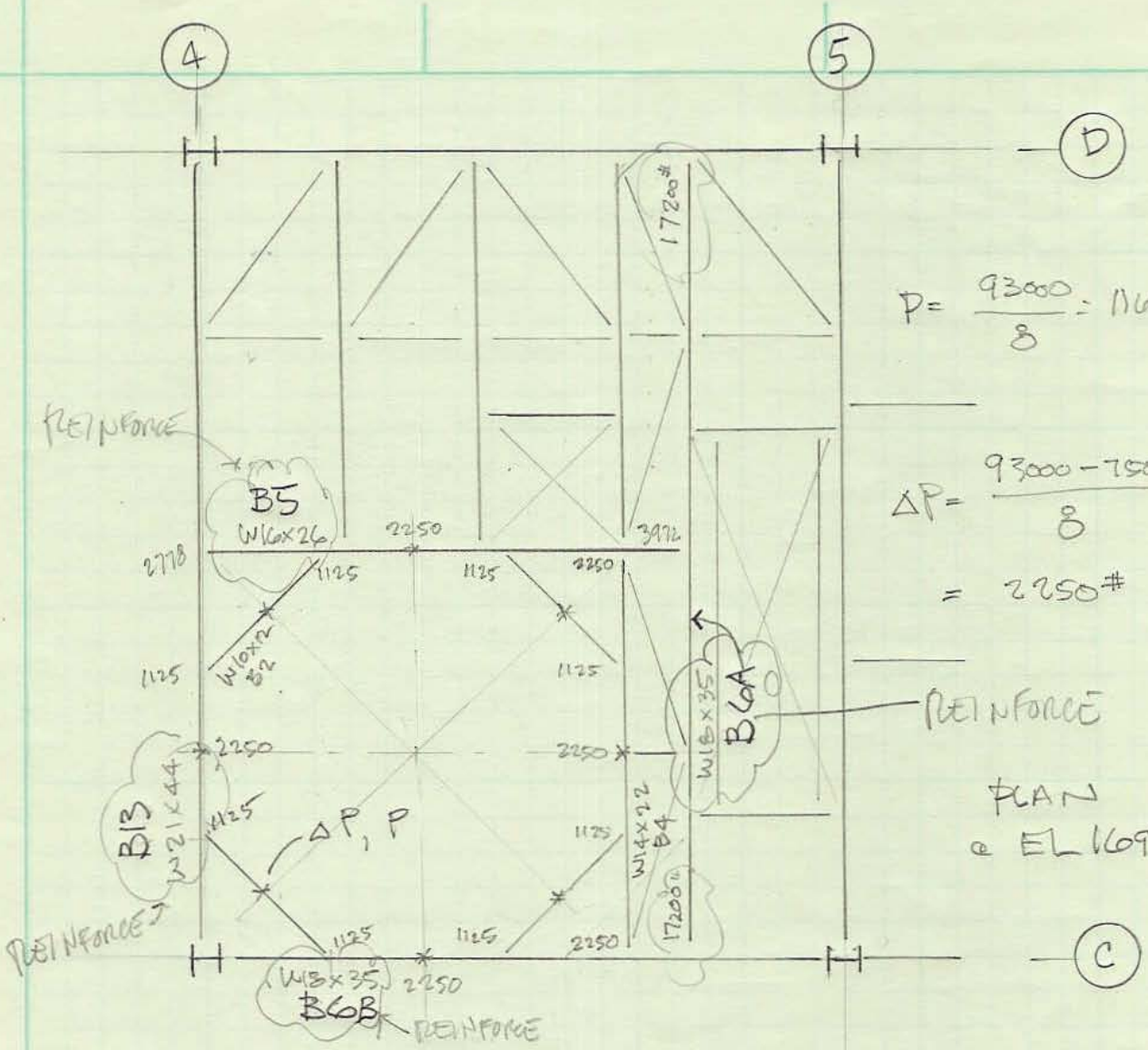
$11019 \text{ ft-}\#$

$W = \frac{8(11019)}{13.5^2} = 483.7 \text{ PLF}$

$= DL + LL\left(\frac{11.33}{2}\right)$

$DL + LL = \frac{2(483.7)}{11.33} = 85.4 \text{ PSF} - 25 = 60.4 \text{ psf}$

NOTE! MILL CERTS FOR STEEL WILL SHOW $F_y > 36000$
USUALLY ∴ LL > 60.4 ALLOWED → 100 PSF



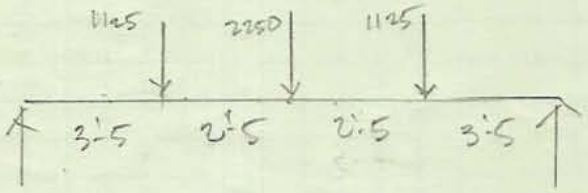
B2
W10x12
L= 4.83'
S= 10.9

$\Delta M = \frac{2250(4.83)}{4} = 2715'^{\#}$

$\Delta f_b = \frac{2715(12)}{10.9} = 2989 \text{ psi} \quad (+12.5\%)$

$f_b = \frac{11625}{2250}(2989) = 15445 \text{ psi}$ (OK)

B4
W14x22
L= 11'-8
S= 29.0



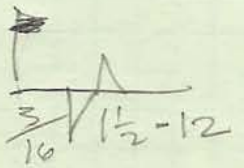
$\Delta R = 1125 + \frac{2250}{2} = 2250$

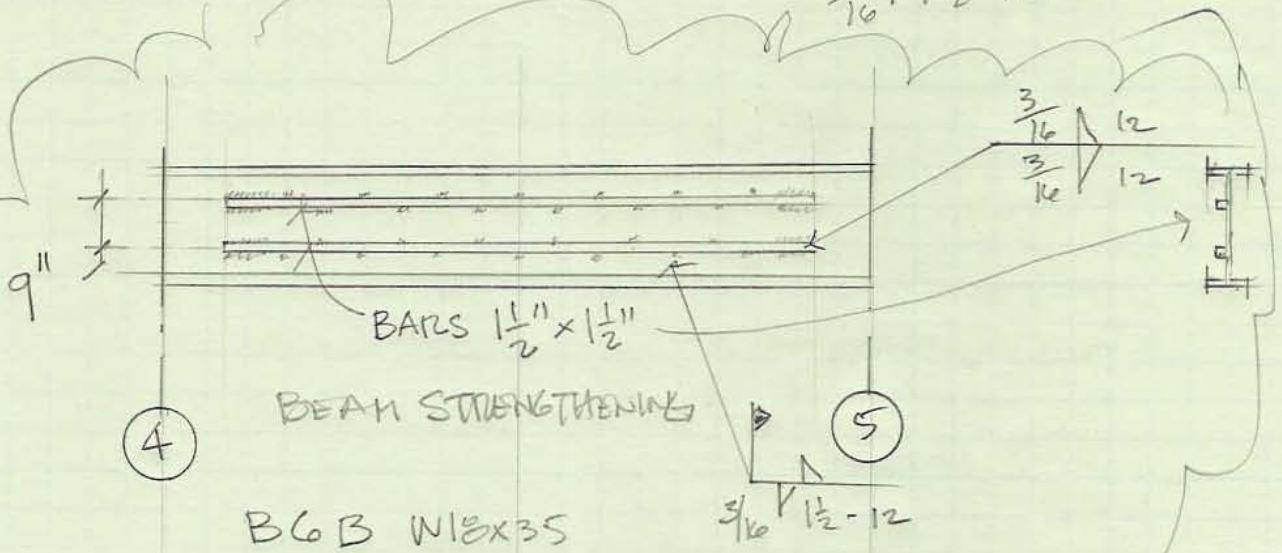
$\Delta M = 2250(5.83) - 1125(2.42) = 10395'^{\#}$

$\Delta f_b = \frac{10395(12)}{29.0} = 4301 \text{ psi} \quad (+17.9\%)$

$Q = 2.85(4.5) = 10.1$

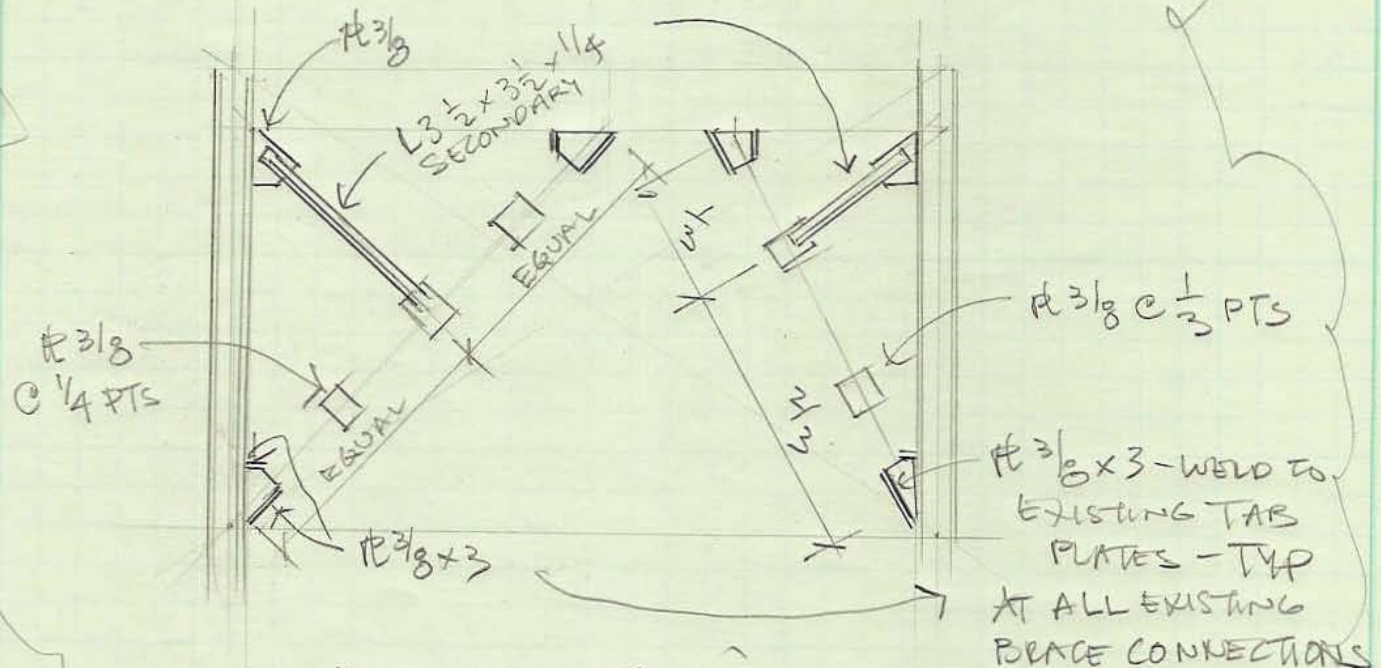
$\frac{VQ}{I} = \frac{29(10.1)}{600} = 48.7$ ppi 3/16 @ 12"





BEAM STRENGTHENING

BGB W18X35



BRACE STRENGTHENING

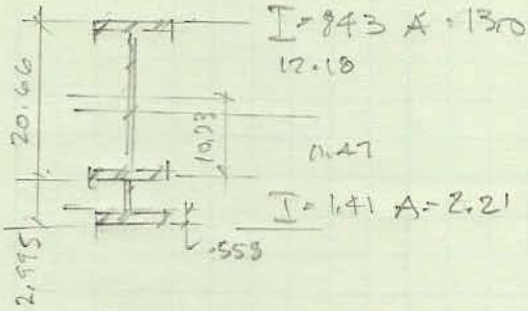
N.AXIS $2.21(.558) = 1.233$

$13(2.995+10.33) = 173.225$

$15.21 \times \bar{Y} = 174.458$

$\bar{Y} = 11.47''$

$V = 28^k$



$I = 843 + 1.41 + 13(11.47-2.995-10.33)^2 + 2.21(11.47-.558)^2 = 1152 \text{ in}^4$

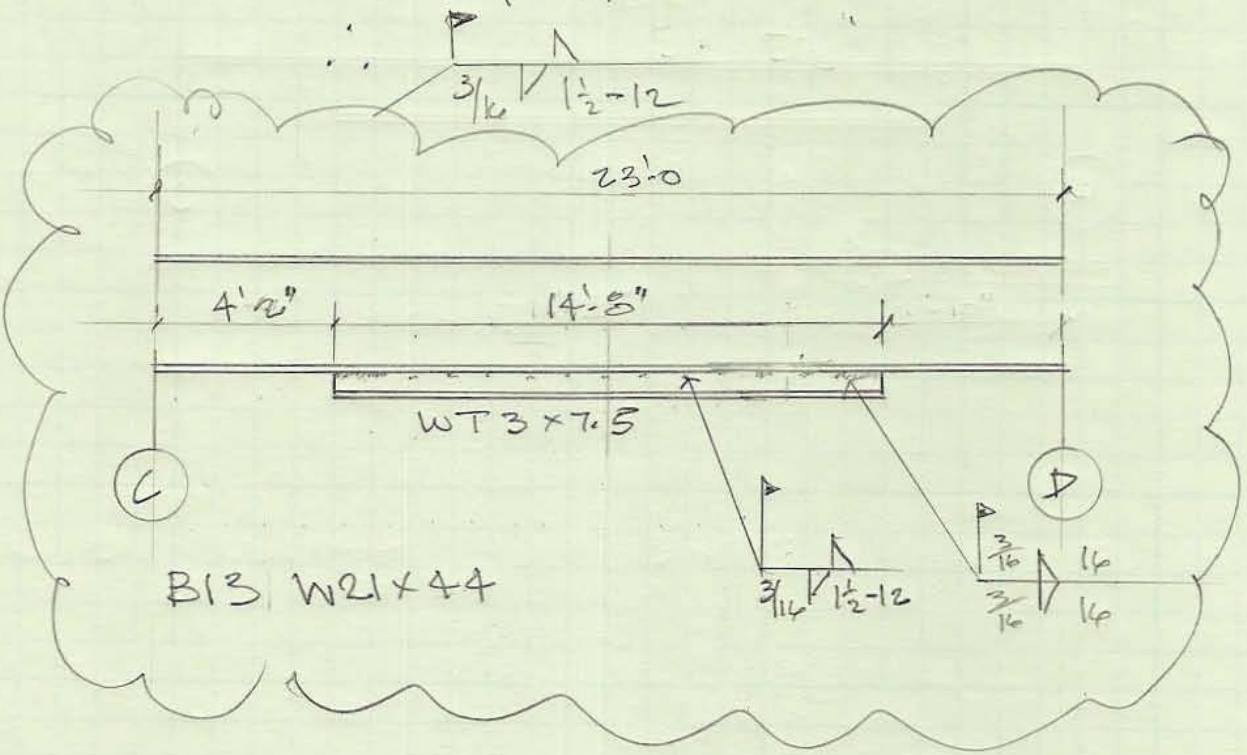
$S_T = 97.6 \quad S_B = 100.5$

$f_b = \frac{187.2(12)}{100.5} < 22.4 \text{ ksi} \quad f_{b_T} = 23.8 \text{ ksi}$ OK

$f = \frac{VQ}{I} \quad Q = 2.21(11.47-.558) = 24.1 \text{ in}^3$

$= \frac{28(24.1)}{1152(.23)} = 2.55 \text{ ksi}\ (.23) = 586 \text{ ppi}$

$\therefore$



ST-3

$S_T = 97.1 \quad S_{BS} = 107.5$

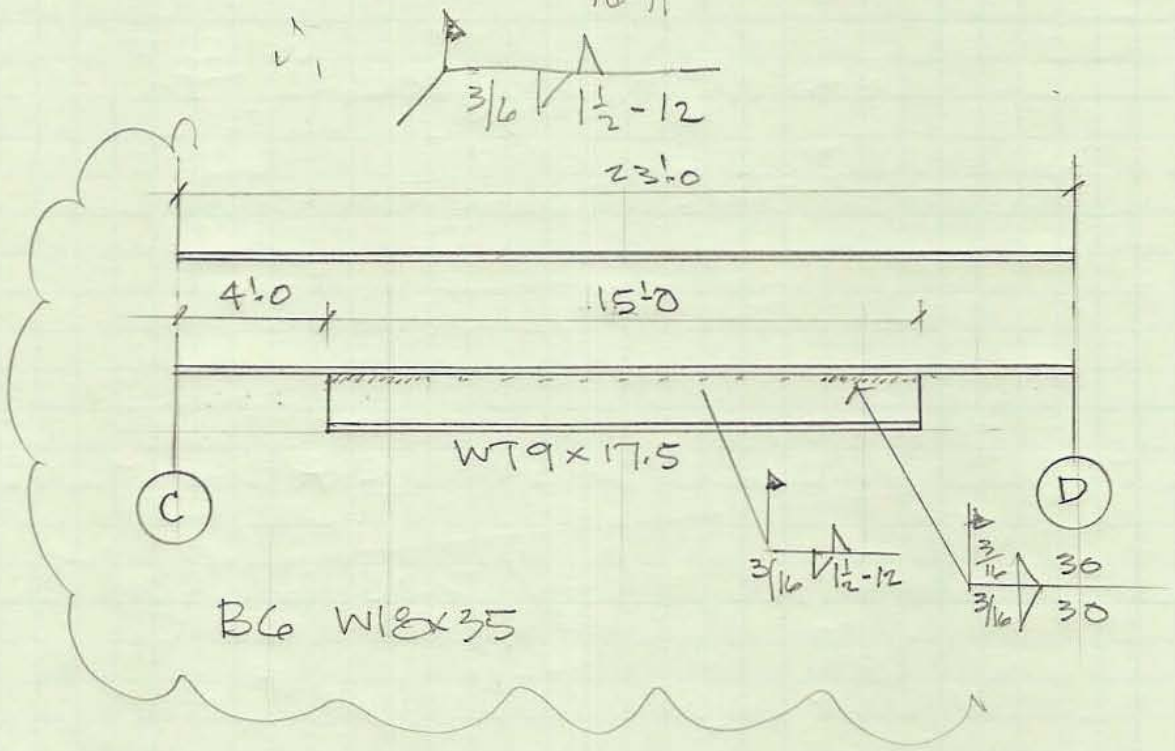
$f_b = \frac{173.76(12)}{97.1} = 21.5 \text{ ksi}$ (OK)

$Q = 5.15(12.6 - 2.39) = 52.58$

$f = \frac{17{,}800(52.58)}{1355} = 691 \text{ ppi}$

FOR 3/16" WELD $928(3) = 2784 \text{ ppi} \times .15 = 417.6$

$S = 417.6 / 69.1 = 6.0"$



B13 W21x44 w/ WT3x7.5 $A_S = 2.21$ $t_w = .23"$

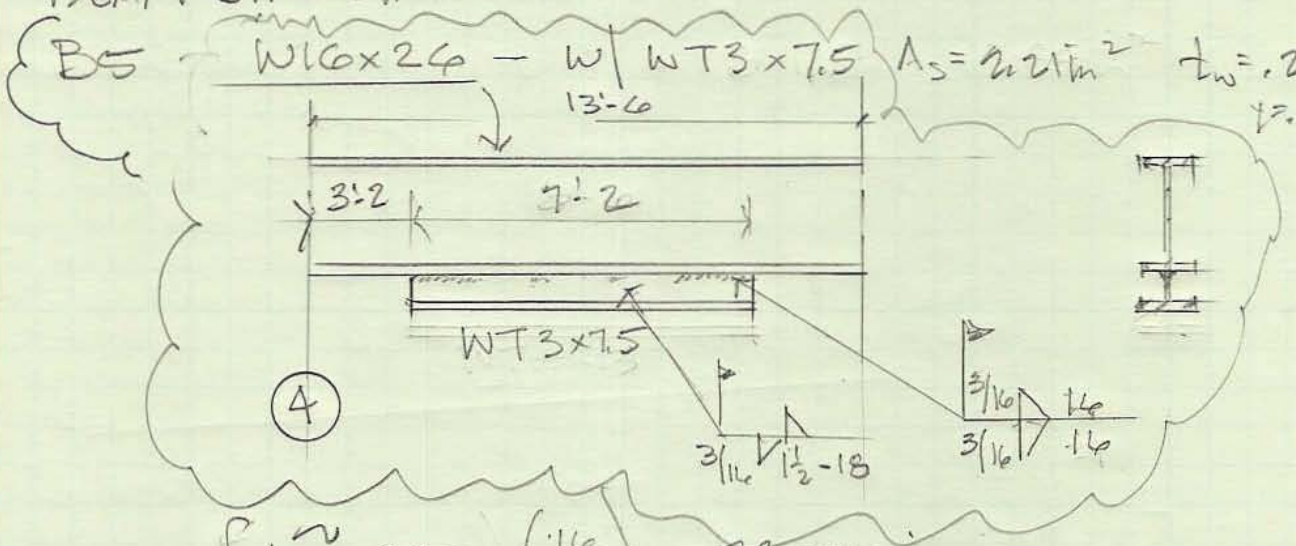
$f_b = 27.5\left(\frac{21}{21+3}\right) = 24.1 \text{ ksi}$

$F = 24.1(2.21) = 53.2^k$

$l_{weld} = \frac{53.2}{.3(14.4)} = 12.3" \rightarrow 6"$

BEAM STRENGTHENING

B5 — W16x26 — W/ WT3x7.5 $A_s = 2.21 in^2$ $t_w = .23$ $\bar{y} = .558$



$$f_b \cong 27.71\left(\frac{16}{16+3}\right) = 23.33 ksi$$

$$F \cong 23.33(2.21) = 51.6k$$

$$l_{weld} = \frac{51.6}{.23(14.4)} = 15.6" \rightarrow 16"$$

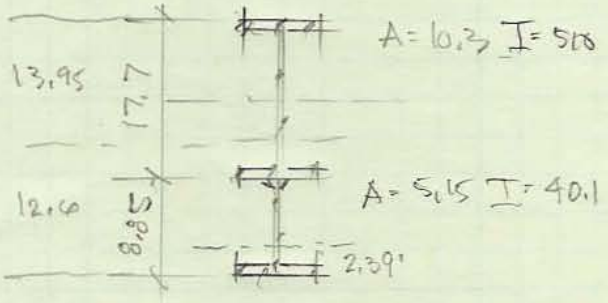
B6A W18x35 - W/ WT9x17.5 $A_s = 5.15$ $t_w = .3$

$$f_b \cong 36.5\left(\frac{18}{18+9}\right) = 24.3 ksi$$

$$F \cong 24.3(5.15) = 125.3k$$

$$l_{weld} = \frac{125.3}{.3(14.4)} = 29" \rightarrow 30"$$

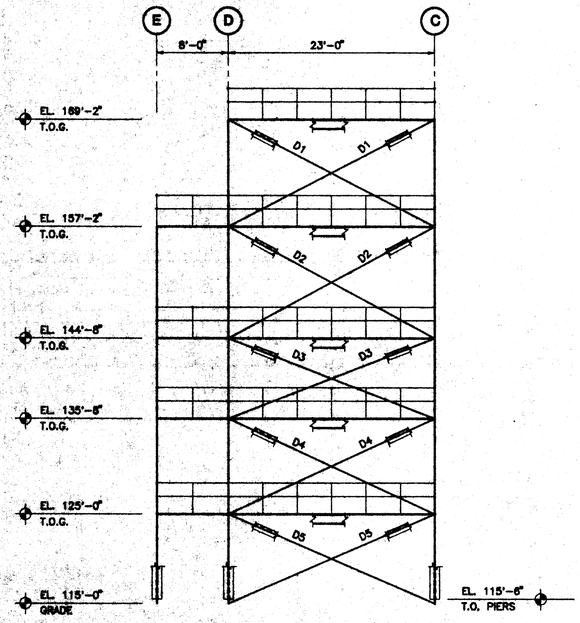
$$f = \frac{VQ}{I}$$



N. AXIS -	5.15	(2.39) =	12.31
	10.3	(8.85+8.85) =	182.31
	15.45	$\times \bar{y}$ =	194.62

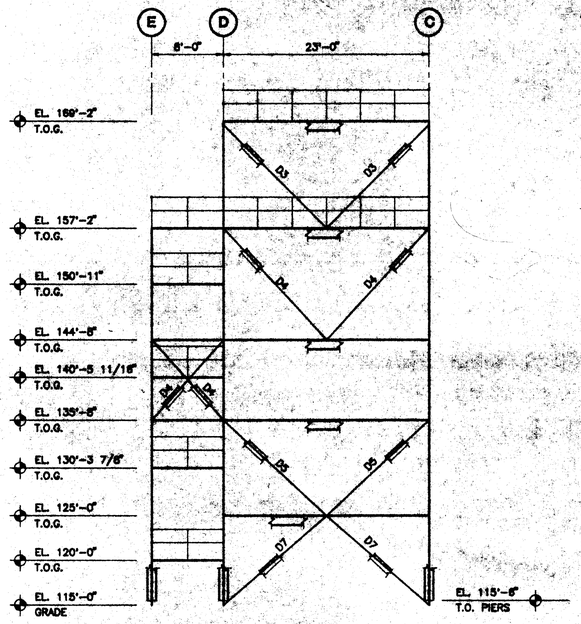
$$\bar{y} = 12.6"$$

$$I = 510 + 40.1 + 5.15(12.6-2.39)^2 + 10.3(17.7-12.6)^2 = 1355 in^4$$



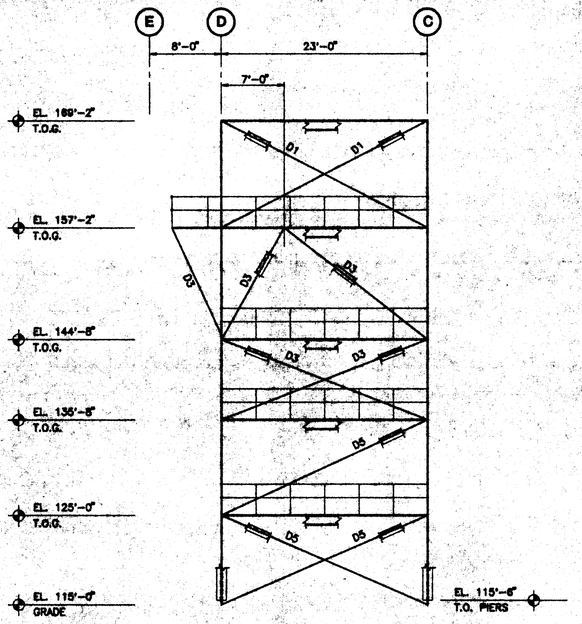
ELEV. ALONG GRID (4)

(LOOKING EAST) 1/8"=1'-0"



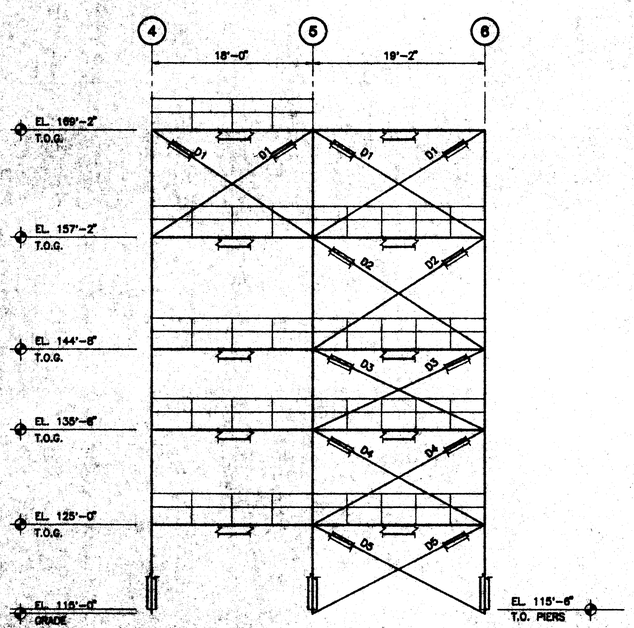
ELEV. ALONG GRID (5)

(LOOKING EAST) 1/8"=1'-0"



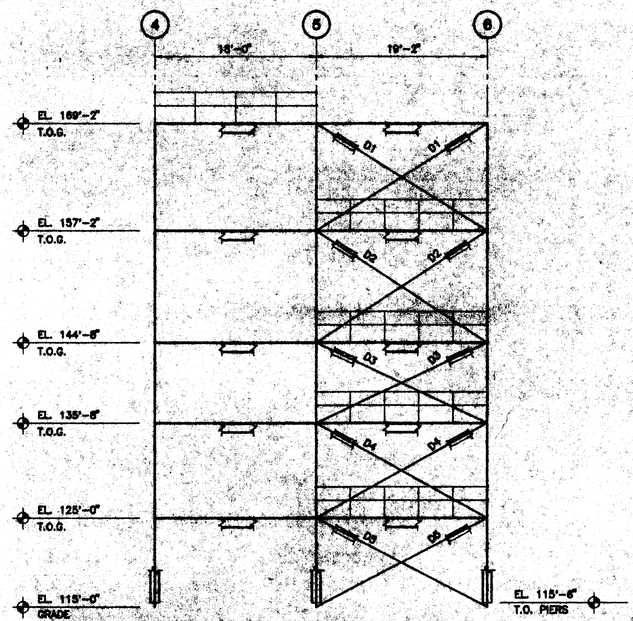
ELEV. ALONG GRID (6)

(LOOKING EAST) 1/8"=1'-0"



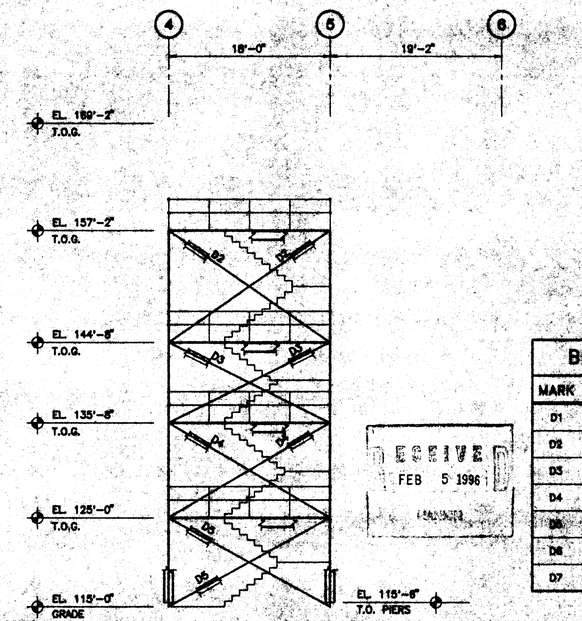
ELEV. ALONG GRID (C)

(LOOKING NORTH) 1/8"=1'-0"



ELEV. ALONG GRID (D)

(LOOKING NORTH) 1/8"=1'-0"



ELEV. ALONG GRID (E)

(LOOKING NORTH) 1/8"=1'-0"

BRACE SCHEDULE	
MARK	SIZE
D1	(2) L3 1/2 X 2 1/2 X 1/4
D2	(2) L3 1/2 X 3 X 1/4
D3	(2) L4 X 3 X 1/4
D4	(2) L4 X 3 1/2 X 1/4
D5	(2) L5 X 3 X 5/16
D6	NOT USED
D7	(2) L5 X 3 1/2 X 3/8

ISSUED
ENGINEERING DEPT.
FEB 5 1996
HANKIN ENVIRONMENTAL SYSTEMS INC.

RECEIVED
FEB 5 1996

SCHEMATIC
NOT FOR CONSTRUCTION USE

S5

AVSCHWAN & ASSOC., Inc.
CONSULTING ENGINEERS

Exhibit C - Hazardous Waste Characteristics

Table 1 - EPA Listed Hazardous Wastes

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
D001	A SOLID WASTE THAT EXHIBITS THE CHARACTERISTIC OF IGNITABILITY
D004	ARSENIC
D005	BARIUM
D006	CADMIUM
D007	CHROMIUM
D008	LEAD
D009	MERCURY
D010	SELENIUM
D011	SILVER
D012	ENDRIN
D013	LINDANE
D014	METHOXYCHLOR
D015	TOXAPHENE
D016	2,4-D
D017	2,4,5-(SILVEX)
D018	BENZENE
D019	CARBON TETRACHLORIDE
D020	CHLORDANE
D021	CHLOROBENZENE
D022	CHLOROFORM
D023	O-CRESOL
D024	M-CRESOL
D025	P-CRESOL
D026	CRESOL
D027	1,4-DICHLOROBENZENE
D028	1,2-DICHLOROETHANE
D029	1,1-DICHLOROETHYLENE
D030	2,4-DITROTOLUENE
D031	HEPTACHLOR (AND ITS EPOXIDE)
D032	HEXACHLOROBENZENE
D033	HEXACHLOROBUTADIENE
D034	HEXACHLOROETHANE
D035	METHYL ETHYL KETONE
D036	NITROBENZENE
D037	PENTRACHLOROPHENOL

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
D038	PYRIDINE
D039	TETRACHLOROETHYLENE
D040	TRICHLOROETHYLENE
D041	2,4,5-TRICHLOROPHENOL
D042	2,4,6-TRICHLOROPHENOL
D043	VINYL CHLORIDE
F001	SPENT HALOGENATED SOLVENTS USED IN DEGREASING: TETRACHLOROETHYLENE, TRICHLOROETHYLENE, METHYLENE CHLORIDE, 1,1,1 TRICHLOROETHANE, CARBON TETRACHLORIDE, CHLORINATED FLUOROCARBONS; AND MIXTURES/BLENDS CONTAINING A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) BEFORE USE OF ONE OR MORE OF THE ABOVE SOLVENTS OR SOLVENTS LISTED IN F002, F004 AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF SPENT SOLVENTS AND MIXTURES
F002	TETRACHLOROETHYLENE, METHYLENE CHLORIDE, TRICHLOROETHYLENE, 1,1,1-TRICHLOROETHANE, CHLOROBENZENE, 1,1,2-TRICHLOROETHANE; AND MIXTURES/BLENDS CONTAINING A TOTAL OF 10% OR MORE (BY VOLUME) BEFORE USE OF ONE OR MORE OF THE ABOVE SOLVENTS OR SOLVENTS LISTED IN F002, F004 AND F005 AND STILL BOTTOMS FROM RECOVERY OF SPENT SOLVENTS AND MIXTURES
F003	XYLENE, ACETONE ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANANE, METHANOL; MIXTURES/BLENDS OF ABOVE; AND 10% OR MORE (BY VOLUME) OF F001, F002, F004, F005; AND STILL BOTTOMS FROM RECOVERY OF SPENT SOLVENTS
F004	CRESOLS AND CRESYLIC ACID, NOTROBENZENE; SOLVENT MIXTURES/BLENDS OF 10% OR MORE BEFORE USE OF ONE OR MORE OF ABOVE OR F001, F002, F005; STILL BOTTOMS FROM RECOVERY OF SPENT SOLVENTS
F005	TOLUENE, METHYL ETHYL KETONE, CARBON DISULFIDE, ISOBUTANOL, PYRIDINE, BENZENE, 2-ETHOXYETHANOL, 2-NITROPROPANE; MIXTURES/BLENDS OF 10% OR MORE (BY VOLUME) OF ABOVE OR SOLVENTS LISTED IN F001, F002, F004 AND STILL BOTTOMS FROM RECOVERY OF SOLVENTS
F006	WASTEWATER TREATMENT SLUDGES FROM ELECTROPLATING OPERATIONS EXCEPT FROM SULFURIC ACID ANODIZING OF ALUMINUM; TIN PLATING ON CARBON STEEL; ZINC PLATING ON CARBON STEEL; ALUMINUM, ZINC ALUMINUM PLATING ON CARBON STEEL; CLEANING/STRIPPING ASSOCIATED WITH TIN, ZINC AND ALUMINUM PLATING ON CARBON STEEL; AND CHEMICAL ETCHING AND MILLING OF ALUMINUM
F012	QUENCHING WASTEWATER TREATMENT SLUDGES FROM METAL HEAT TREATING OPERATIONS WHERE CYANIDES ARE USED
F019	WASTEWATER TREATMENT SLUDGES FROM CHEMICAL CONVERSION COATING OF ALUMINUM EXCEPT ZIRCONIUM PHOSPHATING IN ALUMINUM CAN WASHING
F025	CONDENSED LIGHT ENDS, SPENT FILTERS AND AIDS, SPENT DESICCANT WASTES FROM PRODUCTION OF CERTAIN CHLORINATED ALIPHATIC HYDROCARBONS (HAVING CARBON CHAIN LENGTHS RANGING FROM 1-5 WITH VARYING AMOUNTS

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
	AND POSITIONS OF CHLORINE SUBSTITUTION) BY FREE RADICAL CATALYZED PROCESSES.
F035	WASTEWATERS, PROCESS RESIDUALS, PRESERVATIVE DRIPPAGE, AND SPENT FORMULATIONS FORM WOOD PRESERVING PROCESS GENERATED AT PLANTS THAT USE INORGANIC PRESERVATIVES CONTAINING ARSENIC OR CHROMIUM. DOES NOT INCLUDE K001 BOTTOM SEDIMENT SLUDGE FROM TREATMENT OF WASTEWATER FROM WOOD PRESERVING PROCESSES USING CREOSOTE AND/OR PENTACHLOROPHENOL
F037	PETROLEUM REFINERY PRIMARY OIL/WATER/SOLIDS SEPARATION SLUDGE. SLUDGE FROM GRAVITATIONAL SEPARATION OF OIL/WATER/SOLIDS DURING STORAGE OR TREATMENT OF PROCESS WASTEWATERS AND OILY COOLING WASTEWATERS FROM PETROLEUM REFINERIES. (OIL/WATER/SOLIDS SEPARATORS; TANKS AND IMPOUNDMENTS; DITCHES/CONVEYANCES; SUMPS; STORMWATER UNITS. SLUDGES FROM NON-CONTACT ONCE-THROUGH COOLING WATERS, SLUDG3ES FROM AGRESSIVE BIOLOGICAL TREATMENT UNITS, K051 WASTES
F038	PETROLEUM REFINERY SECONDARY (EMULSIFIED) OIL/WATER/SOLIDS SEPARATION SLUDGE-ANY SLUDGE AND/OR FLOAT GENERATED FROM THE PHYSICAL AND/OR CHEMICAL SEPARATION OF OIL/WATER/SOLIDS IN PROCESS WASTEWATERS AND OILY COOLING WASTEWATERS FROM PETROLEUM REFINERIES. SUCH WASTES INCLUDE, BUT ARE NOT LLIMITED TO, ALL SLUDGES AND FLOATS GENERATED IN: INDUCED AIR FLOTATION (IAF) UNITS, TANKS AND IMPOUNDMENTS, AND ALL SLUDGES GENERATED IN DAF UNITS. SLUDGES GENERATED IN STORMWATER UNITS THAT DO NBOT RECEIVE DRY WEATHER FLOW, SLUDGES GENERATED FROM NON-CONTACT ONCE-THROUGH COOLING WATERS SEGREGATED FOR TREATMENT FROM OTHER PROCESS OR OILY COOLING WATERS, SLUDGES AND FLOATS GENERATED IN AGRESSIVE BIOLOGICAL TREATMENT UNITS (INCLUDING SLUDGES AND FLOATS GENERATED IN ONE OR MORE ADDITIONAL UNITS AFTER WASTEWATERS HAVE BEEN TREATED IN AGGRESSIVE GIOLOGICAL TREATMENT UNITS) AND F037,K048, AND K051 WASTES ARE NOT INCLUDED IN THIS LISTING.
F039	LEACHATE FROM DISPOSAL OF MORE THAN ONE RESTRICTED WASTE (HAZARDOUS UNDER SUBPART D; RESULTING FROM THE DISPOSAL OF ONE OR MORE OF EPA HAZARDOUS WASTES: F020, F021, F022, F026, F027, AND/OR F028)
K001	WASTEWATER TREATMENT SLUDGE BOTTOM SEDIMENT THAT USE CREOSOTE AND/OR PENTACHLOROPHENOL
K002	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF CHROME YELLOW AND ORANGE PIGMENTS
K003	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF MOLYBDATE ORANGE PIGMENTS
K004	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF ZINC YELLOW PIGMENTS
K005	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF CHROME GREEN PIGMENTS
K006	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF CHROME OXIDE GREEN PIGMENTS (ANHYDROUS AND HYDRATED)

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
K007	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF IRON BLUE PIGMENTS
K008	OVEN RESIDUE FROM PRODUCTION OF CHROME OXIDE GREEN PIGMENTS
K009	DISTILLATION BOTTOMS FROM THE PRODUCTION OF ACETALDEHYDE FROM ETHYLENE
K010	DISTILLATION SIDE CUTS FROM PRODUCTION OF ACETALDEHYDE FROM ETHYLENE
K014	VICINALS FROM THE PURIFICATION OF TOLUENEDIAMINE IN THE PRODUCTION OF TOLUENEDIAMINE VIA THE HYDROGENATION OF DINITROTOLUENE
K015	STILL BOTTOMS FROM DISTILLATION OF BENZYL CHLORIDE
K016	HEAVY ENDS OR DISTILLATION RESIDUES FROM PRODUCTION OF CARBON TETRACHLORIDE
K017	HEAVY ENDS (STILL BOTTOMS) FROM PURIFICATION COLUMN IN PRODUCTION OF EPICHLOROHYDRIN
K018	HEAVY ENDS FROM FRACTIONATION COLUMN IN ETHYL CHLORIDE PRODUCTION
K019	HEAVY ENDS FORM THE DISTILLATION OF ETHYLENE DICHLORIDE IN ETHYLENE DICHLORIDE PRODUCTION
K020	HEAVY ENDS FROM DISTILLATION OF VINYL CHLORIDE IN VINYL CHLORIDE MONOMER PRODUCTION
K022	DISTILLATION BOTTOM TARS FROM PRODUCTION OF PHENOL/ACETONE FROM CUMENE
K023	DISTILLATION LIGHT ENDS FROM PRODUCTION OF PHTHALIC ANHYDRIDE FROM NAPHTHALENE
K024	DISTILLATION BOTTOMS FROM PRODUCTION OF PHTHALIC ANHYDRIDE FROM NAPHTHALENE
K025	DISTILLATION BOTTOMS FROM THE PRODUCTION OF NITROBENZENEBY THE NITRATION OF BENZENE
K026	STRIPPING STILL TAILS FROM PRODUCTION OF METHY ETHYL PYRIDINES
K029	WASTE FROM PRODUCT STEAM STRIPPER IN PRODUCTION OF 1,1,1-TRICHLOROETHANE
K030	COLUMN BOTTOMS OR HEAVY ENDS FROM COMBINED PRODUCTION OF TRICHLOROETHYLENE AND PERCHLOROETHYLENE
K031	BY-PRODUCT SALTS GENERATED IN PRODUCTION OF MSMA AND CACODYLIC ACID
K032	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF CHLORDANE
K033	WASTEWATER TREATMENT AND SCRUB WATER FROM CHLORINATION OF CYCLOPENTADIENE IN PRODUCTION OF CHLORDANE
K034	FILTER SOLIDS FROM FILTRATION OF HEXACHLOROCYCLOPENTADIENE IN PRODUCTION OF CHLORDANE
K035	WASTEWATER TREATMENT SLUDGES GENERATED IN PRODUCTION OF CREOSOTE
K036	STILL BOTTOMS FROM TOLUENE RECLAMATION DISTILLATION IN PRODUCTION OF DISULFOTON

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
K037	WASTEWATER TREATMENT SLUDGES FROM PRODUCTION DISULFOTON
K038	WASTEWATER FROM WASHING AND STRIPPING OF PHORATE PRODUCTION
K039	FILTER CAKE FROM FILTRATIN OF DIETHYLPHOSPHORODITHIOIC ACID IN PRODUCTION OF PHORATE
K040	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF PHORATE
K041	WASTEWATER TREATMENT SLUDGE FORM PRODUCTION OF TOXAPHENE
K042	HEAVY ENDS OR DISTILLATION RESIDUES FROM DISTILLATION OF TETRACHLOROBENZENE IN PRODUCTION OF 2,4,5-T
K046	WASTEWATER TREATMENT SLUDGES FROM THE MANUFACTURING, FORMULATION AND LOADING OF LEAD-BASED INTIATING COMPOUNDS.
K048	DISSOLVED AIR FLOTATION FLOAT FROM PETROLEUM REFINING INDUSTRY
K049	SLOP OIL EMULSION SOLIDS FROM PETROLEUM REFINING INDUSTRY
K050	HEAT EXCHANGER BUNDLE CLEANING SLUDGE FROM PETROLEUM REFINING INDUSTRY
K051	API SEPARATOR SLUDGE FROM PETROLEUM REFINING INDUSTRY
K052	TANK BOTTOMS (LEADED) FROM PETROLEUM REFINING INDUSTRY
K061	EMISSION CONTROL DUST/SLUDGE FROM PRIMARY PRODUCTION OF STEEL IN ELECTRIC FURNACES
K064	ACID PLANT BLOWDOWN SLURRY/SLUDGE RESULTING FROM THE THICKENING OF BLOWDOWN SLURRY FROM PRIMARY COPPER PRODUCTION
K065	SURFACE IMPOUNDMENT SOLIDS CONTAINED IN AND DREDGED FROM SURFACE IMPOUNDMENTS AT PRIMARY LEAD SMELTING FACILITIES.
K066	SLUDGE FROM TREATMENT OF PROCESS WASTEWATER AND/OR ACID PLANT BLOWDOWN FROM PRIMARY ZINC PRODUCTION
K071	BRINE PURIFICATION MUDS FROM MERCURY CELL PROCESS IN CHLORINE PRODUCTION WHERE SEPARATELY PREPURIFIED BRINE IS NOT USED
K073	CHLORINATED HYDROCARBON WASTE FROM PURIFICAITON STEP OF THE DIAPHRAGM CELL PROCESS USING GRAPHITE ANODES IN CHLORINE PRODUCTION
K083	DISTILLATION BOTTOMS FROM ANILINE PRODUCTION
K084	WASTEWATER TREATMENT SLUDGES GENERATED DURING PRODUCTION OF VETERINARY PHARMACEUTICALS FROM ARSENIC OR ORGANO-ARSENIC COMPOUNDS
K085	DISTILLATION OR FRACTIONATION COLUMN BOTTOMS FROM PRODUCTION OF CHLOROBENZENES
K086	SOLVENT WASHES AND SLUDGES, CAUSTIC WASHES AND SLUDGES, OR WATER WASHES AND SLUDGES FROM CLEANING TUBS AND EQUIPMENT USED IN FORMULATION OF INK FROM PIGMENTS, DRIERS, SOAPS, STABILIZERS CONTAINING CHROMIUM AND LEAD
K087	DECANTER TANK TAR SLUGE FROM COKING
K088	SPENT POTLINERS FROM PRIMARY ALUMINUM REDUCTION

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
K090	EMISSION CONTROL DUST OR SLUDGE FROM FERROCHROMIUMSILICON PRODUCTION
K091	EMISSION CONTROL DUST OR SLUDGE FROM FERROCHROMIUM PRODUCTION
K093	DISTILLAION LIGHT ENDS FROM PRODUCTION OF PHTHALIC ANHYDRIDE FROM ORTHO-XYLENE
K094	DISTILLATION BOTTOMS FROM PRODUCTION OF PHTHALIC ANHYDRIDE FROM ORTHO-XYLENE
K095	DISTILLAION BOTTOMS FROM PRODUCTION OF 1,1,1-TRICHLOROETHANE
K096	HEAVY ENDS FROM HEAVY ENDS COLUMN FROM PRODUCTION OF 1,1,1-TRICHLOROETHANE
K097	VACUUM STRIPPER DISCHARGE FROM CHLORDANE CHLORINATOR IN PRODUCTION OF CHLORDANE
K098	UNTREATED PROCESS WASTEWATER FROM PRODUCTION OF TOXAPHENE
K100	WASTE LEACHING SOLUTION FROM ACID LEACHING OF EMISSION CONTROL DUST/SLUDGE FROM SECONDARY LEAD SMELTING
K101	DISTILLATION TAR RESIDUES FROM DISTILLATIONOF ANILINE-BASED COMPOUNDS IN PRODUCTION OF VETERINARY PHARMACEUTICALS FROM ARSENIC OR ORGANO-ARSENIC COMPOUNDS
K102	RESIDUE FROM USE OF ACTIVATED CARBON FOR DECOLORIZATION IN PRODUCTION OF VETERINARY PHARMACEUTICALS FRO ARSENIC OR ORGANO-ARSENIC COMPOUNDS
K103	PROCESS RESIDUES FROM ANILINE EXTRACTION FROM PRODUCTIONOF ANILINE
K104	COMBINED WASTEWATER STREAMS GENERATED FROM NITROBENZENE/ANILINE PRODUCTION
K105	SEPARATED AQUEOUS STREAM FROM THE REACTOR PRODUCT WASHING STEP IN PRODUCTION OF CHLOROBENZENES
K106	WASTEWATER TREATMENT SLUDGE FROM MERCURY CELL PROCESS IN CHLORINE PRODUCTION
K112	REACTION BY-PRODUCT WATER FROM THE DRYING COLUMN IN PRODUCTION OF TOLUENEDIAMINE VIA HYDROGENATION OF DINITROTOLUENE
K113	CONDENSED LIQUID LIGHT ENDS FROM THE PURIFICATIONOF TOLUENEDIAMINE IN PRODUCTION OF TOLUENEDIAMINE VIA HYDROGENATION OF DINITROTOLUENE
K114	VICINALS FROM PURIFICAITON OF TOLUENEDIAMINE IN PRODUCTION OF TOLUENEDIAMINE VIA HYDROGENATION OF DINITROTOLUENE
K115	HEAVY ENDS FROM THE PURIFICATION OF TOLUENEDIAMINE IN PRODUCTION OF TOLUENEDIAMINE VIA HYDROGENATION OF DINITROTOLUENE
K116	ORGANIC CONDENSATE FROM SOLVENT RECOVERY COLUMN IN PRODUCTION OF TOLUENE DIISOCYANATE VIA PHOSGENATION OF TOLUENEDIAMINE
K117	WASTEWATER FROM THE REACTOR VENT GAS SCRUBBER IN PRODUCTION OF ETHYLENE DIBROMIDE VIA BROMINATION OF ETHENE
K118	SPENT ADSORBENT SOLIDS FROM PURIFICATION OF ETHYLENE DIBROMIDE IN PRODUCTION OF ETHYLENE DIBROMIDE VIA BROMINATION OF ETHENE

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
K125	FILTRATION, EVAPORATION, AND CENTRIFUGATION SOLIDS FROM THE PRODUCTION OF ETHYLENEBISDITHIOCARBAMIC ACID AND ITS SALTS.
K126	BAGHOUSE DUST AND FLOOR SWEEPINGS IN MILLING AND PACKAGING OPERATIONS FROM PRODUCTION OR FORMULATION OF ETHYLENE BIS DITHIOCARBAMIC ACID AND ITS SALTS
P001	2H-1-BENZOPYRAN-2-ONE, 4-HYDROXY-3-(3-OXO-1-PHENYLBUTYL)-, & SALTS, WHEN PRESENT AT CONCENTRATIONS GREATER THAN 0.3% WARFARIN, & SALTS, WHEN PRESENT AT CONCENTRAIONS GREATER THAN 0.3%
P002	ACETAMINE, N-(AMINOTHIOXOMETHYL); Also known as 1-ACETYL-2-THIOUREA
P003	ACROLEIN; Also known as 2-PROPENAL
P004	ALDRIN; Also known as 1,4,5,8-DIMETHANONAPHTHALENE, 1,2,3,4,10,10-HEXA-CHLORO-1,4,4A,5,8,8A,-HEXAHYDRO, (ALPHA, 4ALPHA, 4 ABETA, 5 ALPHA, 8ALPHA, 8ABETA)-
P005	ALLYL ALCOHOL; Also known as 2-PROPEN-1-OL
P007	5-(AMINOMETHYL)-3-ISOXAZOLOL; Also known as 3(2H)-ISOXAZOLONE, 5-(AMINOMETHYL)-
P008	4-AMINOPYRIDINE; Also known as 4-PYRIDINAMINE
P010	ARSENIC ACID H_3ASO_4
P011	ARSENIC OXIDE AS_2O_5; Also known as ARSENIC PENTOXIDE
P012	ARSENIC OXIDE AS_2O_3; Also known as ARSENIC TRIOXIDE
P013	BARIUM CYANIDE
P014	BENZENETHIOL; Also known as THIOPHENOL
P015	BERYLLIUM
P016	DICHLOROMETHYL ETHER; Also known as METHANE, OXYBIS[CHLORO-
P017	BROMOACETONE; Also known as 2-PROPANONE, 1-BROMO-
P018	BRUCINE
P020	DIOSEB; Also known as PHENOL, 2-(1-METHYLPROPYL)-4,6-DINITRO-
P021	CALCIUM CYANIDE; Also known as CALCIUM CYANIDE $CA(CN)_2$
P022	CARBON DISULFIDE
P023	ACETALDEHYDE, CHLORO-; Also known as CHLOROACETALDEHYDE
P024	BENZENAMINE, 4-CHLORO-; Also known as P-CHLORANILINE
P026	1-(O-CHLOROPHENYL)THIOUREA; Also known as THIOUREA, (2-CHLOROPHENYL)-
P027	PROPANENITRILE, 3-CHLORO-; Also known as 3-CHLOROPROPIONITRILE
P028	BENZENE, (CHLOROMETHYL)-; Also known as BENZYL CHLORIDE
P029	COPPER CYANIDE; Also known as COPPER CYANIDE CU(CN)
P030	CYANIDES (SOLUBLE CYANIDE SALTS), NOT OTHERWISE SPECIFIED
P031	CYANOGEN; Also known as ETHANEDINITRILE
P033	CYANOGEN CHLORIDE; Also known as CYANOGEN CHLORIDE (CN)CL

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
P034	2-CYCLOHEXYL-4,6-DINITROPHENOL; Also known as PHENOL, 2-CYCLOHEXYL-4,6-DINITRO-
P036	ARSONOUS DICHLORIDE, PHENYL-; Also known as DICHLOROPHENYLARSINE
P037	DIELDRIN; Also known as 2,7:3,6-DIMETHANONAPHTH[2,3-B]OXIRENE, 3,4,5,6,9,9-HEXACHLORO-1A,2,2A,3,6,6A,7,7A-OCTAHYDRO-, (1AALPHA, 2BETS, 2AALPHA, 3BETAK, 6BETA, 6AALPHA, 7BETA, 7AALPHA)-
P038	ARSINE, DIETHYL-; Also known as DIETHYLARSINE
P039	PHOSPHORODITHIOIC ACID, O,O-DIETHYL S-[2-(ETHYLTHIO)ETHYL]ESTER; Also known as DISULFOTON
P040	O,O-DIETHYL O-PYRAZINYL PHOSPHOROTHIOATE; Also known as PHOSPHOROTHIOIC ACID, O, O-DIMETHYL O-(4 NITROPHENYL) ESTER
P041	PHOSPHORIC ACID, DIETHYL 4-NITROPHENYL ESTER; Also known as DIETHYL-P-NITROPHENYL PHOSPHATE
P042	1,2-BENZENEDIOL, 4-[HYDROXY-2-(METHYLAMINO)ETHYL]-,(R)-; Also known as EPINEPHRINE
P043	DIISOPROPYLFLUOROPHOSPHATE (DFP); Also known as PHOSPHOROFLUORIDIC ACID, BIS (1-METHYLETHYL)ESTER
P044	DIMETHOATE; Also known as PHOSPHORODITHIOIC ACID,O, O-DIMETHYL S-[2-(METHYLAMINO)-2-OXOETHYL]ESTER
P045	2-BUTANONE, 3, 3-DIMETHYL-1-(METHYITHIO)-,O-[METHYLOAMINO)CARBONYL]OXIME; Also known as THIOFANOX
P046	BENZENEETHANAMINE, ALPHA,ALPHA-DIMETHYL-; Also known as ALPHA,ALPHA-DIMETHYLPHENETHYLAMINE
P047	4,6-DINITRO-O-CRESOL, & SALTS; Also known as PHENOL,2-METHYL-4,6-DINITRO-, & SALTS
P048	2,4-DINITROPHENOL; Also known as PHENOL, 2,4-DINITRO-
P049	DITHIOBIURET; Also known as THIOIMIDODICARBONIC DIAMIDE $[H_2N)C(S)]_2NH$
P050	ENDOSULFAN; Also known as 6M9-METHANO-2,4,3-BENZODIOXATHIEPIN, 6,7,8,9,10,1K0-HEXACHLORO-1,5,5A,6,9,91-HEXAHYDRO-,3-OXIDE
P051	2,7:3,6-DIMETHANONAPHTH [2,3-B]OXIRENE, 3,4,5,6,9,9-HEXACHLORO-1A,2,2A,3,6,6A,7,7A-OCTAHYDRO-, (1AALPHA, 2BETA, 2ABETA, 3ALPHA, 6ALPHA, 6ABETA, 7BETA, 7AALPHA)-, & METABOLITES; Also known as ENDRIN; Also known as ENDRIN, & METABOLITES
P054	AZIRIDINE; Also known as ETHYLENEIMINE
P056	FLUORINE
P057	ACETAMIDE, 2-FLUORO-; Also known as FLUOROACETAMIDE
P058	ACETIC ACID, FLUORO-,SODIUM SALT; Also known as FLUOROACETIC ACIDE, SODIUM SALT
P059	HEPTACHLOR; Also known as

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
	4,7-METHANO-1H-INDENE, 1,4,5,6,7,8,-HEPTACHLORO-3A,4,7,7A-TETRAHYDRO-
P060	1,4,5,8-DIMETHANONAPHTHALENE,1,2,3,4,10,10-HEXA- CHLORO-1,4,4A,5,7,8,8A-HEXAHYDRO-(1ALPHA, 4ALPHA, 4ABETA, 5BETA,8BETA,8ABETA)-; Also known as ISODRIN
P062	HEXAETHYL TETRAPHOSPHATE; Also known as TETRAPHOSPHORIC ACID, HEXAETHYL ESTER
P063	HYDROCYANIC ACID; Also known as HYDROGEN CYANIDE
P064	METHANE, ISOCYANATO-
P066	ETHANIMIDOTHIOIC ACID, N-[[(METHYLAMINO)CARBONYL]OXY]-, METHYL ESTER; Also known as METHOMYL
P067	AZINIDINE, 2-METHYL; Also known as 1,2-PROPYLENIMINE
P068	HYDRAZINE, METHYL-; Also known as METHYL HYDRAZINE
P069	2-METHYLLACTONITRILE; Also known as PROPANENITRILE, 2-HYDROXY-2-METHYL-
P070	ALDICARB; Also known as PROPANAL, 2-METHYL-2-(METHYLTHIO)-, O-[(METHYLAMINO)CARBONYL]OXIME
P071	METHYL PARATHION; Also known as PHOSPHOROTHIOIC ACID, O, O,-DIMETHYL O-(4-NITROPHENYL)ESTER
P072	ALPHA-NAPHTHYLTHIOUREA; Also known as THIOUREA, 1-NAPHTHALENYL-
P073	NICKEL CARBONYL; Also known as NICKEL CARBONYL $NI(CO)_4$, (T-4)-
P074	NICKEL CYANIDE; Also known as NICKEL CYNAIDE $NI(CN)_2$
P075	NICOTINE, & SALTS; Also known as PYRIDINE, 3-(1-METHYL-2-PYRROLIDINYL)-, (S)-, & SALTS
P077	BENZENAMINE, 4-NITRO-; Also known as P-NITROANILINE
P078	NITROGEN DIOXIDE; Also known as NITROGEN OXIDE NO_2
P082	METHANAMINE, N-METHYL-N-NITROSO-; Also known as N-NITROSODIMETHYLAMINE
P084	N-NITROSOMETHYLVINYLAMINE; Also known as VINYLAMINE, N-METHYL-N-NITROSO-
P085	DIPHOSPHORAMIDE, OCTAMETHYL-; Also known as OCTAMETHYLPYROPHOSPHORAMIDE
P087	OSMIUM OXIDE OSO_4, (T-4)-; Also known as OSMIUM TETROXIDE
P088	ENDOTHALL; Also known as 7-OXABICYCLO[2.2.1]HEPTANE-2,3-DICARBOXYLIC ACID
P089	PARATHION; Also known as PHOSPHORIC ACID, O,O-DIETHYL O-(4-NITROPHENYL)ESTER
P092	MERCURY, (ACETATO-O)PHENYL-; Also known as PHENYLMERCURY ACETATE
P093	PHENYLTHIOUREA; Also known as THIOUREA, PHENYL-
P094	PHORATE; Also known as PHOSPHORODITHIOIC ACID, O,O-DIETHYL; Also known as S-[ETHYLTHIO)METHYL] ESTER
P095	CARBONIC DICHLORIDE; Also known as PHOSGENE
P096	HYDROGEN PHOSPHIDE; Also known as PHOSPHINE
P097	FAMPHUR; Also known as

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
	PHOSPHOTHIOIC ACID, O-[4-[(DIMETHYLAMINO)SULFONYL]PHENYL] O,O-DIMETHYL ESTER
P098	POTASSIUM CYANIDE
P099	ARGENTATE(1-), BIS(CYANO-C)-, POTASSIUM; Also known as POTASSIUM SILVER CYANIDE
P101	ETHYL CYANIDE; Also known as PROPANENITRILE
P102	PROPARGYL ALCOHOL; Also known as 1-PROPYN-1-OL
P103	SELENOUREA
P104	SILVER CYANIDE
P105	SODIUM AZIDE
P108	STRYCHNIDIN-10-ONE, & SALTS; Also known as STRYCHNINE, & SALTS
P109	TETRAETHYLDITHIOPYROPHOSPHATE; Also known as THIODIPHOSPHIRIC ACID, TETRAETHYL ESTER
P110	TETRAETHYL LEAD
P113	THALLIUM OXIDE TL_2O_3
P114	THALLIUM(L) SELENITE
P115	THALLIUM(L) SULFATE
P116	THIOSEMICARBAZIDE
P118	TRICHLOROMETHANETHIOL
P119	VANADIC ACID, AMMONIUM SALT
P120	VANADIUM PENTOXIDE
P121	ZINC CYANIDE
P123	TOXAPHENE
U001	ACETALDEHYDE (I); Also known as ETHANAL (I)
U002	ACETONE (I); Also known as 2-PROPANONE (I)
U003	ACETONITRILE (I,T)
U004	ACETONITRILE (I,T)
U005	2, ACETYLAMINOFLUORENE; Also known as ACETAMIDE, N-9H-FLUOREN-2-YL-
U007	ACRYLAMIDE; Also known as 2-PROPENAMIDE
U008	ACRYLIC ACID (I); Also known as 2-PROPENOIC ACID (I)
U009	ACRYLONITRILE; Also known as 2-PROPENENITRILE
U010	AZIRINO[2',3':3,4]PYRROLO[1,2-a]INDOLE-4,7-DIONE,6-AMINO-8-[[(AMINOCARBONYL)OXY]METHYL]-1,1a,2,8,8a,8b-HEXAHYDRO-8a-METHOXY-5-METHYL-, [1aS-(1AALPHA, 8BETA, 8AALPHA, 8BALPHA)]-; Also known as MITOMYCIN C
U011	AMITROLE; Also known as 1H-1,2,-TRIAZOL-3-AMINE
U012	ANILINE (I,T); Also known as BENZENAMINE (I,T)
U014	AURAMINE; Also known as BENZENAMINE, 4,4'-CARBONIMIDOYLBIS[N,N-DIMETHYL-

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EPA WASTE CODE	**WASTE DESCRIPTION**
U015	AZASERINE; Also known as L-SERINE, DIAZOACETATE (ESTER)
U016	BENZ[C]ACRIDINE
U017	BENZAL CHLORIDE; Also known as BENZENE,(DICHLOROMETHYL)-
U018	BENZ[A]ANTHRACENE
U019	BENZENE (I,T)
U021	BENZIDINE; Also known as [1,1'-BIPHENYL]-4,4'-DIAMINE
U022	BENZO[A]PYRENE
U024	DICHLOROMETHOXY ETHANE; Also known as ETHANE, 1,1'-[METHYLENEBIS(OXY)]BIS[2-CHLORO-
U025	DICHLOROETHYL ETHER; Also known as ETHANE,1,1'-OXYBIS[2-CHLORO-
U026	CHLORNAPHAZIN; Also known as NAPHTHALENAMINE, N,N'-BIS(2-CHLOROETHYL)-
U027	DICHLOROISOPROPYL ETHER; Also known as PROPANE, 2,2'-OXYBIS[2-CHLORO-
U028	1,2-BENZENEDICARBOXYLIC ACID, BIS(2-ETHYLHEXYL) ESTER; Also known as DIETHYLHEXYL PHTHALATE
U029	METHANE, BROMO-; Also known as METHYL BROMIDE
U030	BENZENE, 1-BROMO-4-PHENOXY-; Also known as 4-BROMOPHENYL PHENYL ETHER
U031	1-BUTANOL (I); Also known as N-BUTYL ALCOHOL (I)
U032	CHROMIC ACID H_2CRO_4, CALCIUM SALT; Also known as CALCIUM CHROMATE
U034	CHLORAL; Also known as ACETALDEHYDE, TRICHLORO-
U035	CHLORAMBUCIL; Also known as BENZENEBUTANOIC ACID, 4-[BIS(2-CHLOROETHYL)AMINO]-
U036	CHLORDANE, ALPHA & GAMMA ISOMERS; Also known as 4,7-METHANO-1H-INDENE, 1,2,4,5,6,7,8,8-OCTACHLORO-2,3,3A,4,7,7A-HEXAHYDRO-
U037	CHLOROBENZENE; Also known as BENZENE, CHLORO-
U038	CHLOROBENZILATE; Also known as BENZENEACETIC ACID, 4-CHLORO-ALPHA-(4-CHLOROPHENYL)-ALPHA-HYDROXY-, ETHYL ESTER
U039	P-CHLORO-M-CRESOL; Also known as PHENOL, 4-CHLORO-3-METHYL-
U041	EPICHLOROHYDRIN; Also known as OXIRANE, (CHLOROMETHYL)-
U042	2-CHLOROETHYL VINYL ETHER; Also known as ETHENE, (2-CHLOROETHOXY)-
U043	VINYL CHLORIDE; Also known as ETHENE, CHLORO-
U044	CHLOROFORM; Also known as METHANE, TRICHLORO-
U045	METHANE, CHLORO- (I,T); Also known as METHYL CHLORIDE (I,T)
U046	CHLOROMETHYL METHYL ETHER; Also known as METHANE, CHLOROMETHOXY-
U047	BETA-CHLORONAPHTHALENE; Also known as NAPHTHALENE, 2-CHLORO-
U048	O-CHLOROPHENOL; Also known as PHENOL, 2-CHLORO-
U049	4-CHLORO-O-TOLUIDINE, HYDROCHLORIDE; Also known as BENZENAMINE, 4-CHLORO-2-METHYL, HYDROCHLORIDE

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
U050	CHRYSENE
U051	CREOSOTE
U052	CRESOL (CRESYLIC ACID); Also known as PHENOL, METHYL-
U053	CROTONALDEHYDE; Also known as 2-BUTENAL
U055	CUMENE (I); Also known as BENZENE, (1-METHYLETHYL)- (I)
U056	BENZENE, HEXAHYDRO- (I); Also known as CYCLOHEXANE (I)
U057	CYCLOHEXANONE (I)
U058	CYCLOPHOSPHAMIDE; Also known as 2H-1,3,2-OXAZAPHOSPHORIN-2-AMINE, N,N-BIS (2-CHLOROETHYL)TETRAHYDRO-, 2-OXIDE
U059	DAUNOMYCIN; Also known as 5,12-NAPHTHACENEDIONE, 8-ACETYL-10-[(3-AMINO-2,3,6-TRIDEOXY)-ALPHS-L-LYXO-HEXOPYRANOSY)OXY]-7,8,9,10-TETRAHYDRO-6,8,11-TRIHYDROXY-1-METHOXY-, (8S-CIS)-
U060	DDD; Also known as BENZENE, 1,1'-(2,2-DICHLOROETHYLIDENE)BIS[4-CHLORO-
U061	DDT; Also known as BENZENE, 1,1'-(2,2,2-TRICHLOROETHYLIDENT)BIS[4-CHLORO-
U062	DIALLATE; Also known as CARBAMOTHIOIC ACID, BIS(1-METHYLETHYL)-, S-(2,3-DICHLORO-2-PROPENYL) ESTER
U063	DIBENZ[A,H]ANTHRACENE
U064	DIBENZO[A,I]PYRENE; Also known as BENZO[RST]PENTAPHENE
U066	1,2-DIBROMO-3-CHLOROPROPANE; Also known as PROPANE, 1,2-DIBROMO-3-CHLORO-
U067	ETHANE, 1,2-DIBROMO-; Also known as ETHYLENE DIBROMIDE
U068	METHANE, DIBROMO-; Also known as METHYLENE BROMIDE
U069	DIBUTYL PHTHALATE; Also known as 1,2-BENZENEDICARBOXYLIC ACID, DIBUTYL ESTER
U070	o-DICHLOROBENZENE; Also known as BENZENE, 1,2-DICHLORO-
U071	m-DICHLOROBENZENE; Also known as BENZENE, 1,3-DICHLORO-
U072	p-DICHLOROBENZENE; Also known as BENZENE, 1,4-DICHLORO-
U073	3,3'-DICHLOROBENZIDINE; Also known as [1,1'-BIPHENYL]-4,4'-DIAMINE, 3,3'DICHLORO-
U074	1,4-DICHLORO-2-BUTENE (I,T); Also known as 2-BUTENE, 1,4-DICHLORO- (I,T)
U075	DICHLORODIFLUOROMETHANE; Also known as METHANE, DICHLORODIFLUORO-
U076	ETHANE, 1,1-DICHLORO-; Also known as ETHYLIDENE DICHLORIDE
U077	ETHANE, 1,2-DICHLORO-; Also known as ETHYLENE DIBROMIDE
U078	1,1-DICHLOROETHYLENE; Also known as ETHENE, 1,1-DICHLORO-
U079	1,2-DICHLOROETHYLENE; Also known as ETHENE, 1,2-DICHLORO-, (E)
U080	METHANE, DICHLORO-; Also known as METHYLENE CHLORIDE

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
U081	2,4-DICHLOROPHENOL; Also known as PHENOL, 2,4-DICHLORO-
U082	2,6-DICHLOROPHENOL; Also known as PHENOL,2,6-DICHLORO-
U083	PROPANE, 1,2-DICHLORO-; Also known as PROPYLENE DICHLORIDE
U084	1,3-DICHLOROPROPENE; Also known as 1-PROPENE, 1,3-DICHLORO-
U085	1,2:3,4--DIEPOXYBUTANE (I,T); Also known as 2,2'-BIOXIRANE
U086	N,N'-DIETHYLHYDRAZINE; Also known as HYDRAZINE, 1,2,-DIETHYL-
U087	O,O-DIETHYL S-METHYL DITHIOPHOSPHATE; Also known as PHOSPHORODITHIOIC ACID, 0,0-DIETHYL S-METHYL ESTER
U088	DIETHYL PHTHALATE; Also known 1,2-BENZENEDICARBOXYLIC ACID, DIETHYL ESTER
U089	DIETHYLSTILBESTEROL; Also known as PHENOL, 4,4'-(1,2-DIETHYL-1,2-ETHENEDIYL)BIS-, (E)
U090	DIHYDROSAFROLE; Also known as 1,3-BENZODIOXOLE, 5-PROPYL-
U091	3,3'-DIMETHOXYBENZIDINE; Also known as [1,1'-BIPHENYL]-4,4'-DIAMINE, 3,3'DIMETHOXY-
U092	DIMETHYLAMINE (I); Also known as METHANAMINE, N-METHYL- (I)
U093	BENZENAMINE, N,N-DIMETHYL-4-(PHENYLAZO)-; Also known as P-DIMETHYLAMINOAZOBENZENE
U094	BENZ[A]ANTHRACENE, 7,12-DIMETHYL-; Also known as 7,12-DIMETHYLBENZ[A]ANTHRACENE
U095	3,3'-DIMETHYLBENZIDINE; Also known as [1,1'-BIPHENYL]-4,4'-DIAMINE, 3,3'DIMETHYL-
U097	DIMETHYLCARBAMOYL CHLORIDE; Also known as CARBAMIC CHLORIDE, DIMETHYL-
U098	1,1-DIMETHYLHYDRAZINE; Also known as HYDRAZINE, 1,1-DIMETHYL-
U099	1,2-DIMETHYLHYDRAZINE; Also known as HYDRAZINE, 1,2,-DIMETHYL-
U101	2,4-DIMETHYLPHENOL; Also known as PHENOL, 2,4-DIMETHYL-
U102	DIMETHYL PHTHALATE; Also known as 1,2-BENZENEDICARBOXYLIC ACID, DIMETHYL ESTER
U103	DIMETHYL SULFATE; Also known as SULFURIC ACID, DIMETHYL ESTER
U105	2,4-DINITROTOLUENE; Also known as BENZENE, 1-METHYL-2,4-DINITRO-
U106	2,6-DINITROTOLUENE; Also known as BENZENE, 2-METHYL-1,3-DINITRO-
U107	DI-N-OCTYL PHTHALATE; Also known as 1,2-BENZENEDICARBOXYLIC ACID, DIOCTYL ESTER
U108	1,4-DIETHYLENEOXIDE; Also known as 1,4-DIOXANE
U109	1,2-DIPHENYLHYDRAZINE; Also known as HYDRAZINE, 1,2-DIPHENYL-
U110	DIPROPYLAMINE (I); Also known as 1-PROPANAMINE, N-PROPYL- (I)
U111	DI-N-PROPYLNITROSAMINE; Also known as 1-PROPANAMINE, N-NITROSO-N-PROPYL-
U112	ACETIC ACID ETHYL ESTER (I); Also known as ETHYL ACETATE (I)
U113	ETHYL ACRYLATE (I); Also known as 2-PROPENOIC ACID, ETHYL ESTER (I)

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
U114	ETHYLENEBISDITHIOCARBAMIC ACID, SALTS & ESTERS; Also known as CARBAMODITHIOIC ACID, 1,2- ETHANEDIYLBIS-, SALTS & ESTERS
U115	ETHYLENE OXIDE (I,T); Also known as OXIRANE (I,T)
U116	ETHYLENETHIOUREA; Also known as 2-IMIDAZOLIDINETHIONE
U117	ETHANE, 1,1'-OXYBIS-(I); Also known as ETHYL ETHER (I)
U118	ETHYL METHACRYLATE; Also known as 2-PROPENOIC ACID, 2-METHYL-, ETHYL ESTER
U119	ETHYL METHANESULFONATE; Also known as METHANESULFONIC ACID, ETHYL ESTER
U120	FLUORANTHENE
U121	TRICHLOROMONOFLUOROMETHANE; Also known as METHANE, TRICHLOROFLUORO-
U122	FORMALDEHYDE
U124	FURAN (I); Also known as FURFURAN (I)
U125	2-FURANCARBOXALDEHYDE (I); Also known as FURFURAL (I)
U126	GLYCIDYLALDEHYDE; Also known as OXIRANECARBOXYALDEHYDE
U127	HEXACHLOROBENZENE; Also known as BENZENE, HEXACHLORO-
U128	HEXACHLOROBUTADIENE; Also known as 1,3-BUTADIENE, 1,1,2,3,4,4-HEXACHLORO-
U129	LINDANE; Also known as CYCLOHEXANE, 1,2,3,4,5,6- HEXACHLORO-, (1ALPHA, 2ALPHA, 3BETA, 4ALPHA, 5ALPHA, 6BETA)-
U130	HEXACHLOROCYCLOPENTADIENE; Also known 1,3-CYCLOPENTADIENE, 1,2,3,4,5,5-HEXACHLORO-
U131	HEXACHLOROETHANE; Also known as ETHANE, HEXACHLORO-
U132	HEXACHLOROPHENE; Also known as PHENOL, 2,2'-METHYLENEBIS[3,4,6-TRICHLORO-
U135	HYDROGEN SULFIDE; Also known HYDROGEN SULFIDE H_2S
U136	ARSINIC ACID, DIMETHYL-; Also known as CACODYLIC ACID
U137	INDENO[1,2,3-CD]PYRENE
U138	METHANE, IODO-; Also known as METHYL IODIDE
U140	ISOBUTYL ALCOHOL, (I,T); Also known as 1-PROPANOL, 2-METHYL-, (I,T)
U141	ISOSAFROLE; Also known as 1,3-BENZODIOXOLE, 5-(1-PROPENYL)-
U142	KEPONE; Also known as 1,3,4-METHENO-2H-CYCLOBUTA[CD]PENTALEN-2-ONE, 1,1A,3,3A,4,5,5A,5B,6- DECACHLOROOCTAHYDRO-
U143	LASIOCARPINE; Also known as 2-BUTENOIC ACID, 2-METHYL-, 7-[2,3-DIHYDROXY-2-(1-METHOXYETHYL)-3-METHYL-1- OXOBUTOXY]METHYL]-2,3,5,6A-TETRAHYDRO-1H-PYRROLIZIN-1-YL ESTER,[1S-1ALPHA(Z),7(2S*,3R*),7AALPHA]]-
U144	ACETIC ACID, LEAD(2+) SALT; Also known as LEAD ACETATE
U145	LEAD PHOSPHATE; PHOSPHORIC ACID, LEAD(2+) SALT (2:3)
U146	LEAD, BIS(ACETATO-O) TETRAHYDROXYTRI-; Also known as LEAD SUBACETATE

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EPA WASTE CODE	**WASTE DESCRIPTION**
U147	MALEIC ANHYDRIDE; Also known as 2,5-FURANDIONE
U148	MALEIC HYDRAZIDE; Also known as 3,6-PYRIDAZINEDIONE, 1,2-DIHYDRO-
U149	MALONONITRILE; Also known as PROPANEDINITRILE
U150	MELPHALAN; Also known as L-PHENYLALANINE, 4-[BIS(2-CHLOROETHYL)AMINO]-
U151	MERCYR
U152	METHACRYLONITRILE (I,T); Also known as 2-PROPENENITRILW, 2-METHYL- (I,T)
U153	METHANETHIOL (I,T); Also known as THIOMETHANOL (I,T)
U154	METHANOL (I); Also known as METHYL ALCOHOL (I)
U155	METHAPYRILENE; Also known 1,2-ETHANEDIAMINE, N,N- DIMETHYL-N'-W-PYRIDINYL-N'-(2- THIENYLMETHYL)-
U156	METHYL CHLOROCARBONATE (I,T); Also known CARBONOCHLORIDIC ACID, METHYL ESTER (I,T)
U157	BENZ[I]ACEANTHRYLENE, 1,2-DIHYDRO-3-METHYL-; Also known as 3-METHYLCHOLANTHRENE
U158	BENZENAMINE, 4,4'METHYLENEBIS[2-CHLORO-; Also known as 4,4'-METHYLENEBIS(2-CHLOROANILINE)
U159	METHYL ETHYL KETONE (MEK) (I,T); Also known as 2-BUTANONE (I,T)
U161	METHYL ISOBUTYL KETONE (I); Also known as 4-METHYL-2-PENTANONE (I) and PENTANOL, 4-METHYL-
U162	METHYL METHACRYLATE (I,T); Also known as 2-PROPENOIC ACID, 2-METHYL-, METHYL ESTER (I,T)
U163	MNNG; Also known as GUANIDINE, N-METHYL-N'-NITRO-N- NITROSO-
U164	METHYLTHIOURACIL; Also known as 4(1H)-PYRIMIDINONE, 2,3-DIHYDRO-6-METHYL-2-THIOXO-
U165	NAPHTHALENE
U166	1,4-NAPHTHALENEDIONE; Also known as 1,4-NAPHTHOQUINONE
U167	1-NAPHTHALENAMINE; Also known as ALPHA-NAPHTHYLAMINE
U168	2-NAPHTHALENAMINE; Also known as BETA-NAPHTHYLAMINE
U169	NITROBENZENE (I,T); Also known as BENZENE, NITRO-
U170	P-NITROPHENOL; Also known as PHENOL, 4-NITRO
U171	2-NITROPROPANE (I,T); Also known as PROPANE, 2-NITRO (I,T)
U172	N-NITROSODI-N-BUTYLAMINE; Also known as 1-BUTANAMINE, N-BUTYL-N-NITROSO-
U173	N-NITROSODIETHANOLAMINE; Also known as ETHANOL, 2,2'-(NITROSOIMINO)BIS-
U174	N-NITROSODIETHYLAMINE; Also known as ETHANAMINE, N-ETHYL-N-NITROSO-
U176	N-NITROSO-N-ETHYLUREA; Also known as UREA, N-ETHYL-N-NITROSO-
U177	N-NITROSO-N-METHYLUREA; Also known as UREA, N-METHYL-N-NITROSO-
U178	N-NITROSO-N-METHYLURETHANE; Also known as CARBAMIC ACID, METHYLNITROSO-,ETHYL ESTER

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EPA WASTE CODE	**WASTE DESCRIPTION**
U179	N-NITROSOPIPERIDINE; Also known as PIPERIDINE, 1-NITROSO-
U180	N-NITROSOPYRROLIDINE; Also known as PYRROLIDINE, 1-NITROSO-
U181	BENZENAMINE, 2-METHYL-5-NITRO-; Also known as 5-NITRO-O-TOLUIDINE
U182	PARALDEHYDE; Also known as 1,3,5-TRIOXANE, 2,4,6- TRIMETHYL-
U183	PENTACHLOROBENZENE; Also known as BENZENE, PENTACHLORO-
U184	PENTACHLOROETHANE; Also known as ETHANE, PENTACHLORO-
U185	PENTACHLORONITROBENZENE (PCNB); Also known as BENZENE, PENTACHLORONITRO-
U186	1,3-PENTADIENE (I); Also known as 1-METHYLBUTADIENE (I)
U187	ACETAMIDE, N-(4-ETHOXYPHENYL)-; Also known as PHENACETIN
U188	PHENOL
U190	PHTHALIC ANHYDRIDE; Also known as 1,3-ISOBENZOFURANDIONE
U191	2-PICOLINE; Also known as PYRIDINE, 2-METHYL-
U192	BENZAMIDE,3,5-DICHLORO-N-(1,1-DIMETHYL-2-PROPYNYL)-; Also known as PRONAMIDE
U193	1,3-PROPANE SULTONE; Also known as 1,2-OXATHIOLANE, 2,2-DIOXIDE
U194	1-PROPANAMINE (I,T); Also known as N-PROPYLAMINE (I,T)
U196	PYRIDINE
U197	P-BENZOQUINONE; Also known as 2,5-CYCLOHEXADIENE-1,4-DIONE
U200	RESERPINE; Also known as YOHIMBAN-16-CARBOXYLIC ACID, 11,17-DIMETHOXY-18-[(3,4,5-TRIMETHOXYBENZOYL)OXY]-, METHYL ESTER, (3BETA, 16BETA, 17ALPHA, 18BETA, 20ALPHA)-
U201	RESORCINOL; Also known as 1,3-BENZENEDIOL
U202	SACCHARIN, & SALTS; Also known as 1,2-BENZISOTHIAZOL-3(2H)-ONE, 1,1-DIOXIDE, & SALTS
U203	SAFROLE; Also known as 1,3-BENZODIOXOLE, 5-(2- PROPENYL)-
U204	SELENIOUS ACID; Also known as SELENIUM DIOXIDE
U206	STREPTOZOTOCIN; Also known as GLUCOPYRANOSE, 2-DEOXY-2-(3-METHYL-3-NITROSOUREIDO)-, D-D-GLUCOSE, 2-DEOXY-2-[[(METHYLNITROSOAMINO)-CARBONYL]AMINO]-
U207	1,2,4,5-TETRACHLOROBENZENE; Also known as BENZENE, 1,2,4,5-TETRACHLORO-
U208	1,1,1,2-TETRACHLOROETHANE; Also known as ETHANE, 1,1,1,2-TETRACHLORO-
U209	1,1,2,2-TETRACHLOROETHANE; Also known as ETHANE, 1,1,2,2-TETRACHLORO-
U210	TETRACHLOROETHYLENE; Also known as ETHENE, TETRACHLORO-
U211	CARBON TETRACHLORIDE; Also known as METHANE, TETRACHLORO-
U213	TETRAHYDROFURAN (I); Also known as FURAN, TETRAHYDRO-(I)
U214	ACETIC ACID, THALLIUM(1+) SALT; Also known as THALLIUM(I) ACETATE

Exhibit C -- HAZARDOUS WASTES RECEIVED AT SIEMENS WATER TECHNOLOGY CORP.	
EPA WASTE CODE	**WASTE DESCRIPTION**
U215	THALLIUM(I) CARBONATE; Also known as CARBONIC ACID, DITHALLIUM(1+) SALT
U216	THALLIUM(I) CHLORIDE; Also known as THALLIUM CHLORIDE TLCL
U217	THALLIUM(I) NITRATE; Also known as NITRIC ACID, THALLIUM(1+) SALT
U218	THIOACETAMIDE; Also known as ETHANETHIOAMIDE
U219	THIOUREA
U220	TOLUENE; Also known as BENZENE, METHYL-
U221	TOLUENEDIAMINE; Also known as BENZENEDIAMINE, AR-METHYL-
U222	BENZENAMINE, 2-METHYL-, Also known as HYDROCHLORIDE O-TOLUIDINE HYDROCHLORIDE
U225	BROMOFORM; Also known as METHANE, TRIBROMO-
U226	ETHANE, 1,1,1-TRICHLORO-; Also known as METHYL CHLOROFORM
U227	1,1,2-TRICHLOROETHANE; Also known as ETHANE, 1,1,2-TRICHLORO-
U228	TRICHLOROETHYLENE; Also known as ETHENE, TRICHLORO-
U235	TRIS(2,3-DIBROMOPROPYL) PHOSPHATE; Also known as 1-PROPANOL, 2,3-DIBROMO-, PHOSPHATE (3:1)
U236	TRYPAN BLUE; Also known as 2,7-NAPHTHALENEDISULFONIC ACID, 3,3'-[(3,3'-DIMETHYL[1,1'-BIPHENYL]-4,4'- DIYL)BIS(AZO)BIS[5-AMINO-4-HYDROXY]-, TETRASODIUM SALT
U237	URACIL MUSTARD; Also known as 2,4-(1H,3H)-PYRIMIDINEDIONE, 5-[BIS(2-CHLOROETHYL)AMINO]-
U238	CARBAMIC ACID, ETHYL ESTER; Also known as ETHYL CARBAMATE (URETHANE)
U239	XYLENE (I); Also known as BENZENE, DIMETHYL- (I,T)
U240	ACETIC ACID, 92,4-DICHLOROPHENOXY)-, SALTS & ESTERS; Also known as 2,4-D, SALTS & ESTERS
U243	HEXACHLOROPROPENE; Also known as 1-PROPENE, 1,1,2,3,3,3- HEXACHLORO-
U244	THIOPEROXYDICARBONIC DIAMIDE $[(H_2N)C(S)]_2S_2$, TETRAMETHYL-; Also known as THIRAM
U246	CYANOGEN BROMIDE (CN)Br
U247	BENZENE, 1,1'(2,2,2-TRICHLOROETHYLIDENE)BIS[4-METHOXY-; Also known as METHOXYCHLOR
U248	WARFARIN, & SALTS, WHEN PRESENT AT CONCENTRATIONS OF 0.3% OR LESS; Also known as 2H-1-BENZOPYRAN-2-ONE, 4- HYDROXY-3-(3-OXO-1-PHENYL-BUTYL)-, & SALTS, WHEN PRESENT AT CONCENTRATIONS OF 0.3% OR LESS
U249	ZINC PHOSPHIDE Zn_3P_2 WHEN PRESENT AT CONCENTRATIONS OF 10% OR LESS
U328	BENZENAMINE, 2-METHYL-; Also known as o-TOLUIDINE
U353	BENZENAMINE, 4-METHYL-; Also known as p-TOLUIDINE
U359	ETHANOL, 2-ETHOXY-; Also known as ETHYLENE GLYCOL MONOETHYL ETHER

Exhibit C - Hazardous Waste Characteristics

Table 2 – Spent Activated Carbon Organic Constituents

Exhibit C

Spent Activated Carbon Organic Constituent Data Summary				
		Organics (lb constituent per lb spent activated carbon)		
Constituent	**CAS NO.**	Minimum	Maximum	Average
1-Butanol	71-36-3	8.67E-04	8.67E-04	8.67E-04
1-Hexane	110-54-3	3.86E-04	8.45E-02	4.24E-02
1,1 Dichloroethane	75-34-3	9.00E-09	3.20E-02	9.71E-04
1,1 Dichloroethene	75-35-4	2.50E-10	2.94E-01	2.51E-03
1,1,1 Trichloroethane	71-55-6	2.50E-09	3.43E+00	1.31E-02
1,1,2 Trichloroethane	79-00-5	5.00E-07	1.41E-02	3.28E-03
1,1,2,2 Tetrachloroethane	79-34-5	1.45E-05	3.31E-04	2.29E-04
1,2 Dibromoethane	106-93-4	2.50E-08	1.98E-02	4.57E-03
1,2 Dichlorobenzene	95-50-1	2.05E-05	4.60E-03	9.99E-04
1,2 Dichloroethane	107-06-2	0.00E+00	1.39E-01	7.18E-03
1,2 Dichloroethene	540-59-0	2.50E-08	7.32E-03	2.13E-03
1,2 Dichloropropane	78-87-5	3.00E-09	5.30E-02	6.06E-03
1,2,3 Trichloropropane	96-18-4	3.72E-06	3.72E-06	3.72E-06
1,2,4 Trimethylbenzene	95-63-6	1.10E-07	4.80E-04	3.84E-04
1,2-Dichloroethene (cis)	156-59-2	1.00E-09	2.63E-03	1.39E-03
1,2-Dichloroethene (trans)	156-60-5	7.32E-05	5.44E-04	3.65E-04
1,3 Dichlorobenzene	541-73-1	7.40E-05	5.48E-04	1.70E-04
1,4 Dichlorobenzene	106-46-7	2.50E-08	3.44E-03	5.20E-04
2,3,4,6 Tetrachlorophenol	58-90-2	1.82E-05	1.82E-05	1.82E-05
2-Butanol	78-92-2	5.90E-04	5.90E-04	5.90E-04
2-Butoxyethanol	111-76-2	2.73E-03	2.73E-03	2.73E-03
2-ethyl-1-Methylbenzene	611-14-3	9.40E-05	9.40E-05	9.40E-05
2-methoxy-1-Propanol		6.24E-03	6.24E-03	6.24E-03
2-Methylnaphthalene	91-57-6	1.63E-05	1.34E-03	4.61E-04
2-Methylphenol (o-Cresol)	95-48-7	2.14E-05	2.14E-05	2.14E-05
3-/4-Methylphenol (m&p Cresol)	108-39-4 & 106-44-5	3.40E-05	3.40E-05	3.40E-05
4-ethyl-1-Methylbenzene		8.10E-05	8.10E-05	8.10E-05
Acenaphthalene	208-96-8	3.36E-05	6.26E-04	3.30E-04
Acenaphthene	83-32-9	2.81E-06	2.41E-05	1.09E-05
Acenaphthylene		1.18E-06	2.66E-06	1.92E-06
Acetone	67-64-1	4.51E-03	8.49E-03	6.50E-03
Acrylic Acid	79-10-7	2.50E-05	2.50E-05	2.50E-05
Acrylonitrile	107-13-1	9.30E-06	9.30E-06	9.30E-06
Aldrin	309-00-2	6.60E-07	6.60E-07	6.60E-07
Aniline	62-53-3	2.51E-05	4.26E-04	1.47E-04
Benzene	71-43-2	2.50E-10	9.25E-02	1.44E-03
Benzo(a)Anthracene	56-55-3	5.60E-07	2.10E-06	1.33E-06
Benzo(b)Fluoranthene	205-99-2	2.30E-07	4.00E-07	3.20E-07
Bromodichloromethane	75-27-46	3.00E-05	6.18E-04	4.06E-04
Butane	106-97-8	9.69E-06	9.69E-06	9.69E-06
Butyl Acetate	123-86-4	1.36E-02	1.36E-02	1.36E-02
Carbon Tetrachloride	56-23-5	3.00E-08	1.36E-02	5.39E-04
Chlorobenzene	108-90-7	2.50E-08	2.75E-03	4.76E-04
Chloroethane	75-00-3	3.89E-03	3.89E-03	3.89E-03
Chloroform	67-66-3	1.40E-08	2.08E-02	1.05E-02

Exhibit C

Spent Activated Carbon Organic Constituent Data Summary				
		Organics (lb constituent per lb spent activated carbon)		
Constituent	**CAS NO.**	Minimum	Maximum	Average
Chloromethane	74-87-3	2.06E-04	2.06E-04	2.06E-04
Chrysene	218-01-9	6.40E-07	6.40E-07	6.40E-07
Cresol	1319-77-3	5.10E-05	1.74E-04	1.13E-04
Cumene	98-82-8	5.78E-06	1.65E-03	4.37E-04
Dibenzofuran	132-64-9	7.66E-06	2.61E-05	1.69E-05
Dicyclopentadiene	77-73-6	6.06E-04	6.49E-02	1.68E-02
Dioxane	123-91-1	1.16E-04	9.20E-04	5.18E-04
Ethanol	64-17-5	3.56E-04	3.56E-04	3.56E-04
Ethyl Acetate	141-78-6	5.87E-03	5.87E-03	5.87E-03
Ethylbenzene	100-41-4	5.00E-10	2.30E-02	1.14E-03
Ethylene Glycol	107-21-1	2.94E-01	2.94E-01	2.94E-01
Fluoranthene	206-44-0	3.11E-06	2.90E-05	1.61E-05
Freon 113	76-13-1	1.10E-09	1.10E-09	1.10E-09
Isobutane	75-28-5	1.42E-02	1.42E-02	1.42E-02
Isopar C		1.27E-03	5.48E-02	2.80E-02
Isopropyl Alcohol	67-63-0	7.00E-03	7.00E-03	7.00E-03
Lindane	58-89-9	1.54E-09	6.70E-06	1.28E-06
m&p-Xylenes	108-38-3 &106-42-3	7.20E-08	2.89E-03	5.90E-04
Methanol	67-56-1	1.36E-01	1.36E-01	1.36E-01
Methoxychlor	72-43-5	2.80E-06	2.80E-06	2.80E-06
Methyl ethyl ketone	78-93-3	1.20E-08	4.10E-03	1.40E-03
Methyl Isobutyl ketone	108-10-1	5.00E-06	4.24E-02	2.94E-03
Methyl methacrylate	80-62-6	2.50E-08	2.50E-08	2.50E-08
methyl tert-butyl ether	1634-04-4	1.22E-07	4.66E-02	5.86E-03
Methylene chloride	75-09-2	1.90E-08	1.30E-01	1.63E-03
Methylnaphthalene	28804-88-8	3.54E-06	5.03E-06	4.29E-06
Naphthalene	91-20-3	6.00E-09	4.93E-03	4.31E-04
n-Hexane	110-54-3	5.51E-04	8.25E-03	4.40E-03
Nitrobenzene	98-95-3	6.99E-06	3.14E-02	4.50E-03
o-Xylene	95-47-6	2.50E-09	9.00E-05	1.22E-05
Pentachlorophenol	87-86-5	1.00E-06	3.97E-03	7.36E-04
Phenanthrene	85-01-8	3.20E-07	2.95E-05	1.08E-05
Phenol	108-95-2	2.00E-07	4.03E-03	1.27E-03
Polychlorinated Biphenyls	1336-36-3	8.00E-07	3.50E-06	2.15E-06
Propylbenzene	103-65-1	9.00E-05	9.00E-05	9.00E-05
Propylene glycol monomethyl ether acetate	107-98-2	1.45E-02	1.45E-02	1.45E-02
Propylene oxide	75-56-9	4.30E-09	4.00E-03	1.00E-03
Styrene	100-42-5	2.50E-08	3.97E-02	3.57E-03
Tetrachloroethane	630-20-6 & 79-34-5	2.96E-03	2.96E-03	2.96E-03
Tetrachloroethylene	127-18-4	0.00E+00	1.59E-01	1.84E-02
Tetrahydrofuran	109-99-9	4.16E-04	4.16E-04	4.16E-04
Toluene	108-88-3	1.60E-09	1.30E-01	8.68E-03
Trichloroethylene	79-01-6	2.50E-09	2.17E-01	2.24E-03

Exhibit C

Spent Activated Carbon Organic Constituent Data Summary				
Constituent	**CAS NO.**	**Organics (lb constituent per lb spent activated carbon)**		
		Minimum	Maximum	Average
Trichlorofluoromethane	75-69-4	1.00E-07	4.00E-02	1.42E-03
Triethylamine	121-44-8	9.54E-03	9.54E-03	9.54E-03
Tris(hydroxymethyl) Aminomethane		1.77E-02	1.77E-02	1.77E-02
Vinyl Chloride	75-01-4	2.30E-08	2.40E-05	2.58E-06
Xylene	1330-20-7	8.00E-10	1.59E-01	3.41E-03

All data reported on a dry carbon basis.

Exhibit C - Hazardous Waste Characteristics

Table 3 - Spent Activated Carbon Characterization

Exhibit C
Spent Activated Carbon Characterization Summary

Stream Type: Solid
Stream Name: Spent Activated Carbon
Feed Method: Dewatering screw, conveyor belt and rotary airlock

Constituent/Property	Units	Value	
		Typical	Range
Organic Constituents (a)			
Total organics	wt%	3.1	2 - 4
Inorganic Constituents			
Water	wt%	43.5	30 - 50
RCRA Metals (a)			
Antimony	mg/kg	<10	<10
Arsenic	mg/kg	2.8	1.2 - 19
Barium	mg/kg	38.3	1 - 110
Beryllium	mg/kg	0.5	<0.1 - 0.7
Cadmium	mg/kg	0.7	<0.5 - 6.9
Chromium	mg/kg	11	3.1 - 240
Chromium (VI)	mg/kg	<0.9	<1
Lead	mg/kg	2.7	<2 - 25
Mercury	mg/kg	0.1	0 - 0.5
Nickel	mg/kg	21.3	7.5 - 140
Selenium	mg/kg	<2	<1 - 3.9
Silver	mg/kg	1	<0.5 - 1.6
Thallium	mg/kg	10.7	<5 - 29
Other Metals (a)			
Cobalt	mg/kg	4.8	2.1 - 19
Copper	mg/kg	31.4	12 - 60
Manganese	mg/kg	223	54 - 590
Vanadium	mg/kg	6.2	3.7 - 7.9
Zinc	mg/kg	35.4	22 - 44
Elemental Composition (b)			
Carbon (from spent carbon)	wt%	94.5	70 - 99
Carbon (from organic adsorbed on carbon)	wt%	2.9	1.6 - 25
Hydrogen	wt%	0.4	0.2 - 8
Oxygen	wt%	0.5	0.3 - 5
Nitrogen	wt%	0.1	0.06 - 0.5
Sulfur	wt%	0	<0.1
Phosphorous	wt%	0	<0.1
Chlorine/chloride	wt%	1.5	0 - 5
Bromine/bromide	wt%	0	<0.1
Fluorine/fluoride	wt%	0	<0.1
Iodine/iodide	wt%	0	<0.1

(a) - As fed basis (wet)
(b) - Dry basis (as received)

Note: The information presented in this table is considered typical but should not be considered limiting.

Exhibit D – Information on Metal Components

Exhibit D - Information on Metal Components

Modern Custom Fabrication Drawing 1601794, Sheet 2 of 5:

bottom of base ring extension A7 (support lugs) to bottom of T-18 = 4' 3" + 9' 4-3/4" = 13' 7-3/4"

Schwan Drawing 5094, Sheet S2:

Top of T-18 structural steel support = EL 169' 2" - 1-1/4" = EL 169' 0-3/4"

Schwan Drawing 5094, Sheet S3:

Grade = EL 115' 0"

Distance from top of T-18 structural steel support to grade = 169' 0-3/4" - 115' 0" = 54' 0-3/4" above grade

Distance from bottom of T-18 to grade = 54' 0-3/4" - 13' 7-3/4" = 40' 5"

Bottom of T-18 is 40' 5" above grade; therefore no metal component of tank is in contact with the soil or with water.

APPENDIX IX

TAB 3

Certification of the T-Tank Containment Area

Revision 0
February 2007

CBE CHAVOND-BARRY ENGINEERING CORP.
400 County Route 518 • P.O. Box 205
Blawenburg, New Jersey 08504-0205
Tel: (609) 466-4900
Fax: (609) 466-1231

June 12, 2006

Mr. Monte McCue
Director of Plant Operations
Siemens Water Technologies Corp.
2523 Mutahar
PO Box 3308
Parker, AZ 85344

Ref: Certification Of The T-Tank Containment Area

Dear Mr. McCue:

I have reviewed the T-Tank Containment Pad Plan for the Westates Facility, dated 2/11/06, and I am satisfied, using my judgment as a professional engineer, of the following:

1. The proposed containment pad is designed to be constructed with materials that are compatible with the spent carbon wastes to be placed into the tank system that the pad will serve, and will have sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrological forces), physical contact with the spent carbon, climatic conditions, the stress of installation, and the stress of daily operation (including stresses from nearby vehicular traffic).

2. The proposed containment pad will be placed on a foundation or base capable of providing support to the secondary containment system and resistance to pressure gradients above and below the system and capable of preventing failure due to settlement, compression, or uplift.

Regards,
Chavond-Barry Engineering Corp.



Louis T. Barry, P. E. (NJ: 24GE03567600)
President

CC: Stephen M. Richmond SRichmond@BDLaw.com
Karl E. Monninger KEMonninger@Chavond-Barry.com
Darwin M. Owens Darwin.Owens@Patmedia.net

T-TANK CONTAINMENT VOLUME CALCULATIONS
US FILTER WESTATES CARBON
PARKER, AZ

CONTAINMENT VOLUME BELOW TOP OF PIERS					
	ELEV (FT)	DIFF ELEV (FT)	SURFACE AREA (SF)	AVE AREA (SF)	GROSS VOLUME (CF)
TOP OF GRATE	10.60		8.00		
		0.07		20.49	1.43
	10.67		32.97		
		0.04		45.39	1.82
	10.71		57.81		
		0.13		246.37	32.03
	10.84		434.92		
		0.03		486.21	14.59
	10.87		537.50		
		0.21		769.04	161.50
	11.08		1,000.57		
		0.92		1,000.57	920.52
TOP OF PIER	12.00		1,000.57		
				GROSS VOLUME TOTAL =	1,131.89
				LESS PIER VOLUME =	45.10
				LESS STEP VOLUME =	8.56
				NET VOLUME TO TOP OF PIERS =	**1,078.23**

PIER VOLUME						
	TOP ELEV	AVERAGE BOTTOM ELEV	AVERAGE HEIGHT (FT)	SIZE (FTxFT)	SURFACE AREA (SF)	VOLUME (CF)
PIER #1	12.00	10.69	1.31	2 X 2	4.00	5.24
PIER #2	12.00	10.78	1.22	2 X 2.5	5.00	6.10
PIER #3	12.00	10.78	1.22	2 X 2.5	5.00	6.10
PIER #4	12.00	10.87	1.13	2 X 2	4.00	4.52
PIER #5	12.00	10.87	1.13	2 X 2	4.00	4.52
PIER #6	12.00	10.87	1.13	2 X 2	4.00	4.52
PIER #7	12.00	10.97	1.03	2 X 2.5	5.00	5.15
PIER #8	12.00	10.97	1.03	2 X 2.5	5.00	5.15
PIER #9	12.00	11.05	0.95	2 X 2	4.00	3.80
				TOTAL FOR PIERS=	**40.00**	**45.10**

STEP VOLUME OCCURS BELOW TOP OF PIERS:

STEP VOLUME = 1.07 SF X 8 FT = 8.56 CF

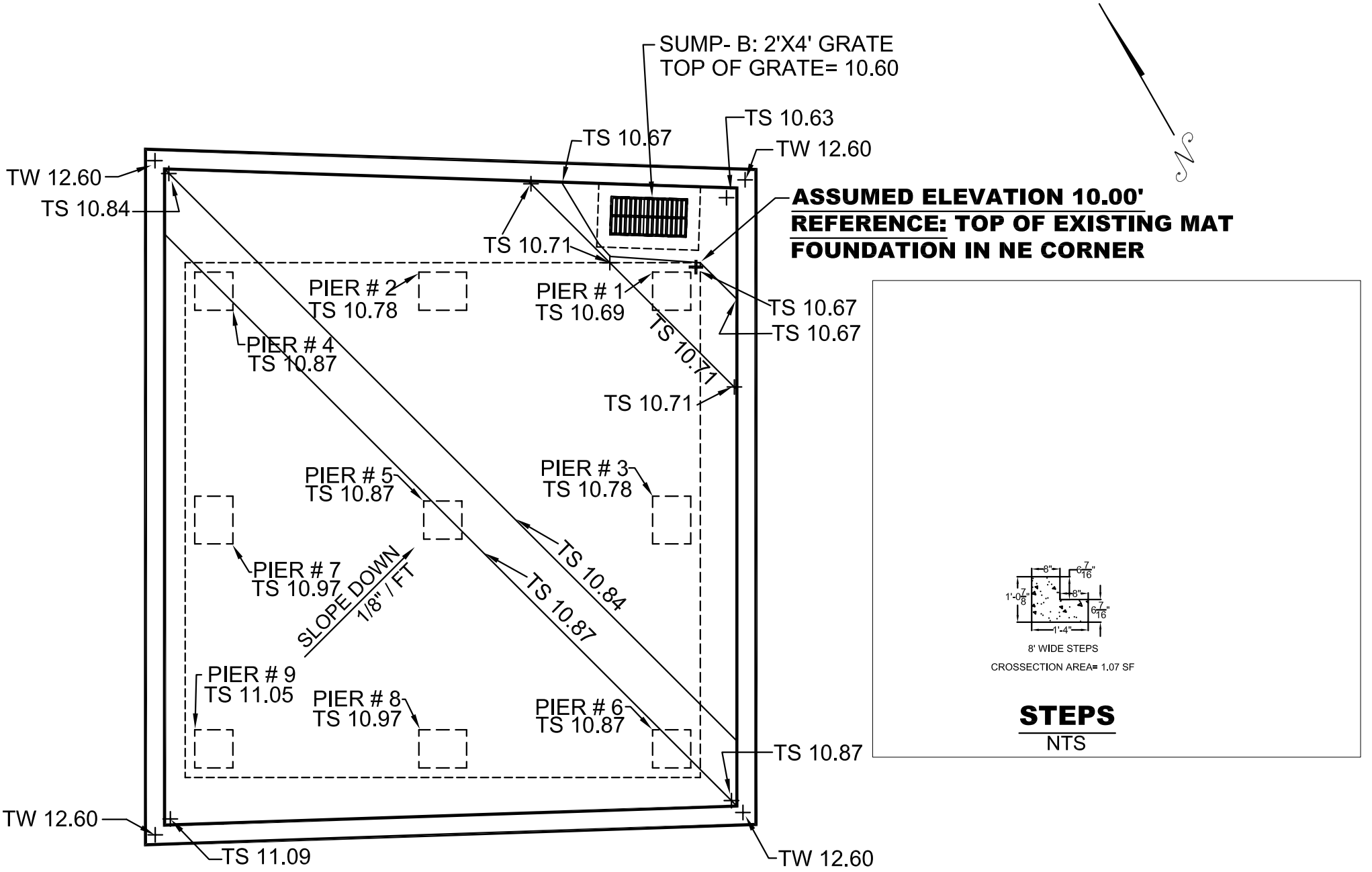
TOTAL STEP VOLUME (ALL BELOW TOP OF PIERS) = 8.56 CF

NOTES:

1. FOR EASE OF CALCULATION AND BEING CONSERVATIVE, ASSUME PIER SURFACE AREA REMAINS CONSTANT TO ACCOUNT FOR THE SUPPORT STEEL
2. RESULTANT SURFACE AREA TAKING OUT PIER SURFACE AREA= 1,000.57 SF - 40 SF = 960.57 SF

CONTAINMENT VOLUME ABOVE TOP OF PIERS								
	ELEV (FT)	DIFF ELEV (FT)	SURFACE AREA (SF)	AVE AREA (SF)	VOLUME (CF)	CUMULATIVE VOLUME (CF)	CUMULATIVE VOLUME (GAL)	
TOP OF PIER	12.00		960.57			1,078	8,065	
		0.60		960.57	576.34			
TOP OF WALL	12.60		960.57			1,655	12,376	
						TOTAL CONTAINMENT VOLUME TO TOP OF WALL =	**12,376**	**GALLONS**

T-TANK CONTAINMENT VOLUME REQUIRED			
LARGEST RCRA TANK VOLUME=		8,319	GALLONS
25-Year, 24 Hour Rain Event (PARKER, AZ) = 2.45 inches (Per ASU Office of Climatology)			
GROSS SURFACE AREA (SF)	RAIN DEPTH (INCHES)	VOL (CF)	VOL (GAL)
1,000.57	2.45	204	1,528
	TANK VOLUME=	8,319	GALLONS
	RAINFALL VOLUME=	1,528	GALLONS
	TOTAL REQUIRED VOLUME=	**9,847**	**GALLONS**

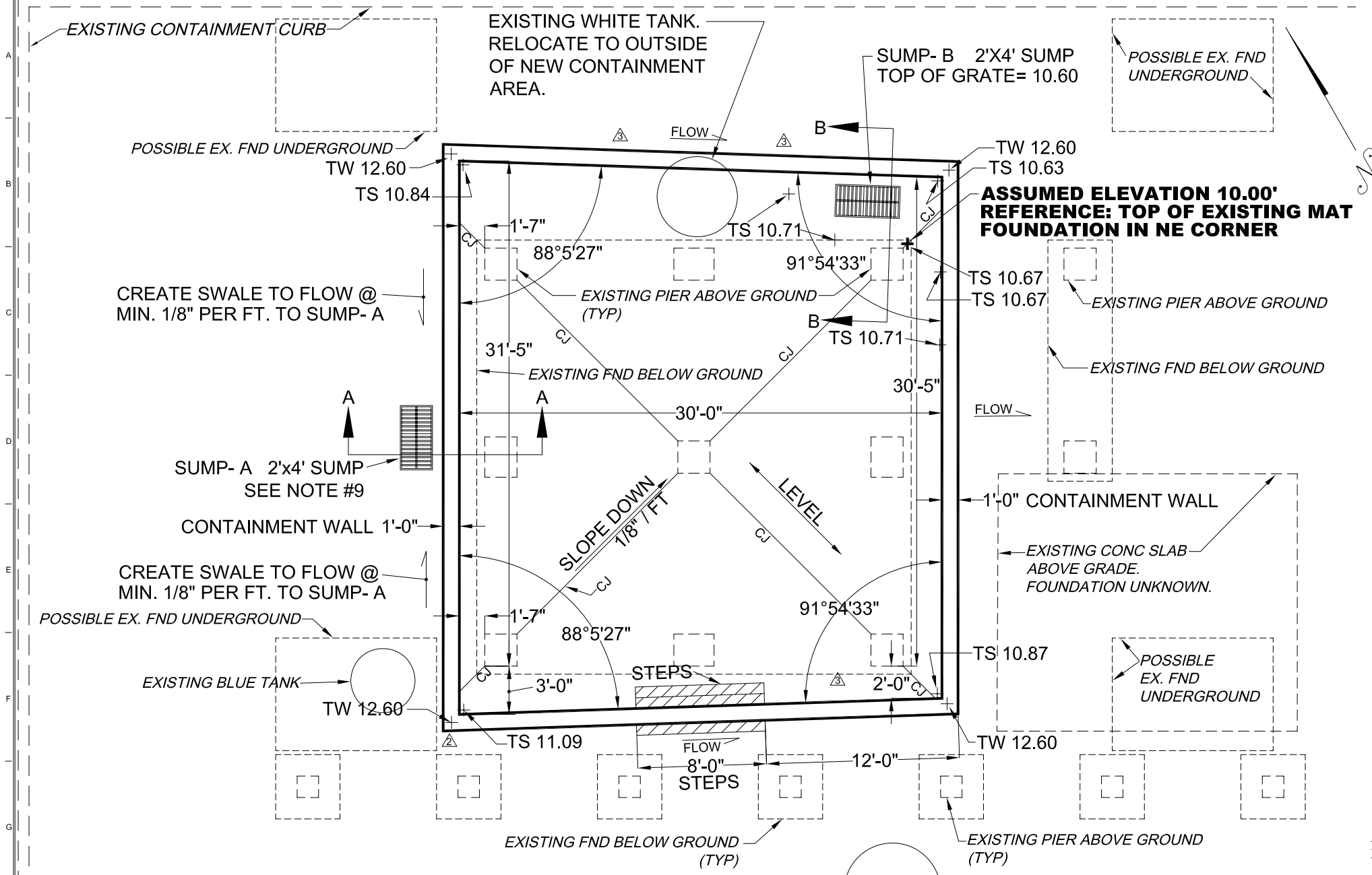


CONTAINMENT VOLUME CALCULATION PLAN

SCALE: 1/8"=1'

GRAPHIC SCALE

8' 4' 0 8' 16'



CONTAINMENT PAD PLAN

SCALE: 1/4"= 1'

GRAPHIC SCALE
4' 2' 0 4' 8'

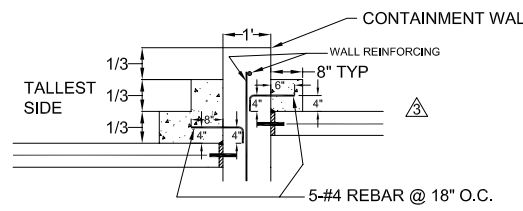
NOTES:

1. A FIELD SURVEY WAS NOT PERFORMED FOR THIS WORK. THE EXISTING CONDITIONS INFORMATION SHOWN HEREON WAS OBTAINED FROM 2 SETS OF PLANS AND SITE PHOTOS PROVIDED BY THE OWNER. THE 2 SETS OF PLANS ARE:
   1) THE FOUNDATION LAYOUT PLANS TITLED "WESTATES CARBON, LOS ANGELES, CA 90040" FOR PROJECT IN PARKER, AZ, PREPARED BY GMG ASSOCIATES, DATED 3-17-92 WITH LATEST REVISION "B" 3-23-92, DRAWING NO. D 9201-401 AND D 9201-402.
   2) PLANS TITLED "USFILTER WESTATES SURVEY OF CONTAINMENT VOLUME" PREPARED BY LEMME ENGINEERING INC., DATED 9-5-02 SHEETS 1&2 OF 5.
2. THE CONTRACTOR IS TO REVIEW THE SITE AND IT'S CONDITION BEFORE PROVIDING A PRICE AND AGAIN BEFORE BEGINNING CONSTRUCTION.
3. THE CONTRACTOR IS TO MOVE/RELOCATE ALL ITEMS AS NECESSARY TO DO THIS WORK. THE OWNER WILL INSTRUCT THE CONTRACTOR AS TO WHICH ITEMS HE WILL BE RESPONSIBLE FOR MOVING/RELOCATING DURING CONSTRUCTION AND WHICH ITEMS ARE TO BE MOVED BACK INTO THE CONTAINMENT AREA AFTER CONSTRUCTION.
4. THE CONTRACTOR IS TO REMOVE THE EXISTING CONCRETE CONTAINMENT PAD IN ITS ENTIRETY FROM THE AREA WHERE THE NEW PAD IS TO BE CONSTRUCTED. CONTRACTOR IS NOT TO DAMAGE THE EXISTING PIERS AND UNDERGROUND FOUNDATIONS.
5. THE CONTRACTOR IS TO UNCOVER THE EXISTING MAT FOUNDATION AND HAVE AN INDEPENDENT TESTING FIRM EXPERIENCED IN CONCRETE TESTING INSPECT THE EXISTING MAT FOUNDATION TO VERIFY ITS CONDITION. THE TESTING FIRM IS TO PROVIDE TO THE OWNER A REPORT SHOWING THAT THE PAD CONDITION IS NOT DAMAGED PRIOR TO THE CONTRACTOR PROCEEDING WITH CONSTRUCTION.
6. SUMP-A&B: USE NEENAH FOUNDRY FRAME & GRATE #R-1879-B8G 24"X48" LIGHT DUTY. GRATE COMES IN 2 PARTS
7. ALL CONSTRUCTION JOINTS ARE TO CONTAIN WATERSTOPS, EXPANSION JOINT MATERIAL AND CAULK.
8. ON BOTH SIDES OF THE CONTAINMENT WALL WHERE THE CONCRETE PAD MEETS THE WALL USE WATERSTOPS, EXPANSION JOINT MATERIAL AND CAULK.
9. SUMP-A TOP OF GRATE ELEVATION IS TO BE DETERMINED IN THE FIELD BY CREATING A SWALE ALONG THE CONTAINMENT WALL AT A MINIMUM SLOPE OF 1/8" PER FOOT FROM THE SW AND NW CORNER OF THE CONTAINMENT WALL SO THAT THE WATER DRAINS TO SUMP- A.

LEGEND

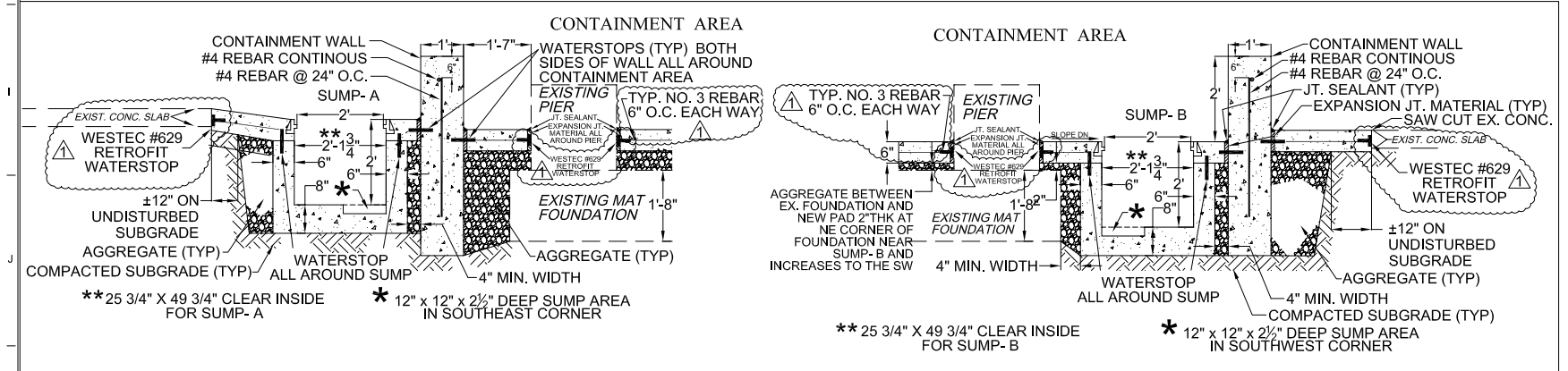
TW 12.60 = TOP OF WALL ELEVATION
TS 10.67 = TOP OF SLAB ELEVATION
CJ = CONSTRUCTION JOINT

TREADS ARE LEVEL, FLAT AND SAME ELEV. ON BOTH SIDES OF WALL



PAINT VERTICAL FACES OF THE STEPS WITH YELLOW PAINT INCLUDING THE WALL WITHIN THE LIMITS OF THE STEPS.

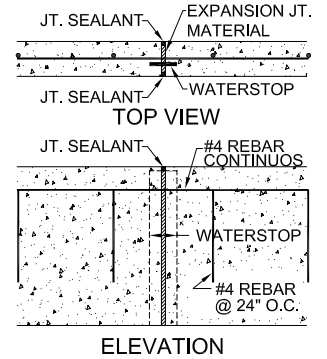
STEP DETAIL 3
NTS



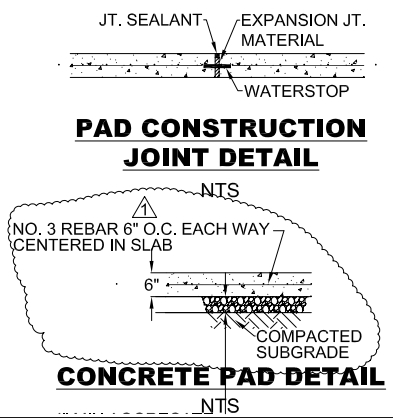
SUMP- A SECTION A-A

SCALE: HORZ & VERT
1/2"=1'-0"

SUMP- B SECTION B-B



WALL CONSTRUCTION JOINT DETAIL
NTS



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NO	DWN	CK'D	APP	REVISIONS	DATE
3	JBE	KEM	KEM	Remove 4' steps and platform.	1/19/07
2	JBE	KEM	KEM	Existing foundation in way of west corner removed. Wall west corner revised.	12/27/06
1	DMO	JBE	KEM	Changed reinforcing in slab & waterstop adjacent existing slab and existing piers	5/23/06

CBE CHAVOND-BARRY ENGINEERING CORP.
NJ Certificate of Authorization Number: 24GA27984700
400 Route 518 • P.O. Box 205 • Blawenburg, New Jersey 08504

SIEMENS WATER TECHNOLOGIES PLANT
2523 MUTAHAR STREET, PARKER, AZ 85344
CONTAINMENT PAD REPLACEMENT

T-TANK CONTAINMENT PAD PLAN

DRAWN	DATE	CHECKED	DATE	APPROVED	DATE
DMO	02/15/06	JBE	02/15/06	KEM	02/15/06

SCALE	DWG. NO.	REV.
1/4"=1'-0"	1541-C-001	3

PRINT DATE: 2-22-07