EVOQUA
WATER TECHNOLOGIES

Via Email to R9LandSubmit@epa.gov February 28, 2019

Director, Land Division
US Environmental Protection Agency, Region 9
75 Hawthorne Street (LND-1)
San Francisco, CA 94105

Re: Evoqua Water Technologies – Parker, Arizona Facility
USEPA ID No.: AZD 982 441 263
Modification No. 003 – Class 1 – H-1 and H-2 Hopper Modifications and Certification

Dear Mr. Scott:

In accordance with 40 CFR 270.72(a), Evoqua Water Technologies LLC hereby submits a Class 1 permit modification notification to the Environmental Protection Agency, Region 9 for the Hazardous Waste Permit issued to its facility located at 2523 Mutahar Street in Parker, Arizona, and an engineering assessment of the structural integrity of new Hoppers H-1 and H-2 that were installed prior to the effective date of the permit. The permit modification is classified as a Class 1 modification in 40 CFR 270.42 Appendix I, Section A.3, which provides for "equipment replacement or upgrading with functionally equivalent equipment components".

The engineering assessment and permit modification are being submitted to address the hopper installation and assessment requirements of Permit Condition IV.B.4. and IV.E.6, IV.E.7 and IV.E.8. As we have discussed with representatives of EPA, Hoppers H-1 and H-2 were replaced with double walled stainless-steel hoppers prior to the effective date of the permit, and therefore the work tasks in the permit calling for replacement of the hoppers and installation of secondary containment are out of date and should be removed. This submittal includes a certification of the structural integrity of the new hoppers and containment system, and modifications to the permit to remove language calling for the installation of a secondary containment system. Please see the redline version in Exhibit XX for changes to the Final Permit pertaining to the hoppers.

Permit Table IV-1 and Permit Conditions IV.E.6, IV.E.7 and IV.E.8 Permit Attachment Appendix IX modifications are as follows:

- Permit Table IV-1 is modified to reflect that the Hoppers H-1 and H-2 are now constructed of stainless steel, and the footnote to the table is removed since new hopper construction was completed prior to the effective date of the permit.
- Permit Conditions IV.E.6, IV.E.7 and IV.E.8 are revised to remove requirements to submit a work plan and construct new secondary containment for Hoppers H-1 and H-2.
- Permit Attachment Appendix IX cover sheet and Tabs are modified to reflect Evoqua Water Technologies and deleting Siemens.
- Permit Attachment Appendix IX cover sheet is modified to reflect the addition of "Assessment of Hoppers H-1 and H-2".
- Permit Attachment Appendix IX cover sheet is modified to reflect Revision 2, February 2019.
- Permit Attachment Appendix IX Table of Contents has been modified to add a new Tab 4 which contains the Assessment of Ancillary Equipment – Hopper H-1 and Hopper H-2.

Posting Instructions for this modification:

Please replace the complete existing Permit Attachment Appendix IX with the revised Permit Attachment IX which includes the hopper assessment.

Notifications:

A Class 1 permit modification requires a notice to the Facility mailing list within 90 days of the date the change is put into effect. However, EPA has not yet supplied the mailing list to Evoqua and has instead provided a process in Permit Condition I.K.5.for EPA to itself send an initial notice to the mailing list with respect to a I.K.5 required amendment. No alternative notice provision is provided for additional amendments.

Evoqua requests that EPA either (i) provide a copy of the Facility mailing list within a reasonable period of time so that Evoqua can provide the applicable notice of this change to those on the mailing list, or (ii) provide a reasonable alternative suggestion on how EPA would prefer to address the notice requirement.

Permit modifications will be posted at the follow electronic address:

http://www.evoqua.com/en/about/service-locations/Pages/Parker-AZ-Permits.aspx

EVOQUA
WATER TECHNOLOGIES

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 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.

Permittees

EVOQUA WATER TECHNOLOGIES LLC

By: ____________________
Its:
Rodney Aulick
EVP and Segment President
Integrated Solutions + Services

eVOQUA
WATER TECHNOLOGIES

The Colorado River Indian Tribes certifies under penalty of law that it understands that this application is being submitted for the purpose of modifying a permit to operate a facility to receive, store, treat, recycle, repackage and subsequently transport hazardous waste. I understand fully that the Colorado River Indian Tribes, as the beneficial landowner pursuant to P.L. 88-302, and Evoqua Water Technologies LLC, the lessee of the land and owner of certain fixtures located thereon, are jointly and severally responsible for compliance with applicable provisions of RCRA, its implementing regulations and any permit modification approved pursuant to the application and those regulations.

Co-Permittee

COLORADO RIVER INDIAN TRIBES

By: ______________________
Its:

cc: Director, CRIT Environmental Protection Office

APPLICATION PAGES
REDLINE

APPENDIX IX

PERMIT ATTACHMENT

APPENDIX IX

TANK ASSESSMENT REPORT

This appendix contains the text portion of the Tank Assessment Report. For the remainder of the Report, refer to the April 2016 Permit Application.

~~September 2018~~February 2019

APPENDIX IX

HAZARDOUS WASTE TANK SYSTEM ASSESSMENT, DESIGN DRAWINGS, ~~AND~~ CONTAINMENT CALCULATIONS, AND ASSESSMENT OF HOPPERS H-1 AND H-2

FOR

~~SIEMENS~~ EVOQUA WATER TECHNOLOGIES~~INDUSTRY, INC.~~

PARKER REACTIVATION FACILITY

PARKER, ARIZONA

Revision ~~1~~2
~~April 2012~~February 2019

TABLE OF CONTENTS

TAB NO.	DESCRIPTION
1	Assessment of Tank Systems T-1, T-2, T-5, and T-6
2	Assessment of Tank System T-18
3	Certification of the T-Tank Containment Area
4	Assessment of Ancillary Equipment - Hopper H-1 and Hopper H-2

APPENDIX IX

TAB 1

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

For the complete TAB 1 section of the Tank Assessment Report refer to the April 2016 Permit Application

Revision ~~1~~2
~~April 2012~~February 2019

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

Tank System Engineering Assessment

I have reviewed the information relating to the above ground tank systems identified in the document *Assessment of Tanks T-1, T-2, T-5 and T-6*, attached as Exhibit A, which are installed at the Siemens Industry, Inc. 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 provided in the attached document:

A. Results of visual inspection and ultrasonic thickness testing for the tank systems.

B. Hazardous characteristics of the wastes stored in the tank system.

C. Structural calculations and design standards for the tank systems .

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.

Christopher M. Doelling, P.E.

April 23, 2012

STATE OF NEW JERSEY
CHRISTOPHER M. DOELLING
No. GE 43230
LICENSED
PROFESSIONAL ENGINEER

Attachment: Exhibit A - Assessment of Tank Systems T-1, T-2, T-5 and T-6

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

EXHIBIT A

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

40 CFR 264.192

Prepared for:

Siemens Industry, Inc.
25323 Mutahar Street
Parker, Arizona 85344

Prepared by:

Karl E. Monninger
Vice President
Chavond-Barry Engineering Corp.

April 2012

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

Table of Contents

Appendices

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

In order to comply with the requirements of EPA 40 CFR, Subpart J, § 264.192, the visual inspections and ultrasonic thickness measurements were performed on the exterior of subject tank systems February 21, 2011 through February 25, 2011. Ancillary equipment including pipelines, fittings, flanges, valves, pumps and supports were also examined and visually inspected during this period. The results of the ultrasonic thickness measurements taken are shown in Appendix A. The following comments are made in conjunction with the EPA requirements:

1. Tank Systems Description

A. The Siemens Industry, Inc. identification numbers for the tanks are T-1, T-2, T-5, and T-6. Each tank is 10'-0" in diameter with a 16'-0" straight side wall height, 8'-0" high nominal 62° bottom cone and umbrella roof (top head). Dimensioned drawings of the tanks are provided in Appendix A.

B. All tanks are located outdoors on the east side of the control room and warehouse building. Each tank is supported by a carbon steel skirt and anchored to a common, elevated support structure. A caged ladder is installed on each tank for access to the roof.

The tanks and support structure are located within a secondary containment area that has sumps routed to the recycle water storage tank T-9 (not part of this evaluation). A portion of the tank system piping is also within this secondary containment area. The recycle water pumps, tank T-9 and the remainder of the tank system piping are located outside of the secondary containment area.

C. The material of construction for the roof, cylindrical side wall and conical bottom of all tanks is 300 series stainless steel, specific grade unknown.

The material of construction for the stiffener rings and support skirt on all tanks is carbon steel. The exposed surfaces of the stiffener angle rings and both sides of the support skirt for each tank are painted.

The material of construction for pipelines and valves used for spent carbon slurry transport is stainless steel, grade 316L.

D. All four tanks were fabricated by Wyatt M&B Works, Inc. in 1956 and put into service at Parker, AZ facility during August of 1992.

E. All tanks operate at atmospheric pressure and at a maximum temperature of 150°F; therefore, the ASME code stamp is not required. A 4-inch diameter vent is provided on the roof of each tank and connected by CPVC piping to a common granular activated carbon (GAC) adsorption system (WS-1) for VOC control. A 3-inch diameter pressure relief safety valve with vacuum breaker is also installed on the roof of each tank. All of these safety valves are set at 8 ounces for pressure relief and at 6 ounces to break the vacuum.

F. Each spent carbon storage tank has a design capacity of 8,319 gallons (31.49 cubic meters). A high carbon level sensor is located 4'-6" below the top of the cylindrical wall for each tank. An automatic safety valve on each of the two spent carbon unloading hoppers cuts off feed to the eductor system when spent carbon reaches the level sensor to ensure each of the tanks cannot be filled above the high level sensor. A 4" diameter overflow nozzle is located 1'-2" below the top of the cylindrical wall for each tank and directs excess recycle water to tank T-9 by gravity piping.

G. The design standards and construction drawings for 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 and recycle water in slurry form. The material is transferred into and out of the tanks by using eductors and a recycle water pump with a discharge pressure of approximately 85 psig.

The recycle water is maintained at a neutral pH (between 6 and 8) to minimize the corrosion.

B. The spent activated carbon stored in these tanks is contaminated with various chemicals in low concentration, as listed in Appendix B. The waste contaminants on the spent carbon treated at this facility vary in the range from < 1 to 300,000 ppmwd on average.

C. The spent carbon storage tanks are constructed of 300 series stainless steel, specific grade unknown, resistant to all of the chemicals listed in Appendix B, and not susceptible to corrosion.

All four tanks were internally lined with Plasite 7122 HAR during the construction phase of this plant prior to startup during August of 1992. The Plasite lining is a cross-linked epoxy-phenolic cured with an alkaline curing agent. Although originally installed for its resistance to abrasion and a wide range of chemicals (acids, alkalis, and solvents), the Plasite lining is not required to protect the tank systems since 300 series stainless steel is compatible with all of the waste codes and hazardous constituents listed in Appendix B. Portions of the lining have likely been damaged during tank maintenance activities or worn away due to abrasion since the tanks were put into service; the existing condition and integrity of any remaining Plasite lining is unknown.

D. All pipelines, valves and fittings used for the transfer of the spent carbon and recycle water slurry are constructed of stainless steel, grade 316L, resistant to all of the chemicals listed in Appendix B, and not susceptible to corrosion.

3. <u>Results of Ultrasonic Testing and Visual Inspection</u>

A. To check the integrity of the tanks, ultrasonic testing (U/T) was performed on the exterior surfaces of the cylindrical wall, umbrella roof, cone bottom and support skirt for each tank to measure the shell thickness. Shell and cone bottom thickness readings were taken at a height of every two feet on each 90° quadrant. The results of the thickness readings obtained for tanks T-1, T-2, T-5, and T-6 are tabulated in Appendix A.

A Model NDT-715 ultrasonic thickness gauge (s/n 733351) and 5.0MHz dual element transducer (s/n AG766) were used for all thickness measurements; the manufacturer's calibration data for this test equipment are provided in Appendix A. Prior to each use (whenever the instrument was turned on) the sound-velocity for the material to be measured was set (0.233 in/µ-sec for carbon steel and 0.223 in/µ-sec for stainless steel) and a probe zero conducted. To ensure the accuracy of all measurements, no thickness reading was recorded unless at least 6 of 8 bars were displayed by the gauge's Stability Indicator. Paint was removed from the test areas on the support skirt of each tank prior to thickness measurements.

B. All four tanks were visually inspected from the exterior during plant operation and the following observations recorded:

1) Tank T-1

The tank's exterior surfaces and weld seams are in good condition with the exception of several small areas located adjacent to welds for carbon steel attachments where minor pitting and slight corrosion attack was evident. An area approximately 12" high x 8" wide is dented slightly inward at the 2-foot elevation on the west side of the cylindrical shell above a nozzle with a blanked off carbon steel elbow and valved city water piping connection. Two unused swirl jet nozzles located on the lower east side of the cylindrical shell are blanked off with carbon steel blind flanges. A carbon steel plate approximately 4" in diameter is welded to the cylindrical shell at the 8.5-foot elevation for closure of a nozzle that was previously removed. Four carbon steel support brackets, no longer in use have been cut off from the north side of the cylindrical shell but not completely removed by grinding.   Unused nozzles and inspection/access ports on the top head of tank T-1 are sealed with stainless steel caps and carbon steel blind flanges.

As previously reported in the 1994 Tank Assessment, the two carbon steel stiffener angle rings (2-1/2" x 2-1/2" x 1/4") located at the bottom and 8-foot elevation on the cylindrical shell are corroded. In several areas, portions of the top horizontal flange on both stiffeners are disconnected from the remainder of the angle at the 90° bend. At other locations, the stiffeners are corroded at the bottom of the vertical flange of the angle. However, in all locations for both angle stiffeners at least 50% of the original material remains intact and the structural analyses performed (based upon a 2" x 1/4" flat bar) indicate they have sufficient strength. Exposed surfaces of the two stiffener angle rings and both sides of the support skirt are painted.

The minimum shell thickness for tank T-1 was determined to be 0.180 inches at the 0-foot elevation on the west side of the cylindrical shell.

2) <u>Tank T-2</u>

The tank's outside surfaces and weld seams are in good condition with the exception of slight corrosion attack in a few small areas located adjacent to carbon steel attachments on the shell. An area approximately 6" wide is dented slightly inward at the 10-foot elevation on the south side of the cylindrical shell. A carbon steel plate approximately 4" in diameter is welded to the cylindrical shell at the 8.5-foot elevation for closure of a nozzle that was previously removed. A carbon steel blind flange is used to blank off an unused nozzle located on the lower east side of the tank. Two swirl jet nozzles on the lower west side of the cylindrical shell are connected to the recycle water supply piping. Nozzles and inspection/access ports on the top head of tank T-2 are sealed with stainless and carbon steel blind flanges.

As previously reported in the 1994 Tank Assessment, the two carbon steel stiffener angle rings (2-1/2" x 2-1/2" x 1/4") located at the bottom and 8-foot elevation on the cylindrical shell are corroded. In several areas, portions of the top horizontal flange on both stiffeners are disconnected from the remainder of the angle at the 90° bend. At other locations, the stiffeners are corroded at the bottom of the vertical flange of the angle. However, in all locations for both angle stiffeners at least 50% of the original material remains intact and the structural analyses performed (based upon a 2" x 1/4" flat bar) indicate they have sufficient strength. Exposed surfaces of the two stiffener angle rings and both sides of the support skirt are painted.

The minimum shell thickness for tank T-2 was determined to be 0.183 inches at the 0.5-foot elevation on the north side of the cylindrical shell.

3) <u>Tank T-5</u>

The tank's exterior surfaces and weld seams are in good condition with the exception of several small areas located adjacent to welds for carbon steel attachments where minor pitting and slight corrosion attack was evident. A carbon steel plate approximately 4" in diameter is welded to the cylindrical shell at the 8.5-foot elevation for closure of a nozzle that was previously removed. A carbon steel blind flange is used to blank off an unused nozzle located on the lower west side of the cylindrical shell. Two swirl jet nozzles located on the lower south side of the cylindrical shell are connected to the recycle water supply piping. Nozzles and inspection/access ports on the top head of tank T-5 are sealed with stainless and carbon steel blind flanges.

As previously reported in the 1994 Tank Assessment, the two carbon steel stiffener angle rings (2-1/2" x 2-1/2" x 1/4") located at the bottom and 8-foot elevation on the cylindrical shell are corroded. In several areas, portions of the top horizontal flange on both stiffeners are disconnected from the remainder of the angle at the 90° bend. At other locations, the stiffeners are corroded at the bottom of the vertical flange of the angle. However, in all locations for both angle stiffeners at least 50% of the original material remains intact and the structural analyses performed (based upon a 2" x 1/4" flat bar) indicate they have sufficient strength. Exposed surfaces of the two stiffener angle rings and both sides of the support skirt are painted.

The minimum shell thickness for tank T-5 was determined to be 0.167 inches on the south side of the cone bottom at location 1, approximately 1-foot below the cone/cylinder intersection.

4) Tank T-6

The tank's outside surfaces and weld seams are in good condition with the exception of slight corrosion attack in a few small areas located adjacent to carbon steel attachments on the shell. A stainless steel plate approximately 4" in diameter is welded to the cylindrical shell at the 8.5-foot elevation for closure of a nozzle that was previously removed. A stainless steel blind flange is used to blank off an unused nozzle located on the lower east side of the cylindrical shell. Two swirl jet nozzles located on the lower south side of the cylindrical shell are connected to the recycle water supply piping. Two small rectangular stainless steel patches are welded to the cylindrical shell at 1.3 and 2.5-foot elevations on both the northeast and southwest sides of the tank. The patches range in size from 5" x 5" to 9" x 9" and were used to close holes previously created to aid in raising and supporting the tank during the repair of the bottom cone. Nozzles and inspection/access ports on the top head of tank T-6 are sealed with stainless and carbon steel blind flanges.

The original bottom cone section of tank T-6 has been replaced with a new cone fabricated from 1/4" thick type 304 stainless steel. The bottom three quarters of the old cone was removed and the new cone continuously seal welded to the remaining upper portion of the original cone from the inside of the tank.

As previously reported in the 1994 Tank Assessment, the two carbon steel stiffener angle rings (2-1/2" x 2-1/2" x 1/4") located at the bottom and 8-foot elevation on the cylindrical shell are corroded. In several areas, portions of the top horizontal flange on both stiffeners are disconnected from the remainder of the angle at the 90° bend. At other locations, the stiffeners are corroded at the bottom of the vertical flange of the angle. However, in all locations for both angle stiffeners at least 50% of the original material remains intact and the structural analyses performed (based upon a 2" x 1/4" flat bar) indicate they have sufficient strength. Exposed surfaces of the two stiffener angle rings and both sides of the support skirt are painted.

The minimum shell thickness for tank T-6 was determined to be 0.176 inches at the 16-foot elevation on the east side of the cylindrical shell.

5) <u>Additional Information</u>

Each tank is supported by a carbon steel skirt and anchored to an elevated structure at eight locations using 1-inch diameter structural grade bolts and nuts. The columns of the elevated support structure for the tanks are grounded by connection to underground grounding cable grids located beneath the secondary containment pad.

No structural defects, settling or distortion of the elevated support structure or foundation for the tank systems was observed.

The bottom of each of the four T-tanks are located approximately 6'- 0" above the secondary containment pad. The bottom of each of the six support columns for elevated structure are located 1' - 4" above the secondary containment pad. None of the external tank shells or any external metal component of the tank system is in contact with soil or water.

The existing pressure/vacuum relief valves for tanks T-1, T-2, T-5, and T-6 were replaced with new valves on May 11, 2011. The new valves (same model and type) are set at 8 ounces for pressure relief and at 6 ounces to break the vacuum.

Two new carbon steel vacuum stiffener angle rings (2-1/2" x 2-1/2" x 3/16") were attached to the cylindrical shell of each tank approximately 21-1/2" above the location of the original stiffeners. Installation and painting of the new stiffeners on the four tanks was completed on June 29, 2011.

D. Ancillary Equipment

1) The nozzle connections and piping for spent carbon slurry, recycle water, city water and vent were carefully examined during the inspection of each tank system and indicated no leaks.

2) Each of the two recycle water pumps (located adjacent to tank T-9 and outside of the secondary containment area) were found to leak at the packing seal for the pump drive shaft during operation. The leaks are intentional and comprised of city water used for cooling and flushing the seal gland of each pump.

3) The exterior surfaces of stainless steel pipelines and fittings are not painted and showed no signs of corrosion.

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

4. Structural Calculations

A. A finite element analysis (FEA) of the tanks was performed for the operating condition (1.5 specific gravity slurry to fill line) and based on the minimum shell metal thicknesses measured for each of the major components (top head, cylindrical wall and bottom cone) on any of the four tanks with wind and seismic loadings calculated from the latest edition of the International Building Code. The calculated FEA stress results are all less than allowable stresses from AWWA D100-05.

In addition to the FEA/AWWA evaluation, a second analysis was performed base on the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1. The Section VIII, Division 1 analysis was conservatively based on an internal pressure of 15 psig plus the hydrostatic pressure of the spent carbon slurry and shows that the basic Code limits are satisfied.

A complete copy of the structural calculations and analyses is provided in Appendix C. Both analyses demonstrate that tanks T-1, T-2, T-5 and T-6 are acceptable for the atmospheric storage of spent carbon slurry.

Stresses due to seismic loading are higher than the stresses from wind loading, but the seismic stresses for the tanks are well below the allowable limits and relatively low when compared to those attributable to the weight/hydrostatic pressure. The structural analyses indicate that the critical component is the thickness of the cylindrical side wall of the tank at the cone/cylinder intersection where the hydrostatic loading produces a localized compressive hoop stress of 6,126 psi, which is 85% of the allowable local buckling stress of 7,209 psi (from AWWA D100-05) for a 10' - 0" diameter cylindrical wall that is 0.176" thick.

Note that the minimum actual thicknesses of the cylindrical wall for each of the four tanks at the cone/cylinder intersection is greater than the 0.176" thickness used in the FEA calculations as follows: 0.180" (T-1), 0.190" (T-2), 0.192" (T-5) and 0.208" (T-6). Since the allowable local buckling compressive stress is a function of the cylindrical wall thickness/radius ratio, the allowable stress at the cone/cylinder intersection for each tank increases such that the actual stress of 6126 psi calculated for the operating condition ranges from 73% to 80% of the allowable local buckling stress from AWWA D100-05.

For any of the four tanks, the maximum allowable stress at the cone/cylinder intersection will be equal to the calculated compressive stress if the cylindrical shell wall thickness decreases to 0.157" at that location. The maximum decrease in the tank cylindrical shell wall thicknesses since the 1993 measurements was found to be 0.028" (on the west side of T-2 at 2' elevation) and yields a maximum "thinning" rate 0.00156" per year. If the thickness of the T-1 cylindrical shell at the cone/cylinder intersection decreases at this accelerated rate, the remaining useful life of T-1 would be 15 years.

B. The corroded vacuum stiffener ring located at the bottom of the cylindrical shell of each tanks is adequate for the shell to cone junction reinforcement. The calculations are based on 2" x 1/4" flat bars in lieu of the two corroded 2-1/2" x 2-1/2" x 1/4" stiffener angles on each tank.

C. Piping drawings showing the thicknesses, layout dimensions, and the supports are not available, but based upon 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.

D. All tanks are supported on the elevated structure, which was designed by LuMar Engineering Co. of Pasadena, California. The structural and foundation drawings are provided in Appendix D.

Each of tanks T-1, T-2, T-5, and T-6 are supported by a continuous skirt support which give uniform load distribution to the W12x26, W21x44, and W24x55 braced beams by means of eight point loads and all structural columns are supported on a mat foundation that is 2' - 6" deep per the LuMar drawings.

Based upon the absence of any observed defects, settling or distortion of the elevated support structure or foundation that have been in continuous service since 1994, the structural support and foundation for the tanks appear to be adequate.

5. Deficiencies

No deficiencies that would compromise the integrity of the tanks for the atmospheric storage of spent carbon slurry were found.

6. Recommendations

A. Continue daily monitoring and visual inspections of the spent carbon storage tanks and ancillary equipment for compliance with RCRA requirements.

B. Conduct annual ultrasonic thickness testing at the bottom of the cylindrical wall above the cone/cylinder intersection and at the previous locations of minimum shell thickness readings for each major component (top head, cylindrical wall, bottom cone and support skirt) on each of the four tanks.

C. Conduct comprehensive ultrasonic thickness testing every 5 years for each major component (top head, cylindrical wall, bottom cone and support skirt) on each of tanks T-1, T-2, T-5, and T-6.

D. Remove from service and repair or replace any tank with a cylindrical wall thickness that is less than or equal to 0.157 inches.

E. Maintain paint coating on exterior surfaces of all tank system components that are carbon steel by repainting if visual observation indicates that 20% or greater of the components paint coating is damaged.

F. Replace all carbon steel components and fittings of the tank system that are in direct contact with the spent carbon and recycle water slurry with 300 series stainless steel components and fittings prior to performing the next set of comprehensive ultrasonic thickness testing measurements.

APPENDIX IX

TAB 2

Assessment of Tank System T-18

For the complete TAB 2 section of the Tank Assessment Report
refer to the April 2016 Permit Application

Revision 12
February 2019April 2012

APPENDIX IX

TAB 3

Certification of the T-Tank Containment Area

For the complete TAB 3 section of the Tank Assessment Report
refer to the April 2016 Permit Application

Revision 12
April 2012February 2019

APPENDIX IX

TAB 4

Assessment of Ancillary Equipment Hopper H-1 and Hopper H-2

Revision 0
February 2019

Geosyntec consultants

11811 N. Tatum Blvd., Suite P186
Phoenix, AZ 85028
PH 602-513-5812
FAX 602-513-5813

Engineering Assessment for New Ancillary Equipment Hoppers H-1 and H-2

Inspection of the hoppers H-1 and H-2 at the Evoqua Water Technologies (Evoqua) carbon regeneration facility in Parker, AZ facility, was conducted on 17 January 2019. Review of related design and installation documents was performed over the subsequent week. It is understood that hoppers H-1 and H-2 are ancillary equipment for the facility hazardous waste storage tanks (T-1, T-2, T-5, and T-6) and were installed April 2018. The hopper locations within the facility are shown in Exhibit A.

The assessment has been carried out pursuant to the provisions of 40 CFR 264.192 and is based on review of the following information and our observations during onsite inspection:

- Design documents for hopper construction (Exhibit B);
- Field communication that hoppers only receive spent carbon;
- Information on the hazardous characteristics of the wastes to be handled in the hoppers (Exhibit C)
- Field communication and observation that the external metal components of the hoppers will not be in contact with the soil or with water;
- Design information indicating that (i) hopper foundations will maintain the load of a full hopper, (ii) anchoring will prevent the flotation or dislodgement where the hoppers are placed in a saturated zone or in a seismic fault zone subject to the standards of 40 CFR 264.18(a), and (iii) the hopper system will withstand the effects of frost heave;
- EPA letter dated March 2015 (Exhibit D), directing Evoqua to install a 3/4-inch valve on the outer wall of each of the hoppers to enable Evoqua to detect leakage from the inner hopper wall; and
- Evoqua letter dated April 2018 (Exhibit E) indicating performance of hydrostatic leak testing for each of the hoppers.

The following conclusions are based on our onsite inspections and assessment of supporting documents for H-1 and H-2 as listed above:

- The hoppers have sufficient structural integrity and are acceptable for the transfer of the planned hazardous waste (spent activated carbon) to the facility's hazardous waste storage tanks;

- The hopper foundations, structural support, connections and pressure controls (where applicable) have been adequately considered in the design;
- The hoppers as designed have sufficient structural strength, compatibility with the wastes being transferred, and corrosion protection, to ensure that they will not collapse, rupture, or fail;
- The hoppers are appropriately supported and protected against physical damage and excess stress due to settlement, vibration, expansion or contraction, given their location and expected use; and
- The ¾-inch valves required by the EPA have been installed to satisfy the requirements of 40 CFR 264.193 for double wall containment.

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.

Geosyntec Consultants, Inc.

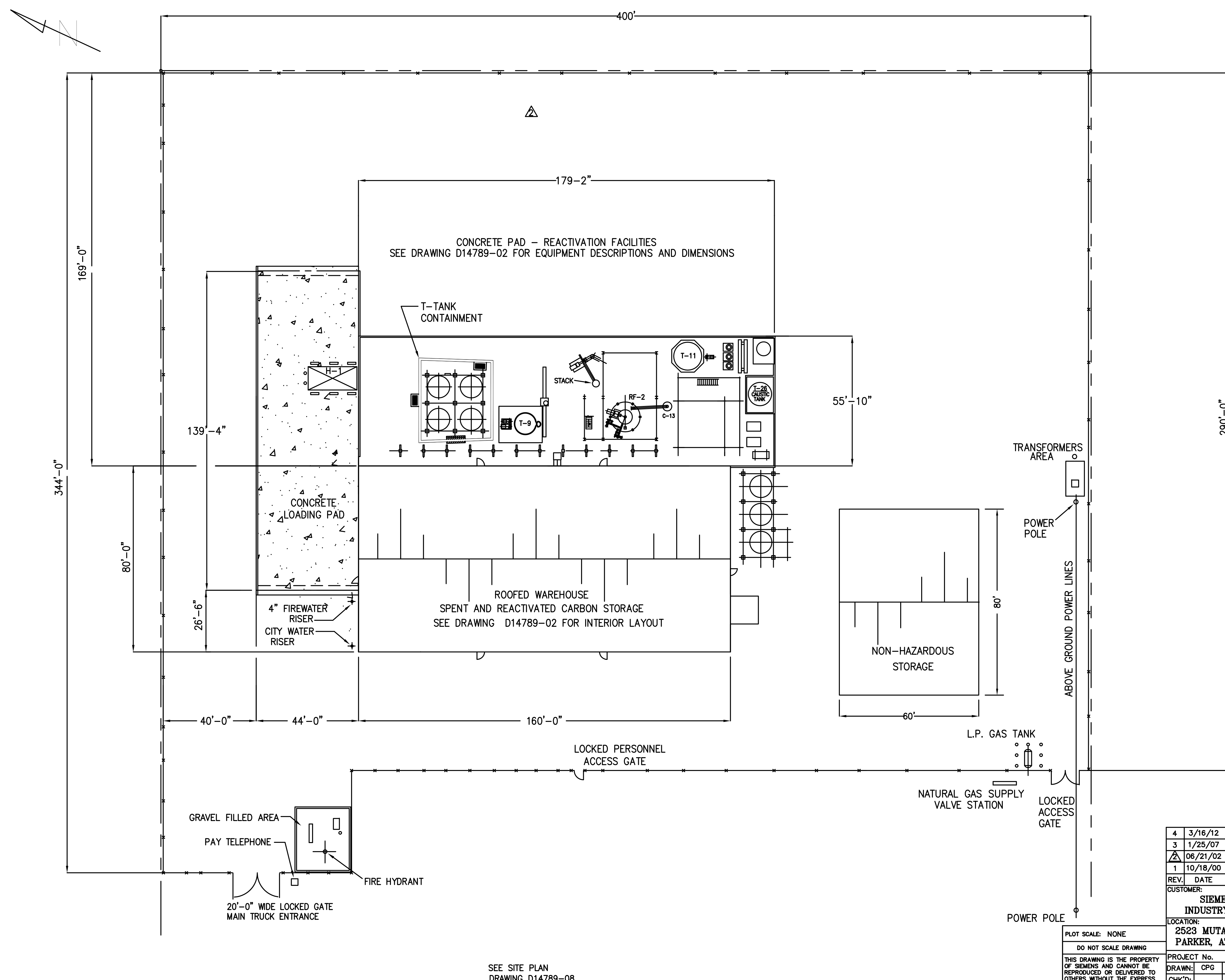
Deran Pursoo, P.E.
Project Engineer

Attachments:

Exhibit A - Site Plan (Hopper Locations within Facility)
Exhibit B - Design Documents
Exhibit C - Hazardous Waste Characteristics Relative to H-1 and H-2
Exhibit D - EPA Letter
Exhibit E - Evoqua Letter Regarding Leak Testing

Exhibit A – Site Plan

(Hopper Locations within Facility)



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
4	3/16/12	NAME CHANGED TO SIEMENS INDUSTRY, INC.	JBE	KEM	
3	1/25/07	UPDATED FOR PERMIT SUBMITTAL	JBE	KEM	
2	06/21/02	REMOVED DUMPSTER PAD	CPG	KEM	
1	10/18/00	REVISED FOR RCRA PART B PERMIT APPLICATION	JBE	---	

PLOT SCALE: NONE

DO NOT SCALE DRAWING

CUSTOMER: SIEMENS INDUSTRY, INC.

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

PROJECT No.

DRAWN: CPG 5/16/94

CHK'D:

ENG'R:

SIEMENS INDUSTRY, INC.
Parker, AZ

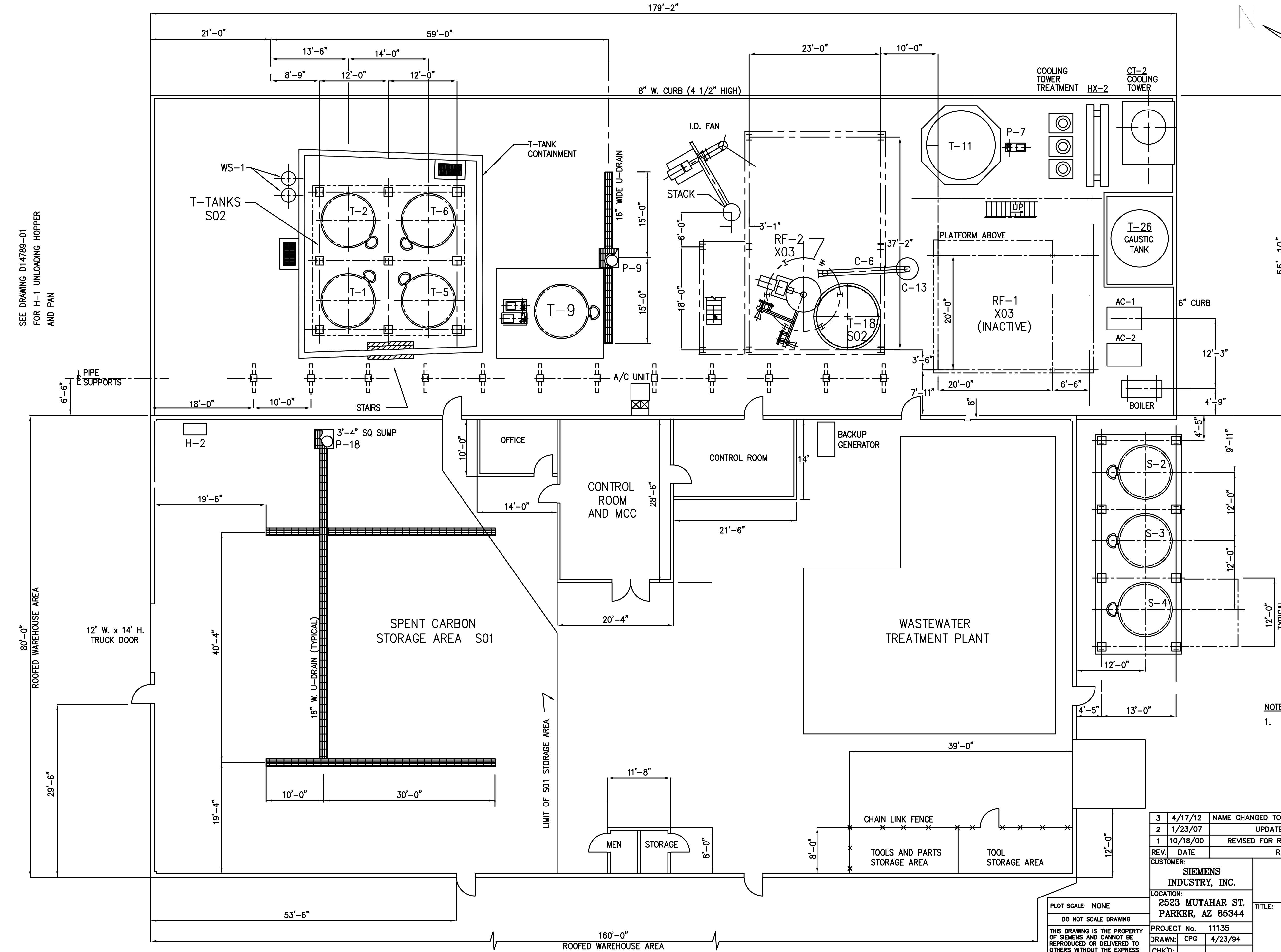
TITLE: REACTIVATION FACILITY SITE PLAN

PART No.

DWG No. D14789-01 REV. 4

PRINT DATE: 4/19/12

DWG: D14789-02



N

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
3	4/17/12	NAME CHANGED TO SIEMENS INDUSTRY, INC., MOVE WS-1	JBE	KEM	
2	1/23/07	UPDATED FOR PERMIT SUBMITTAL	JBE	KEM	
1	10/18/00	REVISED FOR RCRA PART B PERMIT APPLICATION	JBE	---	

PLOT SCALE: NONE

DO NOT SCALE DRAWING

CUSTOMER: SIEMENS INDUSTRY, INC.

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

PROJECT No. 11135

DRAWN: CPG 4/23/94

CHK'D:

ENG'R:

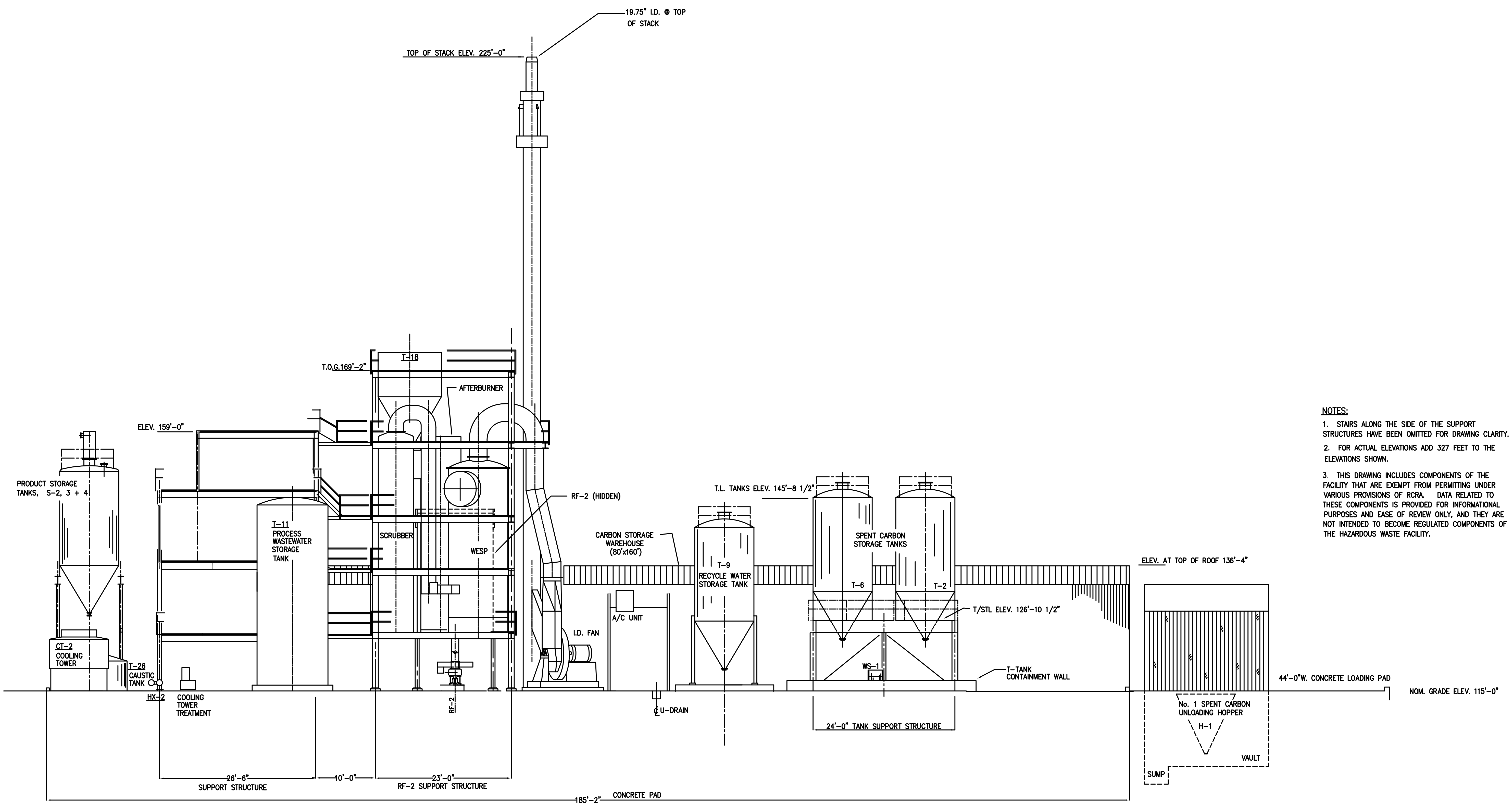
SIEMENS INDUSTRY, INC.
Parker, AZ

TITLE: REACTIVATION FACILITY EQUIPMENT ARRANGEMENT

PART No.

DWG No. D14789-02 REV. 3

PRINT DATE: 4/19/12



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
3	3/16/12	NAME CHANGED TO SIEMENS INDUSTRY, INC.	JBE	KEM	
2	1/18/07	UPDATED FOR PERMIT SUBMITTAL	JBE	KEM	
1	7/24/02	REVISED FOR RCRA PART B PERMIT APPLICATION	CPG	KEM	

PLOT SCALE: NONE

DO NOT SCALE DRAWING

CUSTOMER: SIEMENS INDUSTRY, INC.

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

PROJECT No.

DRAWN: CPG 4/21/94

CHK'D:

ENG'R:

SIEMENS INDUSTRY, INC.
Parker, AZ

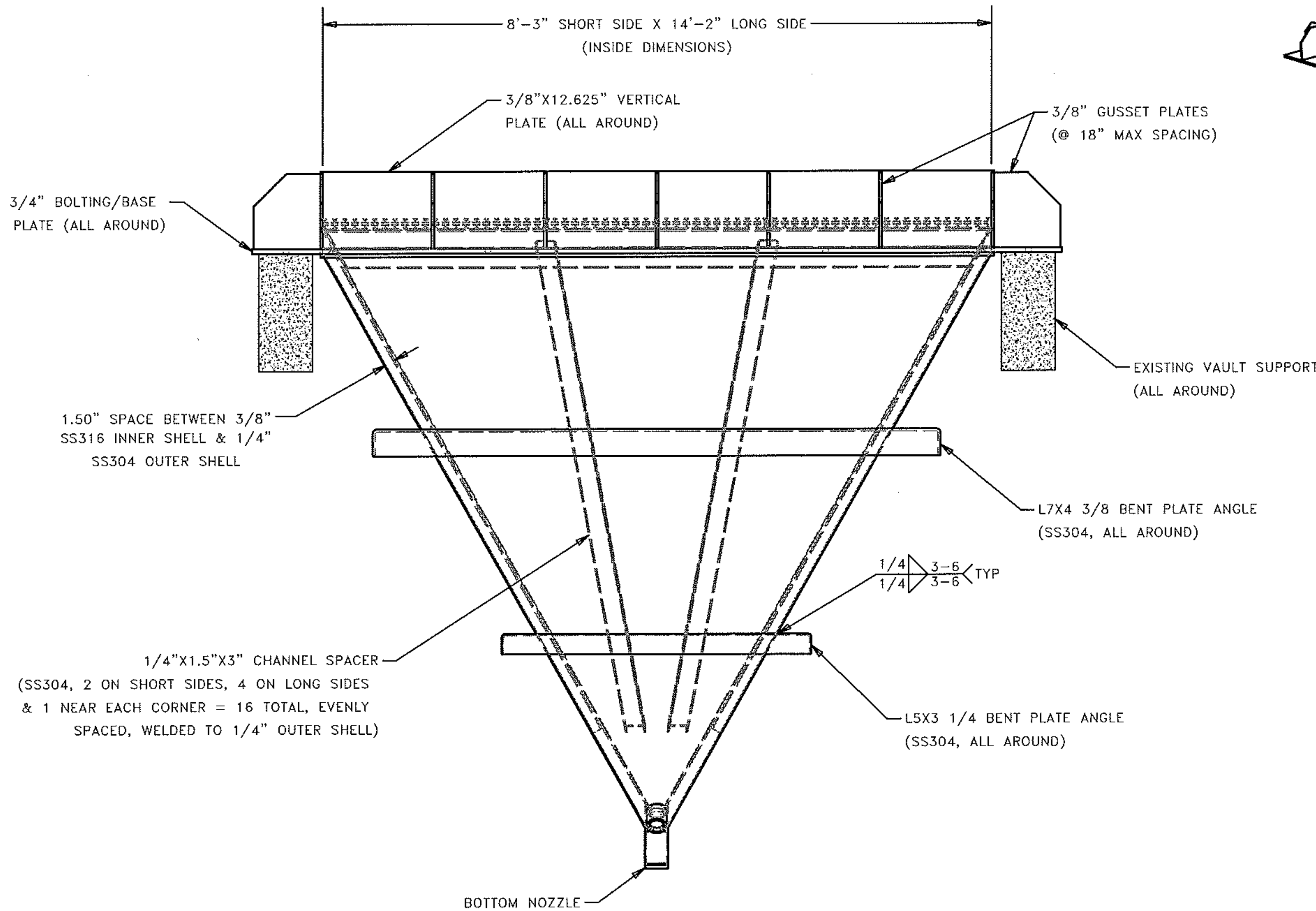
TITLE: REACTIVATION FACILITY SITE VIEW OVERALL ARRANGEMENTS

PART No.

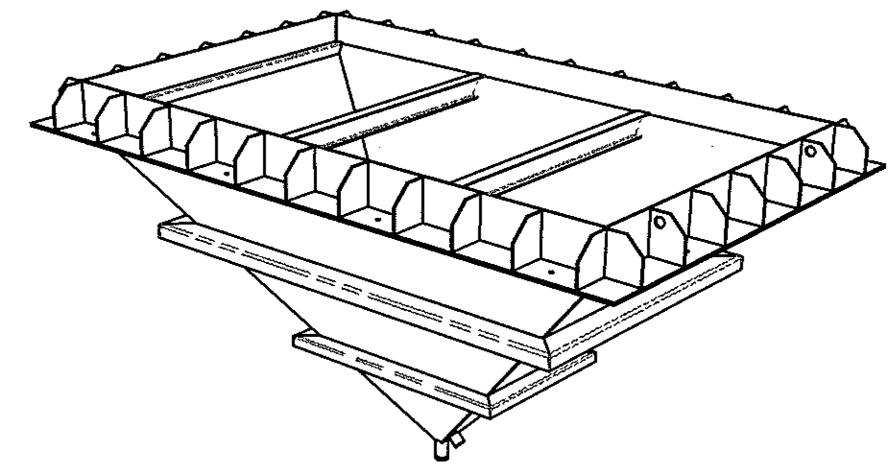
DWG No. D14789-03 REV. 3

PRINT DATE: 4/19/12

Exhibit B – Design Documents



ELEVATION VIEW
SCALE 1 / 20



ISO VIEW
(GRATING NOT SHOWN)
SCALE 1 / 50

DESIGN PRESSURE: 0 PSIG (ATMOSPHERIC)
MAX. TEMPERATURE: 150° F
MIN. DESIGN METAL TEMP: −20° F
DESIGN CODES: 1) API 650 11TH EDITION
2) IBC 2012 FOR WIND & SEISMIC
SEISMIC DESIGN: SITE CLASS D CATEGORY B
WIND DESIGN: NOT REQUIRED

WT (LB): 10207.341 lbmass

DIMENSIONS IN INCHES UNLESS SPECIFIED	
TOLERANCES UNLESS OTHERWISE SPECIFIED	
TWO (2) PLACE DEC. THREE (3) PLACE DEC. ANGULAR	±.06 ±.005 ±.50
STRUCTURAL DIMENSIONS	±1/16
MACHINED SURFACES	250

REV	DESCRIPTION	DATE	APPROVED	ECN

REVISION HISTORY

DESIGNER: KP	DATE: 2/23/2017
CHECKER: EB	DATE: 2/23/2017
ENGINEER	DATE
MANAGER	DATE
FILE:	UPDATE:
SCALE:	SIZE: B

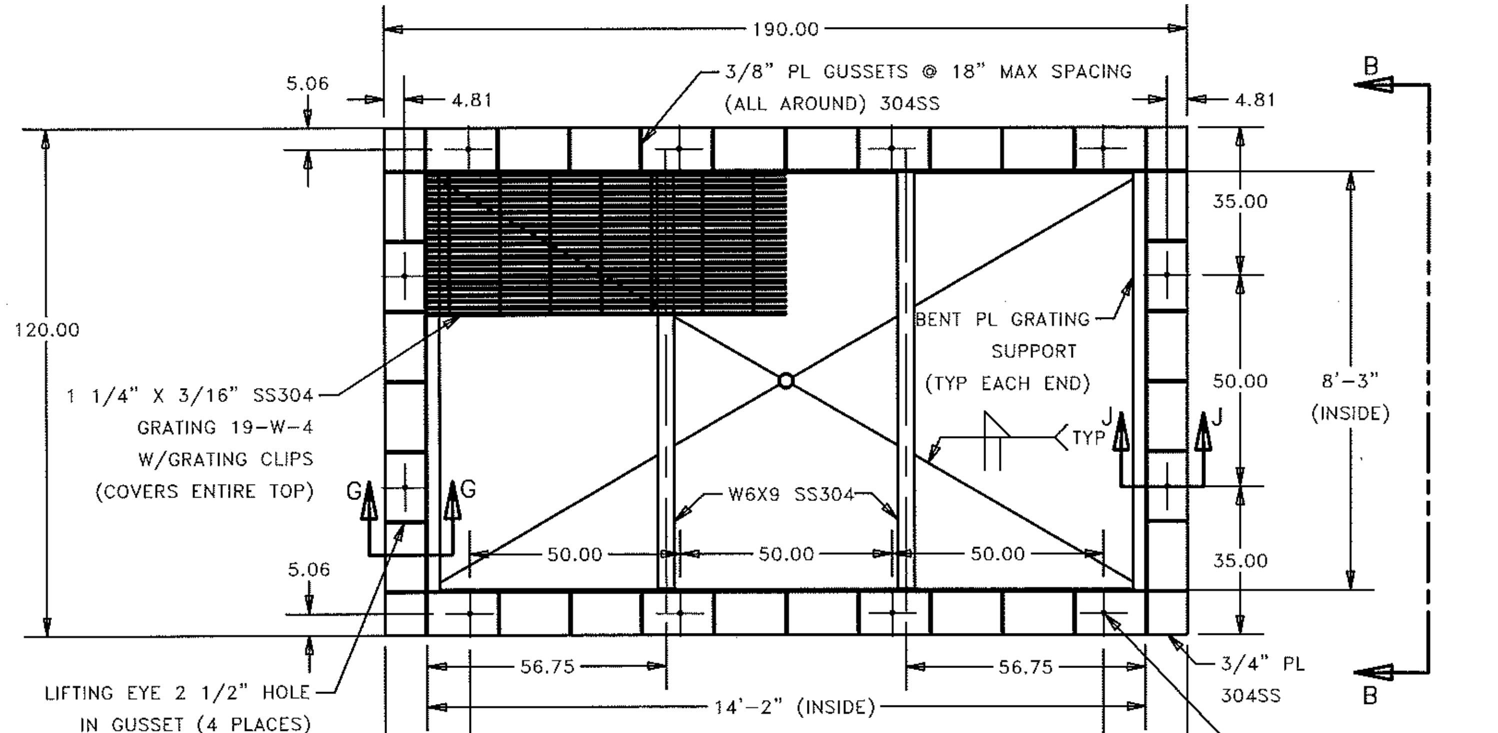
TITLE: HOPPER 14.17' X 8.25' X 7' DOUBLE WALL
STAINLESS STEEL (270 CU FT CAPACITY)

CLIENT

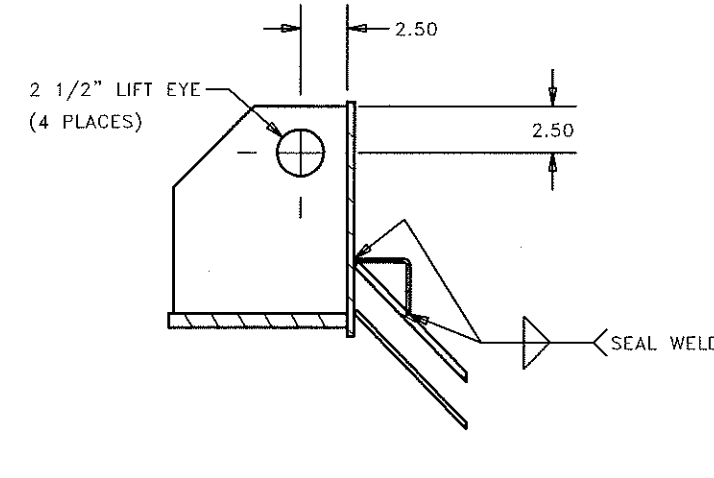
evoqua WATER TECHNOLOGIES
WATER TECHNOLOGIES
Thomasville, GA
1-800-841-1550

PROJECT	CODE	DRAWING	SHEET	REV
		W3T393919	1 OF 4	

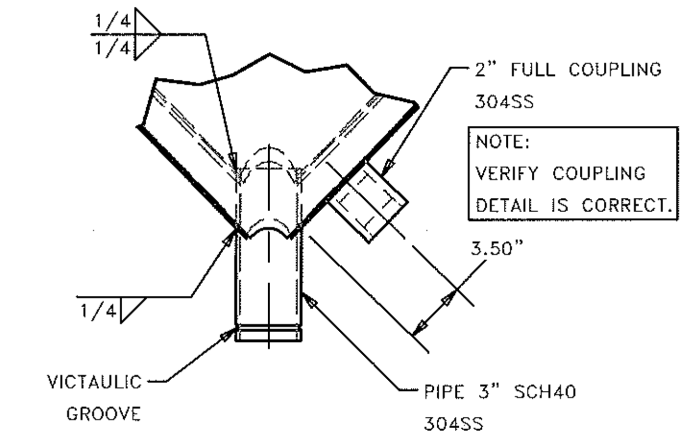
REF:W3T393919.iam



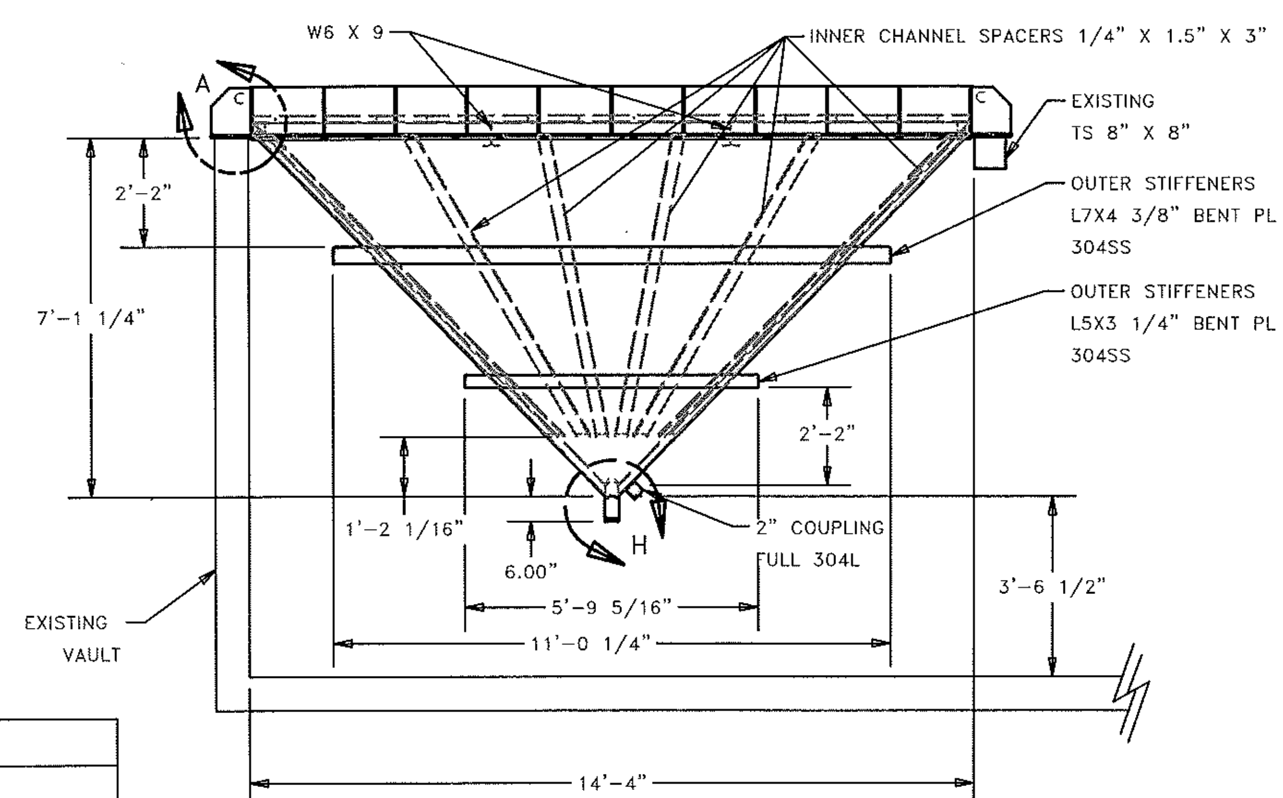
PLAN VIEW
SCALE 1 / 44



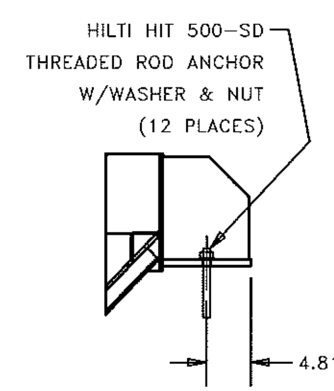
SECTION G–G
SCALE 1 / 10



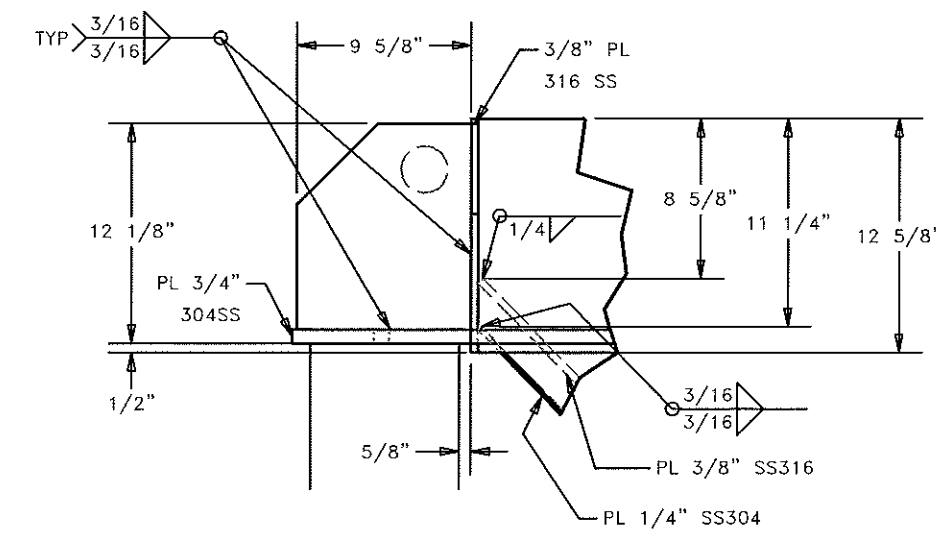
DETAIL H
SCALE 1 / 10



FRONT VIEW
SCALE 1 / 44



SECTION J–J
SCALE 1 / 20



DETAIL A
(TYP LONG SIDE)
SCALE 1 / 10

WT (LB): 10207.341 lbmass

DIMENSIONS IN INCHES UNLESS SPECIFIED	
TOLERANCES UNLESS OTHERWISE SPECIFIED	
TWO (2) PLACE DEC. THREE (3) PLACE DEC. ANGULAR	±.06 ±.005 ±.50
STRUCTURAL DIMENSIONS	±1/16
MACHINED SURFACES	250

DESIGNER KP	DATE 2/23/2017
CHECKER EB	DATE 2/23/2017
ENGINEER	DATE
MANAGER	DATE
FILE:	UPDATE:
SCALE:	SIZE: B

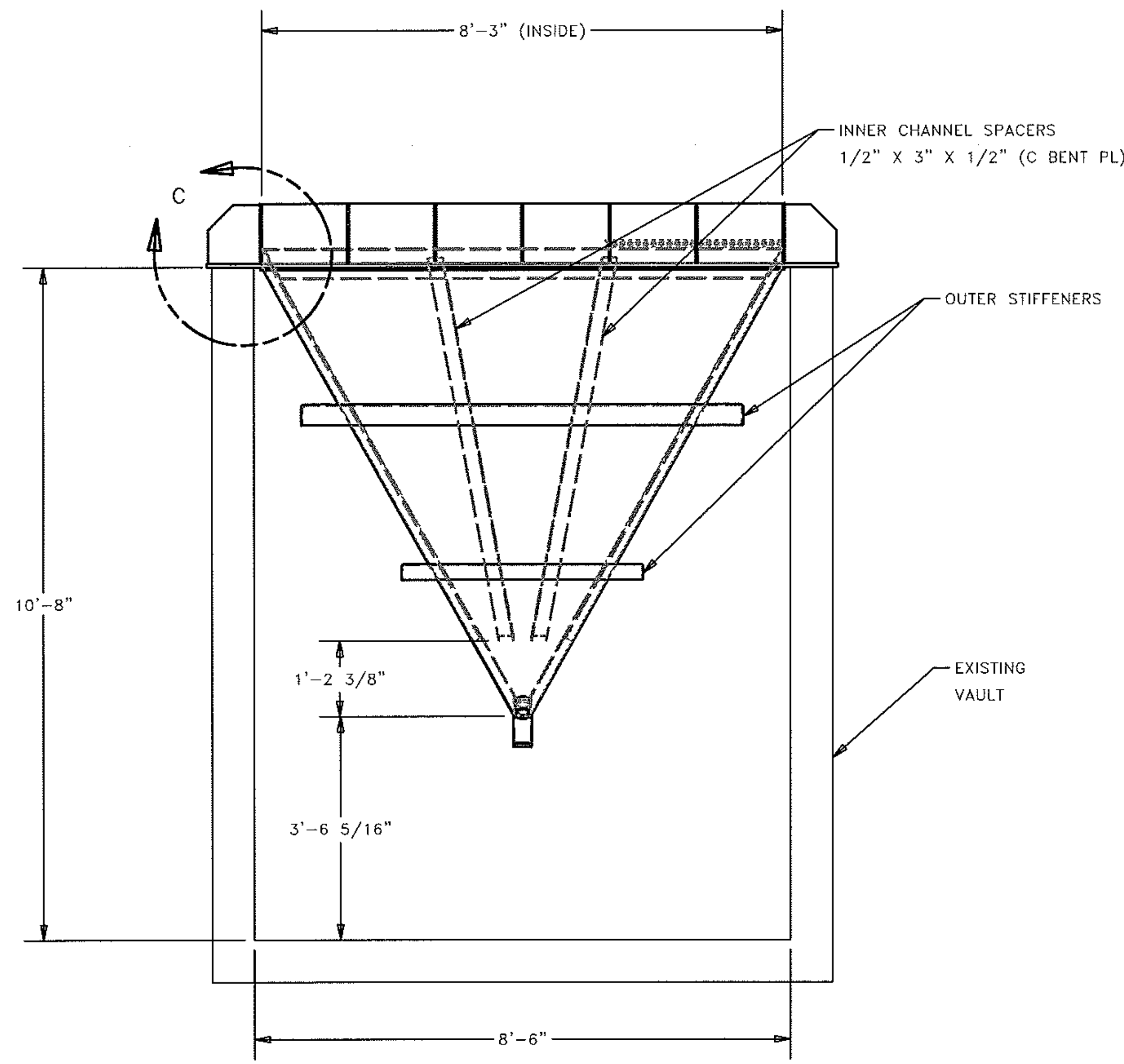
TITLE
HOPPER 14.17' X 8.25' X 7' DOUBLE WALL
STAINLESS STEEL (270 CU FT CAPACITY)

CLIENT

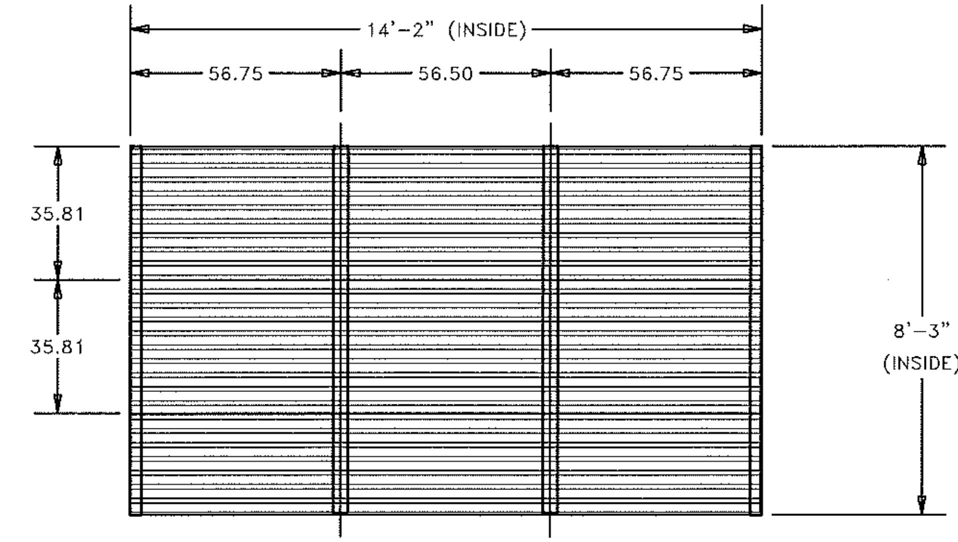
evoqua WATER TECHNOLOGIES
WATER TECHNOLOGIES
Thomasville, GA
1-800-841-1550

PROJECT	CODE	DRAWING	SHEET	REV
		W3T393919	2 OF 4	

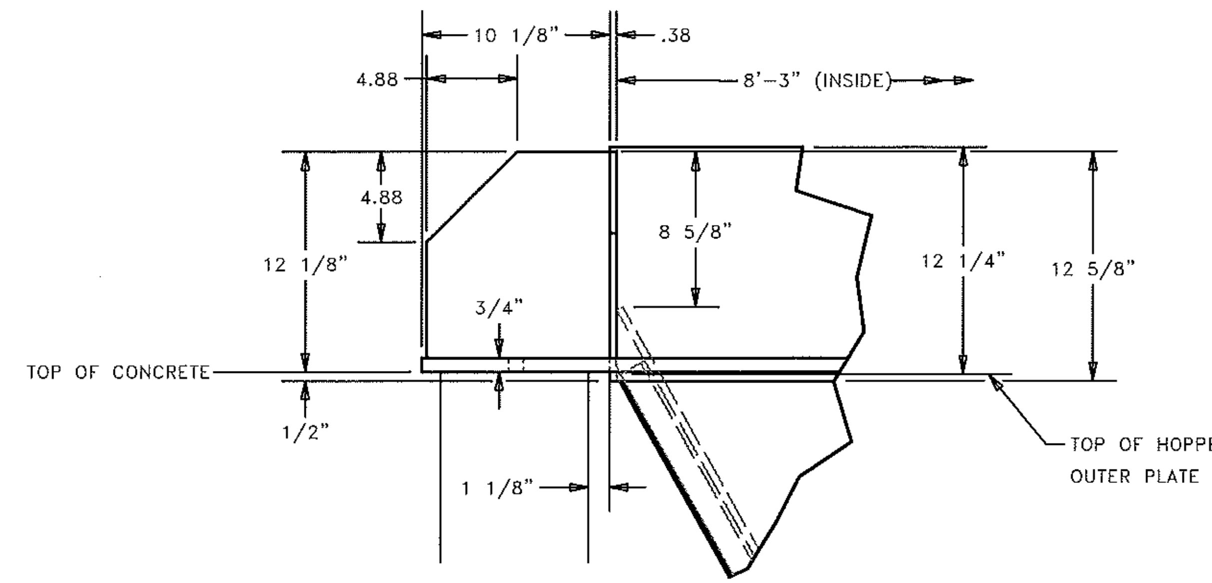
REF:W3T393919.iam



VIEW B–B
SCALE 1 / 30



PLAN VIEW
(GRATING LAYOUT)
SCALE 1 / 50



DETAIL C
(TYP SHORT SIDE)
SCALE 1 / 10

WT (LB): 10207.341 lbmass

DIMENSIONS IN INCHES UNLESS SPECIFIED	
TOLERANCES UNLESS OTHERWISE SPECIFIED	
TWO (2) PLACE DEC.	±.06
THREE (3) PLACE DEC.	±.005
ANGULAR	±.50
STRUCTURAL DIMENSIONS	±1/16
MACHINED SURFACES	250

DESIGNER KP	DATE 2/23/2017
CHECKER EB	DATE 2/23/2017
ENGINEER	DATE
MANAGER	DATE
FILE:	UPDATE:
SCALE:	SIZE: B

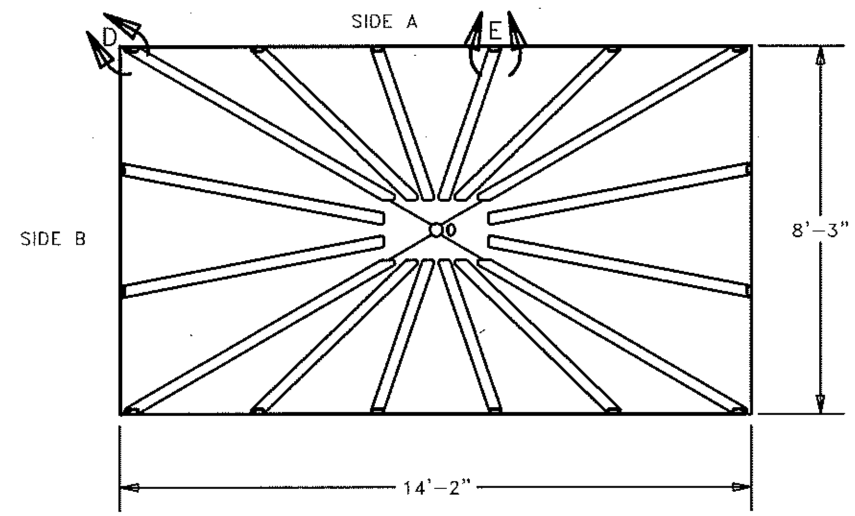
TITLE
HOPPER 14.17' X 8.25' X 7' DOUBLE WALL
STAINLESS STEEL (270 CU FT CAPACITY)

CLIENT

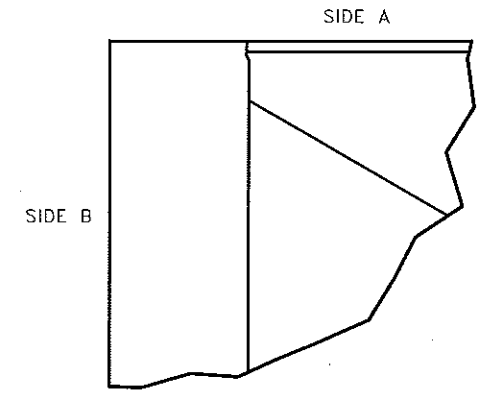
evoqua WATER TECHNOLOGIES
WATER TECHNOLOGIES
Thomasville, GA
1-800-841-1550

PROJECT	CODE	DRAWING	SHEET	REV
		W3T393919	3 OF 4	

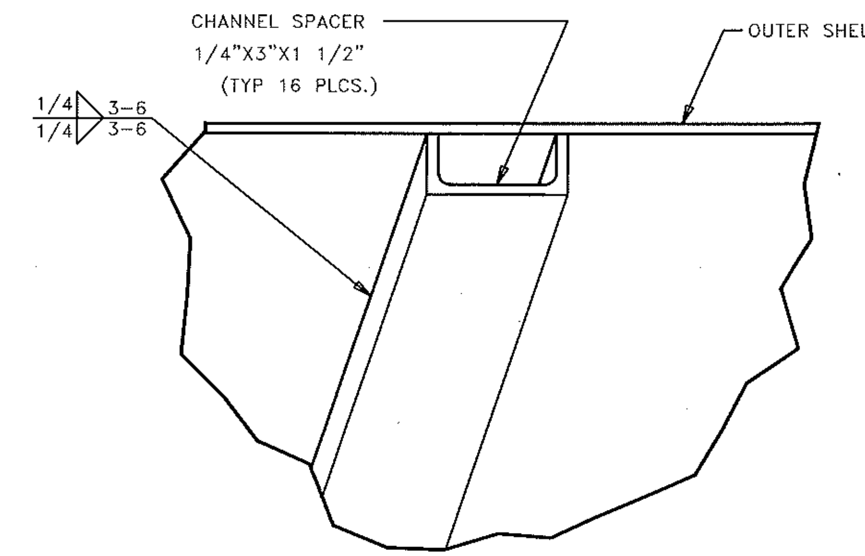
REF:W3T393919.iam



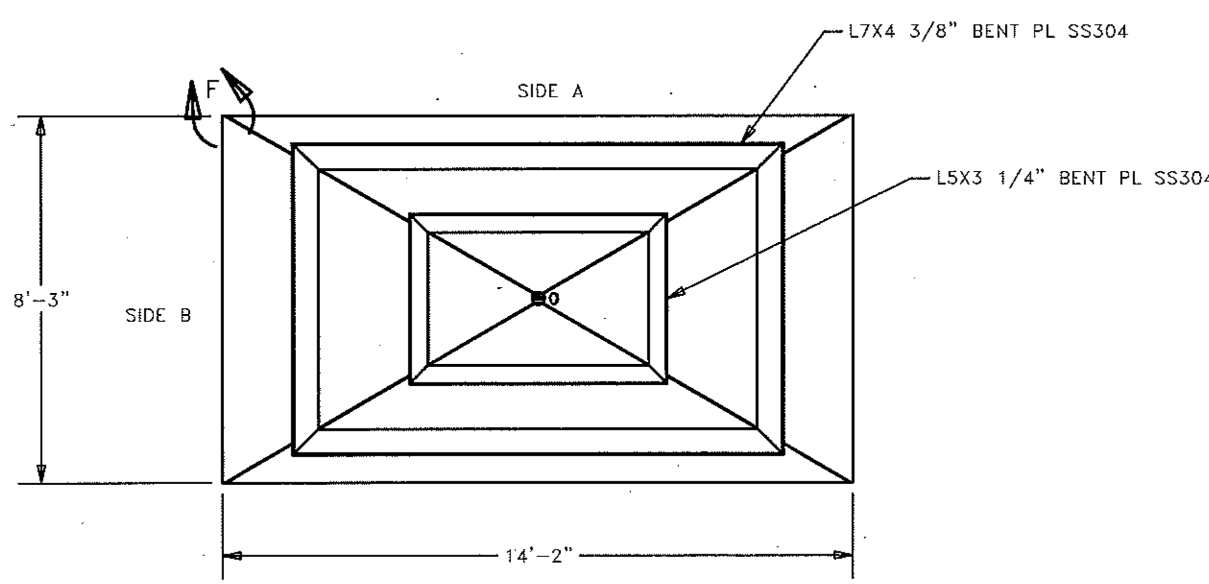
TOP VIEW
(OUTER SHELL)
SCALE 1 / 50



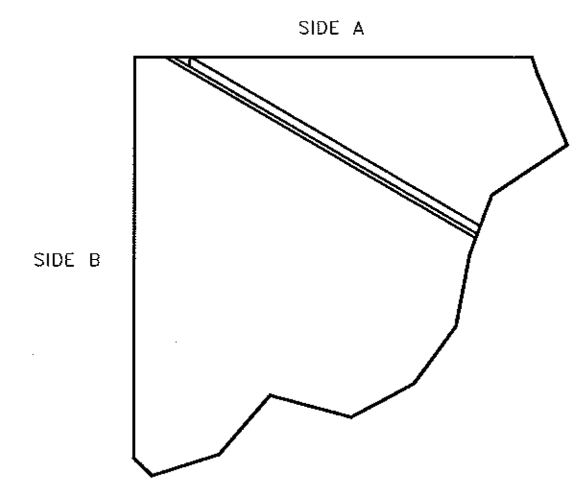
DETAIL D
JOINT DETAIL
(CORNER TO CORNER)
SCALE 1 / 4



DETAIL E
CHANNEL/OUTER SHELL DETAIL
SCALE 1 /4



BOTTOM VIEW
(OUTER SHELL)
SCALE 1 / 50



DETAIL F
JOINT DETAIL
(CORNER TO CORNER)
SCALE 1 / 4

WT (LB): 10207.341 lbmass

DIMENSIONS IN INCHES UNLESS SPECIFIED	
TOLERANCES UNLESS OTHERWISE SPECIFIED	
TWO (2) PLACE DEC. THREE (3) PLACE DEC. ANGULAR	±.06 ±.005 ±.50
STRUCTURAL DIMENSIONS	±1/16
MACHINED SURFACES	250

DESIGNER KP	DATE 2/23/2017
CHECKER EB	DATE 2/23/2017
ENGINEER	DATE
MANAGER	DATE
FILE:	UPDATE:
SCALE:	SIZE: B

TITLE: HOPPER 14.17' X 8.25' X 7' DOUBLE WALL
STAINLESS STEEL (270 CU FT CAPACITY)

CLIENT

EVOQUA WATER TECHNOLOGIES
WATER TECHNOLOGIES
Thomasville, GA
1-800-841-1550

PROJECT	CODE	DRAWING	SHEET	REV
		W3T393919	4 OF 4	

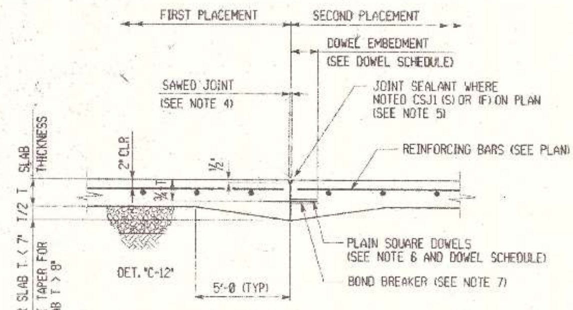
REF:W3T393919.iam

NOTES FOR CONTROL AND CONSTRUCTION JOINTS

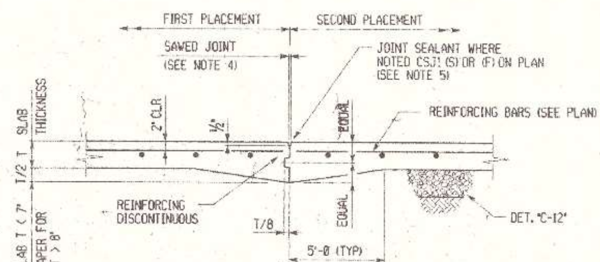
1. SLAB PLACEMENT SHALL BE SUBDIVIDED BY CONTROL JOINTS AT A SPACING (IN FEET) NOT EXCEEDING 2½ TIMES THE THICKNESS OF THE SLAB (IN INCHES) NOR 20 FEET IN ANY ONE DIRECTION UNLESS SHOWN OTHERWISE ON DESIGN DRAWINGS.
2. CONSTRUCTION JOINT AND CONTROL JOINT MAY BE INTERCHANGED TO SUIT CONCRETE POUR SCHEDULE.
3. EXACT LOCATION OF CONTROL JOINTS SHALL BE ESTABLISHED PRIOR TO CUTTING AND PLACING OF CONCRETE. FIELD CONTROL SHALL ASSURE THAT THE JOINTS OCCUR OVER THE CUT REINFORCING.
4. SAWING OF CONSTRUCTION AND CONTROL JOINTS:
   a. THE PREFERRED METHOD FOR SAWING CONTROL JOINTS IS WITH THE 3/32" WIDE X 1¼" DEEP SOFF-CUT SAW WITHIN ONE HOUR OF FINISHING THE CONCRETE.
   b. ALTERNATELY, CONTROL JOINTS MAY BE INSTALLED WITH A 3/16" CONVENTIONAL CONCRETE SAW. SAWING SHALL BEGIN AS SOON AS THE CONCRETE SURFACE HAS HARDENED SUFFICIENTLY TO PERMIT SAWING WITHOUT EXCESSIVE RAVELING AND BEFORE RANDOM SHRINKAGE.
   c. WHERE THE SAW IS OBSTRUCTED, TOOLED OR FORMED JOINTS SHALL BE PROVIDED TO JOIN THE SAW CUT JOINT AND COMPLETE THE CONTROL OR CONSTRUCTION JOINT. CONTROL JOINTS SHALL EXTEND THROUGH CURBS CAST MONOLITHICALLY WITH THE SLAB.
5. JOINT SEALERS AND FILLERS:
   a. JOINT SEALER MATERIALS, DESIGNATED (S) ON PLANS, SHALL BE IN ACCORDANCE WITH SPECIFICATION 0339/01, PARAGRAPH 6i.
   b. JOINT SEALER MATERIALS, DESIGNATED (F) ON PLANS, SHALL BE IN ACCORDANCE WITH SPECIFICATION 0339/01, PARAGRAPH 6h.
   c. NON-EXTRUDING PREMOLDED EXPANSION JOINT MATERIAL SHALL BE IN ACCORDANCE WITH SPECIFICATION 0339/01, PARAGRAPH 6g.
   d. ALL JOINTS SHALL BE CLEAN AND FREE OF MATERIAL AND SHALL BE ABSOLUTELY DRY PRIOR TO RECIEVING SEALER OR FILLER MATERIAL. SEALER AND FILLER SHALL BE INSTALLED NO SOONER THAN 90 DAYS AFTER SLAB PLACEMENT.
6. ALL DOWELS SHALL BE SAW CUT, NOT SHEARED, CONFORMING TO ASTM A615 PLAIN, GRADE 60 AND LOCATED AT MID-DEPTH OF SLAB WITH DOWEL BASKET. CLIP WIRE ON BASKET PRIOR TO SECOND PLACEMENT. EXERCISE EXTREME CARE IN POSITIONING AND ALIGNING DOWELS LEVEL AND PARALLEL WITH EACH OTHER AND PERPENDICULAR TO THE JOINT FACE.
7. SQUARE DOWEL BOND BREAKER SHALL BE SNAP-ON OR SLIP-ON PLASTIC CLIP WITH ¼" COMPRESSIBLE, CLOSED CELL FOAM ATTACHED TO INSIDE VERTICAL FACES OF CLIP AS MANUFACTURED BY SCHRADER/ROTEC OR APPROVED EQUAL.

DOWEL SCHEDULE

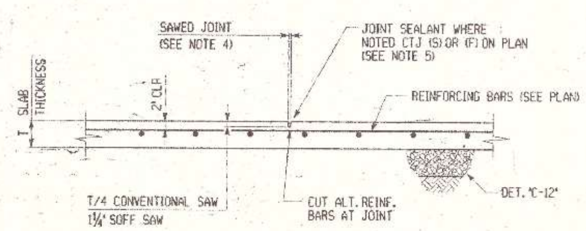
SLAB DEPTH INCHES	SIZE INCHES	TOTAL LENGTH INCHES	SPACING IN. C TO C
5	5/8	12	12
6	3/4	14	12
7	7/8	14	12
8	1	14	12
9	1⅛	16	12
10	1¼	16	12



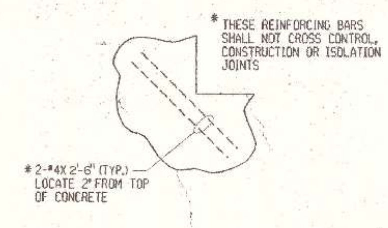
CONSTRUCTION JOINT CSJ1 & CSJ1 (S) OR (F)
(VEHICULAR TRAFFIC)



CONSTRUCTION JOINT CSJ2 & CSJ2 (S) OR (F)
(NO VEHICULAR TRAFFIC)

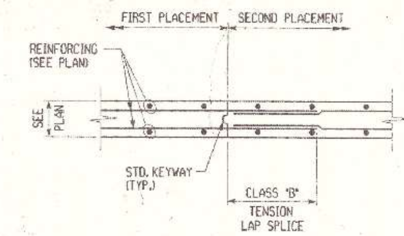


CONTROL JOINT CTJ & CTJ (S) OR (F)



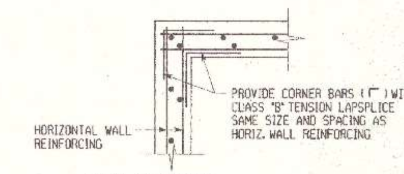
TYPICAL DETAIL SHOWING EXTRA REINFORCING AT RE-ENTRANT CORNERS

DETAIL C-1



TYPICAL WALL CONSTRUCTION JOINT DETAIL (U.N.)

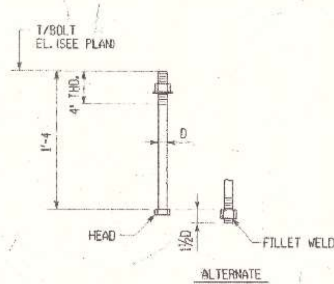
DETAIL C-2



TYPICAL CORNER REINF. W/DOUBLE LAYER OF REINFORCING

TYPICAL CORNER DETAIL

DETAIL C-3



STD. ANCHOR BOLT DETAIL

GENERAL NOTES - CONCRETE

1. DESIGN, MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE FOLLOWING STANDARDS UNLESS OTHERWISE MODIFIED ON THE DRAWINGS OR IN THE STANDARDS:

   ACI-347R-88 RECOMMENDED PRACTICE FOR CONCRETE FORMWORK

   ACI-318-89 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE

   ACI-315-80 (REVISED 1986) DETAILS AND DETAILING OF CONCRETE REINFORCEMENT

   ACI-301-89 SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS

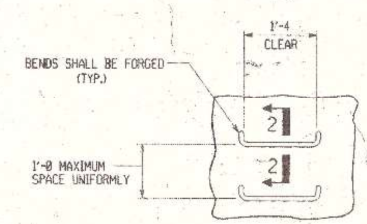
   CRSI RECOMMENDED PRACTICE FOR PLACING REINFORCING STEEL
2. CONCRETE AND REINFORCING STEEL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH SPECIFICATION 0339/01.
3. FABRICATION, DELIVERY AND INSTALLATION OF MISCELLANEOUS MATERIALS SHALL BE IN ACCORDANCE WITH SPECIFICATION 0555/01, "MISCELLANEOUS METALS". REFER TO ARCHITECTURAL, PIPING, PLUMBING AND ELECTRICAL DRAWINGS FOR EMBEDDED ITEMS.
4. EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS AND STRUCTURES SHALL BE IN ACCORDANCE WITH SPECIFICATION 0215/02.
5. CONCRETE SHALL DEVELOP THE FOLLOWING COMPRESSIVE STRENGTHS IN 28 DAYS UNLESS NOTED:

   2000 PSI FOR FILL CONCRETE.

   4000 PSI FOR FOUNDATIONS, RETAINING WALLS AND GRADE BEAMS.

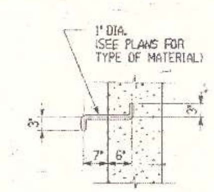
   4000 PSI FOR GROUND FLOOR SLABS, ELEVATED FLOOR SLABS, BEAMS, GIRDERS, COLUMNS AND WATER RETAINING STRUCTURES.

   5000 PSI FOR ROADWAYS.
6. REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A615-87 GRADE 60 UNLESS NOTED.
7. PROVIDE A MINIMUM COVER OF 3 INCHES FOR REINFORCING STEEL WHEN THE CONCRETE IS PLACED DIRECTLY AGAINST THE GROUND.
8. PROVIDE A MINIMUM COVER OF 2 INCHES FOR BARS LARGER THAN NO. 5 AND 1 1/2 INCHES FOR NO. 5 BARS OR SMALLER IF AFTER REMOVAL OF FORMS THE CONCRETE IS EXPOSED TO THE WEATHER OR IN CONTACT WITH THE GROUND.
9. PROVIDE A MINIMUM COVER OF 3/4 INCHES FOR REINFORCING IN SLABS AND WALLS AND 1 1/2 INCHES IN BEAMS AND GIRDERS NOT EXPOSED DIRECTLY TO WEATHER OR GROUND.
10. REINFORCING SHALL BE DETAILED SUCH THAT ALLOWABLE SHOP TOLERANCES WILL NOT PERMIT BARS TO ENCROACH ON MINIMUM COVER REQUIRED IN NOTES 7, 8 AND 9.
11. ALL EXPOSED EDGES OF CONCRETE SHALL HAVE A 3/4 INCH 45° CHAMFER UNLESS NOTED.
12. FLOOR FINISHES, SURFACE TOLERANCES, JOINT SEALANT, SEALANT/DUSTPROOFER, VAPOR BARRIER, WATERSTOPS AND WATERPROOFING SHALL BE AS SHOWN ON THE DRAWINGS AND AS DESCRIBED IN SPECIFICATION NO. 0339/01, "CONCRETE AND REINFORCING STEEL".
13. ALL CONCRETE EXPOSED TO WEATHER AND ALL LIQUID RETAINING STRUCTURES SHALL BE AIR ENTRAINED CONCRETE. AIR ENTRAINMENT TO BE PER SPECIFICATION 0339/01, "CONCRETE AND REINFORCING STEEL".
14. ANCHOR BOLT SLEEVES TO BE FILLED WITH GROUT UNLESS NOTED.
15. ALLOWABLE SOIL BEARING PRESSURE UNDER SPREAD FOOTINGS AND MATS SHALL BE AS NOTED ON THE FOUNDATION DRAWINGS.
16. SEE CONCRETE SPECIFICATION 0339/01 FOR ADDITIONAL REQUIREMENTS AND GROUT REQUIREMENTS.
17. ALL CONCRETE SHALL BE MECHANICALLY VIBRATED IN ACCORDANCE WITH ACI 309R-87.
18. BEFORE CONCRETE IS PLACED, CARE SHALL BE TAKEN TO ASSURE THAT ALL EMBEDDED ITEMS ARE FIRMLY AND SECURELY FASTENED IN PLACE TO PREVENT DISPLACEMENT. ANCHOR BOLTS SHALL BE TIED AT THE TOP AND BOTTOM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ASSURING ANCHOR PLACEMENT AND PLUMBNESS IN ACCORDANCE WITH THE CONCRETE DRAWINGS.
19. WATERSTOP SPLICES SHALL BE IN ACCORDANCE WITH SPECIFICATION 0339/01 AND THE MANUFACTURER'S INSTRUCTIONS.



PIT & TANK LADDER RUNGS

DETAIL 4



SECTION 2-2

RELEASED FOR CONSTRUCTION
BY [signature] DATE 11-6-95

WHEELABRATOR CLEAN AIR SYSTEMS Hampton, New Hampshire

SCALE NONE		DATE
DESIGN:	RUST STD.	10-24-95
DRAWN BY:	D. CARTER	10-24-95
CHECKED BY:	M. CLAIRE	11-06-95
SUPV. BY:	D. CARTER	11-6-95
SUBM'TD BY:	R.E. Williams	11-6-95
APP'D BY:		
APP'D BY:		
APP'D BY:		

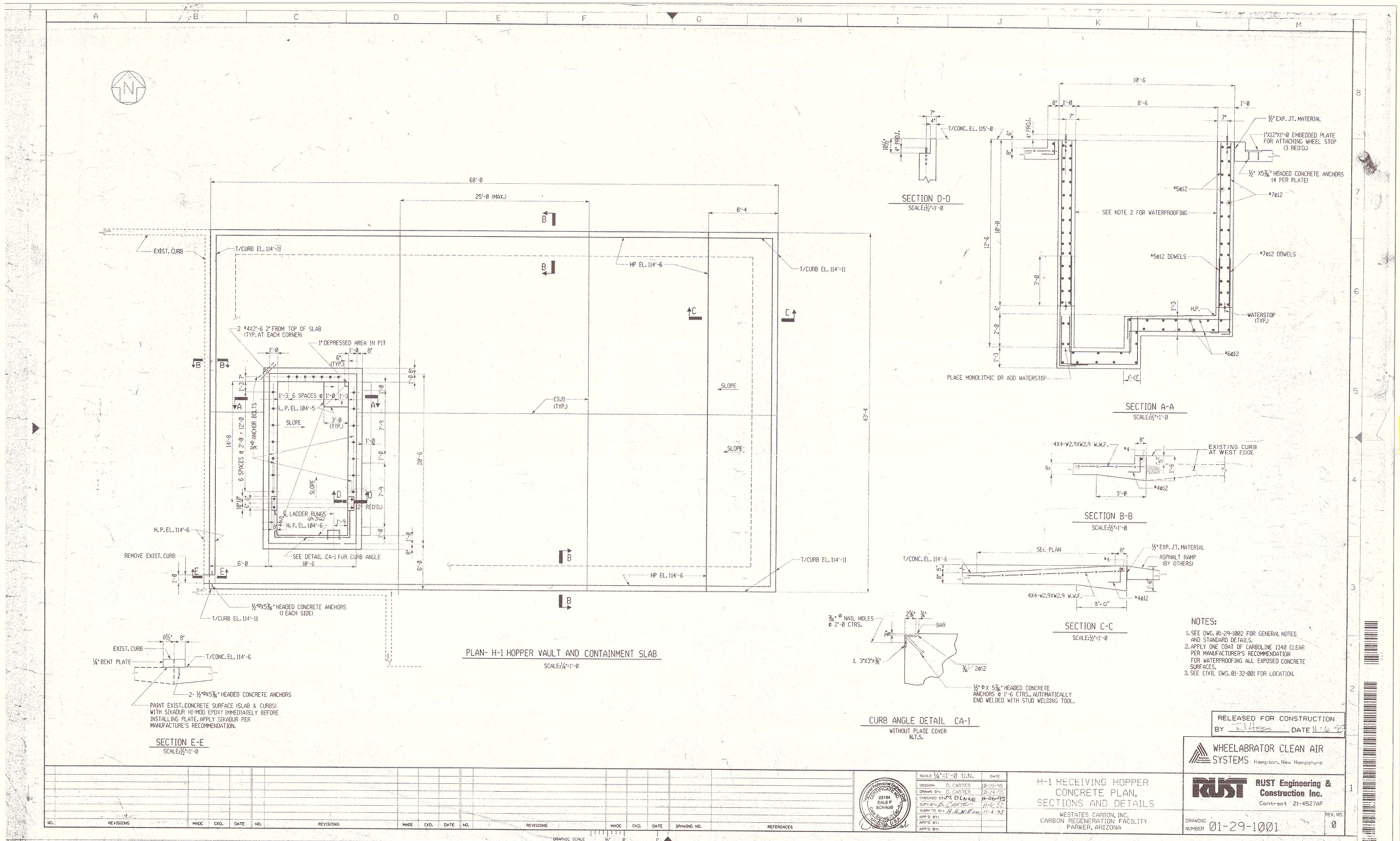
STANDARD CONCRETE DETAILS AND GENERAL NOTES

WESTATES CARBON, INC.
CARBON REGENERATION FACILITY
PARKER, ARIZONA

RUST Engineering & Construction Inc.
Contract 21-4527AF

DRAWING NUMBER 01-29-1002 REV. NO. 0

NO.	REVISIONS	MADE	CKD.	DATE	NO.	REVISIONS	MADE	CKD.	DATE	NO.	REVISIONS	MADE	CKD.	DATE	DRAWING NO.	REFERENCES


PLAN- H-1 HOPPER VAULT AND CONTAINMENT SLAB
SCALE:1/4"=1'-0
68'-0
25'-0 (MAX.)
8'-4
EXIST. CURB
T/CURB EL. 114'-11
HP EL. 114'-6
2 #4X2'-6 2" FROM TOP OF SLAB (TYP. AT EACH CORNER)
1" DEPRESSED AREA IN PIT
L.P. EL. 104'-5
SLOPE
3/4"Ø ANCHOR BOLTS
LADDER RUNGS
H.P. EL. 104'-6
CSJ1 (TYP.)
H.P. EL. 114'-6
REMOVE EXIST. CURB
SEE DETAIL CA-1 FOR CURB ANGLE
1/2"ØX5 3/8" HEADED CONCRETE ANCHORS (1 EACH SIDE)
SECTION D-D
SCALE:1/2"=1'-0
T/CONC. EL. 115'-0
SECTION A-A
SCALE:1/2"=1'-0
1/2" EXP. JT. MATERIAL
1"X12"X1'-0 EMBEDDED PLATE FOR ATTACHING WHEEL STOP (3 REQ'D.)
1/2" X5 3/8" HEADED CONCRETE ANCHORS (4 PER PLATE)
#5@12
#7@12
SEE NOTE 2 FOR WATERPROOFING
#5@12 DOWELS
#7@12 DOWELS
WATERSTOP (TYP.)
#6@12
PLACE MONOLITHIC OR ADD WATERSTOP
SECTION B-B
SCALE:1/2"=1'-0
4X4-W2.9XW2.9 W.W.F.
EXISTING CURB AT WEST EDGE
#4@12
SECTION C-C
SCALE:1/2"=1'-0
T/CONC. EL. 114'-6
ASPHALT RAMP (BY OTHERS)
SECTION E-E
SCALE:1/2"=1'-0
EXIST. CURB
1/4" BENT PLATE
2- 1/2"ØX5 3/8" HEADED CONCRETE ANCHORS
PAINT EXIST. CONCRETE SURFACE (SLAB & CURBS) WITH SIKADUR HI-MOD EPOXY IMMEDIATELY BEFORE INSTALLING PLATE. APPLY SIKADUR PER MANUFACTURE'S RECOMMENDATION.
CURB ANGLE DETAIL CA-1
WITHOUT PLATE COVER
N.T.S.
3/16"Ø NAIL HOLES @ 2'-0 CTRS.
L 3"X3"X3/8"
1/2"Ø X 5 3/8" HEADED CONCRETE ANCHORS @ 1'-6 CTRS., AUTOMATICALLY END WELDED WITH STUD WELDING TOOL.
NOTES:
1. SEE DWG. 01-29-1002 FOR GENERAL NOTES AND STANDARD DETAILS.
2. APPLY ONE COAT OF CARBOLINE 1340 CLEAR PER MANUFACTURER'S RECOMMENDATION FOR WATERPROOFING ALL EXPOSED CONCRETE SURFACES.
3. SEE CIVIL DWG. 01-32-001 FOR LOCATION.
RELEASED FOR CONSTRUCTION
WHEELABRATOR CLEAN AIR SYSTEMS Hampton, New Hampshire
RUST Engineering & Construction Inc.
Contract 21-4527AF
H-1 RECEIVING HOPPER CONCRETE PLAN, SECTIONS AND DETAILS
WESTATES CARBON, INC. CARBON REGENERATION FACILITY PARKER, ARIZONA
SCALE 1/4"=1'-0 U.N.
DESIGN D. CARTER
DRAWN BY D. CARTER
DRAWING NUMBER 01-29-1001
REV. NO. 0
REVISIONS
REFERENCES

STRUCTURAL CALCULATIONS FOR

Hopper H1 (270 cu ft Capacity)

Design of Vessel & Supports

Double Wall Stainless Steel

14.17 ft x 8.25 ft x 7 ft Tall Supported by Concrete Vault

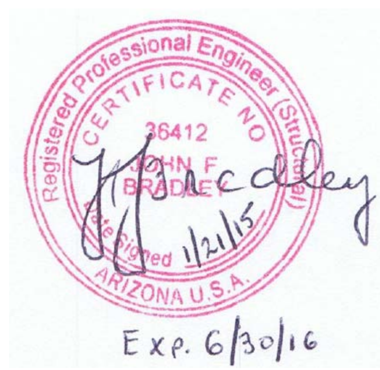
REVISION 1

Dated January 21, 2015

(Added Channel Spacers @ Corners of Hopper)

LOCATED AT

Parker, Arizona



Calculations Prepared For:

Evoqua Water Technologies

2523 Mutahar Street

Parker, AZ 85344

Ph (928) 669-5758, Fax (928) 669-5775

Table of Contents

Design Summary

Product Stored:	Spent Activated Carbon (Design for Both Liquid Slurry & Dry Granular Material)
Specific Gravity:	1.50
Max Temperature:	150^{o} F
Design Pressure:	Atmospheric
Design Codes:	1) API 650 11th Edition
	2) IBC 2012 for Seismic
Wind Design:	Vessel is indoors; wind is not considered
Seismic Design:	IBC 2012: S_S = 0.23g, S_1 = 0.15g, I_e = 1.5, Site Class D

Description △1

This vessel is a double-wall inverted pyramid hopper for use inside a water treatment plant near Parker, Arizona. Product is spent activated carbon granular material (both liquid slurry and dry granular material). Material used for the tank construction is SS304 stainless steel except for the inner shell in contact with product which is SS316. Inner shell is separated from outer shell by (16) evenly spaced bent plate channel spacers @ 1 1/2" tall. These spacers are attached to inside of outer shell. Inner shell is 3/8" thick SS316 plate, and outer shell is 1/4" SS304 plate.

Design Criteria

Specific gravity of product is provided by customer at 1.50 (conservative). Tank is designed for atmospheric pressure (no internal pressure or vacuum) and ambient temperature. Design codes used for this tank are API 650 and IBC 2012. There are no American codes that specifically address all components of hoppers, so other codes & design procedures will be used as appropriate. Allowable steel stresses are taken per API 650. Wind and seismic loads are calculated both per IBC 2012, and load combinations are taken per IBC 2012. Seismic design values above are from USGS website for Parker, AZ.

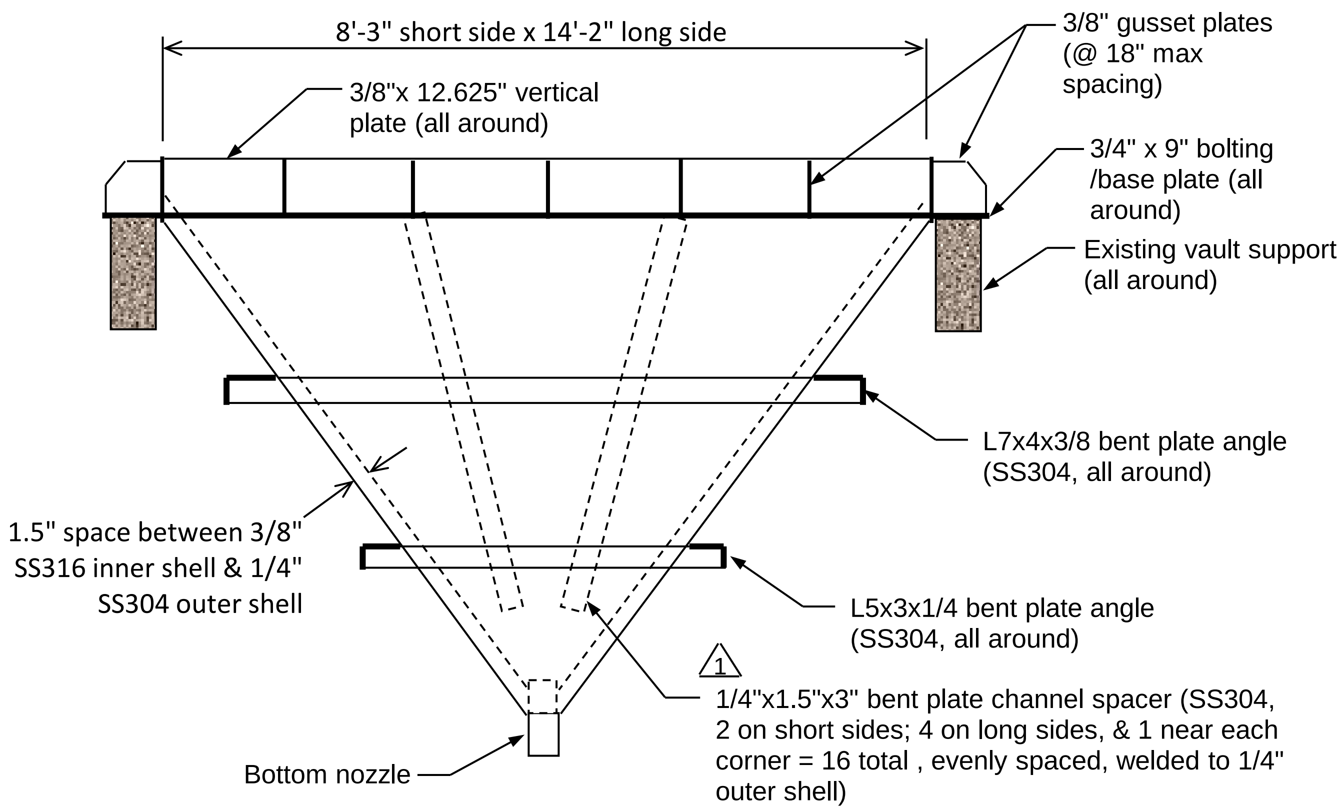
Design Methodology

The Inner tank shell is the normal pressure boundary; the outer tank is used for leak containment. Under normal loading, inner shell transfers loads to the outer shell at discreet locations of spacers. In event of leak in inner shell, space between the two shells may fill up, subjecting the outer shell to uniform product pressure. This full product pressure could only be developed for liquid slurry condition, but 5' head on dry product will conservatively be considered for design of both the inner and outer shell. Vessel is supported at a stiffened rectangular compression bar (base plate) at top of vault walls, and vessel is anchored to tops of these walls.

Vessel is replacing an similar existing hopper at same location. Vessel is supported on (3) walls of a concrete vault, and by an HSS8x8 along one (short) side. Existing anchor bolts are corroded and will be cut off and not reused. New epoxy anchors will be installed in existing concrete walls and welded to existing HSS tube. Check of existing concrete vault is beyond the scope of these calcs, but it should be adequate as hopper is being replaced in kind. For lateral load calculations, it is assumed that tank is a pendulum-type structure rigidly supported at anchor plates. For seismic OTM calculations, product head above the anchor bolt circle is conservatively ignored.

Design Criteria & Sketch

Product Stored:	Spent Activated Carbon (Design for Both Liquid Slurry & Dry Granular Material)
Specific Gravity:	1.50
Max Temperature:	150° F
Min Design Metal Temp:	-20° F
Design Pressure:	0 psig (atmospheric)
Corrosion Allowance:	0 in
Design Codes:	1) API 650 11th Ed.
	2) IBC 2012 for Wind & Seismic
Seismic Design:	S_S = 0.23g, S_1 = 0.15g, F_a = 1.60, F_v = 2.40, I_e = 1.5, Site Class D
	Seismic Design Category B
Wind Design:	Not Required



Weights: Empty Vessel = W_{empty} =	7.5	k
Product in tank (full to grating level) =	25.3	k
Tank + operating product = W_{full1} =	32.8	k
5' head of dry product above top of grating =	54.7	k
Tank + operating product + head = W_{full2} =	87.5	k

IBC 2012 Seismic Design Loads

IBC 2012 Seismic Design Loads: (ref ASCE 7-10 Sections 13 & 15)

Governing Seismic Design Acceleration:

Horizontal:	$A_i = (0.4a_pS_{DS}I_p)[1+2(z/h)]/R_p =$	0.059 g		(Eq 13.3-1)
	or, $A_i = 0.3S_{DS}I_e =$	0.110 g	GOVERNS	(Eq 15.4-5)
	Where: $S_{DS} = (2/3)F_aS_s =$	0.245		
	$F_a =$	1.600		
	$S_s =$	0.230		
	$a_p =$	1.0		
	$R_p =$	2.5 (per ASCE 7-10, Table 13.6-1)		
	$I_e = I_p =$	1.50		
Vertical:	$A_v = 0.2S_{DS}I_p =$	0.074 g		

Base Shear: (ref ASCE 7-10 Eq. 12.8-1)

Vessel full:	$V_{s\text{-}full} = A_iW_{full2} =$	**9.66 k**	GOVERNS
	Where: Design acceleration = $A_i = C_s =$	0.110 g	
	$W_{full2} =$	87.50 k	
Vessel empty:	$V_{s\text{-}empty} = A_iW_{empty} =$	**0.83 k**	
	$W_{empty} =$	7.50 k	

Overturning Moments (at anchor plate level):

Vessel full:	$M_{s\text{-}full} = (V_{s\text{-}full})(CG_{full}) =$	**16.91 ft-k**	GOVERNS
	Where: $CG_{full} =$	1.75 ft (below top of vault / anchor plate)	
Vessel empty:	$M_{s\text{-}empty} = (V_{s\text{-}empty})(CG_{empty}) =$	**1.45 ft-k**	
	Where: $CG_{empty} =$	1.75 ft	

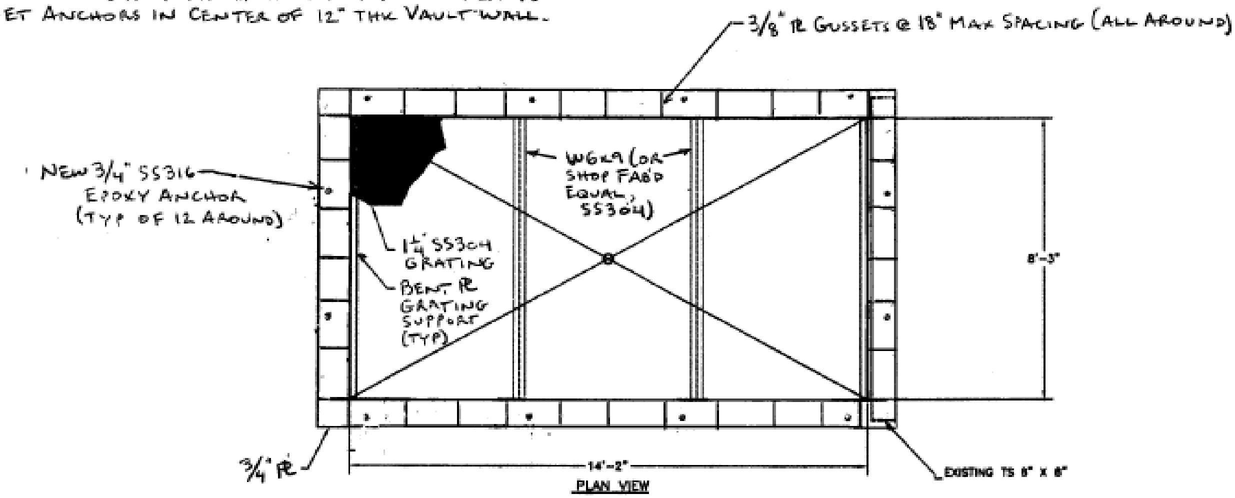
Resisting Moments (at anchor plate level, conserv. ignore product head above grating):

Vessel full:	$M_{resist} = (0.6)(W_{full1})(8.25/2) =$	**81.18 ft-k**
Vessel empty:	$M_{resist} = (0.6)(W_{empty})(8.25/2) =$	**18.56 ft-k**

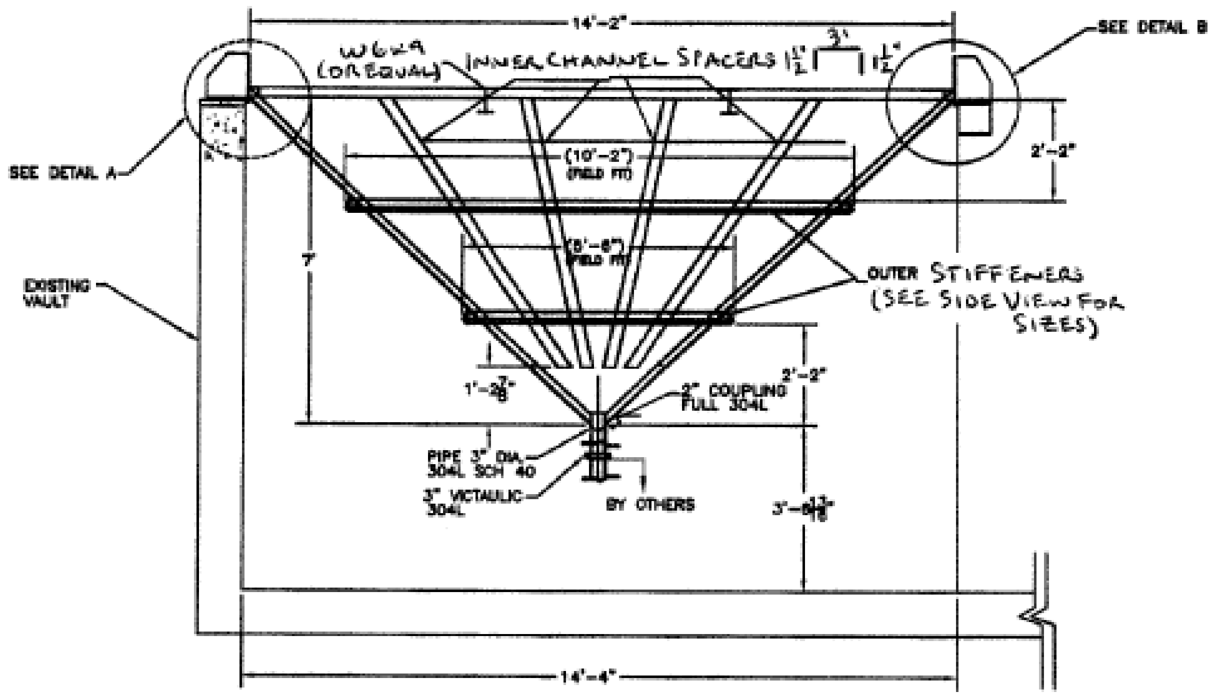
(Since OTM < resisting moment, hopper is stable for seismic overturning)

Hopper Details

NOTES:
1) CUT EXISTING CORRODED STUDS FLUSH W/ TOP OF VAULT WALLS.
2) FIELD DRILL & INSTALL (12) NEW HILTI EPOXY ANCHORS IN LOCATIONS SHOWN AFTER HOPPER IS SET IN PLACE. SET ANCHORS IN CENTER OF 12" THK VAULT WALL.

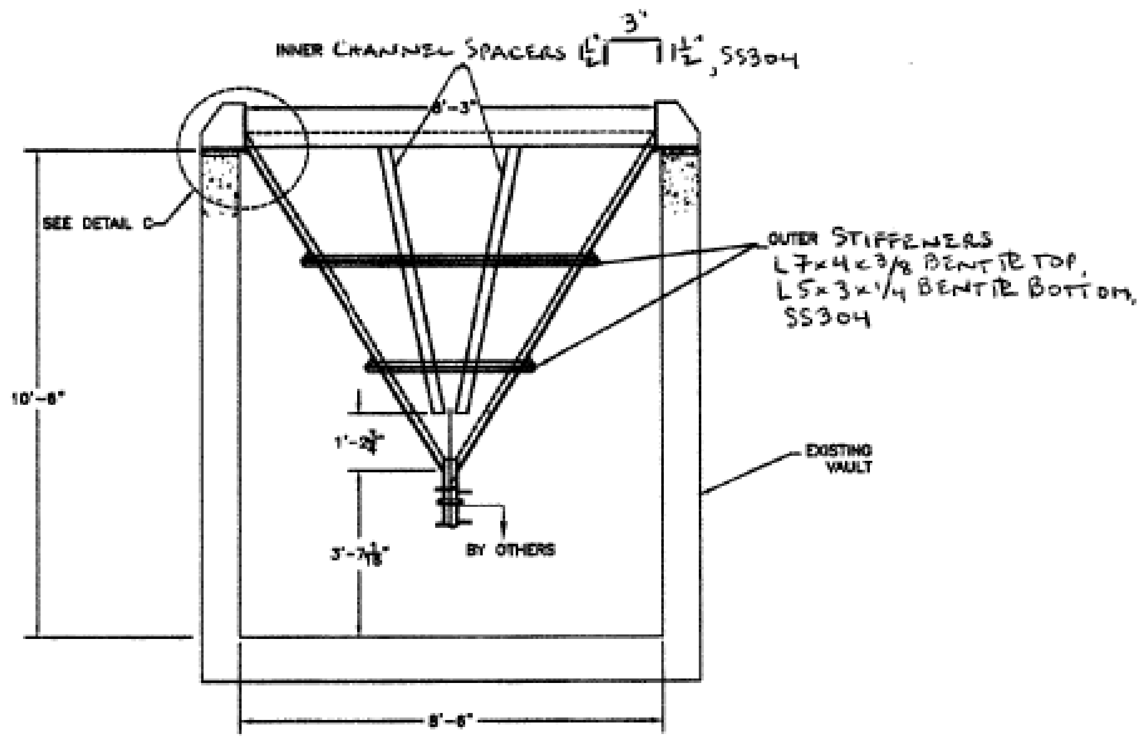


PLAN VIEW

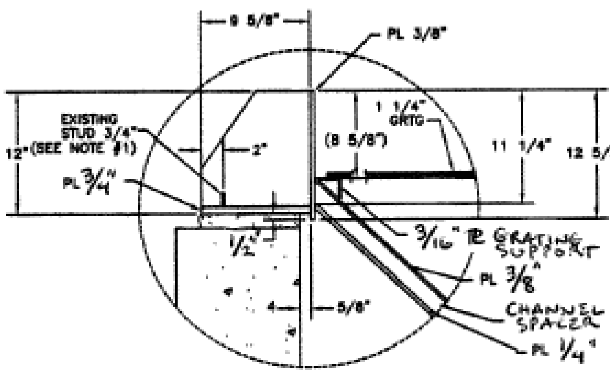


FRONT VIEW

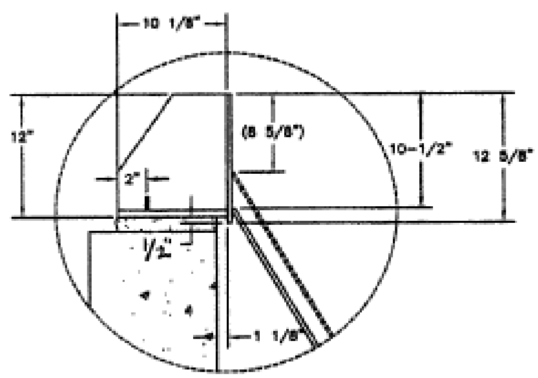
Hopper Details, cont.



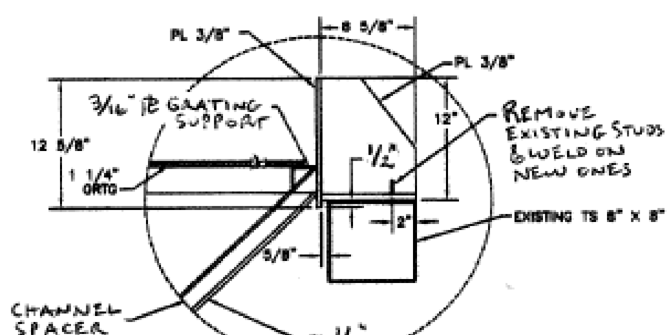
SIDE VIEW



DETAIL -A-

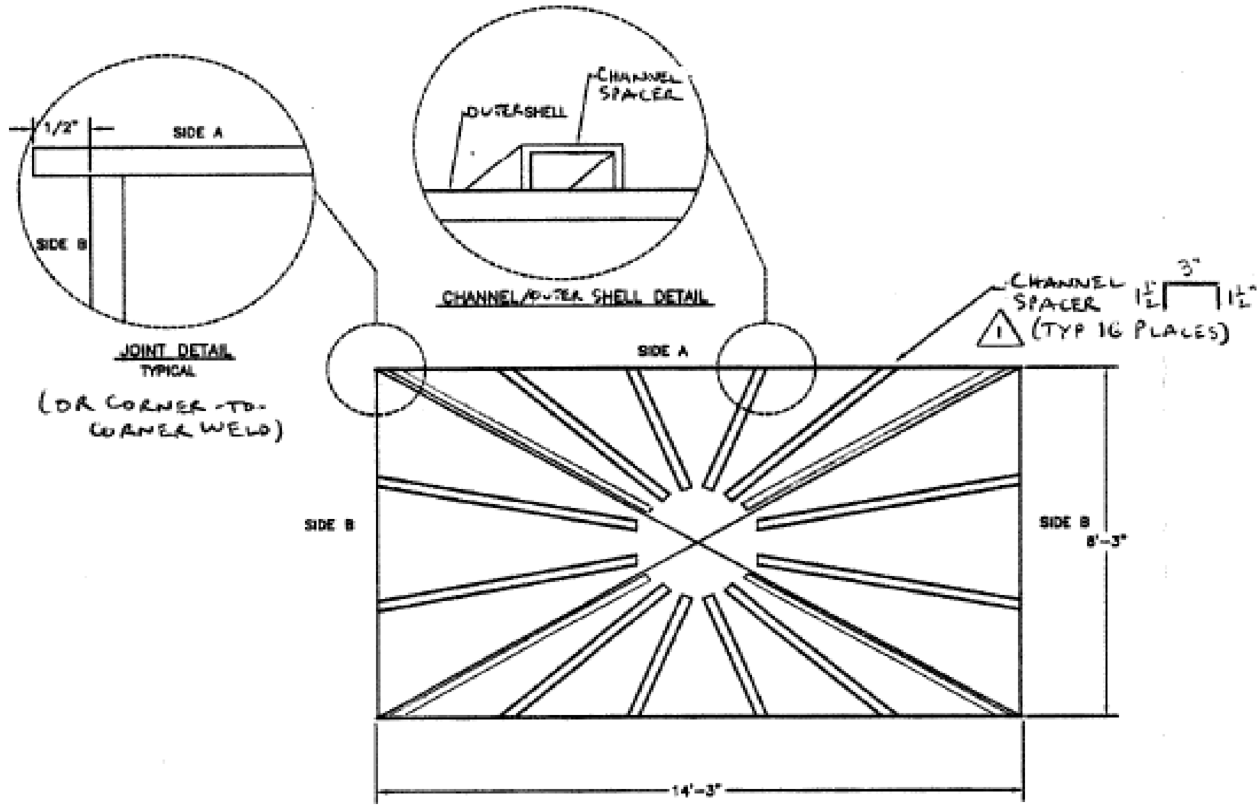


DETAIL -C-

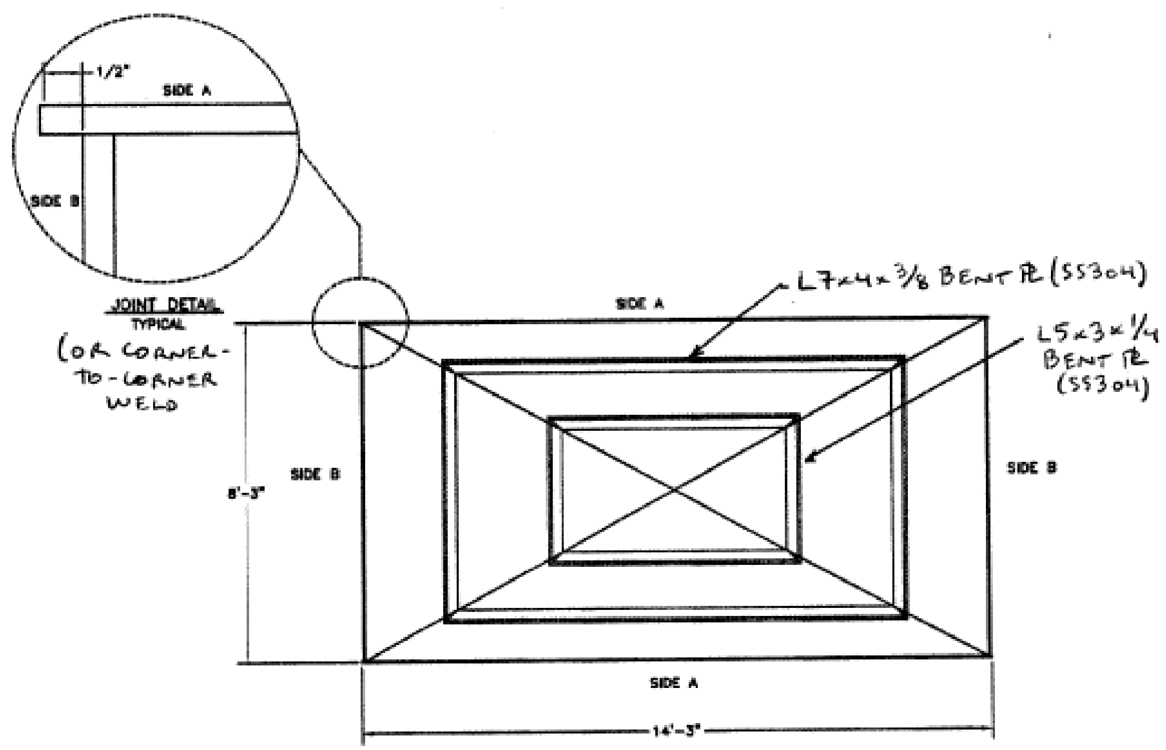


DETAIL -B-

Hopper Details, cont.

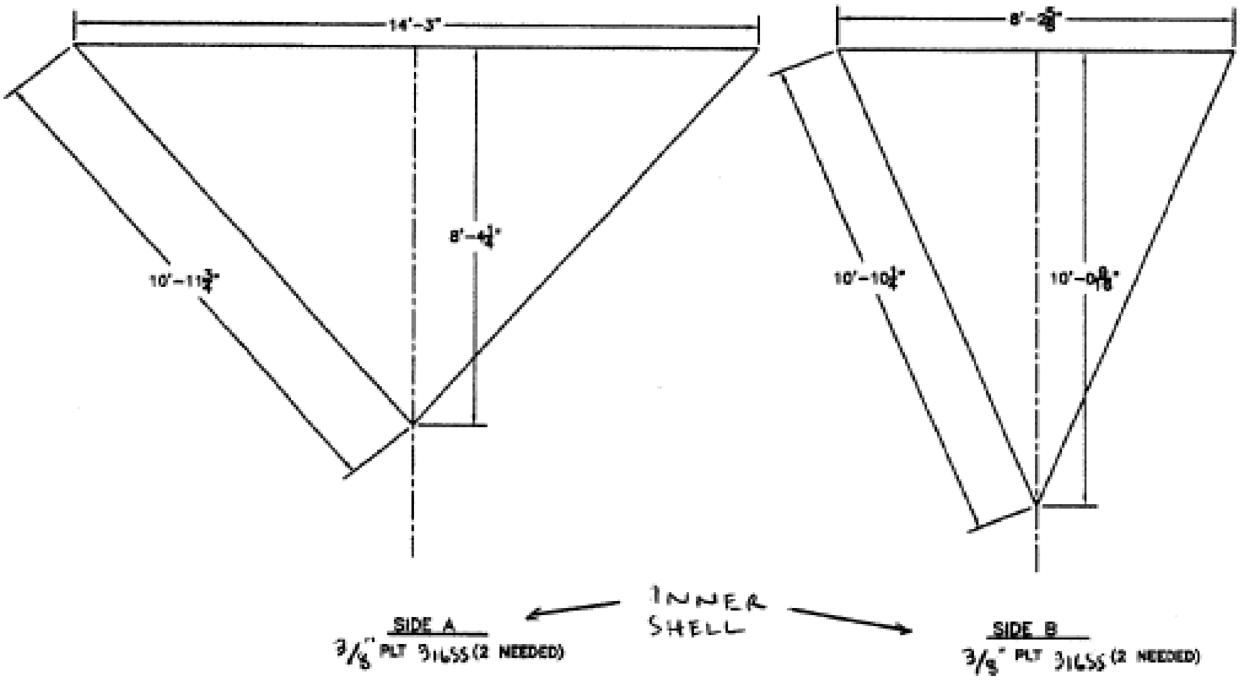


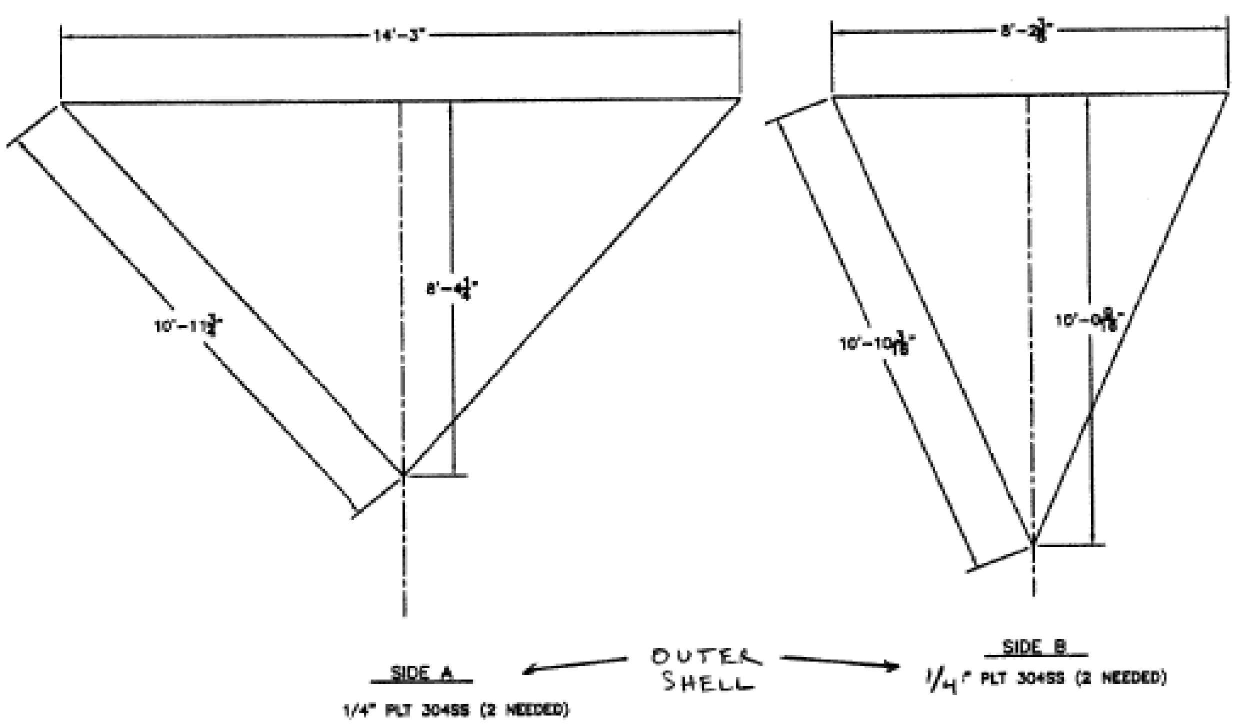
OUTER SHELL
(TOP VIEW)



OUTER SHELL
(BOTTOM VIEW)

Hopper Details, cont.





Design Hopper Components

Spacing of C3x1.5x1/4 Spacers Between Inner & Outer Walls

- Spacers are welded to 1/4" outer shell with min weld shown below
- Support spacing for 1/4" outer wall governs over 3/8" thick inner hopper wall
- Consider granular material with 5' head as governing condition for these checks

Check plate midway down hopper wall:

Max allowable stiffener spacing:

$L_s = (54000t^2/p)^{1/2} =$ 30.3 in

Where: t = 0.25 in

p = 3.68 psi

Max actual stiffener spacing = 17 in **< Allowable, OK**

Check midway between upper horz stiffener and grating:

Max allowable stiffener spacing:

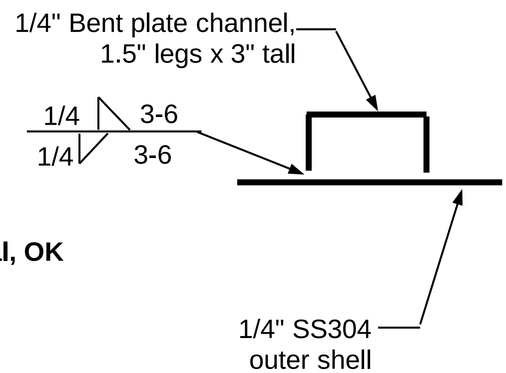
$L_s = (54000t^2/p)^{1/2} =$ 35.0 in

Where: t = 0.25 in

p = 2.76 psi

Max actual stiffener spacing = 29.3 in **< Allowable, OK**

Check C3x1.5x1/4 Stiffeners/Spacers Between Inner & Outer Walls



Channel Spacer Details

Short side of hopper

Check stiffener midway down hopper wall:

$f_b = M/S =$ 9845 psi

Where: $M = wL^2/8 =$ 12110 in-lbs

w = 60.7 pli

L = 40.0 in

S = 1.23 in^3

$F_b = (0.7)(22{,}500 \text{ psi}) =$ 15750 psi **> Actual, OK**

Check midway between upper horz stiffener and grating:

$f_b = M/S =$ 12978 psi

Where: $M = wL^2/8 =$ 15963 in-lbs

w = 80.0 pli

L = 40.0 in

S = 1.23 in^3

$F_b = (0.7)(22{,}500 \text{ psi}) =$ 15750 psi **> Actual, OK**

Long side of hopper

Check stiffener midway down hopper wall:

$f_b = M/S =$ 7053 psi

Where: $M = wL^2/8 =$ 8675 in-lbs

w = 62.5 pli

L = 33.3 in

S = 1.23 in^3

$F_b = (0.7)(22{,}500 \text{ psi}) =$ 15750 psi **> Actual, OK**

Check midway between upper horz stiffener and grating:

$f_b = M/S =$ 9088 psi

Where: $M = wL^2/8 =$ 11178 in-lbs

w = 80.5 pli

L = 33.3 in

S = 1.23 in^3

$F_b = (0.7)(22{,}500 \text{ psi}) =$ 15750 psi **> Actual, OK**

Check Hopper Components, cont.

Angle Stiffeners on Outside of Exterior Shell

Upper stiffener (governing condition is long side)

$f_b = M/S =$ 15587 psi

Where: $M = wL^2/8 =$ 199508 in-lbs

$w =$ 107.2 pli

$L =$ 122.0 in

Try **L7x4x3/8** welded to 1/4" shell, $S =$ 12.8 in^3

$F_b = (0.7)(22{,}500\ psi) =$ 15750 psi **> Actual, OK**

Lower stiffener (governing condition is long side)

$f_b = M/S =$ 15135 psi

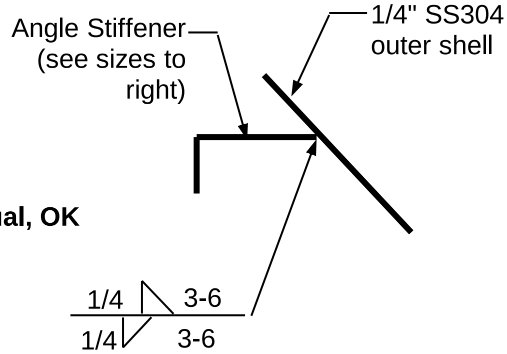
Where: $M = wL^2/8 =$ 75071 in-lbs

$w =$ 137.9 pli

$L =$ 66.0 in

Try **L5x3x1/4** welded to 1/4" shell, $S =$ 4.96 in^3

$F_b = (0.7)(22{,}500\ psi) =$ 15750 psi **> Actual, OK**



Exterior Stiffener Details

Top Compression Bar

Short side of hopper: $f_b = M/S =$ 8421 psi

Where: $M = wL^2/8 =$ 117563 in-lbs

$w =$ 96.0 pli

$L =$ 99.0 in

Try FB 3/4"x 9" welded to 3/8" x 12.625" vert plate, $S =$ 13.96 in^3

$F_b = (0.7)(22{,}500\ psi) =$ 15750 psi **> Actual, OK**

Long side of hopper: $f_b = M/S =$ 14464 psi

Where: $M = wL^2/8 =$ 201923 in-lbs

$w =$ 55.9 pli

$L =$ 170.0 in

Try FB 3/4"x 9" welded to 3/8" x 12.625" vert plate, $S =$ 13.96 in^3

$F_b = (0.7)(22{,}500\ psi) =$ 15750 psi **> Actual, OK**

3/8" x 12.625" Top Vertical Perimeter Plate

Max spacing of gussets for 5' of head pushing outward:

Max allowable gusset spacing:

$L_s = (54000t^2/p)^{1/2} =$ 48.3 in

Where: $t =$ 0.375 in

$p =$ 3.25 psi

Max actual stiffener spacing = 18 in (max) **< Allowable, OK**

Check 18" spacing of gussets for forces due to hopper inner wall pulling inward:

$f_b = M/S =$ 13134 psi

Where: $M = wL^2/8 =$ 3886 in-lbs

$w =$ 96.0 pli

$L =$ 18.0 in

3/8" x 12.625" tall plate, $S =$ 0.30 in^3

$F_b = (0.7)(22{,}500\ psi) =$ 15750 psi **> Actual, OK**

Check Hopper Components, cont.

Grating Max span of bearing bars = 4.72 ft

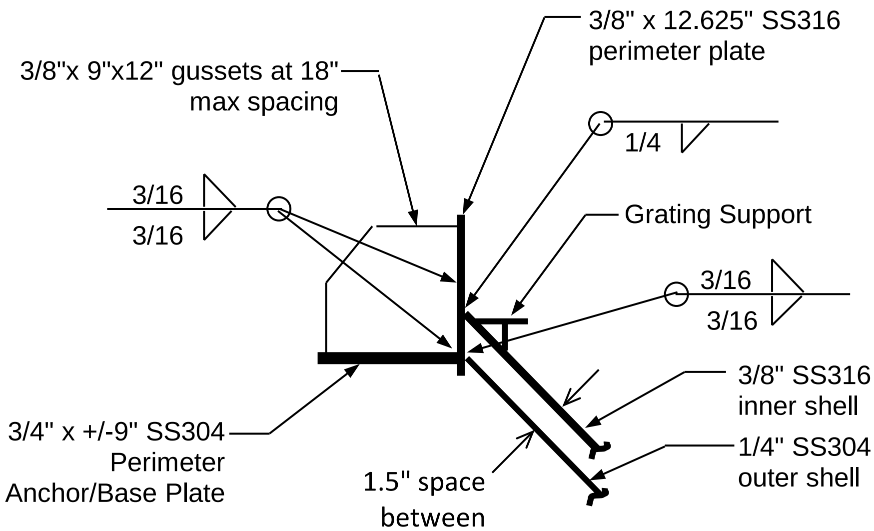
Use 1 1/4" x 3/16" Galvanized Stainless Steel Bar Grating (19-W-4)

→ Allowable uniform load = 325 psf > 100 psf √ OK

(see attached grating data sheet)

Grating Support Beam

f_b = M/S =	10408	psi
Where: M = $wL^2/8$ =	57867	in-lbs
w =	47.2	pli
L =	99.0	in
Try W6x9 (or shop fab'd equal), S =	5.56	in^3
F_b = (0.7)(22,500 psi) =	15750	psi **> Actual, OK**



Section thru Top Edge of Hopper

Hopper Grating

Per chart below, 1 1/4 x 3/16 W-19-4 stainless steel grating is OK for up to 325 psf > 100 psf. √ OK

Stainless Steel Grating Load Table

19-4 / 19-2 LOAD TABLE

LOADS AND DEFLECTIONS ARE THEORETICAL VALUES BASED ON 20,000 PSI UNIT STRESS. FOR PEDESTRIAN COMFORT DEFLECTIONS IN EXCESS OF 1/4" ARE NOT RECOMMENDED.

U = SAFE UNIFORM LOAD, LBS. PER SQ. FT.
C = SAFE CONCENTRATED MID-SPAN LOAD, LBS. PER FT. OF GRATING WIDTH
D = DEFLECTION IN INCHES

BEARING BAR SIZE		UNSUPPORTED SPAN													WEIGHT PER SQ. FT. (LBS.)							
		2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"	19-4	19-2	15-4	15-2	11-4	11-2	7-4	7-2
3/4 X 1/8	U	395	253	175	129	99	78								4.0	4.8	4.9	5.7	6.4	7.2	9.7	10.7
	D	.114	.179	.257	.350	.457	.579															
	C	395	316	263	226	197	175															
	D	.091	.143	.206	.280	.366	.463															
3/4 X 3/16	U	592	379	263	193	148	117								5.6	6.4	6.9	7.7	9.2	10.0	14.5	16.0
	D	.114	.179	.257	.350	.457	.579															
	C	592	474	395	338	296	263															
	D	.091	.143	.206	.280	.366	.463															
1 X 1/8	U	702	449	312	229	175	139	112	93	78					5.1	5.9	6.2	7.1	8.2	9.0	12.9	14.2
	D	.086	.134	.193	.263	.343	.434	.536	.648	.771												
	C	702	561	468	401	351	312	281	255	234												
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617												
1 X 3/16	U	1053	674	468	344	263	208	168	139	117					7.4	8.4	9.2	10.2	12.1	13.1	19.4	21.3
	D	.086	.134	.193	.263	.343	.434	.536	.648	.771												
	C	1053	842	702	602	526	468	421	383	351												
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617												
1-1/4 X 1/8	U	1096	702	487	358	274	217	175	145	122	104	90			6.4	7.4	7.8	8.8	10.3	11.3	15.8	17.1
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617	.724	.840										
	C	1096	877	731	627	548	487	439	399	365	337	313										
	D	.055	.086	.123	.168	.219	.278	.343	.415	.494	.579	.672										
1-1/4 X 3/16	U	1645	1053	731	537	411	325	263	217	183	156	134			9.0	10.0	11.2	12.2	14.9	15.9	23.8	25.7
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617	.724	.840										
	C	1645	1316	1096	940	822	731	658	598	548	506	470										
	D	.055	.086	.123	.168	.219	.278	.343	.415	.494	.579	.672										
1-1/2 X 1/8	U	1579	1011	702	516	395	312	253	209	175	149	129	99	78	7.4	8.4	9.2	10.2	12.1	13.1	18.8	20.0
	D	.057	.089	.129	.175	.229	.289	.357	.432	.514	.604	.700	.914	1.157								
	C	1579	1263	1053	902	789	702	632	574	526	486	451	395	351								
	D	.046	.071	.103	.140	.183	.231	.286	.346	.411	.483	.560	.731	.926								
1-1/2 X 3/16	U	2368	1516	1053	773	592	468	379	313	263	224	193	148	117	11.1	12.5	13.7	15.1	18.1	19.6	28.1	30.1
	D	.057	.089	.129	.175	.229	.289	.357	.432	.514	.604	.700	.914	1.157								
	C	2368	1895	1579	1353	1184	1053	947	861	789	729	677	592	526								
	D	.046	.071	.103	.140	.183	.231	.286	.346	.411	.483	.560	.731	.926								
1-3/4 X 3/16	U	3224	2063	1433	1053	806	637	516	426	358	305	263	201	159	12.7	14.1	15.7	17.1	20.9	22.3	32.5	34.4
	D	.049	.077	.110	.150	.196	.248	.306	.370	.441	.517	.600	.784	.992								
	C	3224	2579	2149	1842	1612	1433	1289	1172	1075	992	921	806	716								
	D	.039	.061	.088	.120	.157	.198	.245	.296	.353	.414	.480	.627	.793								
2 X 3/16	U	4211	2695	1871	1375	1053	832	674	557	466	399	344	263	208	14.3	15.7	17.8	19.2	23.7	25.1	36.9	38.8
	D	.043	.067	.096	.131	.171	.217	.268	.324	.386	.453	.525	.686	.868								
	C	4211	3368	2807	2406	2105	1871	1684	1531	1404	1296	1203	1053	936								
	D	.034	.054	.077	.105	.137	.174	.214	.259	.309	.362	.420	.549	.694								
2-1/4 X 3/16	U	5329	3411	2368	1740	1332	1053	853	705	592	505	435	333	263	15.9	17.4	19.8	21.2	26.5	27.9	41.3	43.2
	D	.038	.060	.086	.117	.152	.193	.238	.288	.343	.402	.467	.610	.771								
	C	5329	4263	3553	3045	2664	2368	2132	1938	1776	1640	1523	1332	1184								
	D	.030	.048	.069	.093	.122	.154	.190	.230	.274	.322	.373	.488	.617								
2-1/2 X 3/16	U	6579	4211	2924	2148	1645	1300	1053	870	731	623	537	411	325	17.5	19.0	21.8	23.3	29.2	30.7	45.6	47.5
	D	.034	.054	.077	.105	.137	.174	.214	.259	.309	.362	.420	.549	.694								
	C	6579	5263	4386	3759	3289	2924	2632	2392	2193	2024	1880	1645	1462								
	D	.027	.043	.062	.084	.110	.139	.171	.207	.247	.290	.336	.439	.555								

NOTE: WHEN GRATINGS WITH SERRATED BEARING BARS ARE SELECTED, THE DEPTH OF GRATING REQUIRED TO SERVICE A SPECIFIED LOAD WILL BE 1/4" GREATER THAN THAT SHOWN IN THE TABLES ABOVE.

CONVERSION TABLE

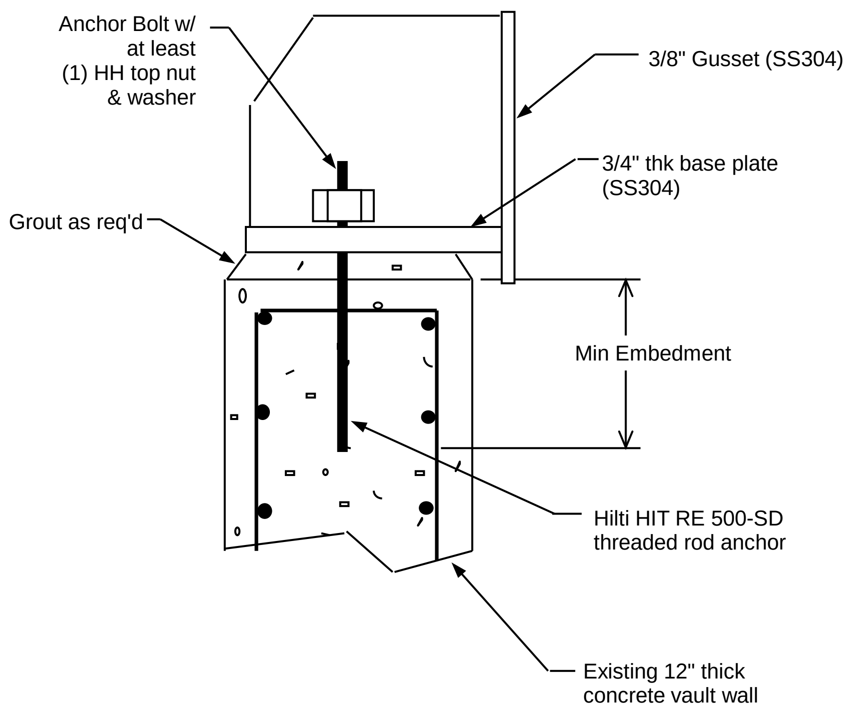
The loads shown above are for type 19-4 and 19-2 gratings. To determine the load carrying capacity for alternative bar spacings, multiply the loads given by the following conversion factors (DEFLECTION REMAINS CONSTANT): **FOR TYPES 15-4 AND 15-2: 1.26** **FOR TYPES 11-4 AND 11-2: 1.72** **FOR TYPES 7-4 AND 7-2: 2.71**

SELECTION GUIDE: 19-4 PLAIN SURFACE GRATING

For deflection of not more than 1/4" when subjected to the severest of the following: (1) the uniform loads below; (2) under concentrated mid-span loads of 300 lbs. up to 6'-0" span; or (3) 400 lbs. for spans 6'-0" and over.

SAFE UNIFORM LOAD LBS./SQ. FT.	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"
50	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16
75	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16
100	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2-1/4 x 3/16	2-1/2 x 3/16
125	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16	–
150	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2 x 3/16	2-1/2 x 3/16	–
200	1 x 1/8	1 x 1/8	1 x 1/8	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16	–	–
300	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2 x 3/16	2-1/4 x 3/16	2-1/2 x 3/16	–	–

Anchorage Summary - Hilti Epoxy Anchors



Anchor Bolt Summary

	Use (12) - 0.75 inch diameter threaded rod Anchor Bolts Around Base Plate		
	Material = ASTM F593 CW2 (316) (threaded rod)		
(Recommended min)	Projection above concrete =	3	in + grout thickness (if this vessel is grouted)
	Min Embedment =	6.0	in
	Min Edge Distance =	6.0	in (all sides of all anchor bolts)
	Min Concrete f'_c =	3000	psi

Tank Anchorage (Hilti Epoxy Anchors)

Check Anchor Bolts per IBC 2012 "Strength Design", ACI 318-11, Appendix D & Hilti ESR-2322.

Trial Input Data

Bolt diameter (d_o) =	0.750	in dia.	
Bolt material =	ASTM F593 CW2 (316)		(threaded rod)
Yield strength of bolt material =	45	ksi	
Bolt embedment depth (h_{ef}) =	6	in	
Minimum bolt edge distance (c_1) =	6	in	
Cross-sectional area of bolt (A_d) =	0.44	in^2	
Tensile stress area of bolt (A_{se}) =	0.334	in^2	
Minimum root area of bolt (A_r) =	0.302	in^2	
Minimum Concrete f_c' =	3000	psi	
Seismic overturning moment (M_s) =	16.91	ft-k	
Seismic Base Shear (V_s) =	9.66	k	
Empty wt. of tank =	7.5	k	
Full wt. product & tank (W_T) =	32.8	k	

Seis. pullout for IBC strength level equations = $1.0E_{tension}$ - 0.6D =	0.01	k/bolt
Where: $E_{tension}$ =	0.50	k/bolt
D =	0.81	k/bolt
Seismic shear used in IBC strength level equations = $1.0E_{shear}$ =	1.21	k/bolt

(conservatively ignore resisting friction due to weight of tank & product)

Total strength level design pullout (N_u) =	0.01	k/bolt
Total strength level design shear (V_u) =	1.21	k/bolt

Per IBC 2012 Anchor Bolts are Acceptable If:

Anchor bolt tensile strength is greater than factored tension load: $\phi N_n > N_u$
and anchor bolt shear strength is greater than factored shear load: $\phi V_n > V_u$

And if interaction checks are satisfied (see loads below):

Case 1) Steel strength:	$N_u/\phi N_s + V_u/\phi V_s$ =	**0.118**	**< 1.2 -- OK**
Case 2) Concrete breakout:	$N_u/\phi N_{cb} + V_u/\phi V_{cb}$ =	**0.328**	**< 1.2 -- OK**

Therefore Anchors are OK per Interaction Checks

Tank Anchorage (Hilti Epoxy), cont.

Check anchor bolt tension:

Check following cases:
1) Steel strength of anchor in tension: $\phi N_s > N_u$
2) Concrete breakout strength of anchor in tension: $\phi N_{cb} > N_u$
3) Pullout strength of anchor in tension: $\phi N_{pn} > N_u$
4) Concrete side-face blowout strength of anchor in tension: $\phi N_{sb} > N_u$

Factored seismic uplift load per bolt (N_u) = **0.01** k (see above)

Case (1): Steel strength of anchor in tension: $\phi N_s > N_u$

$\phi N_s = \phi A_{se} f_{ut}$ = **18.56 k > 0.01 k -- OK**

Where: ϕ = 0.65

f_{ut} = 85.5 ksi

ESR-1682 Test Results (for reference only): **12.39 k > 0.01 k -- OK**

Case (2): Concrete breakout strength of anchor in tension: $\phi N_{cb} > N_u$

$\phi N_{cb} = (\phi)(A_{Nc}/A_{Nco})(\psi_{ed,N})(\psi_{c,N})(\psi_{cp,N})(N_b)$ = **8.65 k > 0.01 k -- OK**

Where: ϕ = 0.65

A_{Nc} = 225 in^2

$A_{Nco} = 9h_{ef}^2$ = 324 in^2

$\psi_{ed,N} = 0.7+(0.3c)/(1.5h_{ef})$ = 1.0

$\psi_{c,N}$ = 1.4

$\psi_{cp,N}$ = 1.0

$N_b = k(f'_c)^{1/2}(h_{ef})^{1.5}$ = 13.7 k

k = 17

Case (3): Pullout strength of anchor in tension (see Hilti ESR-2322,4.1.4):

$\phi N_a = (\phi)(A_{Na}/A_{Nao})(\varphi_{p,Na} N_{ao})$ = **12.45 k > 0.01 k -- OK**

Where: ϕ = 0.65

$\varphi_{p,Na}$ = 1.4

A_{Na} = 212 in^2

A_{Nao} = 212 in^2

$N_{ao} = \pi \tau_{kcr} d h_{ef}$ = 13.68 k

Case (4): Concrete side-face blowout strength of anchor in tension: $\phi N_{sb} > N_u$

$\phi N_{sb} = \phi 160c(A_{brg})^{0.5}(f'_c)^{0.5}$ = **N/A k**

Equation does not apply since bolts are post-installed & not headed.
Since edge distance is 6 in, side blowout is not an issue
(ref. edge distance requirements in Hilti data sheets).

<u>Therefore Anchors are OK for Tension Loads</u>

Tank Anchorage (Hilti Epoxy), cont.

Check anchor bolt shear:

Check following cases:
1) Steel strength of anchor in shear: $\phi V_s > V_u$
2) Concrete breakout strength of anchor in shear: $\phi V_{cb} > V_u$
3) Concrete pryout strength of anchor in shear: $\phi V_{cp} > V_u$

Factored seismic shear load per bolt (V_u) = **1.21** k (see above)

Case (1): Steel strength of anchor in shear: $\phi V_s > V_u$

Check #1:	$\phi V_s = \phi 0.6 A_{se} f_{ut}$ =	**10.28 k**	**>**	**1.21 k -- OK**
	Where: ϕ =	0.60		
	f_{ut} =	85.5 ksi		
Check #2:	ϕV_s =	**10.24 k**	**>**	**1.21 k -- OK**
	Where: V_s =	17.06 k (see Hilti ESR-2322, Table 7)		
ESR-1682 Test Results (for reference only):		**6.38 k**	**>**	**1.21 k -- OK**

Case (2): Concrete breakout strength of anchor in shear: $\phi V_{cb} > V_u$

$\phi V_{cb} = (\phi)(A_{Vc}/A_{Vco})(\varphi_{edV}\varphi_{cV}V_b)$ =	**3.70 k**	**>**	**1.21 k -- OK**
Where: ϕ =	0.60		
A_V =	135 in^2	(based on min dim's)	
A_{Vo} =	162 in^2		
φ_{edV} =	1.0		
φ_{ecV} =	1.0		
$V_b = 7(\ell/d_o)^{0.2}(d_o)^{1/2}(f'_c)^{1/2}(c_1)^{1.5}$ =	7.4 k		
ℓ =	6.0 in		

Case 3) Concrete pryout strength of anchor in shear: $\phi V_{cp} > V_u$

Check #1:	$\phi V_{cp} = (\phi k_{cp} N_{cb})$ =	**15.97 k**	**>**	**1.21 k -- OK**
	Where: ϕ =	0.60		
	k_{cp} =	2.0		
	$N_{cb} = \phi N_{cb}/\phi$ =	13.3		
Check #2:	$\phi V_{cp} = (\phi k_{cp} N_a)$ =	**22.99 k**	**>**	**1.21 k -- OK**
	$N_a = (A_{Na}/A_{Nao})(\varphi_{pNa} N_{ao})$ =	19.16 k		
	$N_{ao} = \tau_{kcr} \pi d h_{ef}$ =	13.68 k		
	τ_{kcr} =	0.97		
	φ_{pNa} =	1.00		
	A_{Na} =	212 in^2		
	A_{Nao} =	212 in^2		

Therefore Anchors are OK for Shear Loads

Rev	Date	Description	Prepared by: **_John F. Bradley, S.E._** Arizona Registered Structural Engineer Lic. #36412 Atascadero, California		JOB NO.	2408161
0	1/21/15	Orig			SHT 1 OF 13	
					DATE	1/21/2015
			FOR	Hopper H2 (50 cu ft Capacity)	DES. BY	JFB
			DESCRIPTION	Design of Vessel & Supports	REV	0

STRUCTURAL CALCULATIONS FOR

Hopper H2 (50 cu ft Capacity)

Design of Vessel & Supports

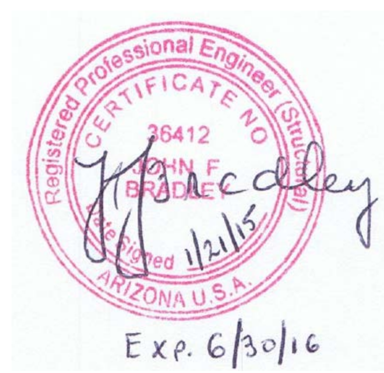
Double Wall Stainless Steel

6 ft x 5 ft x 4 ft Tall Supported on (4) Legs

REVISION 0

Dated January 21, 2015

(Original Calc Package)



LOCATED AT

Parker, Arizona

Calculations Prepared For:
Evoqua Water Technologies
2523 Mutahar Street
Parker, AZ 85344
Ph (928) 669-5758, Fax (928) 669-5775

Table of Contents

Design Summary

Product Stored:	Spent Activated Carbon (Design for Both Liquid Slurry & Dry Granular Material)
Specific Gravity:	1.50
Max Temperature:	150^{o} F
Design Pressure:	Atmospheric
Design Codes:	1) API 650 11th Edition
	2) IBC 2012 for Seismic
Wind Design:	Vessel is indoors; wind is not considered
Seismic Design:	IBC 2012: S_S = 0.23g, S_1 = 0.15g, I_e = 1.5, Site Class D

Description

This vessel is a double-wall inverted pyramid hopper for use inside a water treatment plant near Parker, Arizona. Product is spent activated carbon granular material (both liquid slurry and dry granular material). Material used for the tank construction is SS304 stainless steel except for the inner shell in contact with product which is SS316. Inner shell is separated from outer shell by (8) evenly spaced bent plate channel spacers @ 1 1/2" tall. These spacers are attached to inside of outer shell. Inner shell is 3/8" thick SS316 plate, and outer shell is 1/4" SS304 plate.

Design Criteria

Specific gravity of product is provided by customer at 1.50 (conservative). Tank is designed for atmospheric pressure (no internal pressure or vacuum) and ambient temperature. Design codes used for this tank are API 650 and IBC 2012. There are no American codes that specifically address all components of hoppers, so other codes & design procedures will be used as appropriate. Allowable steel stresses are taken per API 650. Wind and seismic loads are calculated both per IBC 2012, and load combinations are taken per IBC 2012. Seismic design values above are from USGS website for Parker, AZ.

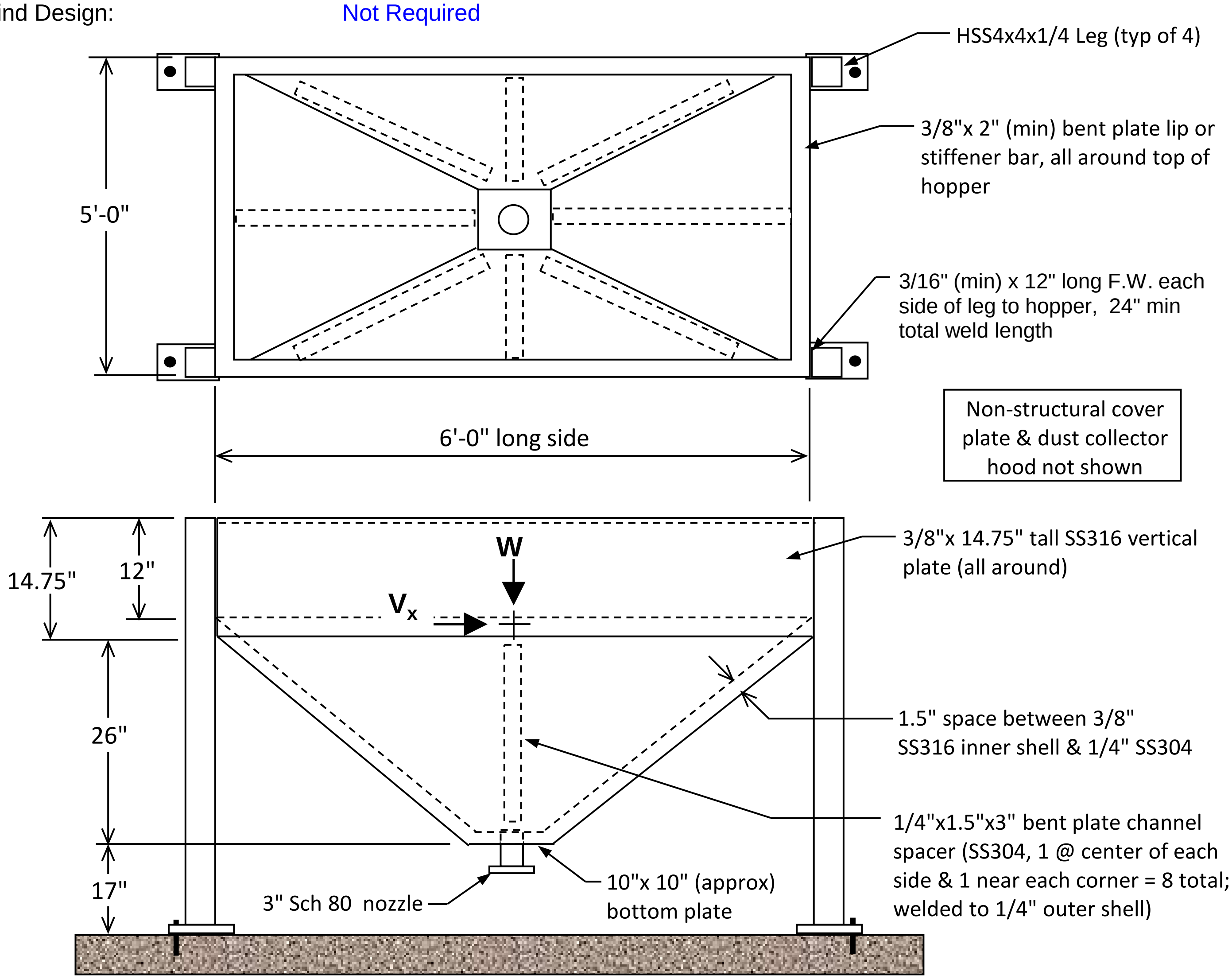
Design Methodology

The Inner tank shell is the normal pressure boundary; the outer tank is used for leak containment. Under normal loading, inner shell transfers loads to the outer shell at discreet locations of spacers. In event of leak in inner shell, space between the two shells may fill up, subjecting the outer shell to uniform product pressure. This full product pressure could only be developed for liquid slurry condition.

Vessel is replacing an similar existing hopper at same location. Vessel is supported by (4) HSS4x4x1/4 support legs. Existing anchor bolts are corroded and will be cut off and not reused. New epoxy anchors will be installed in existing concrete slab. Check of existing concrete slab is beyond the scope of these calcs, but it should be adequate as hopper is being replaced more or less in kind. For seismic calculations, tank is an elevated hopper on unbraced legs.

Design Criteria & Sketch

Product Stored:	Spent Activated Carbon (Design for Both Liquid Slurry & Dry Granular Material)
Specific Gravity:	1.50
Max Temperature:	150^o F
Min Design Metal Temp:	-20^o F
Design Pressure:	0 psig (atmospheric)
Corrosion Allowance:	0 in
Design Codes:	1) API 650 11th Ed.
	2) IBC 2012 for Wind & Seismic
Seismic Design:	S_S = 0.23g, S_1 = 0.15g, F_a = 1.60, F_v = 2.40, I_e = 1.5, Site Class D
	Seismic Design Category B
Wind Design:	Not Required



Weights: Empty Vessel = W_{empty} =	3.1	k
Product in tank (full to top of vertical side plate) =	4.7	k
Tank + operating product = W_{full} =	7.8	k

CBC 2013 Seismic Design Loads

CBC 2013 Seismic Design Loads:

Determine Natural Period of Tank + Supports:

Stiffness:	$k = (3EI/L^3)(4 \text{ Legs}) =$	36.0	k/in
	Where: I_{diag} for each Leg =	8.22	in^4
	Natural frequency = $\omega = (k/m)^{0.5} =$	37.90	rad/sec
	$m = W_{full}/386.4 =$	0.025	$k{\cdot}s^2/in$
	Natural period = $T = 2\pi/\omega =$	0.166	sec

Governing Seismic Design Acceleration:

Horizontal:	$A_i = (0.4a_pS_{DS}I_p)[1+2(z/h)]/R_p =$	0.059	g		(Eq 13.3-1)
	or: $A_i = C_s = S_{DS}/(R/I) =$	0.184	g	GOVERNS	(Eq 12.8-2)
	Where: $S_{DS} = (2/3)F_aS_s =$	0.245	g		
	$F_a =$	1.600			
	$S_s =$	0.230			
	$a_p =$	1.0			
	$R_p =$	2.5	(per ASCE 7-10, Table 13.6-1)		
	$I = I_p =$	1.50			
	$R =$	2	(per ASCE 7-10, Table 15.4-2)		
Vertical:	$A_v = 0.2S_{DS}I =$	0.074	g		

Base Shear: (ref ASCE 7-10 Eq. 12.8-1)

Vessel full:	$V_{s\text{-}full} = A_iW_{full} =$	**1.78**	**k**	GOVERNS
	Where: Design acceleration = $A_i = C_s =$	0.184	g	
	$W_{full} =$	9.7	k	
Vessel empty:	$V_{s\text{-}empty} = A_iW_{empty} =$	**0.57**	**k**	
	$W_{empty} =$	3.1	k	

Overturning Moments (at base plate level):

Vessel full:	$M_{s\text{-}full} = (V_{s\text{-}full})(CG_{full}) =$	**6.68**	**ft-k**	GOVERNS
	Where: $CG_{full} =$	3.75	ft (measured from bottom of base plates)	
Vessel empty:	$M_{s\text{-}empty} = (V_{s\text{-}empty})(CG_{empty}) =$	**2.14**	**ft-k**	
	Where: $CG_{empty} =$	3.75	ft	

Resisting Moments (at base plate level):

Vessel full:	$M_{resist} = (0.9-0.2S_{DS})(W_{full})(D/2) =$	**8.28**	**ft-k**
Vessel empty:	$M_{resist} = (0.9-0.2S_{DS})(W_{empty})(D/2) =$	**3.30**	**ft-k**

(Since OTM < resisting moment, tank is stable)

<u>Notes:</u>

1) For base plate design, above loads will be multiplied by $\Omega_o = 2$ per ASCE 7-10, Sect. 15.7.3.a. (this is not required for tank shell checks, support leg design, or anchor bolt calculations).
2) Allowable stress design is used for portions of following calcs. When ASD is used, seismic E-loads will be multiplied by 0.7 per ASCE 7-10, Sect. 2.4.1 (no allowable stress increases will be used).

Design Hopper Components

Spacing of C3x1.5x1/4 Spacers Between Inner & Outer Walls

- Spacers are welded to 1/4" outer shell with min weld shown below
- Support spacing for 1/4" outer wall governs over 3/8" thick inner hopper wall

Check plate midway down hopper wall:

Max allowable stiffener spacing:

$L_s = (54000t^2/p)^{1/2} =$ 51.7 in

Where: t = 0.25 in

p = 1.26 psi

Max actual stiffener spacing = 36 in **< Allowable, OK**

Check C3x1.5x1/4 Stiffeners/Spacers Between Inner & Outer Walls

Long side of hopper

Check stiffener midway down hopper wall:

$f_b = M/S =$ 8952 psi

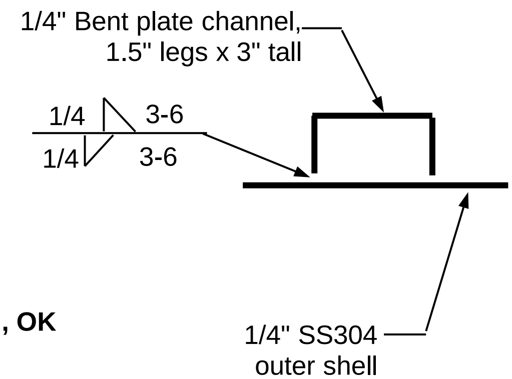
Where: $M = wL^2/8 =$ 11012 in-lbs

w = 45.5 pli

L = 44.0 in

S = 1.23 in^3

$F_b = (0.7)(22{,}500\ psi) =$ 15750 psi **> Actual, OK**



Channel Spacer Details

Top Stiffener / Bent Plate Lip @ Top of Vertical Plates

$f_b = M/S =$ 5158 psi

Where: $M = wL^2/8 =$ 2527 in-lbs

w = 3.90 pli (outward thrust)

L = 72.0 in

Try 3/8"x 2" lip @ top of 14.75" vert plate, S = 0.49 in^3

$F_b = (0.7)(22{,}500\ psi) =$ 15750 psi **> Actual, OK**

Therefore 2" bent plate lip at top of vertical side plates is OK

Compression Region @ Joint of Hopper & Top Vert Plate

Long side of hopper: $f_b = M/S =$ 6329 psi

Where: $M = wL^2/8 =$ 18164 in-lbs

w = 28.0 pli inward thrust

L = 72.0 in

Stiffened region @ hopper - vert plate connection, S = 2.87 in^3

$F_b = (0.7)(22{,}500\ psi) =$ 15750 psi **> Actual, OK**

Therefore compression region is OK without additional stiffeners

Compression Region @ Joint of Hopper & Bottom Horz Plate

$f_b = M/S =$ 9 psi

Where: $M = wL^2/8 =$ 26 in-lbs

w = 2.1 pli inward thrust

L = 10.0 in

Stiffened region @ hopper - vert plate connection, S = 2.87 in^3

$F_b = (0.7)(22{,}500\ psi) =$ 15750 psi **> Actual, OK**

Therefore compression region is OK without additional stiffeners

Support Legs

Support Legs

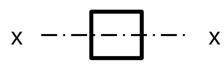
Legs are HSS4x4x1/4, SS304

Section Properties:

$A =$ 3.59 in^2
$S_{weak} =$ 4.11 in^3
$S_{strong} =$ 4.11 in^3
$S_{diag} =$ 3.79 in^3
$r_{weak} =$ 1.51 in

Length (L) = 50 inches to center of attachment to hopper shell

Case 1: Axial & lateral wind/seismic about weak axis:



$f_a = P_1/A =$	0.61	ksi
$F_a =$	14.03	ksi
$f_b = M_1/S_{weak} =$	1.83	ksi
$F_b = 0.6F_y =$	18	ksi

Where: P1 = (1.945 k)+0.7(0.35 k) =	2.2	k
$KL/r_{weak} =$	66	
$K =$	2.0	
M1 = (0.7)(10.74 in-k) =	7.5	in-k

Unity Check: $f_a / F_a + f_b / F_b =$ **0.15** **< 1.0** ✓ **OK**

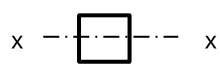
Weld to tank shell:

$a =$	12.0	in
$b =$	4	in
$A_w =$	24.0	in
$S_w =$	48.0	in^2
$V_1 =$	0.21	k

Unit stress in weld:
$= (P_1^2 + V_1^2)^{0.5}/A_w + M_1/S_w$
= 0.25 k/in
Allowable stress in weld:
= (0.3)(70 ksi)(0.707)/1.5 = 9.9 ksi

Fillet weld size required = 0.025 in
Therefore use min 3/16 in fillet weld

Case 2: Axial & lateral wind/seismic about strong axis:
(for square tube, weak & strong axes are same)



$f_a = P_2/A =$	0.61	ksi
$F_a =$	14.03	ksi
$f_b = M_2/S_{strong} =$	1.83	ksi
$F_b = 0.6F_y =$	18	ksi

Where: P2 =	2.2	k
$KL/r_{weak} =$	66	
$K =$	2.0	
M2 = T2 = (0.7)(10.74 in-k) =	7.5	in-k

Unity Check: $f_a / F_a + f_b / F_b =$ **0.15** **< 1.0** ✓ **OK**

Weld to tank shell:

$a =$	12.0	in
$b =$	4	in
$A_w =$	24.0	in
$J_w =$	384	in^2
$V_2 =$	0.21	k

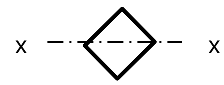
Unit stress in weld:
$= (P_2^2 + V_2^2)^{0.5}/A_w + T_2c/J_w$
= 0.22 k/in
Allowable stress in weld:
= (0.3)(70 ksi)(0.707)/1.5 = 9.9 ksi

Fillet weld size required = 0.022 in
Therefore use min 3/16 in fillet weld

Support Legs (cont.) & Base Plates

Support Legs, cont.

Case 3: Axial & lateral wind/seismic about "neutral" axis:



$f_a = P_3/A =$ 0.62 ksi

$F_a =$ 14.03 ksi

$f_b = M_3/S_{diag} =$ 1.98 ksi

$F_b = 0.6F_y =$ 18 ksi

Where: P3 = (1.945 k)+0.7(0.41 k) = 2.2 k

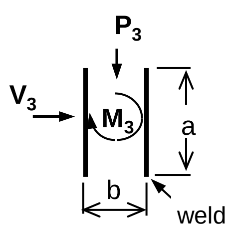
$KL/r_{weak} =$ 66

K = 2.0

M3 = (0.7)(10.74 in-k) = 7.5 in-k

Unity Check: $f_a / F_a + f_b / F_b =$ **0.15** **< 1.0** ✓ **OK**

Weld to tank shell:



a = 12.0 in

b = 4.0 in

$A_w =$ 24.0 in

$S_w =$ 48.0 in^2

$V_3 =$ 0.21 k

Unit stress in weld:

$= (P_3^2 + V_3^2)^{0.5}/A_w + M_3/S_w$

= 0.25 k/in

Allowable stress in weld:

= (0.3)(70 ksi)(0.707)/1.5 = 9.9 ksi

Fillet weld size required = 0.025 in

Therefore use min 3/16 in fillet weld

Therefore use min 12 in long leg attachment to hopper w/ min 0.1875 in fillet weld down both sides of legs

Base Plate:

Consider bending in plate due to uplift times 1.75" moment arm

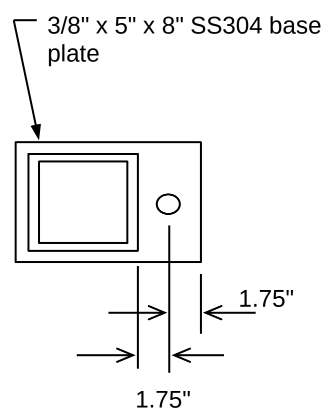
Base plate design uplift = 0.45 k - (0.6)(2.12 k) = 0 k

Uplift per anchor bolt = (0 k) / (1 anchor bolt per leg) = 0 k
(conservatively use 200# design uplift)

Design moment on base plate = (0.2 k)(1.75 in) = 0.35 in-k

Allowable bending stress in base plate (F_b) = $0.6F_y$ = 18000 psi

Therefore min req'd Base Plate Thickness = $t_p = 2 \times \{6M/[(F_b)(5")]\}^{0.5} =$ 0.306 in



Therefore use 0.375 inch thick x 8 inch wide x 5 inch long SS304 base plates

Hopper Grating

Per chart below, 1 1/4 x 3/16 W-19-4 stainless steel grating is OK for up to 263 psf > 100 psf. √ OK

Stainless Steel Grating Load Table

19-4 / 19-2 LOAD TABLE

BEARING BAR SIZE		UNSUPPORTED SPAN													WEIGHT PER SQ. FT. (LBS.)							
		2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"	19-4	19-2	15-4	15-2	11-4	11-2	7-4	7-2
3/4 X 1/8	U	395	253	175	129	99	78								4.0	4.8	4.9	5.7	6.4	7.2	9.7	10.7
	D	.114	.179	.257	.350	.457	.579															
	C	395	316	263	226	197	175															
	D	.091	.143	.206	.280	.366	.463															
3/4 X 3/16	U	592	379	263	193	148	117								5.6	6.4	6.9	7.7	9.2	10.0	14.5	16.0
	D	.114	.179	.257	.350	.457	.579															
	C	592	474	395	338	296	263															
	D	.091	.143	.206	.280	.366	.463															
1 X 1/8	U	702	449	312	229	175	139	112	93	78					5.1	5.9	6.2	7.1	8.2	9.0	12.9	14.2
	D	.086	.134	.193	.263	.343	.434	.536	.648	.771												
	C	702	561	468	401	351	312	281	255	234												
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617												
1 X 3/16	U	1053	674	468	344	263	208	168	139	117					7.4	8.4	9.2	10.2	12.1	13.1	19.4	21.3
	D	.086	.134	.193	.263	.343	.434	.536	.648	.771												
	C	1053	842	702	602	526	468	421	383	351												
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617												
1-1/4 X 1/8	U	1096	702	487	358	274	217	175	145	122	104	90			6.4	7.4	7.8	8.8	10.3	11.3	15.8	17.1
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617	.724	.840										
	C	1096	877	731	627	548	487	439	399	365	337	313										
	D	.055	.086	.123	.168	.219	.278	.343	.415	.494	.579	.672										
1-1/4 X 3/16	U	1645	1053	731	537	411	325	263	217	183	156	134			9.0	10.0	11.2	12.2	14.9	15.9	23.8	25.7
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617	.724	.840										
	C	1645	1316	1096	940	822	731	658	598	548	506	470										
	D	.055	.086	.123	.168	.219	.278	.343	.415	.494	.579	.672										
1-1/2 X 1/8	U	1579	1011	702	516	395	312	253	209	175	149	129	99	78	7.4	8.4	9.2	10.2	12.1	13.1	18.8	20.0
	D	.057	.089	.129	.175	.229	.289	.357	.432	.514	.604	.700	.914	1.157								
	C	1579	1263	1053	902	789	702	632	574	526	486	451	395	351								
	D	.046	.071	.103	.140	.183	.231	.286	.346	.411	.483	.560	.731	.926								
1-1/2 X 3/16	U	2368	1516	1053	773	592	468	379	313	263	224	193	148	117	11.1	12.5	13.7	15.1	18.1	19.6	28.1	30.1
	D	.057	.089	.129	.175	.229	.289	.357	.432	.514	.604	.700	.914	1.157								
	C	2368	1895	1579	1353	1184	1053	947	861	789	729	677	592	526								
	D	.046	.071	.103	.140	.183	.231	.286	.346	.411	.483	.560	.731	.926								
1-3/4 X 3/16	U	3224	2063	1433	1053	806	637	516	426	358	305	263	201	159	12.7	14.1	15.7	17.1	20.9	22.3	32.5	34.4
	D	.049	.077	.110	.150	.196	.248	.306	.370	.441	.517	.600	.784	.992								
	C	3224	2579	2149	1842	1612	1433	1289	1172	1075	992	921	806	716								
	D	.039	.061	.088	.120	.157	.198	.245	.296	.353	.414	.480	.627	.793								
2 X 3/16	U	4211	2695	1871	1375	1053	832	674	557	468	399	344	263	208	14.3	15.7	17.8	19.2	23.7	25.1	36.9	38.8
	D	.043	.067	.096	.131	.171	.217	.268	.324	.386	.453	.525	.686	.868								
	C	4211	3368	2807	2406	2105	1871	1684	1531	1404	1296	1203	1053	936								
	D	.034	.054	.077	.105	.137	.174	.214	.259	.309	.362	.420	.549	.694								
2-1/4 X 3/16	U	5329	3411	2368	1740	1332	1053	853	705	592	505	435	333	263	15.9	17.4	19.8	21.2	26.5	27.9	41.3	43.2
	D	.038	.060	.086	.117	.152	.193	.238	.288	.343	.402	.467	.610	.771								
	C	5329	4263	3553	3045	2664	2368	2132	1938	1776	1640	1523	1332	1184								
	D	.030	.048	.069	.093	.122	.154	.190	.230	.274	.322	.373	.488	.617								
2-1/2 X 3/16	U	6579	4211	2924	2148	1645	1300	1053	870	731	623	537	411	325	17.5	19.0	21.8	23.3	29.2	30.7	45.6	47.5
	D	.034	.054	.077	.105	.137	.174	.214	.259	.309	.362	.420	.549	.694								
	C	6579	5263	4386	3759	3289	2924	2632	2392	2193	2024	1880	1645	1462								
	D	.027	.043	.062	.084	.110	.139	.171	.207	.247	.290	.336	.439	.555								

LOADS AND DEFLECTIONS ARE THEORETICAL VALUES BASED ON 20,000 PSI UNIT STRESS. FOR PEDESTRIAN COMFORT DEFLECTIONS IN EXCESS OF 1/4" ARE NOT RECOMMENDED.

U = SAFE UNIFORM LOAD, LBS. PER SQ. FT.
C = SAFE CONCENTRATED MID-SPAN LOAD, LBS. PER FT. OF GRATING WIDTH
D = DEFLECTION IN INCHES

NOTE: WHEN GRATINGS WITH SERRATED BEARING BARS ARE SELECTED, THE DEPTH OF GRATING REQUIRED TO SERVICE A SPECIFIED LOAD WILL BE 1/4" GREATER THAN THAT SHOWN IN THE TABLES ABOVE.

CONVERSION TABLE

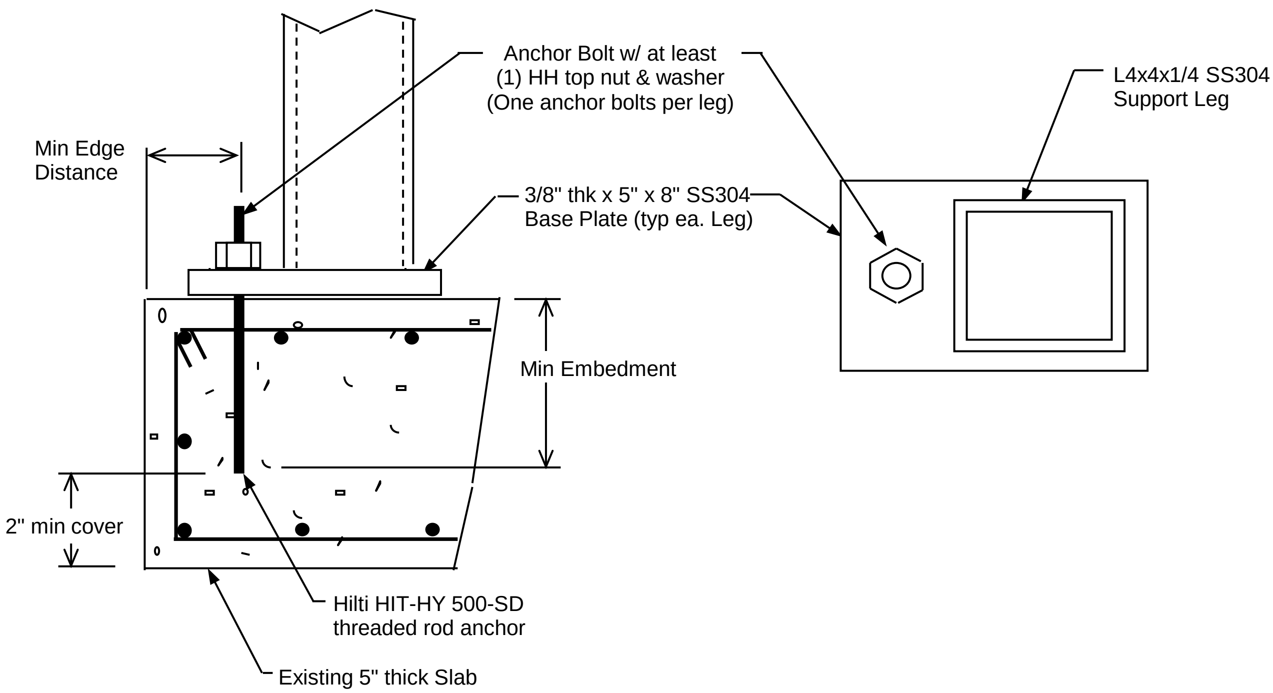
The loads shown above are for type 19-4 and 19-2 gratings. To determine the load carrying capacity for alternative bar spacings, multiply the loads given by the following conversion factors (DEFLECTION REMAINS CONSTANT): **FOR TYPES 15-4 AND 15-2: 1.26** **FOR TYPES 11-4 AND 11-2: 1.72** **FOR TYPES 7-4 AND 7-2: 2.71**

SELECTION GUIDE: 19-4 PLAIN SURFACE GRATING

For deflection of not more than 1/4" when subjected to the severest of the following: (1) the uniform loads below; (2) under concentrated mid-span loads of 300 lbs. up to 6'-0" span; or (3) 400 lbs. for spans 6'-0" and over.

SAFE UNIFORM LOAD LBS./SQ. FT.	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"
50	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16
75	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16
100	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2-1/4 x 3/16	2-1/2 x 3/16
125	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16	–
150	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2 x 3/16	2-1/2 x 3/16	–
200	1 x 1/8	1 x 1/8	1 x 1/8	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16	–	–
300	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2 x 3/16	2-1/4 x 3/16	2-1/2 x 3/16	–	–

Anchorage Summary - Hilti Epoxy Anchors



Anchor Bolt Summary

	Use (4) - 0.625 inch diameter threaded rod Anchor Bolts (One per Leg)		
	Material = ASTM F593 CW2 (316) (threaded rod)		
(Recommended min)	Projection above concrete =	2	in + grout thickness (if this vessel is grouted)
	Min Embedment =	3.0	in
	Min Edge Distance =	6.0	in (all sides of all anchor bolts)
	Existing Concrete f'_c =	3000	psi

Tank Anchorage (Hilti Epoxy Anchors)

Check Anchor Bolts per IBC 2012 "Strength Design", ACI 318-11, Appendix D & Hilti ESR-2322.

Trial Input Data

Bolt diameter (d_o) =	0.625	in dia.
Bolt material =	ASTM F593 CW2 (316)	(threaded rod)
Yield strength of bolt material =	45	ksi
Bolt embedment depth (h_{ef}) =	3	in
Minimum bolt edge distance (c_1) =	6	in
Cross-sectional area of bolt (A_d) =	0.31	in^2
Tensile stress area of bolt (A_{se}) =	0.226	in^2
Minimum root area of bolt (A_r) =	0.202	in^2
Minimum Concrete f_c' =	3000	psi
Seismic overturning moment (M_s) =	3.22	ft-k
Seismic Base Shear (V_s) =	0.86	k
Empty wt. of tank =	3.1	k
Full wt. product & tank (W_T) =	7.8	k

Seis. pullout for IBC strength level equations = 1.0$E_{tension}$ - 0.6D =	0.19	k/leg
Where: $E_{tension}$ =	0.32	k/leg
D =	0.21	k/leg
Seismic shear used in IBC strength level equations = 1.0E_{shear} =	0.21	k/leg

(conservatively ignore resisting friction due to weight of tank & product)

Total strength level design pullout (N_u) =	0.19	k/bolt
Total strength level design shear (V_u) =	0.21	k/bolt

Per IBC 2012 Anchor Bolts are Acceptable If:

Anchor bolt tensile strength is greater than factored tension load: $\phi N_n > N_u$
and anchor bolt shear strength is greater than factored shear load: $\phi V_n > V_u$

And if interaction checks are satisfied (see loads below):

Case 1) Steel strength:	$N_u/\phi N_s + V_u/\phi V_s$ =	**0.046**	**< 1.2 -- OK**
Case 2) Concrete breakout:	$N_u/\phi N_{cb} + V_u/\phi V_{cb}$ =	**0.139**	**< 1.2 -- OK**

Therefore Anchors are OK per Interaction Checks

Tank Anchorage (Hilti Epoxy), cont.

Check anchor bolt tension:

Check following cases:
1) Steel strength of anchor in tension: $\phi N_s > N_u$
2) Concrete breakout strength of anchor in tension: $\phi N_{cb} > N_u$
3) Pullout strength of anchor in tension: $\phi N_{pn} > N_u$
4) Concrete side-face blowout strength of anchor in tension: $\phi N_{sb} > N_u$

Factored seismic uplift load per bolt (N_u) = **0.19** k (see above)

Case (1): Steel strength of anchor in tension: $\phi N_s > N_u$

$\phi N_s = \phi A_{se} f_{ut}$ =	**12.56 k**	**>**	**0.19 k -- OK**
Where: ϕ =	0.65		
f_{ut} =	85.5 ksi		
ESR-1682 Test Results (for reference only):	**10.12 k**	**>**	**0.19 k -- OK**

Case (2): Concrete breakout strength of anchor in tension: $\phi N_{cb} > N_u$

$\phi N_{cb} = (\phi)(A_{Nc}/A_{Nco})(\psi_{ed,N})(\psi_{c,N})(\psi_{cp,N})(N_b)$ =	**4.40 k**	**>**	**0.19 k -- OK**
Where: ϕ =	0.65		
A_{Nc} =	81 in^2		
$A_{Nco} = 9h_{ef}^2$ =	81 in^2		
$\psi_{ed,N} = 0.7+(0.3c)/(1.5h_{ef})$ =	1.0		
$\psi_{c,N}$ =	1.4		
$\psi_{cp,N}$ =	1.0		
$N_b = k(f'_c)^{1/2}(h_{ef})^{1.5}$ =	4.8 k		
k =	17		

Case (3): Pullout strength of anchor in tension (see Hilti ESR-2322,4.1.4):

$\phi N_a = (\phi)(A_{Na}/A_{Nao})(\varphi_{p,Na} N_{ao})$ =	**2.85 k**	**>**	**0.19 k -- OK**
Where: ϕ =	0.65		
$\varphi_{p,Na}$ =	1.4		
A_{Na} =	81 in^2		
A_{Nao} =	125 in^2		
$N_{ao} = \pi \tau_{kcr} d h_{ef}$ =	4.84 k		

Case (4): Concrete side-face blowout strength of anchor in tension: $\phi N_{sb} > N_u$

$\phi N_{sb} = \phi 160c(A_{brg})^{0.5}(f'_c)^{0.5}$ = **N/A k**

Equation does not apply since bolts are post-installed & not headed.
Since edge distance is 6 in, side blowout is not an issue
(ref. edge distance requirements in Hilti data sheets).

<u>Therefore Anchors are OK for Tension Loads</u>

Tank Anchorage (Hilti Epoxy), cont.

Check anchor bolt shear:

Check following cases:
1) Steel strength of anchor in shear: $\phi V_s > V_u$
2) Concrete breakout strength of anchor in shear: $\phi V_{cb} > V_u$
3) Concrete pryout strength of anchor in shear: $\phi V_{cp} > V_u$

Factored seismic shear load per bolt (V_u) = **0.21** k (see above)

Case (1): Steel strength of anchor in shear: $\phi V_s > V_u$

Check #1:	$\phi V_s = \phi 0.6 A_{se} f_{ut}$ =	**6.96 k**	**> 0.21 k -- OK**
	Where: ϕ =	0.60	
	f_{ut} =	85.5 ksi	
Check #2:	ϕV_s =	**8.14 k**	**> 0.21 k -- OK**
	Where: V_s =	13.56 k (see Hilti ESR-2322, Table 7)	
ESR-1682 Test Results (for reference only):		**5.21 k**	**> 0.21 k -- OK**

Case (2): Concrete breakout strength of anchor in shear: $\phi V_{cb} > V_u$

$\phi V_{cb} = (\phi)(A_{Vc}/A_{Vco})(\varphi_{edV}\varphi_{cV}V_b)$ =	**2.25 k**	**> 0.21 k -- OK**
Where: ϕ =	0.60	
A_V =	90 in^2	(based on min dim's)
A_{Vo} =	162 in^2	
φ_{edV} =	1.0	
φ_{ecV} =	1.0	
$V_b = 7(\ell/d_o)^{0.2}(d_o)^{1/2}(f'_c)^{1/2}(c_1)^{1.5}$ =	6.8 k	
ℓ =	5.0 in	

Case 3) Concrete pryout strength of anchor in shear: $\phi V_{cp} > V_u$

Check #1:	$\phi V_{cp} = (\phi k_{cp} N_{cb})$ =	**8.13 k**	**> 0.21 k -- OK**
	Where: ϕ =	0.60	
	k_{cp} =	2.0	
	$N_{cb} = \phi N_{cb}/\phi$ =	6.8	
Check #2:	$\phi V_{cp} = (\phi k_{cp} N_a)$ =	**8.13 k**	**> 0.21 k -- OK**
	$N_a = (A_{Na}/A_{Nao})(\varphi_{pNa} N_{ao})$ =	6.77 k	
	$N_{ao} = \tau_{kcr}\pi d h_{ef}$ =	4.84 k	
	τ_{kcr} =	0.82	
	φ_{pNa} =	1.00	
	A_{Na} =	81 in^2	
	A_{Nao} =	81 in^2	

Therefore Anchors are OK for Shear Loads

Exhibit C – Hazardous Waste Characteristics

ATTACHMENT 1

WASTE CODES

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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 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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
K005	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF CHROME GREEN PIGMENTS
K006	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF CHROME OXIDE GREEN PIGMENTS (ANHYDROUS AND HYDRATED)
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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 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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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 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)

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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-
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)
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)-

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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-

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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)
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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-

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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 D - EPA Letter

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

MAR 2 0 2015

CERTIFIED MAIL: 7003 3110 0006 1998 6972
RETURN RECEIPT REQUESTED

In Reply: LND-4-2
Refer To: Evoqua Water Technologies
EPA ID # AZD 982 441 263

Mr. Monte McCue
Evoqua Water Technologies
2523 Mutahar St.
Parker, Arizona 85344

Re: Draft Hopper Designs dated February 20, 2015 (EPA ID # AZD 982 441 263)

Dear Mr. McCue:

The United States Environmental Protection Agency Region 9 (EPA) has completed its review of the Evoqua Water Technologies (Evoqua) Facility's hopper designs for hoppers (H-1) and (H-2). As submitted, the designs do not satisfy the requirement to have a means to detect leakage from the inner wall. Based on Evoqua's email dated March 3, 2015, Evoqua will install a ¾ inch valve on each of the hoppers once the hoppers are installed. The valve will enable Evoqua to detect leakage from the inner wall. With that addition, EPA will accept the hopper designs and find them sufficient to satisfy the requirements of 40 CFR 264.193 for double wall containment.

Per your request, we are also clarifying that hoppers H-1 and H-2 are ancillary equipment to tanks T-1, T-2, T-5, and T-6 under 40 CFR Part 264, Subpart J and are individual drain systems under 40 CFR Part 61, Subpart FF.

If you have questions or would like to discuss any issues, please contact me at 415-972-3972 or Mike Zabaneh at 415-972-3348.

Sincerely,

Barbara Gross, Manager
Permit Section
Land Division

cc: Mr. Wilfred Nabahe, Director, CRIT Environmental Protection Office

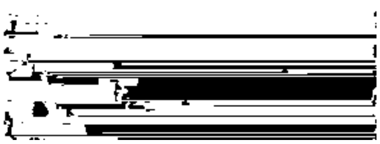
Exhibit E - Evoqua Leak Testing Letter

Date: April 18, 2018

From: Monte McCue
To: H-1 and H-2 Hopper File
Subject: Leak Test

Both hoppers, after installation were filled completely with city water to test for leaks. They were filled at approximately 2:00 pm on April 17, 2018 and let stand for 24 hours.

The were no leaks from either H-1 or H-2 during the 24-hour period. Water from both hoppers was pumped out at approximately 3:00pm on April 18, 2018



Plant Manager
Evoqua Water Technologies

PO Box 3308
Parker, AZ 85344 USA

Tel: +1 (928) 669-5758
Fax: +1 (928) 669-5775

APPLICATION PAGES
CLEAN

APPENDIX IX

PERMIT ATTACHMENT

APPENDIX IX

TANK ASSESSMENT REPORT

This appendix contains the text portion of the Tank Assessment Report. For the remainder of the Report, refer to the April 2016 Permit Application.

February 2019

APPENDIX IX

HAZARDOUS WASTE TANK SYSTEM ASSESSMENT, DESIGN DRAWINGS, CONTAINMENT CALCULATIONS, AND ASSESSMENT OF HOPPERS H-1 AND H-2

FOR

EVOQUA WATER TECHNOLOGIES

PARKER REACTIVATION FACILITY

PARKER, ARIZONA

Revision 2
February 2019

TABLE OF CONTENTS

APPENDIX IX

TAB 1

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

For the complete TAB 1 section of the Tank Assessment Report
refer to the April 2016 Permit Application

Revision 2
February 2019

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

Tank System Engineering Assessment

I have reviewed the information relating to the above ground tank systems identified in the document *Assessment of Tanks T-1, T-2, T-5 and T-6*, attached as Exhibit A, which are installed at the Siemens Industry, Inc. 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 provided in the attached document:

A. Results of visual inspection and ultrasonic thickness testing for the tank systems.

B. Hazardous characteristics of the wastes stored in the tank system.

C. Structural calculations and design standards for the tank systems .

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.

Christopher M. Doelling, P.E.

April 23, 2012

STATE OF NEW JERSEY CHRISTOPHER M. DOELLING No. GE 43230 LICENSED PROFESSIONAL ENGINEER

Attachment: Exhibit A - Assessment of Tank Systems T-1, T-2, T-5 and T-6

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

EXHIBIT A

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

40 CFR 264.192

Prepared for:

Siemens Industry, Inc.
25323 Mutahar Street
Parker, Arizona 85344

Prepared by:

Karl E. Monninger
Vice President
Chavond-Barry Engineering Corp.

April 2012

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

Table of Contents

Appendices

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

In order to comply with the requirements of EPA 40 CFR, Subpart J, § 264.192, the visual inspections and ultrasonic thickness measurements were performed on the exterior of subject tank systems February 21, 2011 through February 25, 2011. Ancillary equipment including pipelines, fittings, flanges, valves, pumps and supports were also examined and visually inspected during this period. The results of the ultrasonic thickness measurements taken are shown in Appendix A. The following comments are made in conjunction with the EPA requirements:

1. <u>Tank Systems Description</u>

A. The Siemens Industry, Inc. identification numbers for the tanks are T-1, T-2, T-5, and T-6. Each tank is 10'-0" in diameter with a 16'-0" straight side wall height, 8'-0" high nominal 62° bottom cone and umbrella roof (top head). Dimensioned drawings of the tanks are provided in Appendix A.

B. All tanks are located outdoors on the east side of the control room and warehouse building. Each tank is supported by a carbon steel skirt and anchored to a common, elevated support structure. A caged ladder is installed on each tank for access to the roof.

The tanks and support structure are located within a secondary containment area that has sumps routed to the recycle water storage tank T-9 (not part of this evaluation). A portion of the tank system piping is also within this secondary containment area. The recycle water pumps, tank T-9 and the remainder of the tank system piping are located outside of the secondary containment area.

C. The material of construction for the roof, cylindrical side wall and conical bottom of all tanks is 300 series stainless steel, specific grade unknown.

The material of construction for the stiffener rings and support skirt on all tanks is carbon steel. The exposed surfaces of the stiffener angle rings and both sides of the support skirt for each tank are painted.

The material of construction for pipelines and valves used for spent carbon slurry transport is stainless steel, grade 316L.

D. All four tanks were fabricated by Wyatt M&B Works, Inc. in 1956 and put into service at Parker, AZ facility during August of 1992.

E. All tanks operate at atmospheric pressure and at a maximum temperature of 150°F; therefore, the ASME code stamp is not required. A 4-inch diameter vent is provided on the roof of each tank and connected by CPVC piping to a common granular activated carbon (GAC) adsorption system (WS-1) for VOC control. A 3-inch diameter pressure relief safety valve with vacuum breaker is also installed on the roof of each tank. All of these safety valves are set at 8 ounces for pressure relief and at 6 ounces to break the vacuum.

F. Each spent carbon storage tank has a design capacity of 8,319 gallons (31.49 cubic meters). A high carbon level sensor is located 4'-6" below the top of the cylindrical wall for each tank. An automatic safety valve on each of the two spent carbon unloading hoppers cuts off feed to the eductor system when spent carbon reaches the level sensor to ensure each of the tanks cannot be filled above the high level sensor. A 4" diameter overflow nozzle is located 1'-2" below the top of the cylindrical wall for each tank and directs excess recycle water to tank T-9 by gravity piping.

G. The design standards and construction drawings for the tanks and ancillary equipment are not available.

2. <u>Characteristics of Stored Chemicals and Compatibility with Tank Materials</u>

A. The spent carbon storage tanks (T-1, T-2, T-5, and T-6) are used to store spent activated carbon and recycle water in slurry form. The material is transferred into and out of the tanks by using eductors and a recycle water pump with a discharge pressure of approximately 85 psig.

The recycle water is maintained at a neutral pH (between 6 and 8) to minimize the corrosion.

B. The spent activated carbon stored in these tanks is contaminated with various chemicals in low concentration, as listed in Appendix B. The waste contaminants on the spent carbon treated at this facility vary in the range from < 1 to 300,000 ppmwd on average.

C. The spent carbon storage tanks are constructed of 300 series stainless steel, specific grade unknown, resistant to all of the chemicals listed in Appendix B, and not susceptible to corrosion.

All four tanks were internally lined with Plasite 7122 HAR during the construction phase of this plant prior to startup during August of 1992. The Plasite lining is a cross-linked epoxy-phenolic cured with an alkaline curing agent. Although originally installed for its resistance to abrasion and a wide range of chemicals (acids, alkalis, and solvents), the Plasite lining is not required to protect the tank systems since 300 series stainless steel is compatible with all of the waste codes and hazardous constituents listed in Appendix B. Portions of the lining have likely been damaged during tank maintenance activities or worn away due to abrasion since the tanks were put into service; the existing condition and integrity of any remaining Plasite lining is unknown.

D. All pipelines, valves and fittings used for the transfer of the spent carbon and recycle water slurry are constructed of stainless steel, grade 316L, resistant to all of the chemicals listed in Appendix B, and not susceptible to corrosion.

3. <u>Results of Ultrasonic Testing and Visual Inspection</u>

A. To check the integrity of the tanks, ultrasonic testing (U/T) was performed on the exterior surfaces of the cylindrical wall, umbrella roof, cone bottom and support skirt for each tank to measure the shell thickness. Shell and cone bottom thickness readings were taken at a height of every two feet on each 90° quadrant. The results of the thickness readings obtained for tanks T-1, T-2, T-5, and T-6 are tabulated in Appendix A.

A Model NDT-715 ultrasonic thickness gauge (s/n 733351) and 5.0MHz dual element transducer (s/n AG766) were used for all thickness measurements; the manufacturer's calibration data for this test equipment are provided in Appendix A. Prior to each use (whenever the instrument was turned on) the sound-velocity for the material to be measured was set (0.233 in/µ-sec for carbon steel and 0.223 in/µ-sec for stainless steel) and a probe zero conducted. To ensure the accuracy of all measurements, no thickness reading was recorded unless at least 6 of 8 bars were displayed by the gauge's Stability Indicator. Paint was removed from the test areas on the support skirt of each tank prior to thickness measurements.

B. All four tanks were visually inspected from the exterior during plant operation and the following observations recorded:

1) Tank T-1

The tank's exterior surfaces and weld seams are in good condition with the exception of several small areas located adjacent to welds for carbon steel attachments where minor pitting and slight corrosion attack was evident. An area approximately 12" high x 8" wide is dented slightly inward at the 2-foot elevation on the west side of the cylindrical shell above a nozzle with a blanked off carbon steel elbow and valved city water piping connection. Two unused swirl jet nozzles located on the lower east side of the cylindrical shell are blanked off with carbon steel blind flanges. A carbon steel plate approximately 4" in diameter is welded to the cylindrical shell at the 8.5-foot elevation for closure of a nozzle that was previously removed. Four carbon steel support brackets, no longer in use have been cut off from the north side of the cylindrical shell but not completely removed by grinding. Unused nozzles and inspection/access ports on the top head of tank T-1 are sealed with stainless steel caps and carbon steel blind flanges.

As previously reported in the 1994 Tank Assessment, the two carbon steel stiffener angle rings (2-1/2" x 2-1/2" x 1/4") located at the bottom and 8-foot elevation on the cylindrical shell are corroded. In several areas, portions of the top horizontal flange on both stiffeners are disconnected from the remainder of the angle at the 90° bend. At other locations, the stiffeners are corroded at the bottom of the vertical flange of the angle. However, in all locations for both angle stiffeners at least 50% of the original material remains intact and the structural analyses performed (based upon a 2" x 1/4" flat bar) indicate they have sufficient strength. Exposed surfaces of the two stiffener angle rings and both sides of the support skirt are painted.

The minimum shell thickness for tank T-1 was determined to be 0.180 inches at the 0-foot elevation on the west side of the cylindrical shell.

2) Tank T-2

The tank's outside surfaces and weld seams are in good condition with the exception of slight corrosion attack in a few small areas located adjacent to carbon steel attachments on the shell. An area approximately 6" wide is dented slightly inward at the 10-foot elevation on the south side of the cylindrical shell. A carbon steel plate approximately 4" in diameter is welded to the cylindrical shell at the 8.5-foot elevation for closure of a nozzle that was previously removed. A carbon steel blind flange is used to blank off an unused nozzle located on the lower east side of the tank. Two swirl jet nozzles on the lower west side of the cylindrical shell are connected to the recycle water supply piping. Nozzles and inspection/access ports on the top head of tank T-2 are sealed with stainless and carbon steel blind flanges.

As previously reported in the 1994 Tank Assessment, the two carbon steel stiffener angle rings (2-1/2" x 2-1/2" x 1/4") located at the bottom and 8-foot elevation on the cylindrical shell are corroded. In several areas, portions of the top horizontal flange on both stiffeners are disconnected from the remainder of the angle at the 90° bend. At other locations, the stiffeners are corroded at the bottom of the vertical flange of the angle. However, in all locations for both angle stiffeners at least 50% of the original material remains intact and the structural analyses performed (based upon a 2" x 1/4" flat bar) indicate they have sufficient strength. Exposed surfaces of the two stiffener angle rings and both sides of the support skirt are painted.

The minimum shell thickness for tank T-2 was determined to be 0.183 inches at the 0.5-foot elevation on the north side of the cylindrical shell.

3) Tank T-5

The tank's exterior surfaces and weld seams are in good condition with the exception of several small areas located adjacent to welds for carbon steel attachments where minor pitting and slight corrosion attack was evident. A carbon steel plate approximately 4" in diameter is welded to the cylindrical shell at the 8.5-foot elevation for closure of a nozzle that was previously removed. A carbon steel blind flange is used to blank off an unused nozzle located on the lower west side of the cylindrical shell. Two swirl jet nozzles located on the lower south side of the cylindrical shell are connected to the recycle water supply piping. Nozzles and inspection/access ports on the top head of tank T-5 are sealed with stainless and carbon steel blind flanges.

As previously reported in the 1994 Tank Assessment, the two carbon steel stiffener angle rings (2-1/2" x 2-1/2" x 1/4") located at the bottom and 8-foot elevation on the cylindrical shell are corroded. In several areas, portions of the top horizontal flange on both stiffeners are disconnected from the remainder of the angle at the 90° bend. At other locations, the stiffeners are corroded at the bottom of the vertical flange of the angle. However, in all locations for both angle stiffeners at least 50% of the original material remains intact and the structural analyses performed (based upon a 2" x 1/4" flat bar) indicate they have sufficient strength. Exposed surfaces of the two stiffener angle rings and both sides of the support skirt are painted.

The minimum shell thickness for tank T-5 was determined to be 0.167 inches on the south side of the cone bottom at location 1, approximately 1-foot below the cone/cylinder intersection.

4) <u>Tank T-6</u>

The tank's outside surfaces and weld seams are in good condition with the exception of slight corrosion attack in a few small areas located adjacent to carbon steel attachments on the shell. A stainless steel plate approximately 4" in diameter is welded to the cylindrical shell at the 8.5-foot elevation for closure of a nozzle that was previously removed. A stainless steel blind flange is used to blank off an unused nozzle located on the lower east side of the cylindrical shell. Two swirl jet nozzles located on the lower south side of the cylindrical shell are connected to the recycle water supply piping. Two small rectangular stainless steel patches are welded to the cylindrical shell at 1.3 and 2.5-foot elevations on both the northeast and southwest sides of the tank. The patches range in size from 5" x 5" to 9" x 9" and were used to close holes previously created to aid in raising and supporting the tank during the repair of the bottom cone. Nozzles and inspection/access ports on the top head of tank T-6 are sealed with stainless and carbon steel blind flanges.

The original bottom cone section of tank T-6 has been replaced with a new cone fabricated from 1/4" thick type 304 stainless steel. The bottom three quarters of the old cone was removed and the new cone continuously seal welded to the remaining upper portion of the original cone from the inside of the tank.

As previously reported in the 1994 Tank Assessment, the two carbon steel stiffener angle rings (2-1/2" x 2-1/2" x 1/4") located at the bottom and 8-foot elevation on the cylindrical shell are corroded. In several areas, portions of the top horizontal flange on both stiffeners are disconnected from the remainder of the angle at the 90° bend. At other locations, the stiffeners are corroded at the bottom of the vertical flange of the angle. However, in all locations for both angle stiffeners at least 50% of the original material remains intact and the structural analyses performed (based upon a 2" x 1/4" flat bar) indicate they have sufficient strength. Exposed surfaces of the two stiffener angle rings and both sides of the support skirt are painted.

The minimum shell thickness for tank T-6 was determined to be 0.176 inches at the 16-foot elevation on the east side of the cylindrical shell.

5) Additional Information

Each tank is supported by a carbon steel skirt and anchored to an elevated structure at eight locations using 1-inch diameter structural grade bolts and nuts. The columns of the elevated support structure for the tanks are grounded by connection to underground grounding cable grids located beneath the secondary containment pad.

No structural defects, settling or distortion of the elevated support structure or foundation for the tank systems was observed.

The bottom of each of the four T-tanks are located approximately 6'- 0" above the secondary containment pad. The bottom of each of the six support columns for elevated structure are located 1' - 4" above the secondary containment pad. None of the external tank shells or any external metal component of the tank system is in contact with soil or water.

The existing pressure/vacuum relief valves for tanks T-1, T-2, T-5, and T-6 were replaced with new valves on May 11, 2011. The new valves (same model and type) are set at 8 ounces for pressure relief and at 6 ounces to break the vacuum.

Two new carbon steel vacuum stiffener angle rings (2-1/2" x 2-1/2" x 3/16") were attached to the cylindrical shell of each tank approximately 21-1/2" above the location of the original stiffeners. Installation and painting of the new stiffeners on the four tanks was completed on June 29, 2011.

D. Ancillary Equipment

1) The nozzle connections and piping for spent carbon slurry, recycle water, city water and vent were carefully examined during the inspection of each tank system and indicated no leaks.

2) Each of the two recycle water pumps (located adjacent to tank T-9 and outside of the secondary containment area) were found to leak at the packing seal for the pump drive shaft during operation. The leaks are intentional and comprised of city water used for cooling and flushing the seal gland of each pump.

3) The exterior surfaces of stainless steel pipelines and fittings are not painted and showed no signs of corrosion.

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

4. <u>Structural Calculations</u>

A. A finite element analysis (FEA) of the tanks was performed for the operating condition (1.5 specific gravity slurry to fill line) and based on the minimum shell metal thicknesses measured for each of the major components (top head, cylindrical wall and bottom cone) on any of the four tanks with wind and seismic loadings calculated from the latest edition of the International Building Code. The calculated FEA stress results are all less than allowable stresses from AWWA D100-05.

In addition to the FEA/AWWA evaluation, a second analysis was performed base on the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1. The Section VIII, Division 1 analysis was conservatively based on an internal pressure of 15 psig plus the hydrostatic pressure of the spent carbon slurry and shows that the basic Code limits are satisfied.

A complete copy of the structural calculations and analyses is provided in Appendix C. Both analyses demonstrate that tanks T-1, T-2, T-5 and T-6 are acceptable for the atmospheric storage of spent carbon slurry.

Stresses due to seismic loading are higher than the stresses from wind loading, but the seismic stresses for the tanks are well below the allowable limits and relatively low when compared to those attributable to the weight/hydrostatic pressure. The structural analyses indicate that the critical component is the thickness of the cylindrical side wall of the tank at the cone/cylinder intersection where the hydrostatic loading produces a localized compressive hoop stress of 6,126 psi, which is 85% of the allowable local buckling stress of 7,209 psi (from AWWA D100-05) for a 10' - 0" diameter cylindrical wall that is 0.176" thick.

Note that the minimum actual thicknesses of the cylindrical wall for each of the four tanks at the cone/cylinder intersection is greater than the 0.176" thickness used in the FEA calculations as follows: 0.180" (T-1), 0.190" (T-2), 0.192" (T-5) and 0.208" (T-6). Since the allowable local buckling compressive stress is a function of the cylindrical wall thickness/radius ratio, the allowable stress at the cone/cylinder intersection for each tank increases such that the actual stress of 6126 psi calculated for the operating condition ranges from 73% to 80% of the allowable local buckling stress from AWWA D100-05.

For any of the four tanks, the maximum allowable stress at the cone/cylinder intersection will be equal to the calculated compressive stress if the cylindrical shell wall thickness decreases to 0.157" at that location. The maximum decrease in the tank cylindrical shell wall thicknesses since the 1993 measurements was found to be 0.028" (on the west side of T-2 at 2' elevation) and yields a maximum "thinning" rate 0.00156" per year. If the thickness of the T-1 cylindrical shell at the cone/cylinder intersection decreases at this accelerated rate, the remaining useful life of T-1 would be 15 years.

B. The corroded vacuum stiffener ring located at the bottom of the cylindrical shell of each tanks is adequate for the shell to cone junction reinforcement. The calculations are based on 2" x 1/4" flat bars in lieu of the two corroded 2-1/2" x 2-1/2" x 1/4" stiffener angles on each tank.

C. Piping drawings showing the thicknesses, layout dimensions, and the supports are not available, but based upon 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.

D. All tanks are supported on the elevated structure, which was designed by LuMar Engineering Co. of Pasadena, California. The structural and foundation drawings are provided in Appendix D.

Each of tanks T-1, T-2, T-5, and T-6 are supported by a continuous skirt support which give uniform load distribution to the W12x26, W21x44, and W24x55 braced beams by means of eight point loads and all structural columns are supported on a mat foundation that is 2' - 6" deep per the LuMar drawings.

Based upon the absence of any observed defects, settling or distortion of the elevated support structure or foundation that have been in continuous service since 1994, the structural support and foundation for the tanks appear to be adequate.

5. Deficiencies

No deficiencies that would compromise the integrity of the tanks for the atmospheric storage of spent carbon slurry were found.

6. Recommendations

A. Continue daily monitoring and visual inspections of the spent carbon storage tanks and ancillary equipment for compliance with RCRA requirements.

B. Conduct annual ultrasonic thickness testing at the bottom of the cylindrical wall above the cone/cylinder intersection and at the previous locations of minimum shell thickness readings for each major component (top head, cylindrical wall, bottom cone and support skirt) on each of the four tanks.

C. Conduct comprehensive ultrasonic thickness testing every 5 years for each major component (top head, cylindrical wall, bottom cone and support skirt) on each of tanks T-1, T-2, T-5, and T-6.

D. Remove from service and repair or replace any tank with a cylindrical wall thickness that is less than or equal to 0.157 inches.

E. Maintain paint coating on exterior surfaces of all tank system components that are carbon steel by repainting if visual observation indicates that 20% or greater of the components paint coating is damaged.

F. Replace all carbon steel components and fittings of the tank system that are in direct contact with the spent carbon and recycle water slurry with 300 series stainless steel components and fittings prior to performing the next set of comprehensive ultrasonic thickness testing measurements.

APPENDIX IX

TAB 2

Assessment of Tank System T-18

For the complete TAB 2 section of the Tank Assessment Report
refer to the April 2016 Permit Application

Revision 2
February 2019

APPENDIX IX

TAB 3

Certification of the T-Tank Containment Area

For the complete TAB 3 section of the Tank Assessment Report
refer to the April 2016 Permit Application

Revision 2
February 2019

APPENDIX IX

TAB 4

Assessment of Ancillary Equipment Hopper H-1 and Hopper H-2

Revision 0
February 2019

11811 N. Tatum Blvd., Suite P186
Phoenix, AZ 85028
PH 602-513-5812
FAX 602-513-5813

Engineering Assessment for New Ancillary Equipment Hoppers H-1 and H-2

Inspection of the hoppers H-1 and H-2 at the Evoqua Water Technologies (Evoqua) carbon regeneration facility in Parker, AZ facility, was conducted on 17 January 2019. Review of related design and installation documents was performed over the subsequent week. It is understood that hoppers H-1 and H-2 are ancillary equipment for the facility hazardous waste storage tanks (T-1, T-2, T-5, and T-6) and were installed April 2018. The hopper locations within the facility are shown in Exhibit A.

The assessment has been carried out pursuant to the provisions of 40 CFR 264.192 and is based on review of the following information and our observations during onsite inspection:

- Design documents for hopper construction (Exhibit B);
- Field communication that hoppers only receive spent carbon;
- Information on the hazardous characteristics of the wastes to be handled in the hoppers (Exhibit C)
- Field communication and observation that the external metal components of the hoppers will not be in contact with the soil or with water;
- Design information indicating that (i) hopper foundations will maintain the load of a full hopper, (ii) anchoring will prevent the flotation or dislodgement where the hoppers are placed in a saturated zone or in a seismic fault zone subject to the standards of 40 CFR 264.18(a), and (iii) the hopper system will withstand the effects of frost heave;
- EPA letter dated March 2015 (Exhibit D), directing Evoqua to install a 3/4-inch valve on the outer wall of each of the hoppers to enable Evoqua to detect leakage from the inner hopper wall; and
- Evoqua letter dated April 2018 (Exhibit E) indicating performance of hydrostatic leak testing for each of the hoppers.

The following conclusions are based on our onsite inspections and assessment of supporting documents for H-1 and H-2 as listed above:

- The hoppers have sufficient structural integrity and are acceptable for the transfer of the planned hazardous waste (spent activated carbon) to the facility's hazardous waste storage tanks;

- The hopper foundations, structural support, connections and pressure controls (where applicable) have been adequately considered in the design;
- The hoppers as designed have sufficient structural strength, compatibility with the wastes being transferred, and corrosion protection, to ensure that they will not collapse, rupture, or fail;
- The hoppers are appropriately supported and protected against physical damage and excess stress due to settlement, vibration, expansion or contraction, given their location and expected use; and
- The ¾-inch valves required by the EPA have been installed to satisfy the requirements of 40 CFR 264.193 for double wall containment.

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.

Geosyntec Consultants, Inc.

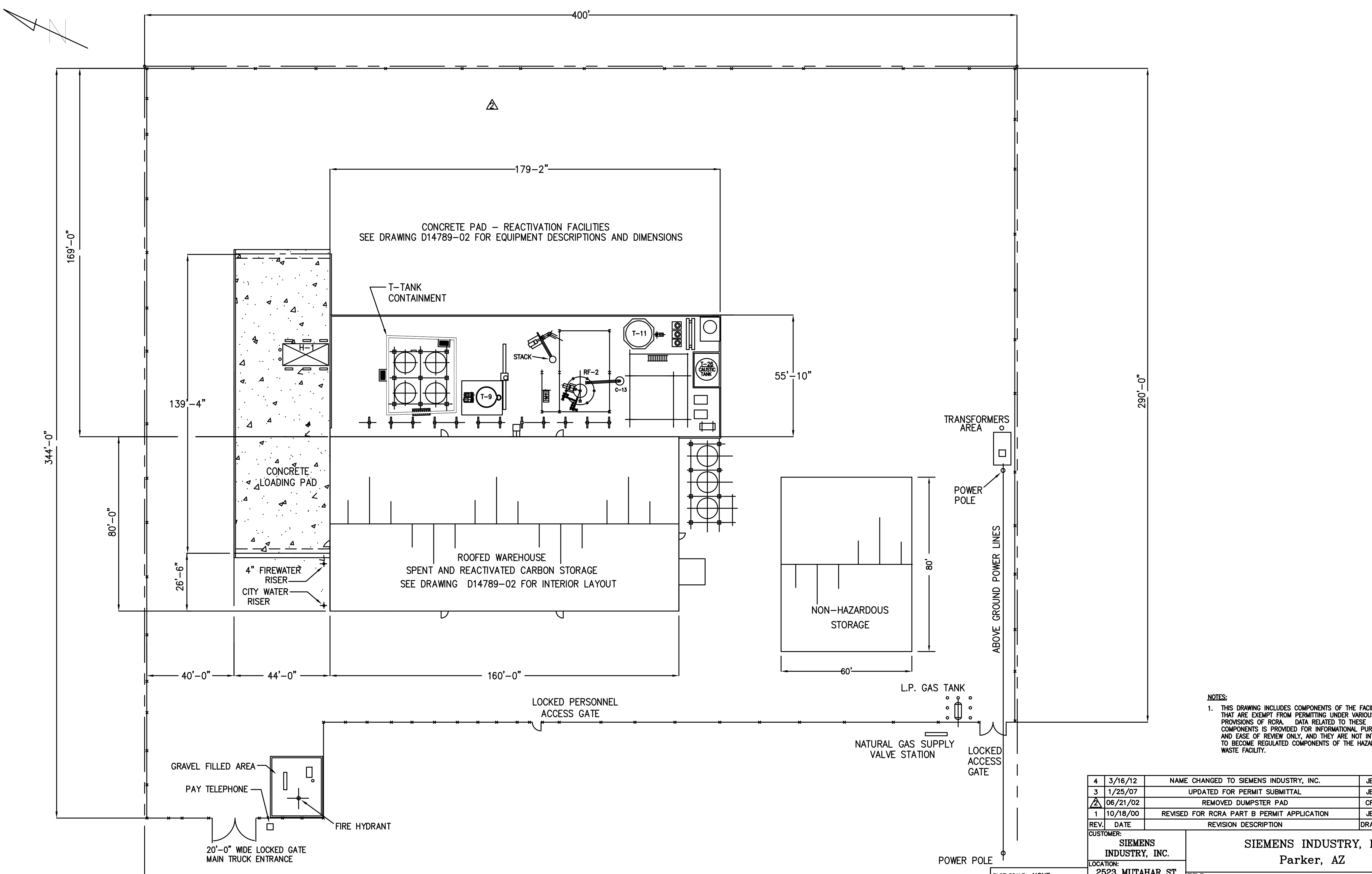
Deran Pursoo, P.E.
Project Engineer

Attachments:

Exhibit A - Site Plan (Hopper Locations within Facility)
Exhibit B - Design Documents
Exhibit C - Hazardous Waste Characteristics Relative to H-1 and H-2
Exhibit D - EPA Letter
Exhibit E - Evoqua Letter Regarding Leak Testing

Exhibit A – Site Plan

(Hopper Locations within Facility)



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
4	3/16/12	NAME CHANGED TO SIEMENS INDUSTRY, INC.	JBE	KEM	
3	1/25/07	UPDATED FOR PERMIT SUBMITTAL	JBE	KEM	
2	06/21/02	REMOVED DUMPSTER PAD	CPG	KEM	
1	10/18/00	REVISED FOR RCRA PART B PERMIT APPLICATION	JBE	---	

PLOT SCALE: NONE

DO NOT SCALE DRAWING

CUSTOMER: SIEMENS INDUSTRY, INC.

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

PROJECT No.

DRAWN: CPG 5/16/94

CHK'D:

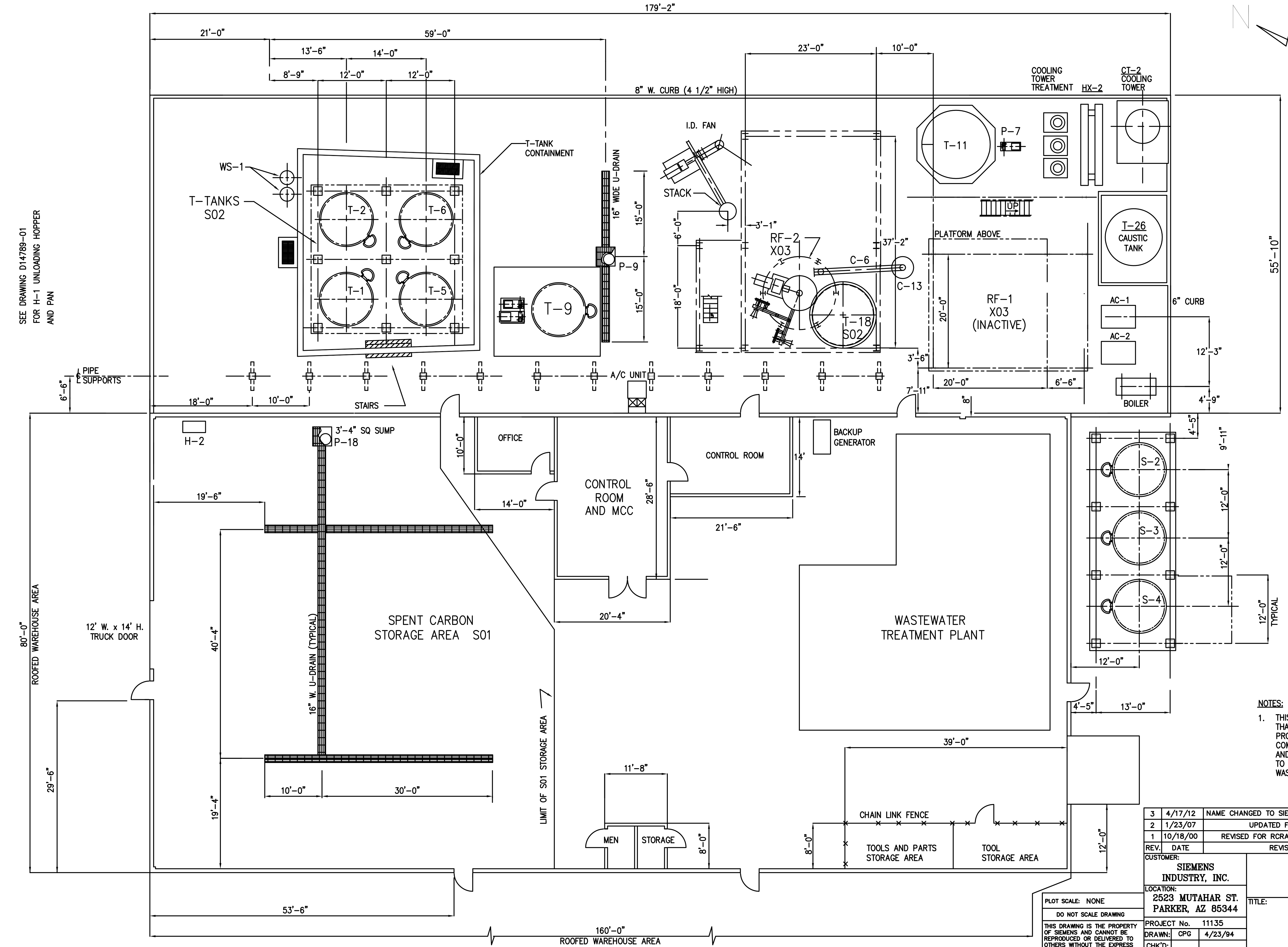
ENG'R:

SIEMENS INDUSTRY, INC.
Parker, AZ

TITLE: REACTIVATION FACILITY SITE PLAN

PART No.

DWG No. D14789-01 REV. 4



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
3	4/17/12	NAME CHANGED TO SIEMENS INDUSTRY, INC., MOVE WS-1	JBE	KEM	
2	1/23/07	UPDATED FOR PERMIT SUBMITTAL	JBE	KEM	
1	10/18/00	REVISED FOR RCRA PART B PERMIT APPLICATION	JBE	---	

PLOT SCALE: NONE

DO NOT SCALE DRAWING

CUSTOMER: SIEMENS INDUSTRY, INC.

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

PROJECT No. 11135

DRAWN: CPG 4/23/94

CHK'D:

ENG'R:

SIEMENS INDUSTRY, INC.
Parker, AZ

TITLE:

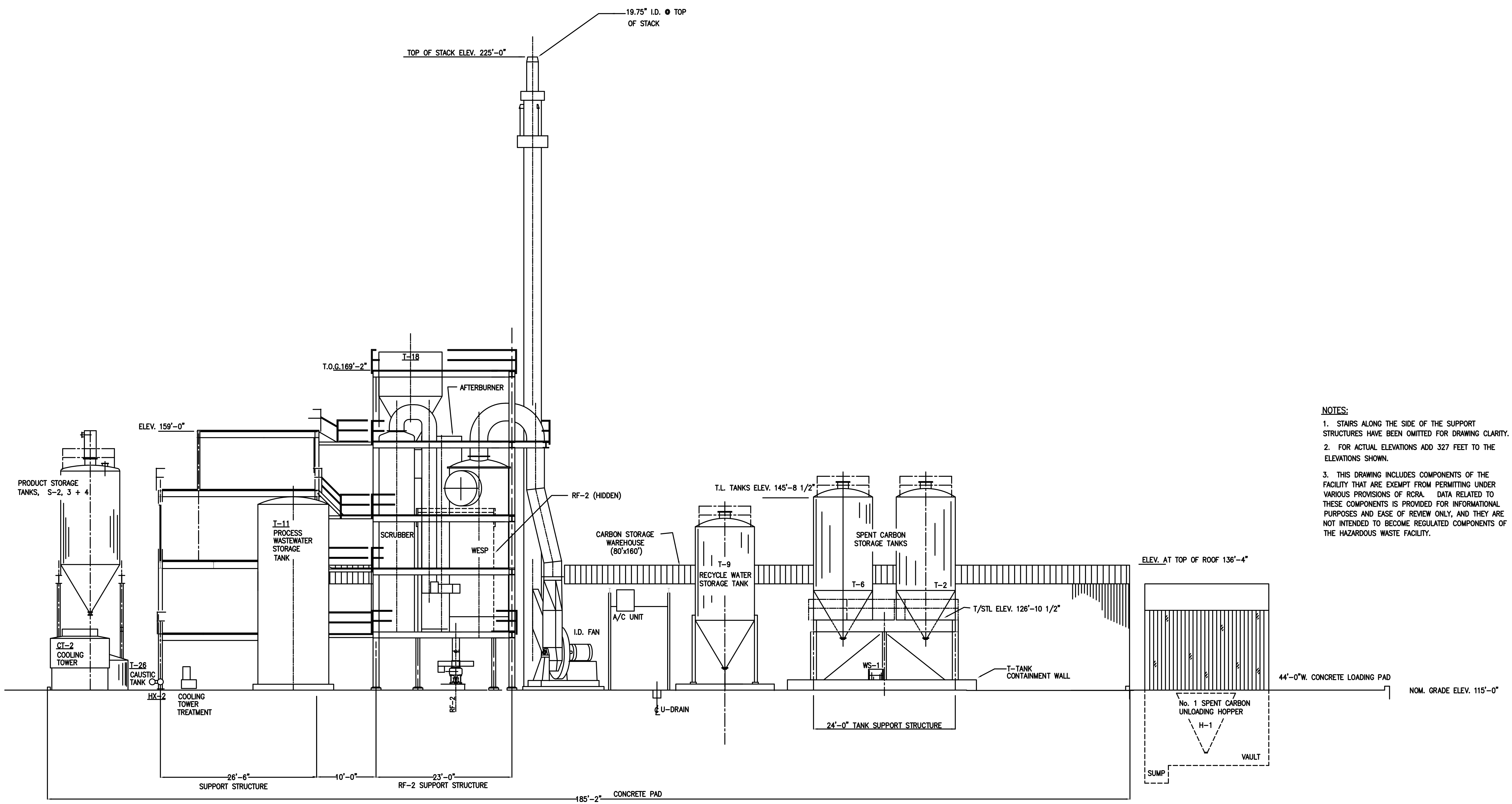
REACTIVATION FACILITY
EQUIPMENT ARRANGEMENT

PART No.

DWG No. D14789-02 REV. 3

PRINT DATE: 4/19/12

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
3	3/16/12	NAME CHANGED TO SIEMENS INDUSTRY, INC.	JBE	KEM	
2	1/18/07	UPDATED FOR PERMIT SUBMITTAL	JBE	KEM	
1	7/24/02	REVISED FOR RCRA PART B PERMIT APPLICATION	CPG	KEM	

PLOT SCALE: NONE

DO NOT SCALE DRAWING

CUSTOMER: SIEMENS INDUSTRY, INC.

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

PROJECT No.

DRAWN: CPG 4/21/94

CHK'D:

ENG'R:

SIEMENS INDUSTRY, INC.
Parker, AZ

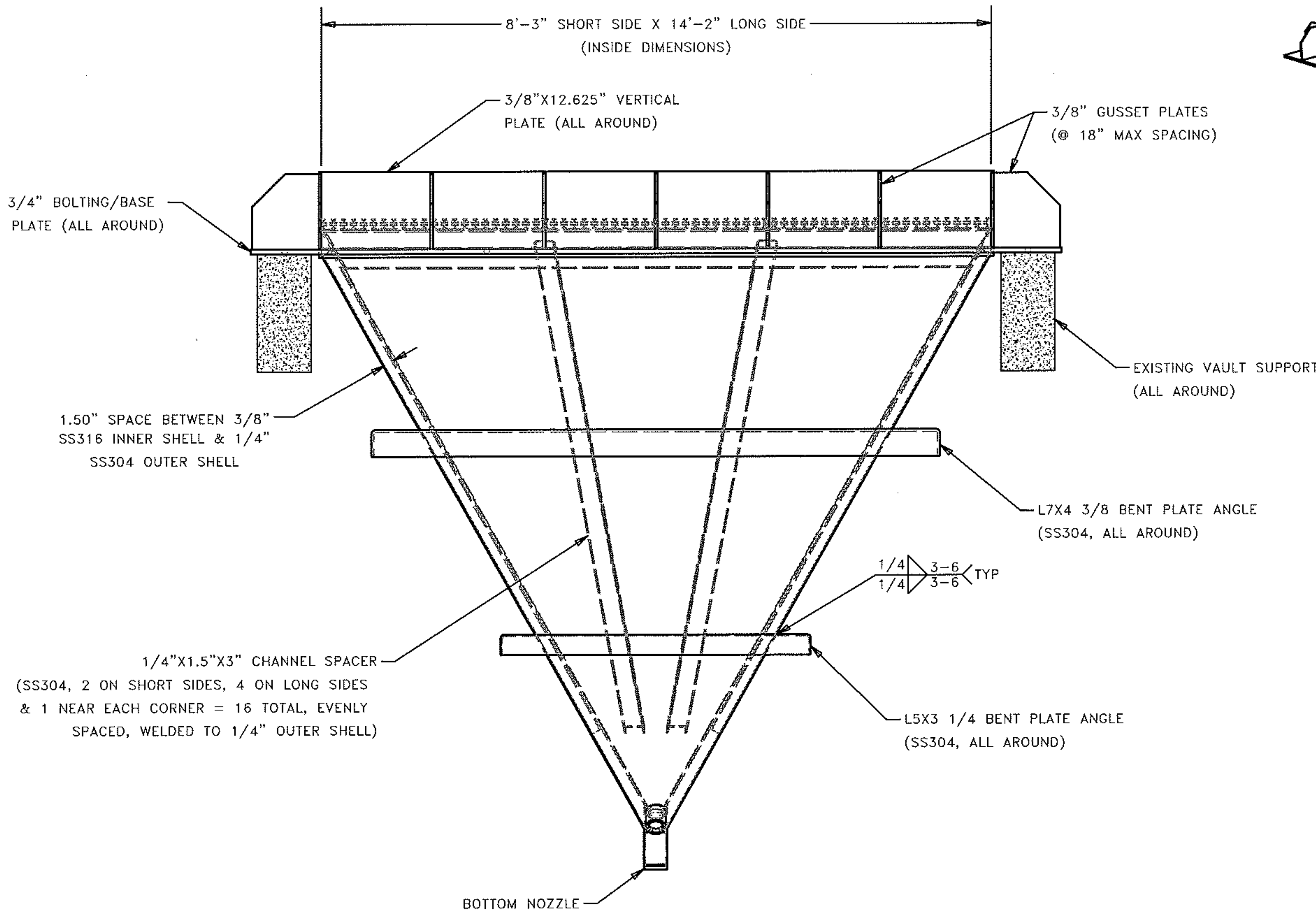
TITLE: REACTIVATION FACILITY SITE VIEW OVERALL ARRANGEMENTS

PART No.

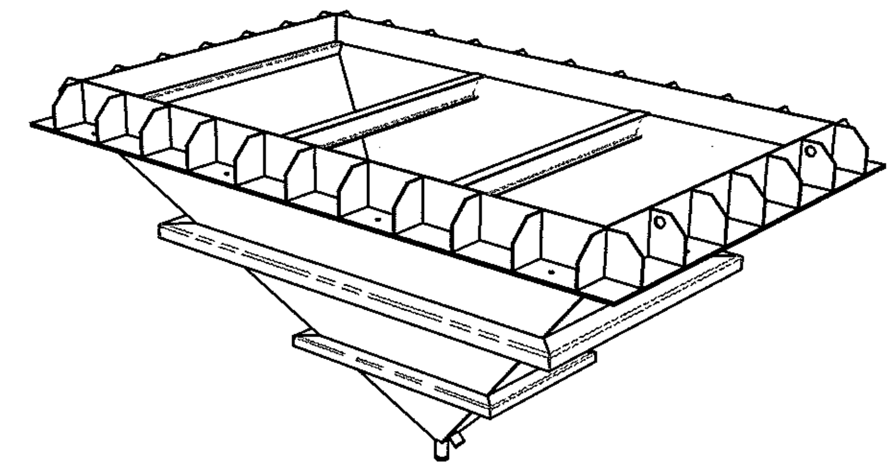
DWG No. D14789-03 REV. 3

PRINT DATE: 4/19/12

Exhibit B – Design Documents



ELEVATION VIEW
SCALE 1 / 20



ISO VIEW
(GRATING NOT SHOWN)
SCALE 1 / 50

DESIGN PRESSURE: 0 PSIG (ATMOSPHERIC)
MAX. TEMPERATURE: 150° F
MIN. DESIGN METAL TEMP: -20° F
DESIGN CODES: 1) API 650 11TH EDITION
2) IBC 2012 FOR WIND & SEISMIC
SEISMIC DESIGN: SITE CLASS D CATEGORY B
WIND DESIGN: NOT REQUIRED

WT (LB): 10207.341 lbmass

DIMENSIONS IN INCHES UNLESS SPECIFIED	
TOLERANCES UNLESS OTHERWISE SPECIFIED	
TWO (2) PLACE DEC. THREE (3) PLACE DEC. ANGULAR	±.06 ±.005 ±.50
STRUCTURAL DIMENSIONS	±1/16
MACHINED SURFACES	250

REV	DESCRIPTION	DATE	APPROVED	ECN

REVISION HISTORY

DESIGNER: KP	DATE: 2/23/2017
CHECKER: EB	DATE: 2/23/2017
ENGINEER	DATE
MANAGER	DATE
FILE:	UPDATE:
SCALE:	SIZE: B

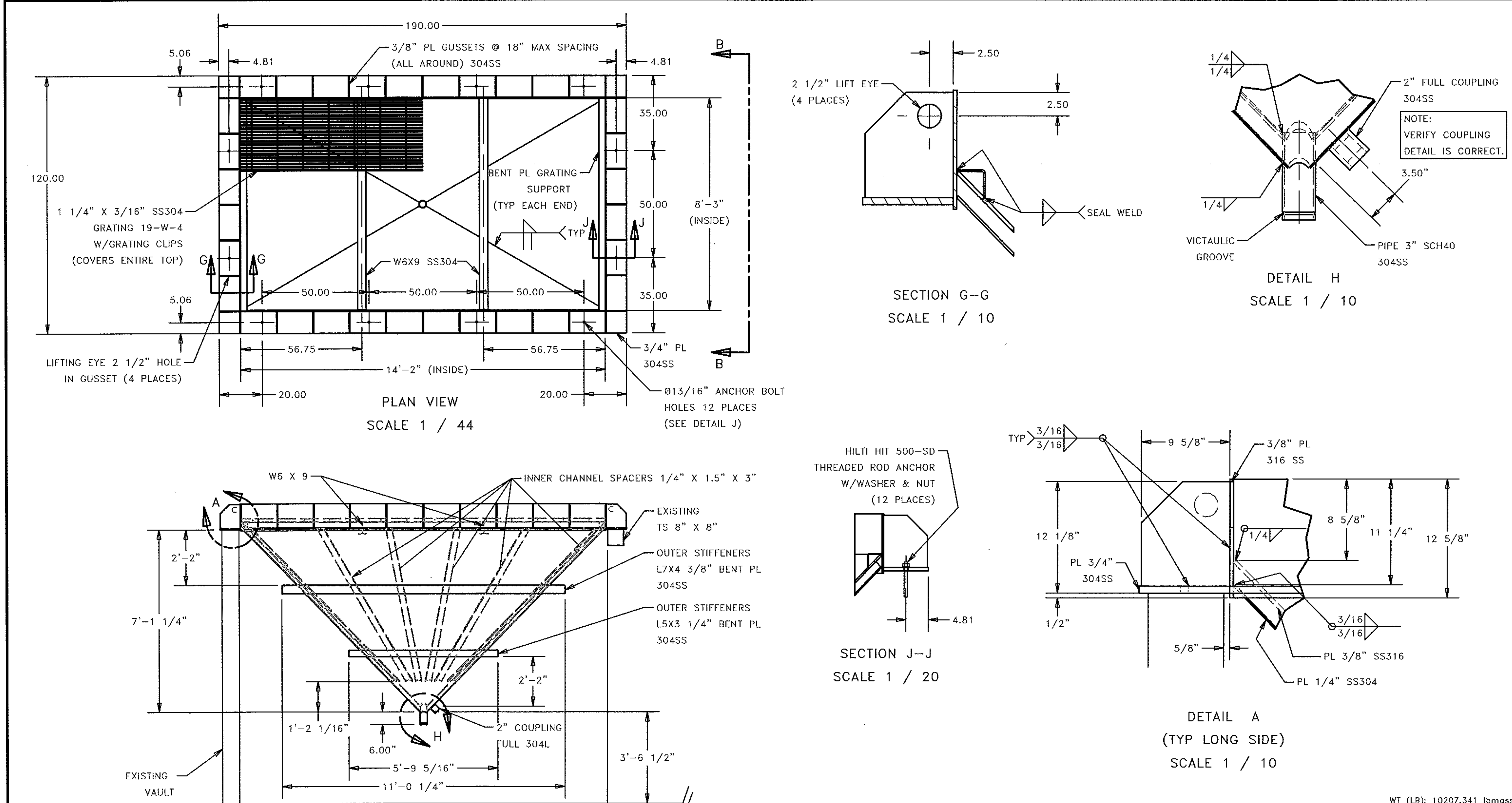
TITLE
HOPPER 14.17' X 8.25' X 7' DOUBLE WALL
STAINLESS STEEL (270 CU FT CAPACITY)

CLIENT

EVOQUA WATER TECHNOLOGIES
WATER TECHNOLOGIES
Thomasville, GA
1-800-841-1550

PROJECT	CODE	DRAWING	SHEET	REV
		W3T393919	1 OF 4	

REF:W3T393919.iam



WT (LB): 10207.341 lbmass

DIMENSIONS IN INCHES UNLESS SPECIFIED	
TOLERANCES UNLESS OTHERWISE SPECIFIED	
TWO (2) PLACE DEC. THREE (3) PLACE DEC. ANGULAR	±.06 ±.005 ±.50
STRUCTURAL DIMENSIONS	±1/16
MACHINED SURFACES	250

DESIGNER	KP	DATE	2/23/2017
CHECKER	EB	DATE	2/23/2017
ENGINEER		DATE	
MANAGER		DATE	
FILE:		UPDATE:	
SCALE:		SIZE:	B

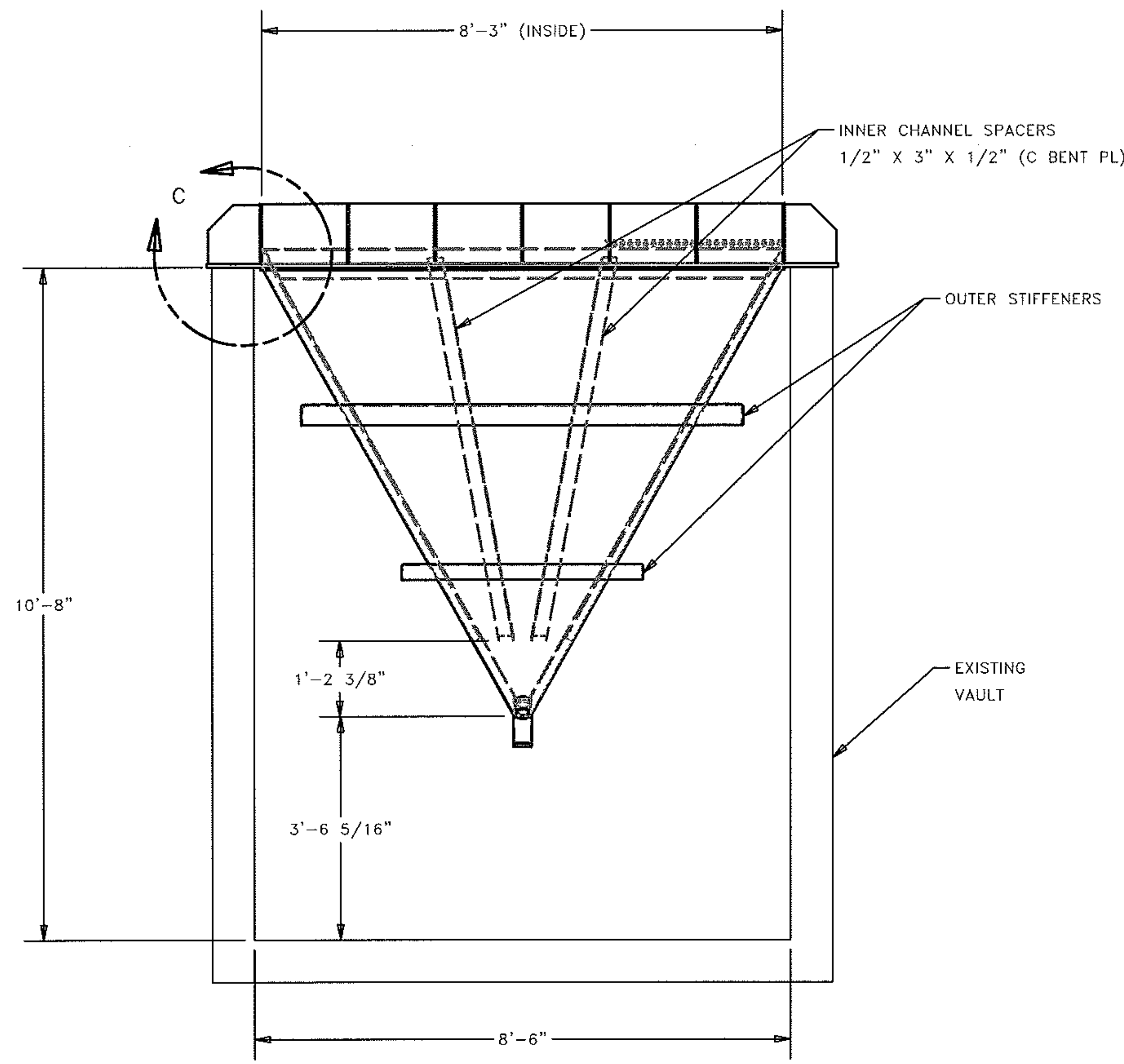
TITLE: HOPPER 14.17' X 8.25' X 7' DOUBLE WALL
STAINLESS STEEL (270 CU FT CAPACITY)

CLIENT

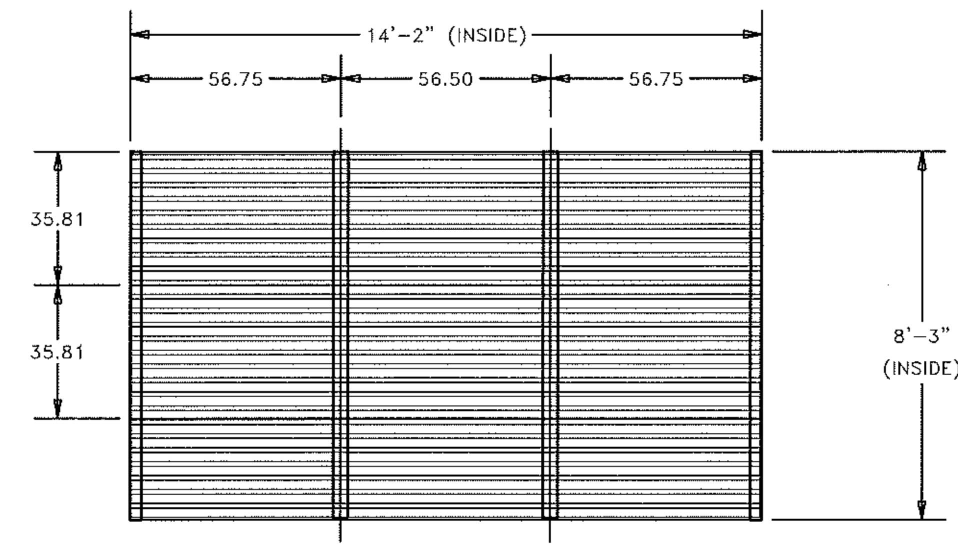
EVOQUA WATER TECHNOLOGIES
WATER TECHNOLOGIES
Thomasville, GA
1-800-841-1550

PROJECT	CODE	DRAWING	SHEET	REV
		W3T393919	2 OF 4	

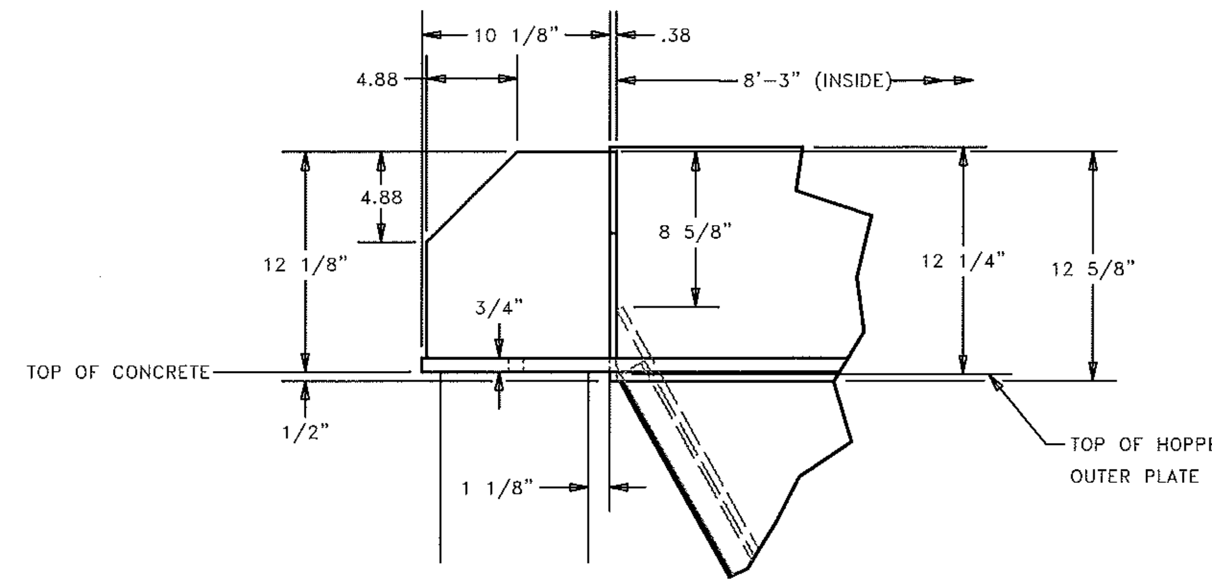
REF:W3T393919.iam



VIEW B–B
SCALE 1 / 30



PLAN VIEW
(GRATING LAYOUT)
SCALE 1 / 50



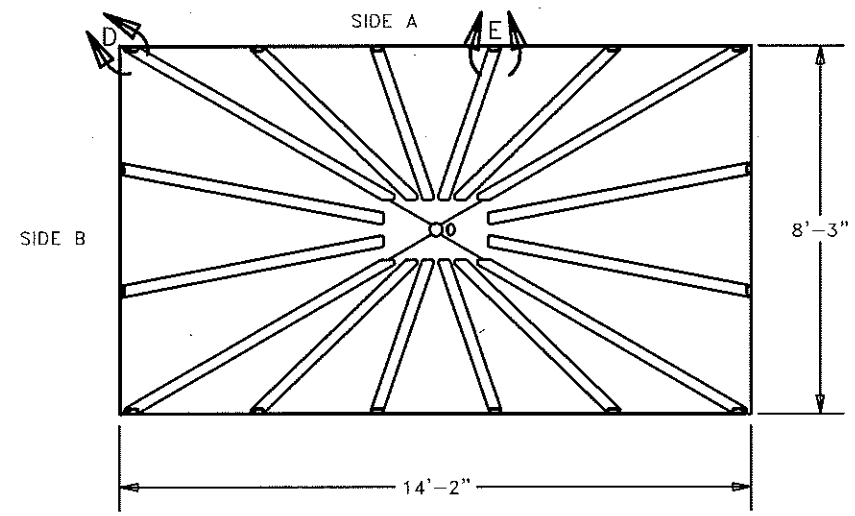
DETAIL C
(TYP SHORT SIDE)
SCALE 1 / 10

WT (LB): 10207.341 lbmass

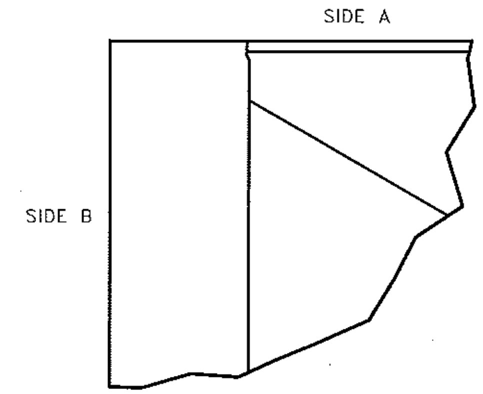
DIMENSIONS IN INCHES UNLESS SPECIFIED	
TOLERANCES UNLESS OTHERWISE SPECIFIED	
TWO (2) PLACE DEC.	±.06
THREE (3) PLACE DEC.	±.005
ANGULAR	±.50
STRUCTURAL DIMENSIONS	±1/16
MACHINED SURFACES	250

DESIGNER: KP	DATE: 2/23/2017	TITLE: HOPPER 14.17' X 8.25' X 7' DOUBLE WALL STAINLESS STEEL (270 CU FT CAPACITY)
CHECKER: EB	DATE: 2/23/2017	
ENGINEER:	DATE:	CLIENT:
MANAGER:	DATE:	EVOQUA WATER TECHNOLOGIES — WATER TECHNOLOGIES, Thomasville, GA, 1-800-841-1550
FILE:	UPDATE:	
SCALE:	SIZE: B	PROJECT: / CODE: / DRAWING: W3T393919 / SHEET: 3 OF 4 / REV:

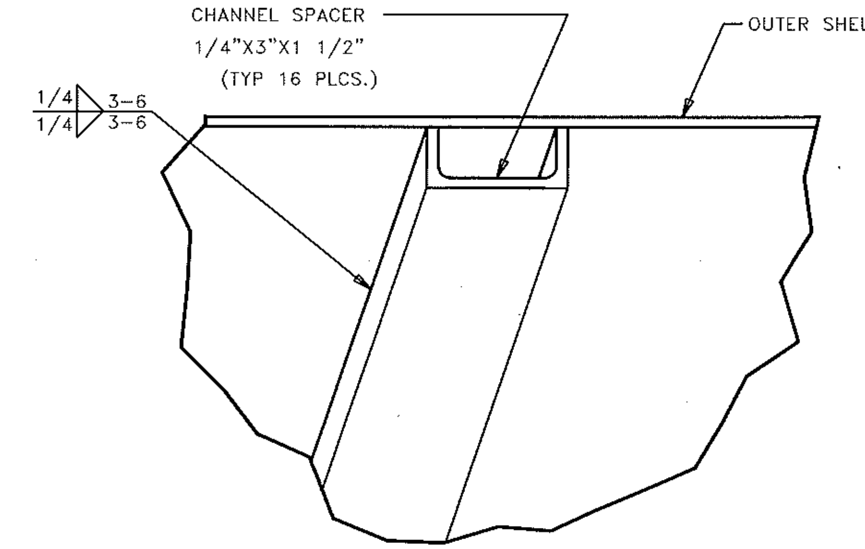
REF:W3T393919.iam



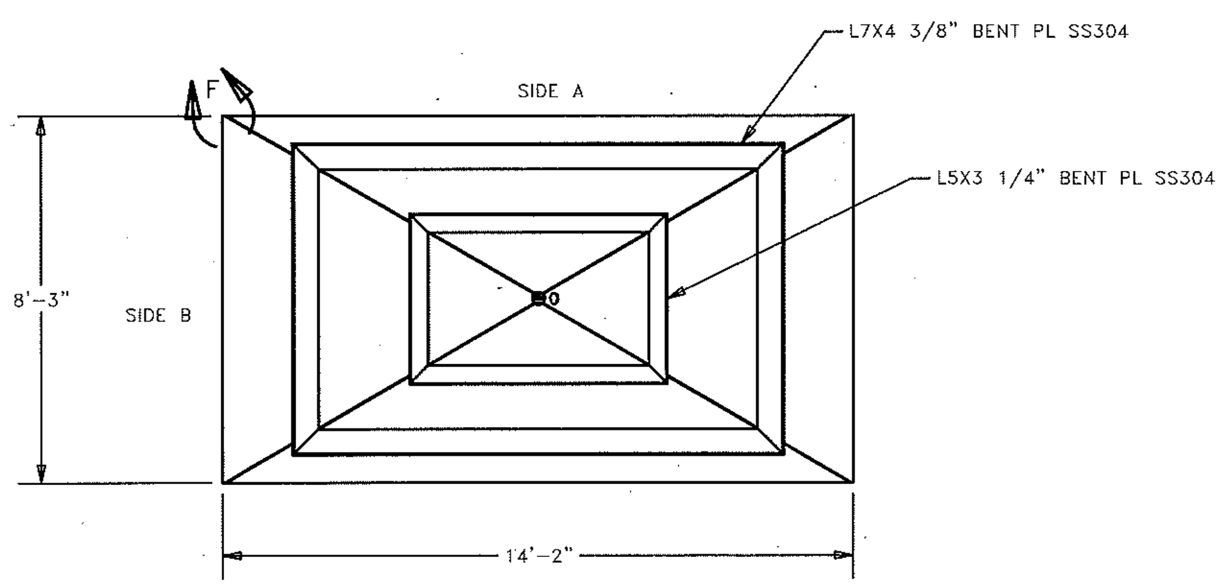
TOP VIEW
(OUTER SHELL)
SCALE 1 / 50



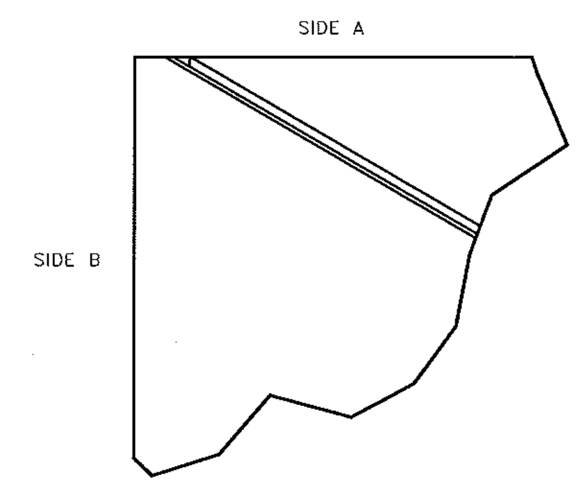
DETAIL D
JOINT DETAIL
(CORNER TO CORNER)
SCALE 1 / 4



DETAIL E
CHANNEL/OUTER SHELL DETAIL
SCALE 1 /4



BOTTOM VIEW
(OUTER SHELL)
SCALE 1 / 50



DETAIL F
JOINT DETAIL
(CORNER TO CORNER)
SCALE 1 / 4

WT (LB): 10207.341 lbmass

DIMENSIONS IN INCHES UNLESS SPECIFIED	
TOLERANCES UNLESS OTHERWISE SPECIFIED	
TWO (2) PLACE DEC. THREE (3) PLACE DEC. ANGULAR	±.06 ±.005 ±.50
STRUCTURAL DIMENSIONS	±1/16
MACHINED SURFACES	250

DESIGNER KP	DATE 2/23/2017
CHECKER EB	DATE 2/23/2017
ENGINEER	DATE
MANAGER	DATE
FILE:	UPDATE:
SCALE:	SIZE: B

TITLE
HOPPER 14.17' X 8.25' X 7' DOUBLE WALL
STAINLESS STEEL (270 CU FT CAPACITY)

CLIENT

EVOQUA WATER TECHNOLOGIES
WATER TECHNOLOGIES
Thomasville, GA
1-800-841-1550

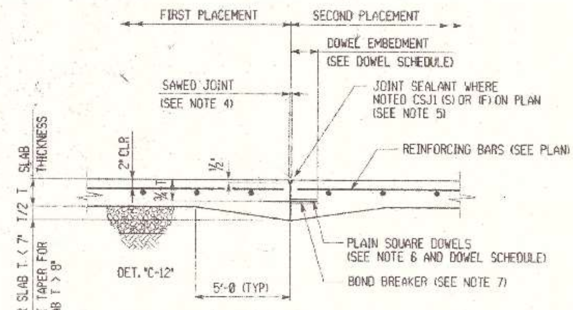
PROJECT	CODE	DRAWING	SHEET	REV
		W3T393919	4 OF 4	

REF:W3T393919.iam

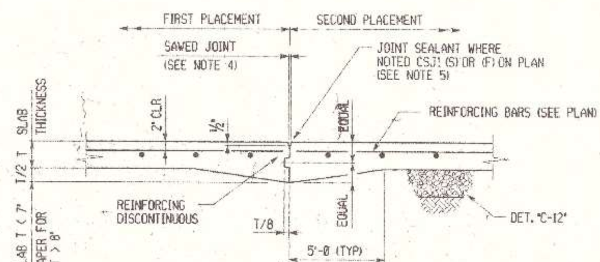
NOTES FOR CONTROL AND CONSTRUCTION JOINTS

1. SLAB PLACEMENT SHALL BE SUBDIVIDED BY CONTROL JOINTS AT A SPACING (IN FEET) NOT EXCEEDING 2½ TIMES THE THICKNESS OF THE SLAB (IN INCHES) NOR 20 FEET IN ANY ONE DIRECTION UNLESS SHOWN OTHERWISE ON DESIGN DRAWINGS.
2. CONSTRUCTION JOINT AND CONTROL JOINT MAY BE INTERCHANGED TO SUIT CONCRETE POUR SCHEDULE.
3. EXACT LOCATION OF CONTROL JOINTS SHALL BE ESTABLISHED PRIOR TO CUTTING AND PLACING OF CONCRETE. FIELD CONTROL SHALL ASSURE THAT THE JOINTS OCCUR OVER THE CUT REINFORCING.
4. SAWING OF CONSTRUCTION AND CONTROL JOINTS:
   a. THE PREFERRED METHOD FOR SAWING CONTROL JOINTS IS WITH THE 3/32" WIDE X 1¼" DEEP SOFF-CUT SAW WITHIN ONE HOUR OF FINISHING THE CONCRETE.
   b. ALTERNATELY, CONTROL JOINTS MAY BE INSTALLED WITH A 3/16" CONVENTIONAL CONCRETE SAW. SAWING SHALL BEGIN AS SOON AS THE CONCRETE SURFACE HAS HARDENED SUFFICIENTLY TO PERMIT SAWING WITHOUT EXCESSIVE RAVELING AND BEFORE RANDOM SHRINKAGE.
   c. WHERE THE SAW IS OBSTRUCTED, TOOLED OR FORMED JOINTS SHALL BE PROVIDED TO JOIN THE SAW CUT JOINT AND COMPLETE THE CONTROL OR CONSTRUCTION JOINT. CONTROL JOINTS SHALL EXTEND THROUGH CURBS CAST MONOLITHICALLY WITH THE SLAB.
5. JOINT SEALERS AND FILLERS:
   a. JOINT SEALER MATERIALS, DESIGNATED (S) ON PLANS, SHALL BE IN ACCORDANCE WITH SPECIFICATION 0339/01, PARAGRAPH 6i.
   b. JOINT SEALER MATERIALS, DESIGNATED (F) ON PLANS, SHALL BE IN ACCORDANCE WITH SPECIFICATION 0339/01, PARAGRAPH 6h.
   c. NON-EXTRUDING PREMOLDED EXPANSION JOINT MATERIAL SHALL BE IN ACCORDANCE WITH SPECIFICATION 0339/01, PARAGRAPH 6g.
   d. ALL JOINTS SHALL BE CLEAN AND FREE OF MATERIAL AND SHALL BE ABSOLUTELY DRY PRIOR TO RECIEVING SEALER OR FILLER MATERIAL. SEALER AND FILLER SHALL BE INSTALLED NO SOONER THAN 90 DAYS AFTER SLAB PLACEMENT.
6. ALL DOWELS SHALL BE SAW CUT, NOT SHEARED, CONFORMING TO ASTM A615 PLAIN, GRADE 60 AND LOCATED AT MID-DEPTH OF SLAB WITH DOWEL BASKET. CLIP WIRE ON BASKET PRIOR TO SECOND PLACEMENT. EXERCISE EXTREME CARE IN POSITIONING AND ALIGNING DOWELS LEVEL AND PARALLEL WITH EACH OTHER AND PERPENDICULAR TO THE JOINT FACE.
7. SQUARE DOWEL BOND BREAKER SHALL BE SNAP-ON OR SLIP-ON PLASTIC CLIP WITH 1/4" COMPRESSIBLE, CLOSED CELL FOAM ATTACHED TO INSIDE VERTICAL FACES OF CLIP AS MANUFACTURED BY SCHRADER/ROTEC OR APPROVED EQUAL.

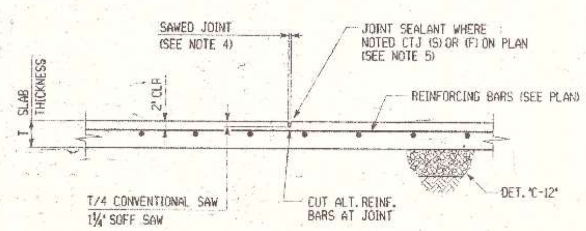
DOWEL SCHEDULE			
SLAB DEPTH INCHES	SIZE INCHES	TOTAL LENGTH INCHES	SPACING IN. C TO C
5	5/8	12	12
6	3/4	14	12
7	7/8	14	12
8	1	14	12
9	1⅛	16	12
10	1¼	16	12



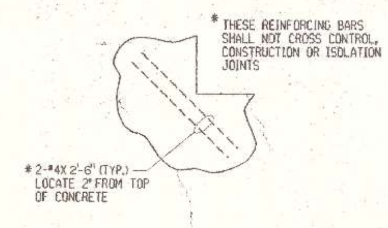
CONSTRUCTION JOINT CSJ1 & CSJ1 (S) OR (F)
(VEHICULAR TRAFFIC)



CONSTRUCTION JOINT CSJ2 & CSJ2 (S) OR (F)
(NO VEHICULAR TRAFFIC)

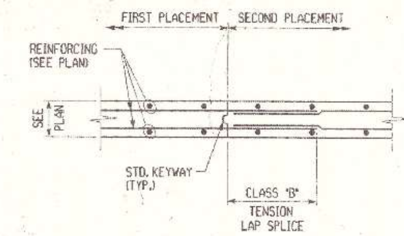


CONTROL JOINT CTJ & CTJ (S) OR (F)



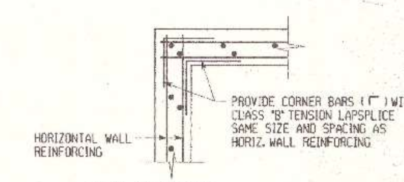
TYPICAL DETAIL SHOWING EXTRA REINFORCING AT RE-ENTRANT CORNERS

DETAIL C-1



TYPICAL WALL CONSTRUCTION JOINT DETAIL (U.N.)

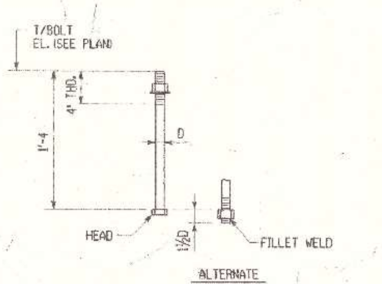
DETAIL C-2



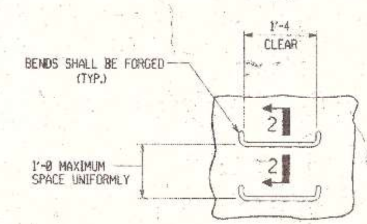
TYPICAL CORNER REINF. W/DOUBLE LAYER OF REINFORCING

TYPICAL CORNER DETAIL

DETAIL C-3

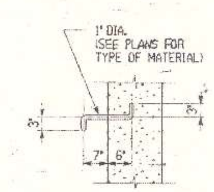


STD. ANCHOR BOLT DETAIL



PIT & TANK LADDER RUNGS

DETAIL 4



SECTION 2-2

GENERAL NOTES - CONCRETE

1. DESIGN, MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE FOLLOWING STANDARDS UNLESS OTHERWISE MODIFIED ON THE DRAWINGS OR IN THE STANDARDS:
   - ACI-347R-88 RECOMMENDED PRACTICE FOR CONCRETE FORMWORK
   - ACI-318-89 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE
   - ACI-315-80 (REVISED 1986) DETAILS AND DETAILING OF CONCRETE REINFORCEMENT
   - ACI-301-89 SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS
   - CRSI RECOMMENDED PRACTICE FOR PLACING REINFORCING STEEL
2. CONCRETE AND REINFORCING STEEL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH SPECIFICATION 0339/01.
3. FABRICATION, DELIVERY AND INSTALLATION OF MISCELLANEOUS MATERIALS SHALL BE IN ACCORDANCE WITH SPECIFICATION 0555/01, "MISCELLANEOUS METALS". REFER TO ARCHITECTURAL, PIPING, PLUMBING AND ELECTRICAL DRAWINGS FOR EMBEDDED ITEMS.
4. EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS AND STRUCTURES SHALL BE IN ACCORDANCE WITH SPECIFICATION 0215/02.
5. CONCRETE SHALL DEVELOP THE FOLLOWING COMPRESSIVE STRENGTHS IN 28 DAYS UNLESS NOTED:

2000 PSI	FOR FILL CONCRETE.
4000 PSI	FOR FOUNDATIONS, RETAINING WALLS AND GRADE BEAMS.
4000 PSI	FOR GROUND FLOOR SLABS, ELEVATED FLOOR SLABS, BEAMS, GIRDERS, COLUMNS AND WATER RETAINING STRUCTURES.
5000 PSI	FOR ROADWAYS.

6. REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A615-87 GRADE 60 UNLESS NOTED.
7. PROVIDE A MINIMUM COVER OF 3 INCHES FOR REINFORCING STEEL WHEN THE CONCRETE IS PLACED DIRECTLY AGAINST THE GROUND.
8. PROVIDE A MINIMUM COVER OF 2 INCHES FOR BARS LARGER THAN NO.5 AND 1 1/2 INCHES FOR NO.5 BARS OR SMALLER IF AFTER REMOVAL OF FORMS THE CONCRETE IS EXPOSED TO THE WEATHER OR IN CONTACT WITH THE GROUND.
9. PROVIDE A MINIMUM COVER OF 3/4 INCHES FOR REINFORCING IN SLABS AND WALLS AND 1 1/2 INCHES IN BEAMS AND GIRDERS NOT EXPOSED DIRECTLY TO WEATHER OR GROUND.
10. REINFORCING SHALL BE DETAILED SUCH THAT ALLOWABLE SHOP TOLERANCES WILL NOT PERMIT BARS TO ENCROACH ON MINIMUM COVER REQUIRED IN NOTES 7, 8 AND 9.
11. ALL EXPOSED EDGES OF CONCRETE SHALL HAVE A 3/4 INCH 45° CHAMFER UNLESS NOTED.
12. FLOOR FINISHES, SURFACE TOLERANCES, JOINT SEALANT, SEALANT/DUSTPROOFER, VAPOR BARRIER, WATERSTOPS AND WATERPROOFING SHALL BE AS SHOWN ON THE DRAWINGS AND AS DESCRIBED IN SPECIFICATION NO. 0339/01. "CONCRETE AND REINFORCING STEEL".
13. ALL CONCRETE EXPOSED TO WEATHER AND ALL LIQUID RETAINING STRUCTURES SHALL BE AIR ENTRAINED CONCRETE. AIR ENTRAINMENT TO BE PER SPECIFICATION 0339/01, "CONCRETE AND REINFORCING STEEL".
14. ANCHOR BOLT SLEEVES TO BE FILLED WITH GROUT UNLESS NOTED.
15. ALLOWABLE SOIL BEARING PRESSURE UNDER SPREAD FOOTINGS AND MATS SHALL BE AS NOTED ON THE FOUNDATION DRAWINGS.
16. SEE CONCRETE SPECIFICATION 0339/01 FOR ADDITIONAL REQUIREMENTS AND GROUT REQUIREMENTS.
17. ALL CONCRETE SHALL BE MECHANICALLY VIBRATED IN ACCORDANCE WITH ACI 309R-87.
18. BEFORE CONCRETE IS PLACED, CARE SHALL BE TAKEN TO ASSURE THAT ALL EMBEDDED ITEMS ARE FIRMLY AND SECURELY FASTENED IN PLACE TO PREVENT DISPLACEMENT. ANCHOR BOLTS SHALL BE TIED AT THE TOP AND BOTTOM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ASSURING ANCHOR PLACEMENT AND PLUMBNESS IN ACCORDANCE WITH THE CONCRETE DRAWINGS.
19. WATERSTOP SPLICES SHALL BE IN ACCORDANCE WITH SPECIFICATION 0339/01 AND THE MANUFACTURER'S INSTRUCTIONS.

RELEASED FOR CONSTRUCTION
BY [signature] DATE 11-6-95

WHEELABRATOR CLEAN AIR SYSTEMS Hampton, New Hampshire

RUST Engineering & Construction Inc.
Contract 21-4527AF

PROFESSIONAL ENGINEER CERTIFICATE NO. 23194 DALE F. SCHAUB ARIZONA, U.S.A.

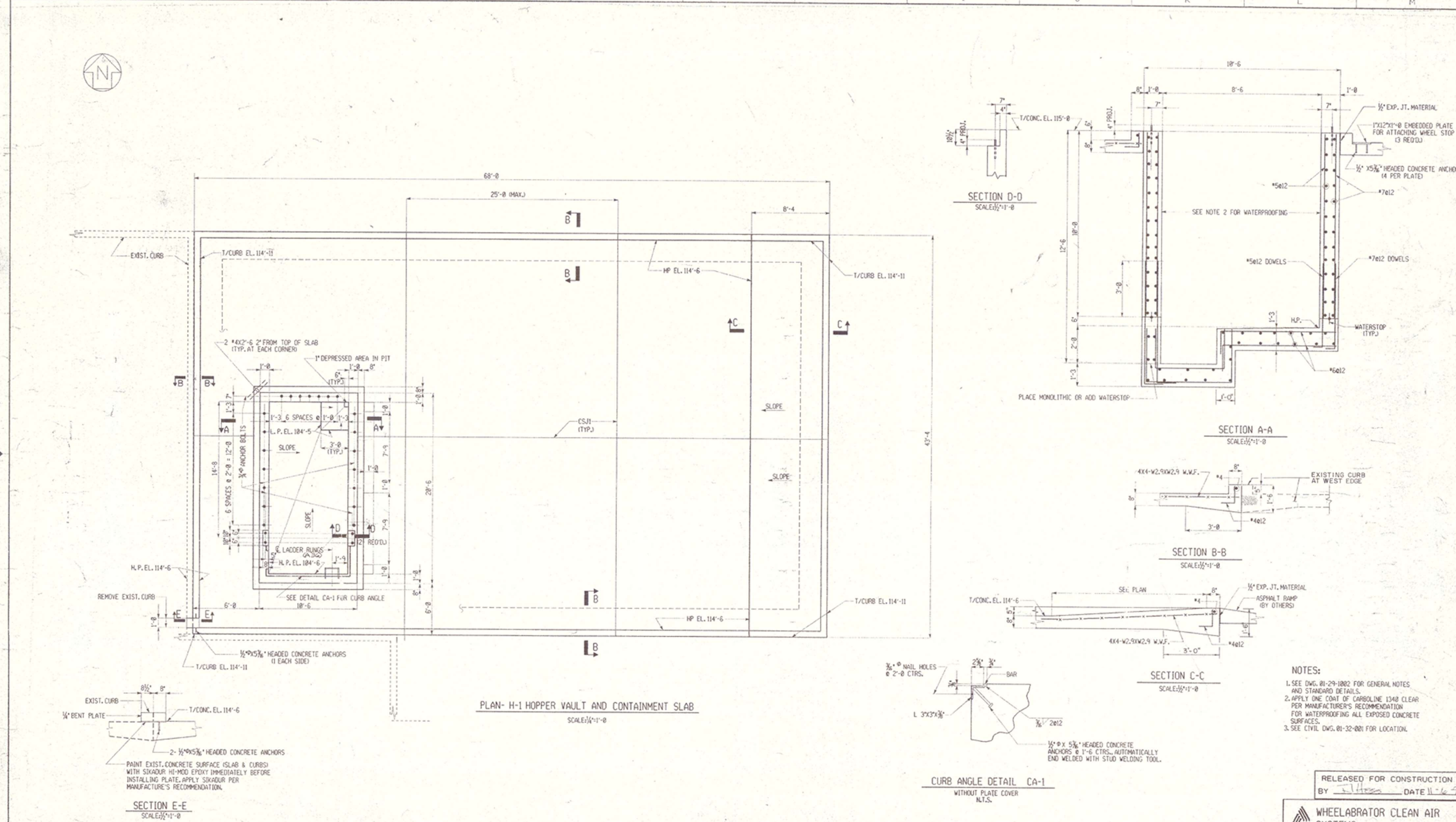
SCALE NONE	DATE
DESIGN: RUST STD.	10-24-95
DRAWN BY: D. CARTER	10-24-95
CHECKED BY: M. O'LAIRE	11-06-95
SUPV. BY: D. CARTER	11-6-95
SUBM'TD BY: R.E. Williams	11-6-95
APP'D BY:	
APP'D BY:	
APP'D BY:	

STANDARD CONCRETE DETAILS AND GENERAL NOTES

WESTATES CARBON, INC.
CARBON REGENERATION FACILITY
PARKER, ARIZONA

DRAWING NUMBER 01-29-1002 REV. NO. 0

NO.	REVISIONS	MADE	CKD.	DATE	NO.	REVISIONS	MADE	CKD.	DATE	NO.	REVISIONS	MADE	CKD.	DATE	DRAWING NO.	REFERENCES



NOTES:

1. SEE DWG. 01-29-1002 FOR GENERAL NOTES AND STANDARD DETAILS.
2. APPLY ONE COAT OF CARBOLINE 1340 CLEAR PER MANUFACTURER'S RECOMMENDATION FOR WATERPROOFING ALL EXPOSED CONCRETE SURFACES.
3. SEE CIVIL DWG. 01-32-001 FOR LOCATION.

RELEASED FOR CONSTRUCTION
BY [signature] DATE 11-6-95

WHEELABRATOR CLEAN AIR SYSTEMS Hampton, New Hampshire

RUST Engineering & Construction Inc.
Contract 21-4527AF

SCALE	¼"=1'-0 U.N.
DESIGN	D. CARTER 10-15-95
DRAWN BY	D. CARTER 10-24-95
CHECKED BY	M. Olaire 11-06-95
SUPV. BY	D. Carter 11-6-95
SUBM TO BY	R. E. Williams 11-6-95
APP'D BY	
APP'D BY	
APP'D BY	

H-1 RECEIVING HOPPER
CONCRETE PLAN,
SECTIONS AND DETAILS

WESTATES CARBON, INC.
CARBON REGENERATION FACILITY
PARKER, ARIZONA

DRAWING NUMBER 01-29-1001 REV. NO. 0

NO. | REVISIONS | MADE | CKD. | DATE | DRAWING NO. | REFERENCES

Rev	Date	Description	Prepared by: ***John F. Bradley, S.E.*** Arizona Registered Structural Engineer Lic. #36412 Atascadero, California		JOB NO.	2408160
0	12/12/15	Orig			SHT 1 OF 17	
1	1/21/15	Shts 1,3,4 & 8			DATE	1/21/2015
			FOR	Hopper H1 (270 cu ft Capacity)	DES. BY	JFB
			DESCRIPTION	Design of Vessel & Supports	REV	1

STRUCTURAL CALCULATIONS FOR

Hopper H1 (270 cu ft Capacity)

Design of Vessel & Supports

Double Wall Stainless Steel

14.17 ft x 8.25 ft x 7 ft Tall Supported by Concrete Vault

REVISION 1

Dated January 21, 2015

(Added Channel Spacers @ Corners of Hopper)

LOCATED AT

Parker, Arizona

Calculations Prepared For:
Evoqua Water Technologies
2523 Mutahar Street
Parker, AZ 85344
Ph (928) 669-5758, Fax (928) 669-5775

Table of Contents

Design Summary

Product Stored:	Spent Activated Carbon (Design for Both Liquid Slurry & Dry Granular Material)
Specific Gravity:	1.50
Max Temperature:	150^{o} F
Design Pressure:	Atmospheric
Design Codes:	1) API 650 11th Edition
	2) IBC 2012 for Seismic
Wind Design:	Vessel is indoors; wind is not considered
Seismic Design:	IBC 2012: S_S = 0.23g, S_1 = 0.15g, I_e = 1.5, Site Class D

Description △1

This vessel is a double-wall inverted pyramid hopper for use inside a water treatment plant near Parker, Arizona. Product is spent activated carbon granular material (both liquid slurry and dry granular material). Material used for the tank construction is SS304 stainless steel except for the inner shell in contact with product which is SS316. Inner shell is separated from outer shell by (16) evenly spaced bent plate channel spacers @ 1 1/2" tall. These spacers are attached to inside of outer shell. Inner shell is 3/8" thick SS316 plate, and outer shell is 1/4" SS304 plate.

Design Criteria

Specific gravity of product is provided by customer at 1.50 (conservative). Tank is designed for atmospheric pressure (no internal pressure or vacuum) and ambient temperature. Design codes used for this tank are API 650 and IBC 2012. There are no American codes that specifically address all components of hoppers, so other codes & design procedures will be used as appropriate. Allowable steel stresses are taken per API 650. Wind and seismic loads are calculated both per IBC 2012, and load combinations are taken per IBC 2012. Seismic design values above are 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 shell transfers loads to the outer shell at discreet locations of spacers. In event of leak in inner shell, space between the two shells may fill up, subjecting the outer shell to uniform product pressure. This full product pressure could only be developed for liquid slurry condition, but 5' head on dry product will conservatively be considered for design of both the inner and outer shell. Vessel is supported at a stiffened rectangular compression bar (base plate) at top of vault walls, and vessel is anchored to tops of these walls.

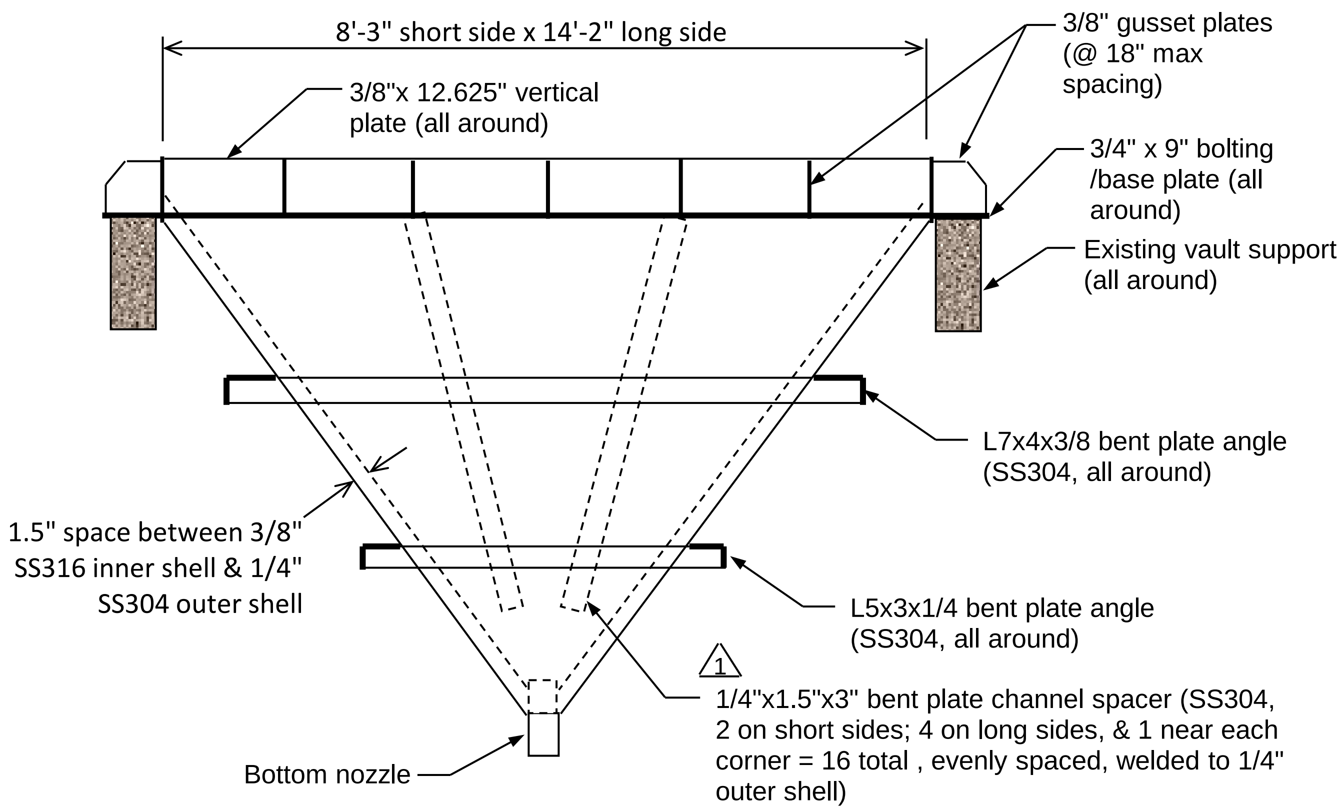
Vessel is replacing an similar existing hopper at same location. Vessel is supported on (3) walls of a concrete vault, and by an HSS8x8 along one (short) side. Existing anchor bolts are corroded and will be cut off and not reused. New epoxy anchors will be installed in existing concrete walls and welded to existing HSS tube. Check of existing concrete vault is beyond the scope of these calcs, but it should be adequate as hopper is being replaced in kind. For lateral load calculations, it is assumed that tank is a pendulum-type structure rigidly supported at anchor plates. For seismic OTM calculations, product head above the anchor bolt circle is conservatively ignored.

For: Evoqua Water Technologies
Parker, Arizona
By: John F. Bradley, S.E.
January 21, 2015

Hopper H1 (270 cu ft Capacity)
Location: Parker, Arizona
Design of Vessel & Supports
Sheet 4

Design Criteria & Sketch

Product Stored:	Spent Activated Carbon (Design for Both Liquid Slurry & Dry Granular Material)
Specific Gravity:	1.50
Max Temperature:	150^o F
Min Design Metal Temp:	-20^o F
Design Pressure:	0 psig (atmospheric)
Corrosion Allowance:	0 in
Design Codes:	1) API 650 11th Ed.
	2) IBC 2012 for Wind & Seismic
Seismic Design:	S_S = 0.23g, S_1 = 0.15g, F_a = 1.60, F_v = 2.40, I_e = 1.5, Site Class D
	Seismic Design Category B
Wind Design:	Not Required



Weights: Empty Vessel = W_{empty} =	7.5	k
Product in tank (full to grating level) =	25.3	k
Tank + operating product = W_{full1} =	32.8	k
5' head of dry product above top of grating =	54.7	k
Tank + operating product + head = W_{full2} =	87.5	k

IBC 2012 Seismic Design Loads

IBC 2012 Seismic Design Loads: (ref ASCE 7-10 Sections 13 & 15)

Governing Seismic Design Acceleration:

Horizontal:	$A_i = (0.4a_pS_{DS}I_p)[1+2(z/h)]/R_p =$	0.059 g		(Eq 13.3-1)
	or, $A_i = 0.3S_{DS}I_e =$	0.110 g	GOVERNS	(Eq 15.4-5)
	Where: $S_{DS} = (2/3)F_aS_s =$	0.245		
	$F_a =$	1.600		
	$S_s =$	0.230		
	$a_p =$	1.0		
	$R_p =$	2.5 (per ASCE 7-10, Table 13.6-1)		
	$I_e = I_p =$	1.50		
Vertical:	$A_v = 0.2S_{DS}I_p =$	0.074 g		

Base Shear: (ref ASCE 7-10 Eq. 12.8-1)

Vessel full:	$V_{s\text{-}full} = A_iW_{full2} =$	**9.66 k**	GOVERNS
	Where: Design acceleration = $A_i = C_s =$	0.110 g	
	$W_{full2} =$	87.50 k	
Vessel empty:	$V_{s\text{-}empty} = A_iW_{empty} =$	**0.83 k**	
	$W_{empty} =$	7.50 k	

Overturning Moments (at anchor plate level):

Vessel full:	$M_{s\text{-}full} = (V_{s\text{-}full})(CG_{full}) =$	**16.91 ft-k**	GOVERNS
	Where: $CG_{full} =$	1.75 ft (below top of vault / anchor plate)	
Vessel empty:	$M_{s\text{-}empty} = (V_{s\text{-}empty})(CG_{empty}) =$	**1.45 ft-k**	
	Where: $CG_{empty} =$	1.75 ft	

Resisting Moments (at anchor plate level, conserv. ignore product head above grating):

Vessel full:	$M_{resist} = (0.6)(W_{full1})(8.25/2) =$	**81.18 ft-k**
Vessel empty:	$M_{resist} = (0.6)(W_{empty})(8.25/2) =$	**18.56 ft-k**

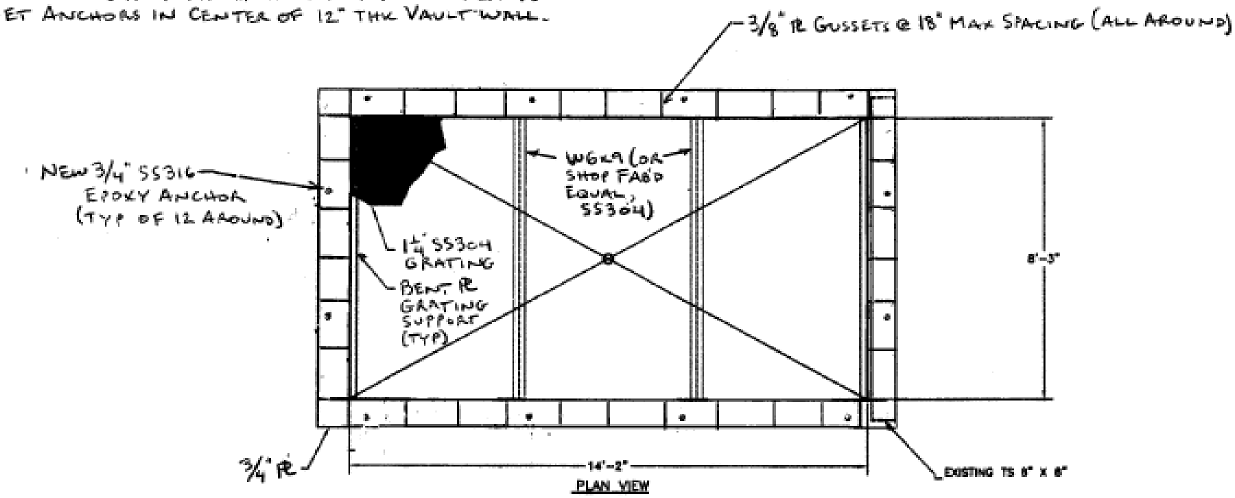
(Since OTM < resisting moment, hopper is stable for seismic overturning)

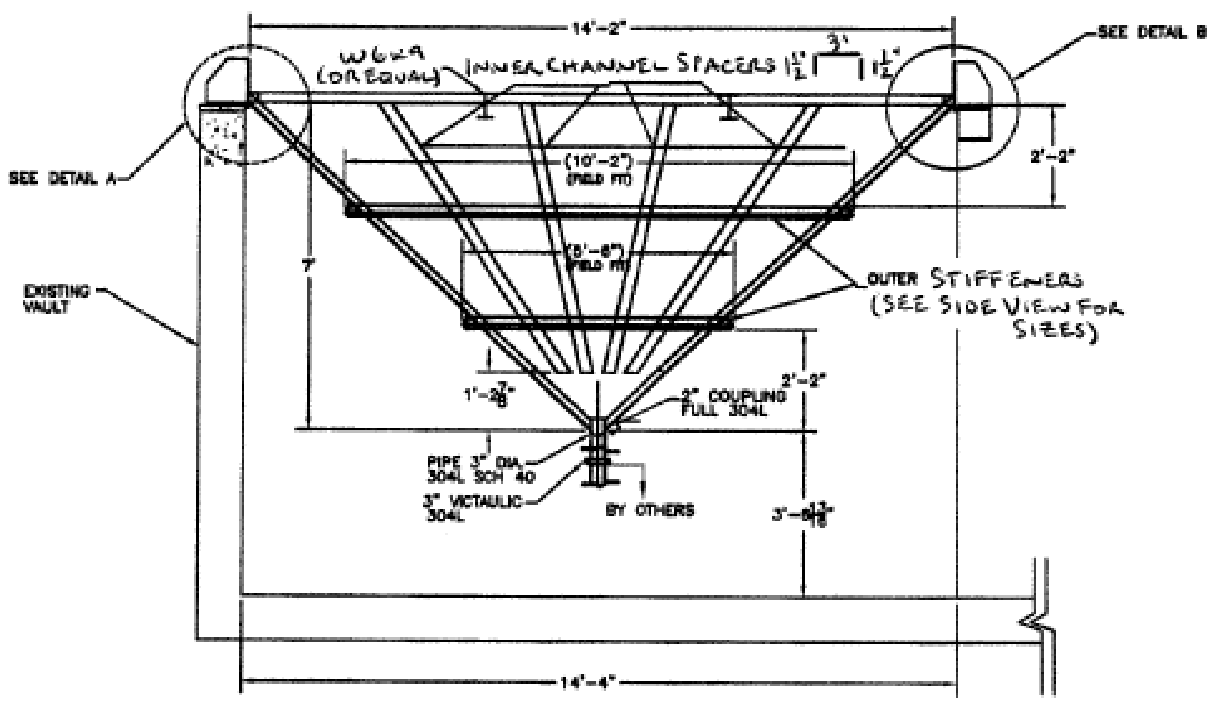
For: Evoqua Water Technologies
Parker, Arizona
By: John F. Bradley, S.E.
January 21, 2015

Hopper H1 (270 cu ft Capacity)
Location: Parker, Arizona
Design of Vessel & Supports
Sheet 6

Hopper Details

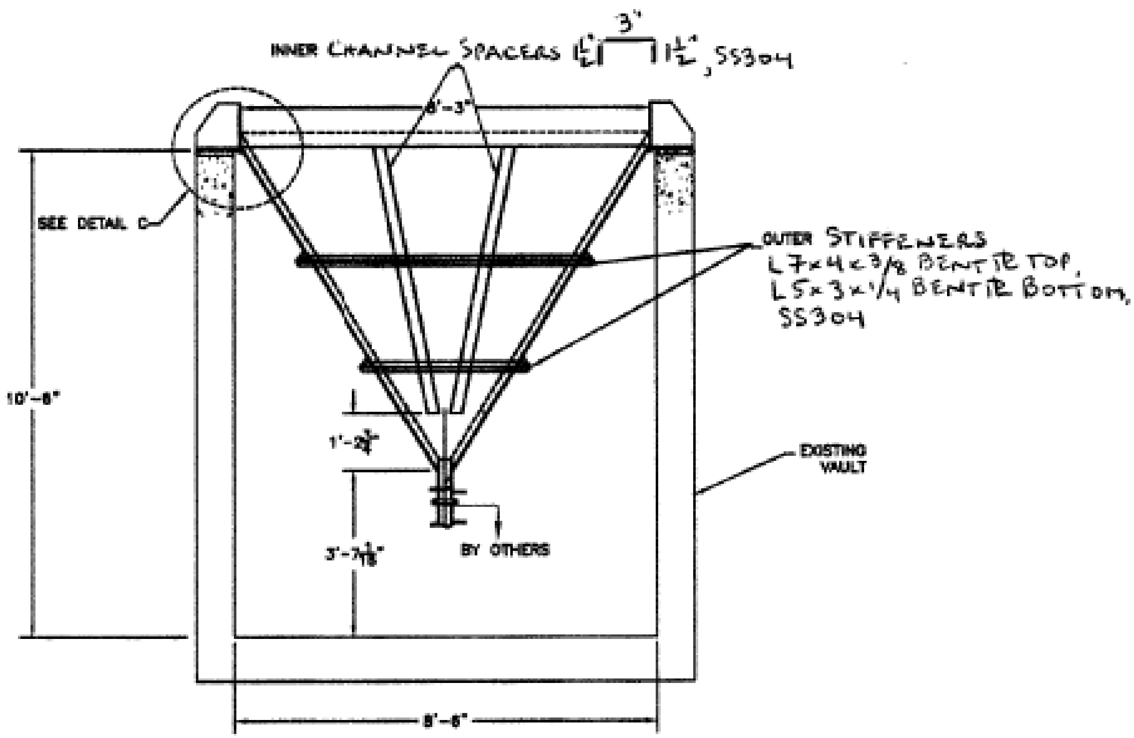
NOTES:
1) CUT EXISTING CORRODED STUDS FLUSH W/ TOP OF VAULT WALLS.
2) FIELD DRILL & INSTALL (12) NEW HILTI EPOXY ANCHORS IN LOCATIONS SHOWN AFTER HOPPER IS SET IN PLACE. SET ANCHORS IN CENTER OF 12" THK VAULT WALL.



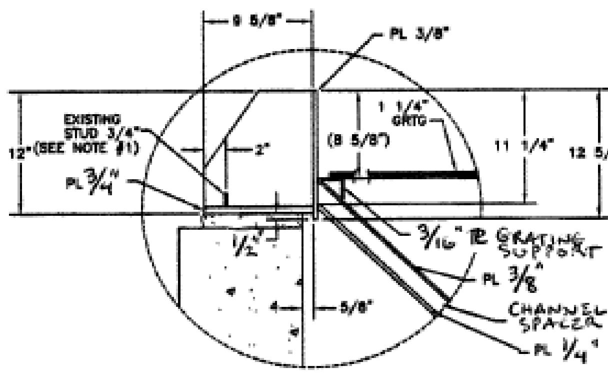


FRONT VIEW

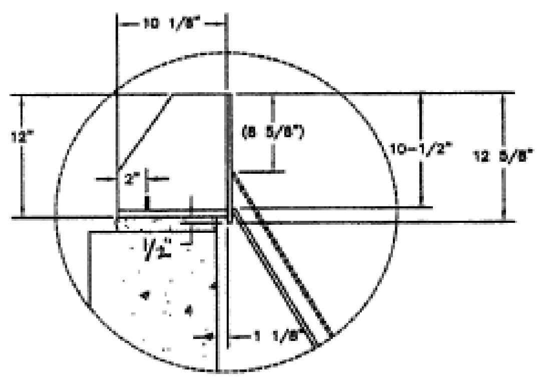
Hopper Details, cont.



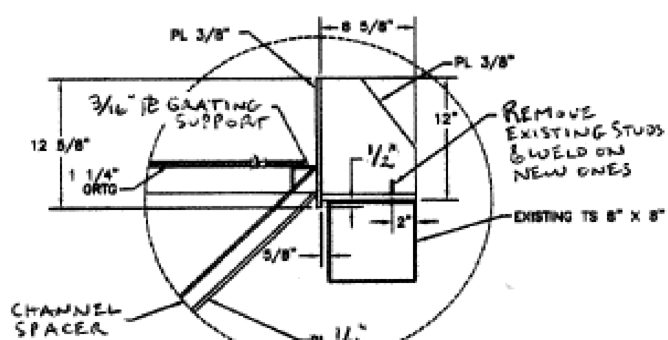
SIDE VIEW



DETAIL —A—

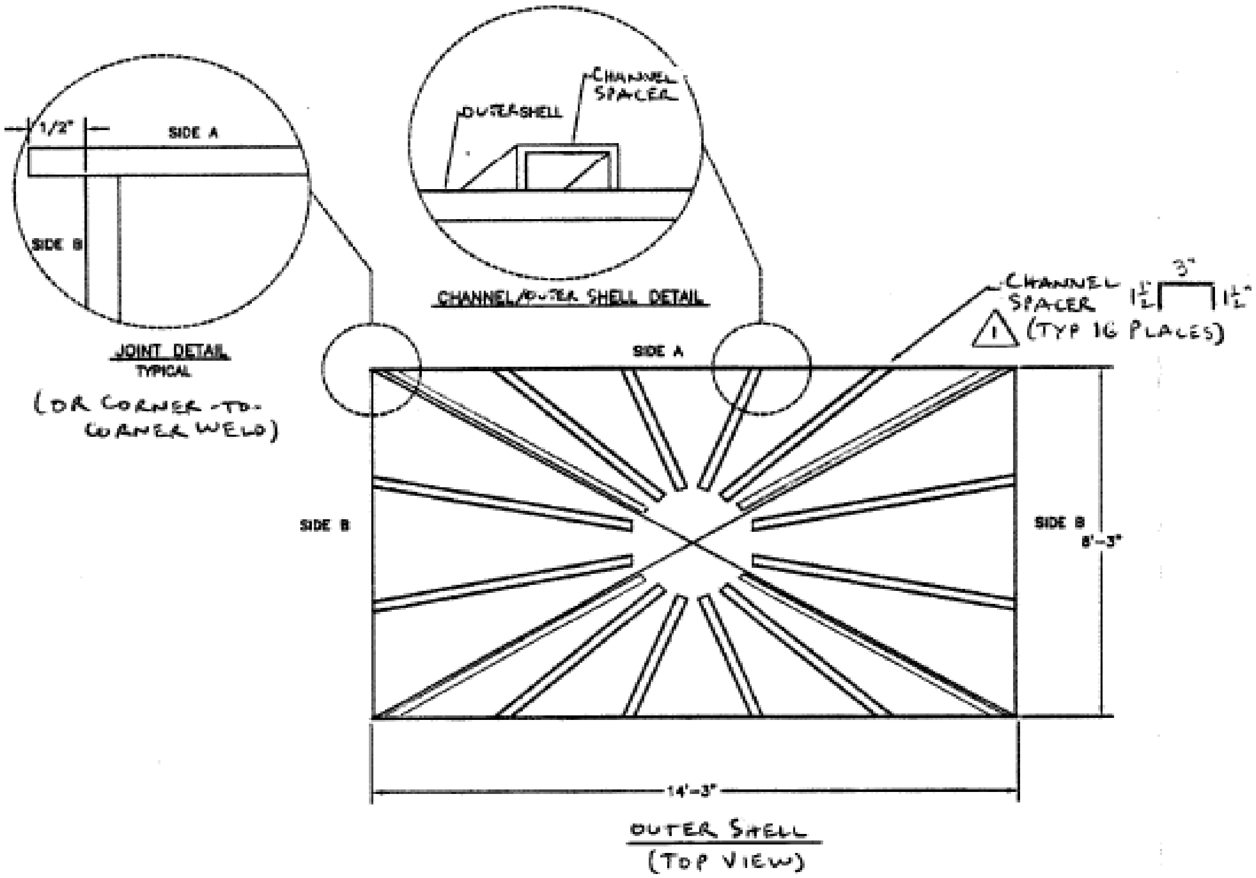


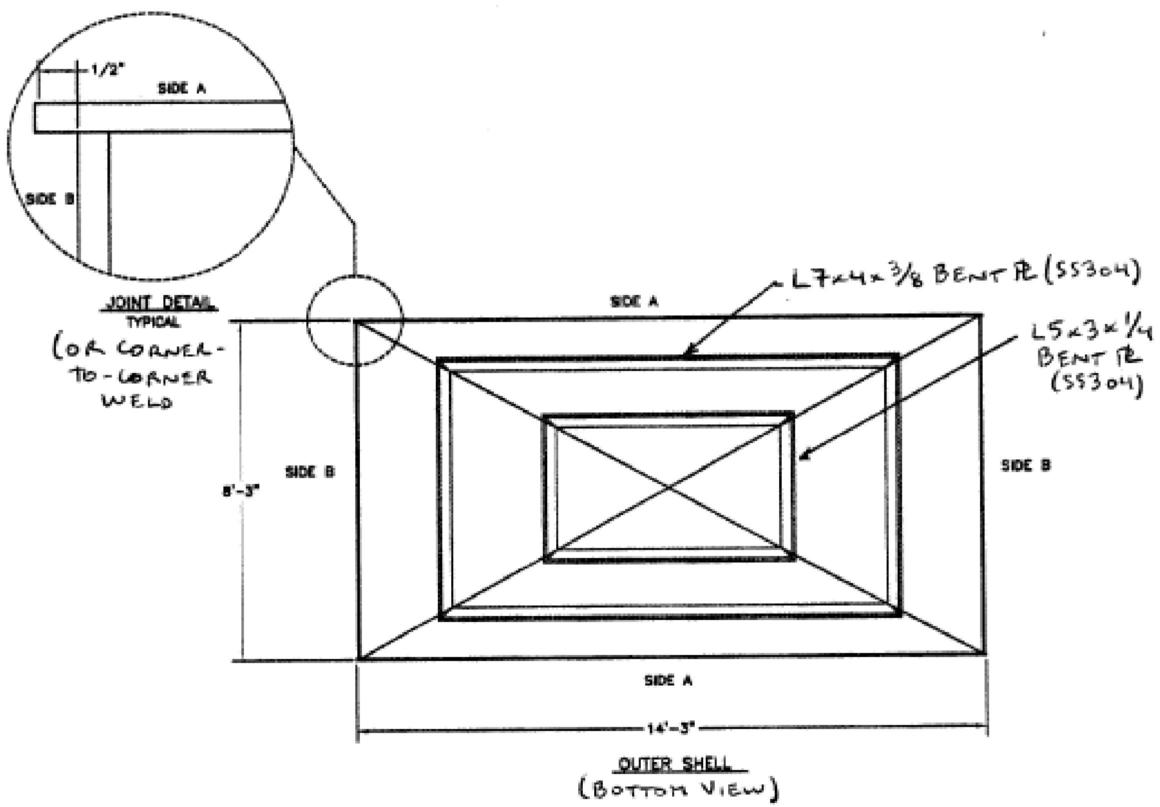
DETAIL —C—



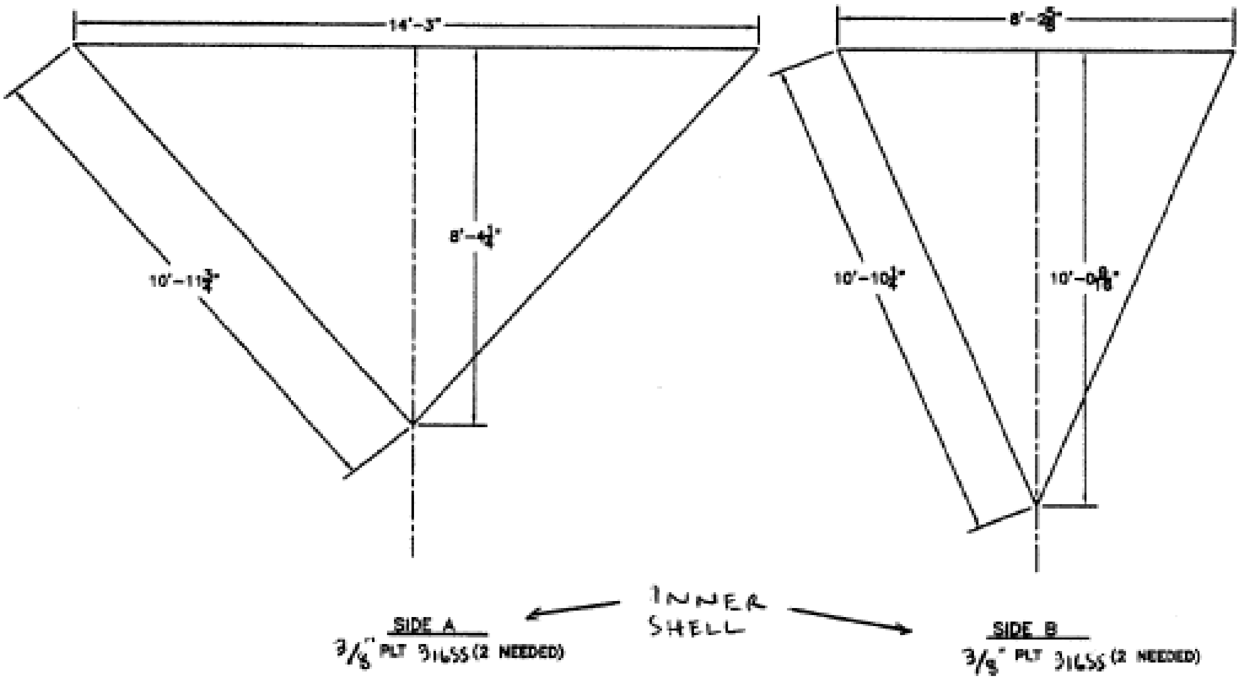
DETAIL —B—

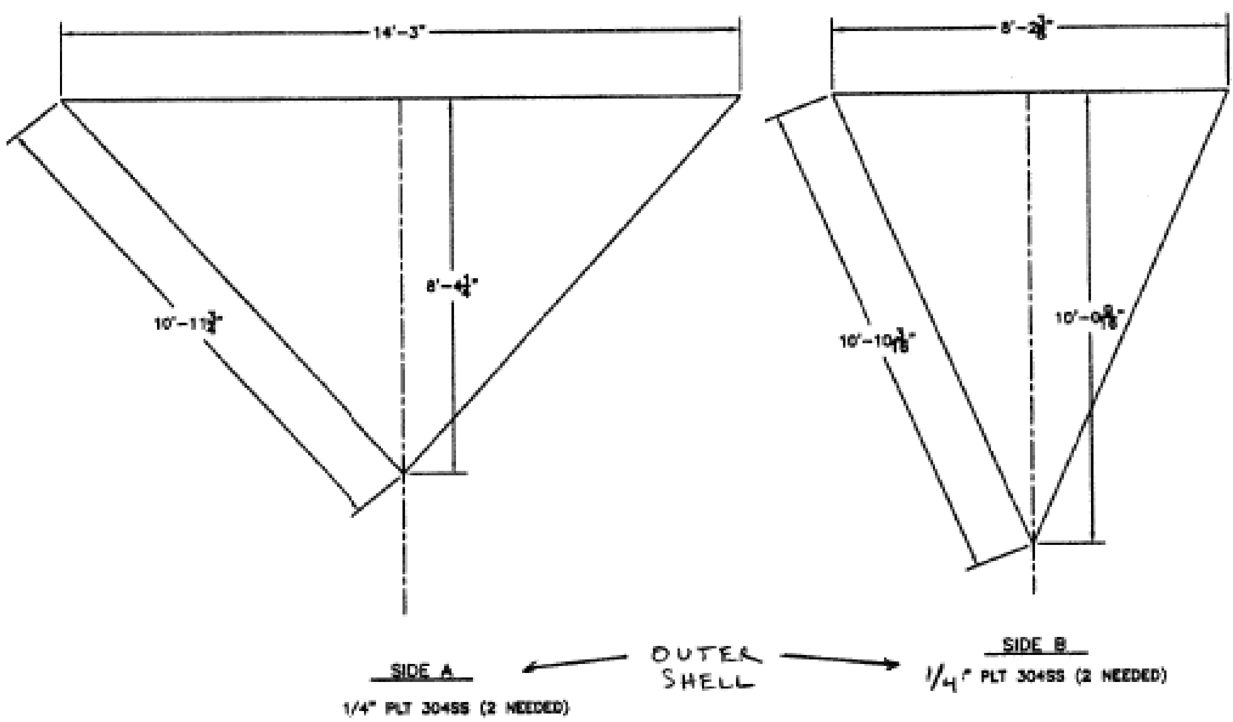
Hopper Details, cont.





Hopper Details, cont.





Design Hopper Components

<u>Spacing of C3x1.5x1/4 Spacers Between Inner & Outer Walls</u>

- Spacers are welded to 1/4" outer shell with min weld shown below
- Support spacing for 1/4" outer wall governs over 3/8" thick inner hopper wall
- Consider granular material with 5' head as governing condition for these checks

Check plate midway down hopper wall:

Max allowable stiffener spacing:

$L_s = (54000t^2/p)^{1/2}$ =	30.3	in	
Where: t =	0.25	in	
p =	3.68	psi	
Max actual stiffener spacing =	17	in	**< Allowable, OK**

Check midway between upper horz stiffener and grating:

Max allowable stiffener spacing:

$L_s = (54000t^2/p)^{1/2}$ =	35.0	in	
Where: t =	0.25	in	
p =	2.76	psi	
Max actual stiffener spacing =	29.3	in	**< Allowable, OK**

<u>Check C3x1.5x1/4 Stiffeners/Spacers Between Inner & Outer Walls</u>

Short side of hopper

Check stiffener midway down hopper wall:

f_b = M/S =	9845	psi	
Where: M = $wL^2/8$ =	12110	in-lbs	
w =	60.7	pli	
L =	40.0	in	
S =	1.23	in^3	
F_b = (0.7)(22,500 psi) =	15750	psi	**> Actual, OK**

Check midway between upper horz stiffener and grating:

f_b = M/S =	12978	psi	
Where: M = $wL^2/8$ =	15963	in-lbs	
w =	80.0	pli	
L =	40.0	in	
S =	1.23	in^3	
F_b = (0.7)(22,500 psi) =	15750	psi	**> Actual, OK**

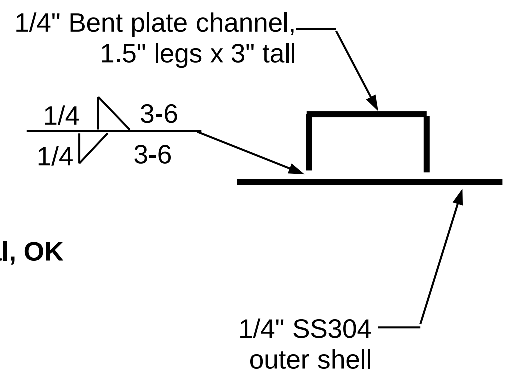
Long side of hopper

Check stiffener midway down hopper wall:

f_b = M/S =	7053	psi	
Where: M = $wL^2/8$ =	8675	in-lbs	
w =	62.5	pli	
L =	33.3	in	
S =	1.23	in^3	
F_b = (0.7)(22,500 psi) =	15750	psi	**> Actual, OK**

Check midway between upper horz stiffener and grating:

f_b = M/S =	9088	psi	
Where: M = $wL^2/8$ =	11178	in-lbs	
w =	80.5	pli	
L =	33.3	in	
S =	1.23	in^3	
F_b = (0.7)(22,500 psi) =	15750	psi	**> Actual, OK**



<u>Channel Spacer Details</u>

Check Hopper Components, cont.

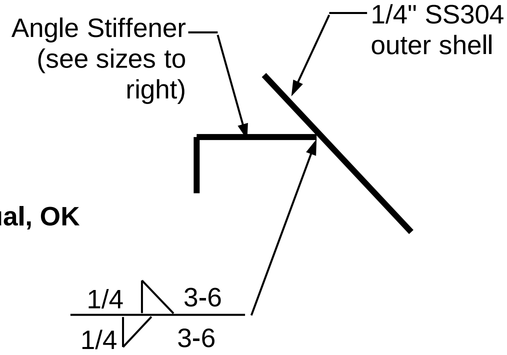
Angle Stiffeners on Outside of Exterior Shell

Upper stiffener (governing condition is long side)

f_b = M/S =	15587	psi	
Where: M = $wL^2/8$ =	199508	in-lbs	
w =	107.2	pli	
L =	122.0	in	
Try **L7x4x3/8** welded to 1/4" shell, S =	12.8	in^3	
F_b = (0.7)(22,500 psi) =	15750	psi	**> Actual, OK**

Lower stiffener (governing condition is long side)

f_b = M/S =	15135	psi	
Where: M = $wL^2/8$ =	75071	in-lbs	
w =	137.9	pli	
L =	66.0	in	
Try **L5x3x1/4** welded to 1/4" shell, S =	4.96	in^3	
F_b = (0.7)(22,500 psi) =	15750	psi	**> Actual, OK**



Exterior Stiffener Details

Top Compression Bar

Short side of hopper:	f_b = M/S =	8421	psi	
	Where: M = $wL^2/8$ =	117563	in-lbs	
	w =	96.0	pli	
	L =	99.0	in	
	Try FB 3/4"x 9" welded to 3/8" x 12.625" vert plate, S =	13.96	in^3	
	F_b = (0.7)(22,500 psi) =	15750	psi	**> Actual, OK**
Long side of hopper:	f_b = M/S =	14464	psi	
	Where: M = $wL^2/8$ =	201923	in-lbs	
	w =	55.9	pli	
	L =	170.0	in	
	Try FB 3/4"x 9" welded to 3/8" x 12.625" vert plate, S =	13.96	in^3	
	F_b = (0.7)(22,500 psi) =	15750	psi	**> Actual, OK**

3/8" x 12.625" Top Vertical Perimeter Plate

Max spacing of gussets for 5' of head pushing outward:

Max allowable gusset spacing:

$L_s = (54000t^2/p)^{1/2}$ =	48.3	in	
Where: t =	0.375	in	
p =	3.25	psi	
Max actual stiffener spacing =	18	in (max)	**< Allowable, OK**

Check 18" spacing of gussets for forces due to hopper inner wall pulling inward:

f_b = M/S =	13134	psi	
Where: M = $wL^2/8$ =	3886	in-lbs	
w =	96.0	pli	
L =	18.0	in	
3/8" x 12.625" tall plate, S =	0.30	in^3	
F_b = (0.7)(22,500 psi) =	15750	psi	**> Actual, OK**

Check Hopper Components, cont.

Grating Max span of bearing bars = 4.72 ft

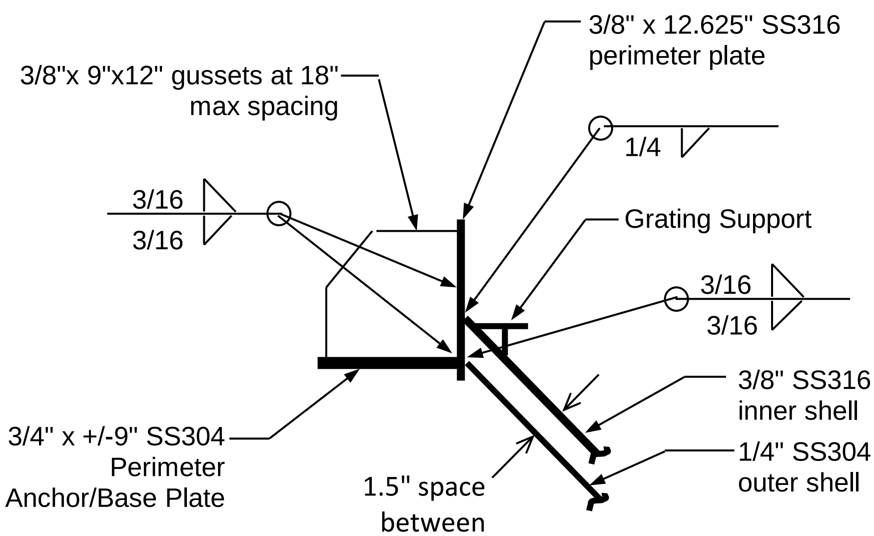
Use 1 1/4" x 3/16" Galvanized Stainless Steel Bar Grating (19-W-4)

→ Allowable uniform load = 325 psf > 100 psf √ OK

(see attached grating data sheet)

Grating Support Beam

f_b = M/S =	10408	psi
Where: M = $wL^2/8$ =	57867	in-lbs
w =	47.2	pli
L =	99.0	in
Try W6x9 (or shop fab'd equal), S =	5.56	in^3
F_b = (0.7)(22,500 psi) =	15750	psi **> Actual, OK**



Section thru Top Edge of Hopper

Hopper Grating

Per chart below, 1 1/4 x 3/16 W-19-4 stainless steel grating is OK for up to 325 psf > 100 psf. √ OK

Stainless Steel Grating Load Table

19-4 / 19-2 LOAD TABLE

BEARING BAR SIZE		UNSUPPORTED SPAN 2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"	WEIGHT PER SQ. FT. (LBS.) 19-4	19-2	15-4	15-2	11-4	11-2	7-4	7-2
3/4 X 1/8	U	395	253	175	129	99	78								4.0	4.8	4.9	5.7	6.4	7.2	9.7	10.7
	D	.114	.179	.257	.350	.457	.579															
	C	395	316	263	226	197	175															
	D	.091	.143	.206	.280	.366	.463															
3/4 X 3/16	U	592	379	263	193	148	117								5.6	6.4	6.9	7.7	9.2	10.0	14.5	16.0
	D	.114	.179	.257	.350	.457	.579															
	C	592	474	395	338	296	263															
	D	.091	.143	.206	.280	.366	.463															
1 X 1/8	U	702	449	312	229	175	139	112	93	78					5.1	5.9	6.2	7.1	8.2	9.0	12.9	14.2
	D	.086	.134	.193	.263	.343	.434	.536	.648	.771												
	C	702	561	468	401	351	312	281	255	234												
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617												
1 X 3/16	U	1053	674	468	344	263	208	168	139	117					7.4	8.4	9.2	10.2	12.1	13.1	19.4	21.3
	D	.086	.134	.193	.263	.343	.434	.536	.648	.771												
	C	1053	842	702	602	526	468	421	383	351												
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617												
1-1/4 X 1/8	U	1096	702	487	358	274	217	175	145	122	104	90			6.4	7.4	7.8	8.8	10.3	11.3	15.8	17.1
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617	.724	.840										
	C	1096	877	731	627	548	487	439	399	365	337	313										
	D	.055	.086	.123	.168	.219	.278	.343	.415	.494	.579	.672										
1-1/4 X 3/16	U	1645	1053	731	537	411	325	263	217	183	156	134			9.0	10.0	11.2	12.2	14.9	15.9	23.8	25.7
	D	.069	.107	.154	.210	.274	.347	.429	.519	.617	.724	.840										
	C	1645	1316	1096	940	822	731	658	598	548	506	470										
	D	.055	.086	.123	.168	.219	.278	.343	.415	.494	.579	.672										
1-1/2 X 1/8	U	1579	1011	702	516	395	312	253	209	175	149	129	99	78	7.4	8.4	9.2	10.2	12.1	13.1	18.8	20.0
	D	.057	.089	.129	.175	.229	.289	.357	.432	.514	.604	.700	.914	1.157								
	C	1579	1263	1053	902	789	702	632	574	526	486	451	395	351								
	D	.046	.071	.103	.140	.183	.231	.286	.346	.411	.483	.560	.731	.926								
1-1/2 X 3/16	U	2368	1516	1053	773	592	468	379	313	263	224	193	148	117	11.1	12.5	13.7	15.1	18.1	19.6	28.1	30.1
	D	.057	.089	.129	.175	.229	.289	.357	.432	.514	.604	.700	.914	1.157								
	C	2368	1895	1579	1353	1184	1053	947	861	789	729	677	592	526								
	D	.046	.071	.103	.140	.183	.231	.286	.346	.411	.483	.560	.731	.926								
1-3/4 X 3/16	U	3224	2063	1433	1053	806	637	516	426	358	305	263	201	159	12.7	14.1	15.7	17.1	20.9	22.3	32.5	34.4
	D	.049	.077	.110	.150	.196	.248	.306	.370	.441	.517	.600	.784	.992								
	C	3224	2579	2149	1842	1612	1433	1289	1172	1075	992	921	806	716								
	D	.039	.061	.088	.120	.157	.198	.245	.296	.353	.414	.480	.627	.793								
2 X 3/16	U	4211	2695	1871	1375	1053	832	674	557	468	399	344	263	208	14.3	15.7	17.8	19.2	23.7	25.1	36.9	38.8
	D	.043	.067	.096	.131	.171	.217	.268	.324	.386	.453	.525	.686	.868								
	C	4211	3368	2807	2406	2105	1871	1684	1531	1404	1296	1203	1053	936								
	D	.034	.054	.077	.105	.137	.174	.214	.259	.309	.362	.420	.549	.694								
2-1/4 X 3/16	U	5329	3411	2368	1740	1332	1053	853	705	592	505	435	333	263	15.9	17.4	19.8	21.2	26.5	27.9	41.3	43.2
	D	.038	.060	.086	.117	.152	.193	.238	.288	.343	.402	.467	.610	.771								
	C	5329	4263	3553	3045	2664	2368	2132	1938	1776	1640	1523	1332	1184								
	D	.030	.048	.069	.093	.122	.154	.190	.230	.274	.322	.373	.488	.617								
2-1/2 X 3/16	U	6579	4211	2924	2148	1645	1300	1053	870	731	623	537	411	325	17.5	19.0	21.8	23.3	29.2	30.7	45.6	47.5
	D	.034	.054	.077	.105	.137	.174	.214	.259	.309	.362	.420	.549	.694								
	C	6579	5263	4386	3759	3289	2924	2632	2392	2193	2024	1880	1645	1462								
	D	.027	.043	.062	.084	.110	.139	.171	.207	.247	.290	.336	.439	.555								

LOADS AND DEFLECTIONS ARE THEORETICAL VALUES BASED ON 20,000 PSI UNIT STRESS. FOR PEDESTRIAN COMFORT DEFLECTIONS IN EXCESS OF 1/4" ARE NOT RECOMMENDED.

U = SAFE UNIFORM LOAD, LBS. PER SQ. FT.
C = SAFE CONCENTRATED MID-SPAN LOAD, LBS. PER FT. OF GRATING WIDTH
D = DEFLECTION IN INCHES

NOTE: WHEN GRATINGS WITH SERRATED BEARING BARS ARE SELECTED, THE DEPTH OF GRATING REQUIRED TO SERVICE A SPECIFIED LOAD WILL BE 1/4" GREATER THAN THAT SHOWN IN THE TABLES ABOVE.

CONVERSION TABLE

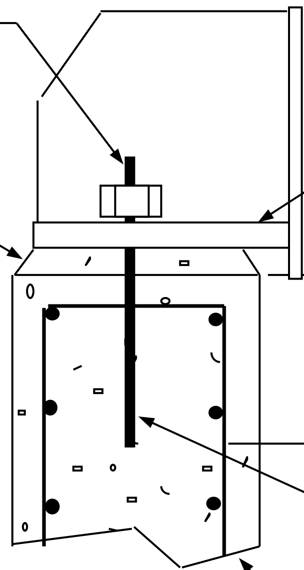
The loads shown above are for type 19-4 and 19-2 gratings. To determine the load carrying capacity for alternative bar spacings, multiply the loads given by the following conversion factors (DEFLECTION REMAINS CONSTANT): **FOR TYPES 15-4 AND 15-2: 1.26** **FOR TYPES 11-4 AND 11-2: 1.72** **FOR TYPES 7-4 AND 7-2: 2.71**

SELECTION GUIDE: 19-4 PLAIN SURFACE GRATING

For deflection of not more than 1/4" when subjected to the severest of the following: (1) the uniform loads below; (2) under concentrated mid-span loads of 300 lbs. up to 6'-0" span; or (3) 400 lbs. for spans 6'-0" and over.

SAFE UNIFORM LOAD LBS./SQ. FT.	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"
50	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16
75	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16
100	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2-1/4 x 3/16	2-1/2 x 3/16
125	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16	–
150	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2 x 3/16	2-1/2 x 3/16	–
200	1 x 1/8	1 x 1/8	1 x 1/8	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16	–	–
300	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2 x 3/16	2-1/4 x 3/16	2-1/2 x 3/16	–	–

Anchorage Summary - Hilti Epoxy Anchors



Anchor Bolt Summary

	Use (12) - 0.75 inch diameter threaded rod Anchor Bolts Around Base Plate		
	Material = ASTM F593 CW2 (316) (threaded rod)		
(Recommended min)	Projection above concrete =	3	in + grout thickness (if this vessel is grouted)
	Min Embedment =	6.0	in
	Min Edge Distance =	6.0	in (all sides of all anchor bolts)
	Min Concrete f'_c =	3000	psi

Tank Anchorage (Hilti Epoxy Anchors)

Check Anchor Bolts per IBC 2012 "Strength Design", ACI 318-11, Appendix D & Hilti ESR-2322.

Trial Input Data

Bolt diameter (d_o) =	0.750	in dia.	
Bolt material =	ASTM F593 CW2 (316)		(threaded rod)
Yield strength of bolt material =	45	ksi	
Bolt embedment depth (h_{ef}) =	6	in	
Minimum bolt edge distance (c_1) =	6	in	
Cross-sectional area of bolt (A_d) =	0.44	in^2	
Tensile stress area of bolt (A_{se}) =	0.334	in^2	
Minimum root area of bolt (A_r) =	0.302	in^2	
Minimum Concrete f_c' =	3000	psi	
Seismic overturning moment (M_s) =	16.91	ft-k	
Seismic Base Shear (V_s) =	9.66	k	
Empty wt. of tank =	7.5	k	
Full wt. product & tank (W_T) =	32.8	k	

Seis. pullout for IBC strength level equations = $1.0E_{tension} - 0.6D$ =	0.01	k/bolt
Where: $E_{tension}$ =	0.50	k/bolt
D =	0.81	k/bolt
Seismic shear used in IBC strength level equations = $1.0E_{shear}$ =	1.21	k/bolt

(conservatively ignore resisting friction due to weight of tank & product)

Total strength level design pullout (N_u) =	0.01	k/bolt
Total strength level design shear (V_u) =	1.21	k/bolt

Per IBC 2012 Anchor Bolts are Acceptable If:

Anchor bolt tensile strength is greater than factored tension load: $\phi N_n > N_u$

and anchor bolt shear strength is greater than factored shear load: $\phi V_n > V_u$

And if interaction checks are satisfied (see loads below):

Case 1) Steel strength:	$N_u/\phi N_s + V_u/\phi V_s$ =	**0.118**	**< 1.2 -- OK**
Case 2) Concrete breakout:	$N_u/\phi N_{cb} + V_u/\phi V_{cb}$ =	**0.328**	**< 1.2 -- OK**

<u>Therefore Anchors are OK per Interaction Checks</u>

Tank Anchorage (Hilti Epoxy), cont.

Check anchor bolt tension:

Check following cases:
1) Steel strength of anchor in tension: $\phi N_s > N_u$
2) Concrete breakout strength of anchor in tension: $\phi N_{cb} > N_u$
3) Pullout strength of anchor in tension: $\phi N_{pn} > N_u$
4) Concrete side-face blowout strength of anchor in tension: $\phi N_{sb} > N_u$

Factored seismic uplift load per bolt (N_u) = **0.01** k (see above)

Case (1): Steel strength of anchor in tension: $\phi N_s > N_u$

$\phi N_s = \phi A_{se} f_{ut}$ = **18.56 k > 0.01 k -- OK**

Where: ϕ = 0.65

f_{ut} = 85.5 ksi

ESR-1682 Test Results (for reference only): **12.39 k > 0.01 k -- OK**

Case (2): Concrete breakout strength of anchor in tension: $\phi N_{cb} > N_u$

$\phi N_{cb} = (\phi)(A_{Nc}/A_{Nco})(\psi_{ed,N})(\psi_{c,N})(\psi_{cp,N})(N_b)$ = **8.65 k > 0.01 k -- OK**

Where: ϕ = 0.65

A_{Nc} = 225 in^2

$A_{Nco} = 9h_{ef}^2$ = 324 in^2

$\psi_{ed,N} = 0.7+(0.3c)/(1.5h_{ef})$ = 1.0

$\psi_{c,N}$ = 1.4

$\psi_{cp,N}$ = 1.0

$N_b = k(f'_c)^{1/2}(h_{ef})^{1.5}$ = 13.7 k

k = 17

Case (3): Pullout strength of anchor in tension (see Hilti ESR-2322,4.1.4):

$\phi N_a = (\phi)(A_{Na}/A_{Nao})(\varphi_{p,Na} N_{ao})$ = **12.45 k > 0.01 k -- OK**

Where: ϕ = 0.65

$\varphi_{p,Na}$ = 1.4

A_{Na} = 212 in^2

A_{Nao} = 212 in^2

$N_{ao} = \pi \tau_{kcr} d h_{ef}$ = 13.68 k

Case (4): Concrete side-face blowout strength of anchor in tension: $\phi N_{sb} > N_u$

$\phi N_{sb} = \phi 160c(A_{brg})^{0.5}(f'_c)^{0.5}$ = **N/A k**

Equation does not apply since bolts are post-installed & not headed.
Since edge distance is 6 in, side blowout is not an issue
(ref. edge distance requirements in Hilti data sheets).

<u>Therefore Anchors are OK for Tension Loads</u>

Tank Anchorage (Hilti Epoxy), cont.

Check anchor bolt shear:

Check following cases:
1) Steel strength of anchor in shear: $\phi V_s > V_u$
2) Concrete breakout strength of anchor in shear: $\phi V_{cb} > V_u$
3) Concrete pryout strength of anchor in shear: $\phi V_{cp} > V_u$

Factored seismic shear load per bolt (V_u) = **1.21** k (see above)

Case (1): Steel strength of anchor in shear: $\phi V_s > V_u$

Check #1:	$\phi V_s = \phi 0.6 A_{se} f_{ut}$ =	**10.28 k**	**>**	**1.21 k -- OK**
	Where: ϕ =	0.60		
	f_{ut} =	85.5 ksi		
Check #2:	ϕV_s =	**10.24 k**	**>**	**1.21 k -- OK**
	Where: V_s =	17.06 k (see Hilti ESR-2322, Table 7)		
ESR-1682 Test Results (for reference only):		**6.38 k**	**>**	**1.21 k -- OK**

Case (2): Concrete breakout strength of anchor in shear: $\phi V_{cb} > V_u$

$\phi V_{cb} = (\phi)(A_{Vc}/A_{Vco})(\varphi_{edV}\varphi_{cV}V_b)$ =	**3.70 k**	**>**	**1.21 k -- OK**
Where: ϕ =	0.60		
A_V =	135 in^2	(based on min dim's)	
A_{Vo} =	162 in^2		
φ_{edV} =	1.0		
φ_{ecV} =	1.0		
$V_b = 7(\ell/d_o)^{0.2}(d_o)^{1/2}(f'_c)^{1/2}(c_1)^{1.5}$ =	7.4 k		
ℓ =	6.0 in		

Case 3) Concrete pryout strength of anchor in shear: $\phi V_{cp} > V_u$

Check #1:	$\phi V_{cp} = (\phi k_{cp} N_{cb})$ =	**15.97 k**	**>**	**1.21 k -- OK**
	Where: ϕ =	0.60		
	k_{cp} =	2.0		
	$N_{cb} = \phi N_{cb}/\phi$ =	13.3		
Check #2:	$\phi V_{cp} = (\phi k_{cp} N_a)$ =	**22.99 k**	**>**	**1.21 k -- OK**
	$N_a = (A_{Na}/A_{Nao})(\varphi_{pNa} N_{ao})$ =	19.16 k		
	$N_{ao} = \tau_{kcr}\pi d h_{ef}$ =	13.68 k		
	τ_{kcr} =	0.97		
	φ_{pNa} =	1.00		
	A_{Na} =	212 in^2		
	A_{Nao} =	212 in^2		

Therefore Anchors are OK for Shear Loads

Rev	Date	Description	Prepared by:		
0	1/21/15	Orig	***John F. Bradley, S.E.*** Arizona Registered Structural Engineer Lic. #36412 Atascadero, California	JOB NO.	2408161
				SHT 1 OF 13	
				DATE	1/21/2015
			FOR: Hopper H2 (50 cu ft Capacity)	DES. BY	JFB
			DESCRIPTION: Design of Vessel & Supports	REV	0

STRUCTURAL CALCULATIONS FOR

Hopper H2 (50 cu ft Capacity)

Design of Vessel & Supports

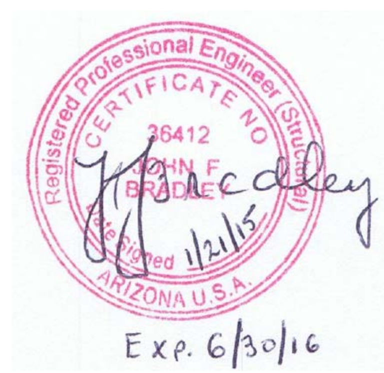
Double Wall Stainless Steel

6 ft x 5 ft x 4 ft Tall Supported on (4) Legs

REVISION 0

Dated January 21, 2015

(Original Calc Package)



LOCATED AT

Parker, Arizona

Calculations Prepared For:

Evoqua Water Technologies

2523 Mutahar Street

Parker, AZ 85344

Ph (928) 669-5758, Fax (928) 669-5775

Table of Contents

Design Summary

Product Stored:	Spent Activated Carbon (Design for Both Liquid Slurry & Dry Granular Material)
Specific Gravity:	1.50
Max Temperature:	150^{o} F
Design Pressure:	Atmospheric
Design Codes:	1) API 650 11th Edition
	2) IBC 2012 for Seismic
Wind Design:	Vessel is indoors; wind is not considered
Seismic Design:	IBC 2012: S_S = 0.23g, S_1 = 0.15g, I_e = 1.5, Site Class D

Description

This vessel is a double-wall inverted pyramid hopper for use inside a water treatment plant near Parker, Arizona. Product is spent activated carbon granular material (both liquid slurry and dry granular material). Material used for the tank construction is SS304 stainless steel except for the inner shell in contact with product which is SS316. Inner shell is separated from outer shell by (8) evenly spaced bent plate channel spacers @ 1 1/2" tall. These spacers are attached to inside of outer shell. Inner shell is 3/8" thick SS316 plate, and outer shell is 1/4" SS304 plate.

Design Criteria

Specific gravity of product is provided by customer at 1.50 (conservative). Tank is designed for atmospheric pressure (no internal pressure or vacuum) and ambient temperature. Design codes used for this tank are API 650 and IBC 2012. There are no American codes that specifically address all components of hoppers, so other codes & design procedures will be used as appropriate. Allowable steel stresses are taken per API 650. Wind and seismic loads are calculated both per IBC 2012, and load combinations are taken per IBC 2012. Seismic design values above are from USGS website for Parker, AZ.

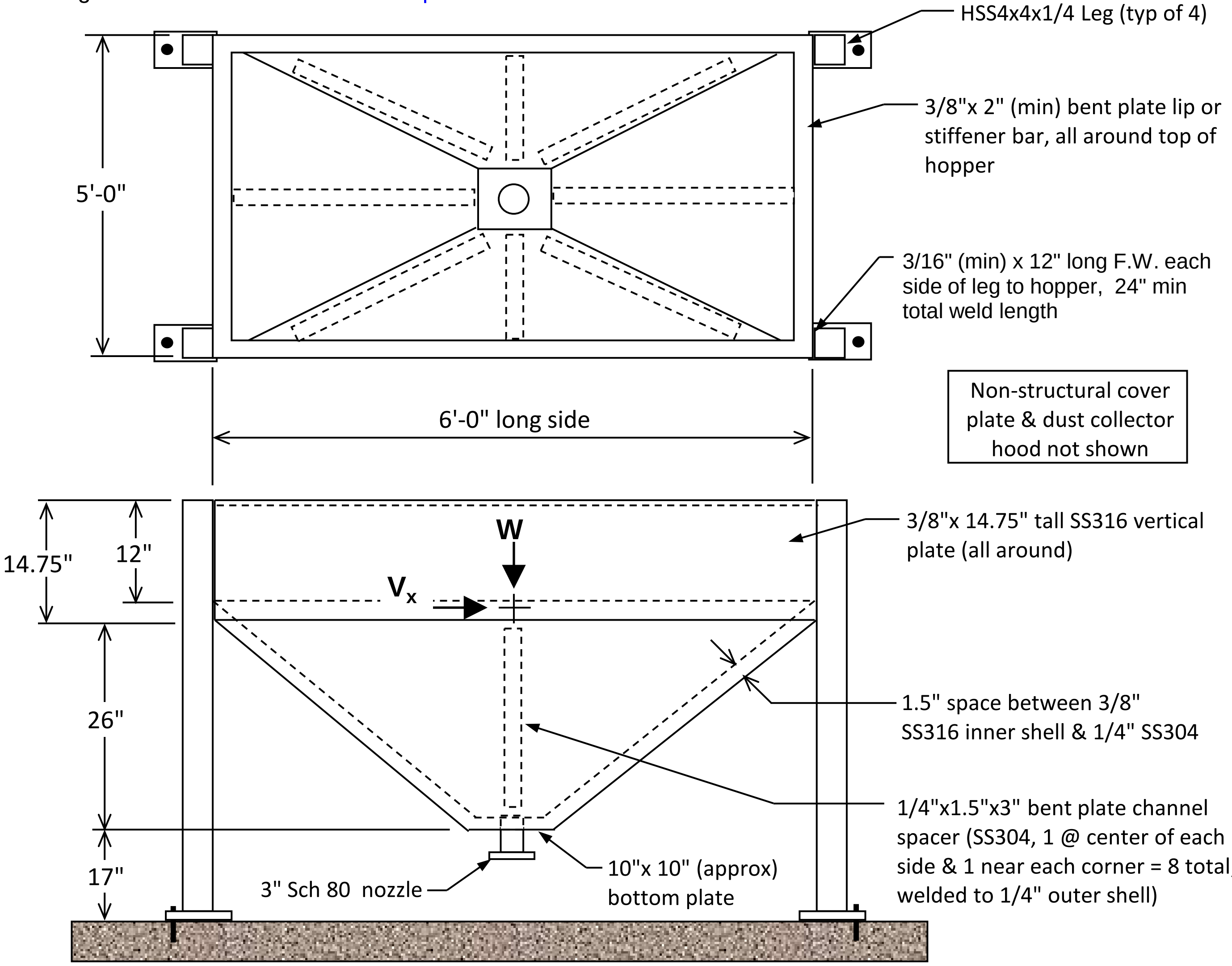
Design Methodology

The Inner tank shell is the normal pressure boundary; the outer tank is used for leak containment. Under normal loading, inner shell transfers loads to the outer shell at discreet locations of spacers. In event of leak in inner shell, space between the two shells may fill up, subjecting the outer shell to uniform product pressure. This full product pressure could only be developed for liquid slurry condition.

Vessel is replacing an similar existing hopper at same location. Vessel is supported by (4) HSS4x4x1/4 support legs. Existing anchor bolts are corroded and will be cut off and not reused. New epoxy anchors will be installed in existing concrete slab. Check of existing concrete slab is beyond the scope of these calcs, but it should be adequate as hopper is being replaced more or less in kind. For seismic calculations, tank is an elevated hopper on unbraced legs.

Design Criteria & Sketch

Product Stored:	Spent Activated Carbon (Design for Both Liquid Slurry & Dry Granular Material)
Specific Gravity:	1.50
Max Temperature:	150^o F
Min Design Metal Temp:	-20^o F
Design Pressure:	0 psig (atmospheric)
Corrosion Allowance:	0 in
Design Codes:	1) API 650 11th Ed.
	2) IBC 2012 for Wind & Seismic
Seismic Design:	S_S = 0.23g, S_1 = 0.15g, F_a = 1.60, F_v = 2.40, I_e = 1.5, Site Class D
	Seismic Design Category B
Wind Design:	Not Required



Weights: Empty Vessel = W_{empty} =	3.1	k
Product in tank (full to top of vertical side plate) =	4.7	k
Tank + operating product = W_{full} =	7.8	k

CBC 2013 Seismic Design Loads

CBC 2013 Seismic Design Loads:

Determine Natural Period of Tank + Supports:

Stiffness:	$k = (3EI/L^3)(4\text{ Legs}) =$	36.0	k/in
	Where: I_{diag} for each Leg =	8.22	in^4
	Natural frequency = $\omega = (k/m)^{0.5} =$	37.90	rad/sec
	$m = W_{full}/386.4 =$	0.025	$k \cdot s^2/in$
	Natural period = $T = 2\pi/\omega =$	0.166	sec

Governing Seismic Design Acceleration:

Horizontal:	$A_i = (0.4a_pS_{DS}I_p)[1+2(z/h)]/R_p =$	0.059	g		(Eq 13.3-1)
	or: $A_i = C_s = S_{DS}/(R/I) =$	0.184	g	GOVERNS	(Eq 12.8-2)
	Where: $S_{DS} = (2/3)F_aS_s =$	0.245	g		
	$F_a =$	1.600			
	$S_s =$	0.230			
	$a_p =$	1.0			
	$R_p =$	2.5	(per ASCE 7-10, Table 13.6-1)		
	$I = I_p =$	1.50			
	$R =$	2	(per ASCE 7-10, Table 15.4-2)		
Vertical:	$A_v = 0.2S_{DS}I =$	0.074	g		

Base Shear: (ref ASCE 7-10 Eq. 12.8-1)

Vessel full:	$V_{s\text{-}full} = A_iW_{full} =$	**1.78**	**k**	GOVERNS
	Where: Design acceleration = $A_i = C_s =$	0.184	g	
	$W_{full} =$	9.7	k	
Vessel empty:	$V_{s\text{-}empty} = A_iW_{empty} =$	**0.57**	**k**	
	$W_{empty} =$	3.1	k	

Overturning Moments (at base plate level):

Vessel full:	$M_{s\text{-}full} = (V_{s\text{-}full})(CG_{full}) =$	**6.68**	**ft-k**	GOVERNS
	Where: $CG_{full} =$	3.75	ft (measured from bottom of base plates)	
Vessel empty:	$M_{s\text{-}empty} = (V_{s\text{-}empty})(CG_{empty}) =$	**2.14**	**ft-k**	
	Where: $CG_{empty} =$	3.75	ft	

Resisting Moments (at base plate level):

Vessel full:	$M_{resist} = (0.9-0.2S_{DS})(W_{full})(D/2) =$	**8.28**	**ft-k**
Vessel empty:	$M_{resist} = (0.9-0.2S_{DS})(W_{empty})(D/2) =$	**3.30**	**ft-k**

(Since OTM < resisting moment, tank is stable)

Notes:

1) For base plate design, above loads will be multiplied by $\Omega_o = 2$ per ASCE 7-10, Sect. 15.7.3.a. (this is not required for tank shell checks, support leg design, or anchor bolt calculations).
2) Allowable stress design is used for portions of following calcs. When ASD is used, seismic E-loads will be multiplied by 0.7 per ASCE 7-10, Sect. 2.4.1 (no allowable stress increases will be used).

Design Hopper Components

Spacing of C3x1.5x1/4 Spacers Between Inner & Outer Walls

- Spacers are welded to 1/4" outer shell with min weld shown below
- Support spacing for 1/4" outer wall governs over 3/8" thick inner hopper wall

Check plate midway down hopper wall:

Max allowable stiffener spacing:

$L_s = (54000t^2/p)^{1/2}$ = 51.7 in

Where: t = 0.25 in

p = 1.26 psi

Max actual stiffener spacing = 36 in **< Allowable, OK**

Check C3x1.5x1/4 Stiffeners/Spacers Between Inner & Outer Walls

Long side of hopper

Check stiffener midway down hopper wall:

f_b = M/S = 8952 psi

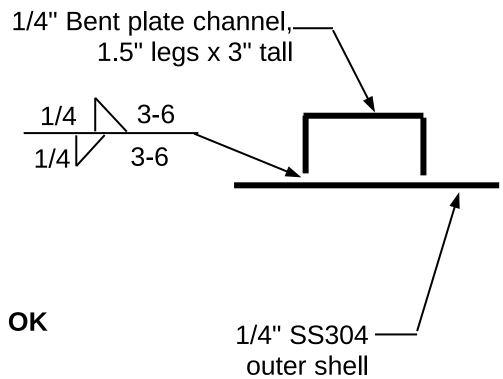
Where: M = $wL^2/8$ = 11012 in-lbs

w = 45.5 pli

L = 44.0 in

S = 1.23 in^3

F_b = (0.7)(22,500 psi) = 15750 psi **> Actual, OK**



Channel Spacer Details

Top Stiffener / Bent Plate Lip @ Top of Vertical Plates

f_b = M/S = 5158 psi

Where: M = $wL^2/8$ = 2527 in-lbs

w = 3.90 pli (outward thrust)

L = 72.0 in

Try 3/8"x 2" lip @ top of 14.75" vert plate, S = 0.49 in^3

F_b = (0.7)(22,500 psi) = 15750 psi **> Actual, OK**

Therefore 2" bent plate lip at top of vertical side plates is OK

Compression Region @ Joint of Hopper & Top Vert Plate

Long side of hopper: f_b = M/S = 6329 psi

Where: M = $wL^2/8$ = 18164 in-lbs

w = 28.0 pli inward thrust

L = 72.0 in

Stiffened region @ hopper - vert plate connection, S = 2.87 in^3

F_b = (0.7)(22,500 psi) = 15750 psi **> Actual, OK**

Therefore compression region is OK without additional stiffeners

Compression Region @ Joint of Hopper & Bottom Horz Plate

f_b = M/S = 9 psi

Where: M = $wL^2/8$ = 26 in-lbs

w = 2.1 pli inward thrust

L = 10.0 in

Stiffened region @ hopper - vert plate connection, S = 2.87 in^3

F_b = (0.7)(22,500 psi) = 15750 psi **> Actual, OK**

Therefore compression region is OK without additional stiffeners

Support Legs

Support Legs

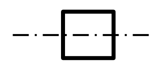
Legs are HSS4x4x1/4, SS304

Section Properties:

$A =$	3.59	in^2
$S_{weak} =$	4.11	in^3
$S_{strong} =$	4.11	in^3
$S_{diag} =$	3.79	in^3
$r_{weak} =$	1.51	in

Length (L) = 50 inches to center of attachment to hopper shell

Case 1: Axial & lateral wind/seismic about weak axis:



$f_a = P_1/A =$	0.61	ksi	Where: P1 = (1.945 k)+0.7(0.35 k) =	2.2	k
$F_a =$	14.03	ksi	$KL/r_{weak} =$	66	
$f_b = M_1/S_{weak} =$	1.83	ksi	$K =$	2.0	
$F_b = 0.6F_y =$	18	ksi	M1 = (0.7)(10.74 in-k) =	7.5	in-k

Unity Check: $f_a / F_a + f_b / F_b =$ **0.15** **< 1.0** ✓ **OK**

Weld to tank shell:

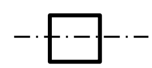
$a =$	12.0	in	Unit stress in weld:
$b =$	4	in	$= (P_1^2 + V_1^2)^{0.5}/A_w + M_1/S_w$
$A_w =$	24.0	in	= 0.25 k/in
$S_w =$	48.0	in^2	Allowable stress in weld:
$V_1 =$	0.21	k	= (0.3)(70 ksi)(0.707)/1.5 = 9.9 ksi

Fillet weld size required = 0.025 in

Therefore use min 3/16 in fillet weld

Case 2: Axial & lateral wind/seismic about strong axis:

(for square tube, weak & strong axes are same)



$f_a = P_2/A =$	0.61	ksi	Where: P2 =	2.2	k
$F_a =$	14.03	ksi	$KL/r_{weak} =$	66	
$f_b = M_2/S_{strong} =$	1.83	ksi	$K =$	2.0	
$F_b = 0.6F_y =$	18	ksi	M2 = T2 = (0.7)(10.74 in-k) =	7.5	in-k

Unity Check: $f_a / F_a + f_b / F_b =$ **0.15** **< 1.0** ✓ **OK**

Weld to tank shell:

$a =$	12.0	in	Unit stress in weld:
$b =$	4	in	$= (P_2^2 + V_2^2)^{0.5}/A_w + T_2c/J_w$
$A_w =$	24.0	in	= 0.22 k/in
$J_w =$	384	in^2	Allowable stress in weld:
$V_2 =$	0.21	k	= (0.3)(70 ksi)(0.707)/1.5 = 9.9 ksi

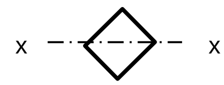
Fillet weld size required = 0.022 in

Therefore use min 3/16 in fillet weld

Support Legs (cont.) & Base Plates

Support Legs, cont.

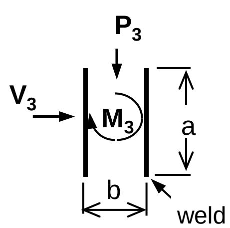
Case 3: Axial & lateral wind/seismic about "neutral" axis:



$f_a = P_3/A =$	0.62	ksi	Where: P3 = (1.945 k)+0.7(0.41 k) =	2.2	k
$F_a =$	14.03	ksi	$KL/r_{weak} =$	66	
$f_b = M_3/S_{diag} =$	1.98	ksi	K =	2.0	
$F_b = 0.6F_y =$	18	ksi	M3 = (0.7)(10.74 in-k) =	7.5	in-k

Unity Check: $f_a / F_a + f_b / F_b =$ **0.15** **< 1.0** ✓ **OK**

Weld to tank shell:



a =	12.0	in
b =	4.0	in
$A_w =$	24.0	in
$S_w =$	48.0	in^2
$V_3 =$	0.21	k

Unit stress in weld:
$= (P_3^2 + V_3^2)^{0.5}/A_w + M_3/S_w$
= 0.25 k/in
Allowable stress in weld:
= (0.3)(70 ksi)(0.707)/1.5 = 9.9 ksi

Fillet weld size required = 0.025 in
Therefore use min 3/16 in fillet weld

<u>Therefore use min 12 in long leg attachment to hopper w/ min 0.1875 in fillet weld down both sides of legs</u>

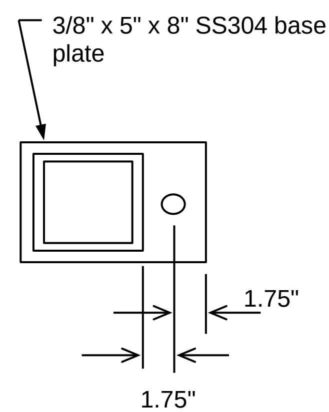
Base Plate:

Consider bending in plate due to uplift times 1.75" moment arm

Base plate design uplift = 0.45 k - (0.6)(2.12 k) = 0 k

Uplift per anchor bolt = (0 k) / (1 anchor bolt per leg) = 0 k
(conservatively use 200# design uplift)

Design moment on base plate = (0.2 k)(1.75 in) = 0.35 in-k



Allowable bending stress in base plate (F_b) = $0.6F_y$ = 18000 psi

Therefore min req'd Base Plate Thickness = $t_p = 2 \times \{6M/[(F_b)(5")]\}^{0.5}$ = 0.306 in

<u>Therefore use 0.375 inch thick x 8 inch wide x 5 inch long SS304 base plates</u>

For: Evoqua Water Technologies
Parker, Arizona
By: John F. Bradley, S.E.
January 21, 2015

Hopper H2 (50 cu ft Capacity)
Location: Parker, Arizona
Design of Vessel & Supports
Sheet 9

Hopper Grating

Per chart below, 1 1/4 x 3/16 W-19-4 stainless steel grating is OK for up to 263 psf > 100 psf. √ OK

Stainless Steel Grating Load Table

19-4 / 19-2 LOAD TABLE

BEARING BAR SIZE		UNSUPPORTED SPAN 2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"	WEIGHT PER SQ. FT. (LBS.) 19-4	19-2	15-4	15-2	11-4	11-2	7-4	7-2
3/4 X 1/8	U D C D	395 .114 395 .091	253 .179 316 .143	175 .257 263 .206	129 .350 226 .280	99 .457 197 .366	78 .579 175 .463								4.0	4.8	4.9	5.7	6.4	7.2	9.7	10.7
3/4 X 3/16	U D C D	592 .114 592 .091	379 .179 474 .143	263 .257 395 .206	193 .350 338 .280	148 .457 296 .366	117 .579 263 .463								5.6	6.4	6.9	7.7	9.2	10.0	14.5	16.0
1 X 1/8	U D C D	702 .086 702 .069	449 .134 561 .107	312 .193 468 .154	229 .263 401 .210	175 .343 351 .274	139 .434 312 .347	112 .536 281 .429	93 .648 255 .519	78 .771 234 .617					5.1	5.9	6.2	7.1	8.2	9.0	12.9	14.2
1 X 3/16	U D C D	1053 .086 1053 .069	674 .134 842 .107	468 .193 702 .154	344 .263 602 .210	263 .343 526 .274	208 .434 468 .347	168 .536 421 .429	139 .648 383 .519	117 .771 351 .617					7.4	8.4	9.2	10.2	12.1	13.1	19.4	21.3
1-1/4 X 1/8	U D C D	1096 .069 1096 .055	702 .107 877 .086	487 .154 731 .123	358 .210 627 .168	274 .274 548 .219	217 .347 487 .278	175 .429 439 .343	145 .519 399 .415	122 .617 365 .494	104 .724 337 .579	90 .840 313 .672			6.4	7.4	7.8	8.8	10.3	11.3	15.8	17.1
1-1/4 X 3/16	U D C D	1645 .069 1645 .055	1053 .107 1316 .086	731 .154 1096 .123	537 .210 940 .168	411 .274 822 .219	325 .347 731 .278	263 .429 658 .343	217 .519 598 .415	183 .617 548 .494	156 .724 506 .579	134 .840 470 .672			9.0	10.0	11.2	12.2	14.9	15.9	23.8	25.7
1-1/2 X 1/8	U D C D	1579 .057 1579 .046	1011 .089 1263 .071	702 .129 1053 .103	516 .175 902 .140	395 .229 789 .183	312 .289 702 .231	253 .357 632 .286	209 .432 574 .346	175 .514 526 .411	149 .604 486 .483	129 .700 451 .560	99 .914 395 .731	78 1.157 351 .926	7.4	8.4	9.2	10.2	12.1	13.1	18.8	20.0
1-1/2 X 3/16	U D C D	2368 .057 2368 .046	1516 .089 1895 .071	1053 .129 1579 .103	773 .175 1353 .140	592 .229 1184 .183	468 .289 1053 .231	379 .357 947 .286	313 .432 861 .346	263 .514 789 .411	224 .604 729 .483	193 .700 677 .560	148 .914 592 .731	117 1.157 526 .926	11.1	12.5	13.7	15.1	18.1	19.6	28.1	30.1
1-3/4 X 3/16	U D C D	3224 .049 3224 .039	2063 .077 2579 .061	1433 .110 2149 .088	1053 .150 1842 .120	806 .196 1612 .157	637 .248 1433 .198	516 .306 1289 .245	426 .370 1172 .296	358 .441 1075 .353	305 .517 992 .414	263 .600 921 .480	201 .784 806 .627	159 .992 716 .793	12.7	14.1	15.7	17.1	20.9	22.3	32.5	34.4
2 X 3/16	U D C D	4211 .043 4211 .034	2695 .067 3368 .054	1871 .096 2807 .077	1375 .131 2406 .105	1053 .171 2105 .137	832 .217 1871 .174	674 .268 1684 .214	557 .324 1531 .259	466 .386 1404 .309	399 .453 1296 .362	344 .525 1203 .420	263 .686 1053 .549	208 .868 936 .694	14.3	15.7	17.8	19.2	23.7	25.1	36.9	38.8
2-1/4 X 3/16	U D C D	5329 .038 5329 .030	3411 .060 4263 .048	2368 .086 3553 .069	1740 .117 3045 .093	1332 .152 2664 .122	1053 .193 2368 .154	853 .238 2132 .190	705 .288 1938 .230	592 .343 1776 .274	505 .402 1640 .322	435 .467 1523 .373	333 .610 1332 .488	263 .771 1184 .617	15.9	17.4	19.8	21.2	26.5	27.9	41.3	43.2
2-1/2 X 3/16	U D C D	6579 .034 6579 .027	4211 .054 5263 .043	2924 .077 4386 .062	2148 .105 3759 .084	1645 .137 3289 .110	1300 .174 2924 .139	1053 .214 2632 .171	870 .259 2392 .207	731 .309 2193 .247	623 .362 2024 .290	537 .420 1880 .336	411 .549 1645 .439	325 .694 1462 .555	17.5	19.0	21.8	23.3	29.2	30.7	45.6	47.5

LOADS AND DEFLECTIONS ARE THEORETICAL VALUES BASED ON 20,000 PSI UNIT STRESS. FOR PEDESTRIAN COMFORT DEFLECTIONS IN EXCESS OF 1/4" ARE NOT RECOMMENDED.

U = SAFE UNIFORM LOAD, LBS. PER SQ. FT.
C = SAFE CONCENTRATED MID-SPAN LOAD, LBS. PER FT. OF GRATING WIDTH
D = DEFLECTION IN INCHES

NOTE: WHEN GRATINGS WITH SERRATED BEARING BARS ARE SELECTED, THE DEPTH OF GRATING REQUIRED TO SERVICE A SPECIFIED LOAD WILL BE 1/4" GREATER THAN THAT SHOWN IN THE TABLES ABOVE.

CONVERSION TABLE

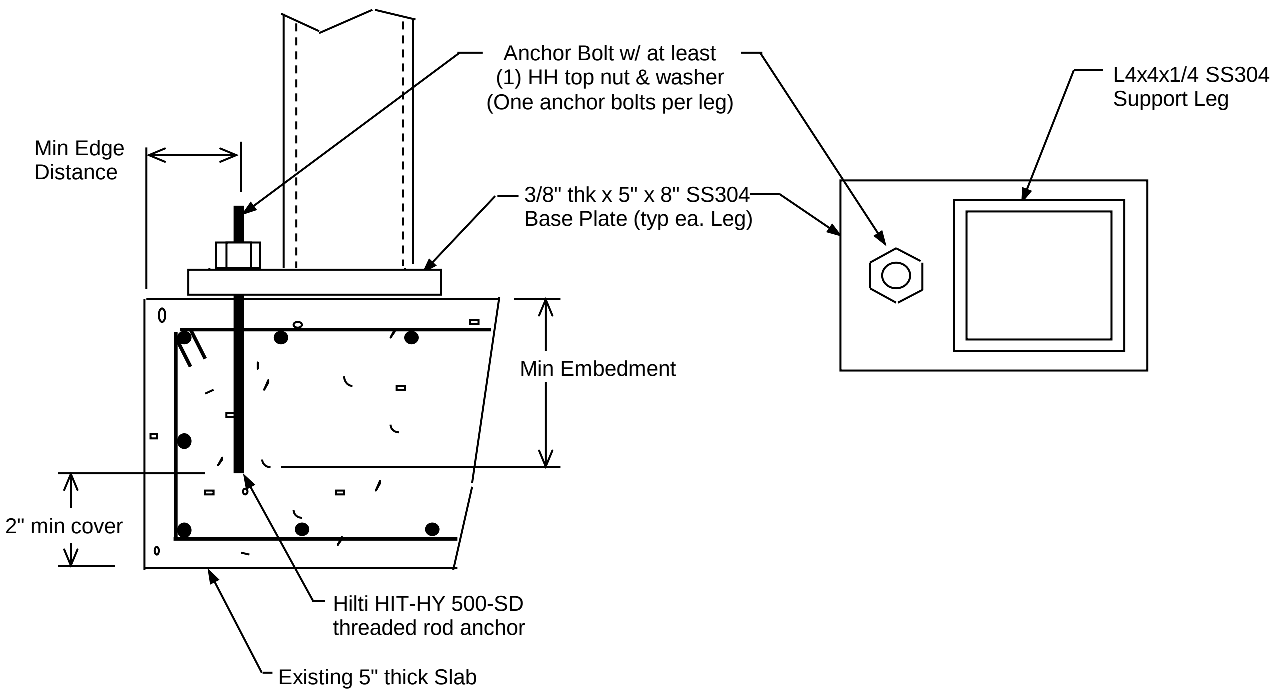
The loads shown above are for type 19-4 and 19-2 gratings. To determine the load carrying capacity for alternative bar spacings, multiply the loads given by the following conversion factors (DEFLECTION REMAINS CONSTANT): ***FOR TYPES 15-4 AND 15-2: 1.26*** ***FOR TYPES 11-4 AND 11-2: 1.72*** ***FOR TYPES 7-4 AND 7-2: 2.71***

SELECTION GUIDE: 19-4 PLAIN SURFACE GRATING

For deflection of not more than 1/4" when subjected to the severest of the following: (1) the uniform loads below; (2) under concentrated mid-span loads of 300 lbs. up to 6'-0" span; or (3) 400 lbs. for spans 6'-0" and over.

SAFE UNIFORM LOAD LBS./SQ. FT.	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"
50	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16
75	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16
100	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2-1/4 x 3/16	2-1/2 x 3/16
125	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16	–
150	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2 x 3/16	2-1/2 x 3/16	–
200	1 x 1/8	1 x 1/8	1 x 1/8	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16	–	–
300	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2 x 3/16	2-1/4 x 3/16	2-1/2 x 3/16	–	–

Anchorage Summary - Hilti Epoxy Anchors



Anchor Bolt Summary

Use (4) - 0.625 inch diameter threaded rod Anchor Bolts (One per Leg)

Material = ASTM F593 CW2 (316) (threaded rod)

(Recommended min) Projection above concrete = 2 in + grout thickness (if this vessel is grouted)

Min Embedment = 3.0 in

Min Edge Distance = 6.0 in (all sides of all anchor bolts)

Existing Concrete f'_c = 3000 psi

Tank Anchorage (Hilti Epoxy Anchors)

Check Anchor Bolts per IBC 2012 "Strength Design", ACI 318-11, Appendix D & Hilti ESR-2322.

Trial Input Data

Bolt diameter (d_o) =	0.625	in dia.
Bolt material =	ASTM F593 CW2 (316)	(threaded rod)
Yield strength of bolt material =	45	ksi
Bolt embedment depth (h_{ef}) =	3	in
Minimum bolt edge distance (c_1) =	6	in
Cross-sectional area of bolt (A_d) =	0.31	in^2
Tensile stress area of bolt (A_{se}) =	0.226	in^2
Minimum root area of bolt (A_r) =	0.202	in^2
Minimum Concrete f_c' =	3000	psi
Seismic overturning moment (M_s) =	3.22	ft-k
Seismic Base Shear (V_s) =	0.86	k
Empty wt. of tank =	3.1	k
Full wt. product & tank (W_T) =	7.8	k

Seis. pullout for IBC strength level equations = 1.0$E_{tension}$ - 0.6D =	0.19	k/leg
Where: $E_{tension}$ =	0.32	k/leg
D =	0.21	k/leg
Seismic shear used in IBC strength level equations = 1.0E_{shear} =	0.21	k/leg

(conservatively ignore resisting friction due to weight of tank & product)

Total strength level design pullout (N_u) =	0.19	k/bolt
Total strength level design shear (V_u) =	0.21	k/bolt

Per IBC 2012 Anchor Bolts are Acceptable If:

Anchor bolt tensile strength is greater than factored tension load: $\phi N_n > N_u$

and anchor bolt shear strength is greater than factored shear load: $\phi V_n > V_u$

And if interaction checks are satisfied (see loads below):

Case 1) Steel strength:	$N_u/\phi N_s + V_u/\phi V_s$ =	**0.046**	**< 1.2 -- OK**
Case 2) Concrete breakout:	$N_u/\phi N_{cb} + V_u/\phi V_{cb}$ =	**0.139**	**< 1.2 -- OK**

<u>Therefore Anchors are OK per Interaction Checks</u>

Tank Anchorage (Hilti Epoxy), cont.

Check anchor bolt tension:

Check following cases:
1) Steel strength of anchor in tension: $\phi N_s > N_u$
2) Concrete breakout strength of anchor in tension: $\phi N_{cb} > N_u$
3) Pullout strength of anchor in tension: $\phi N_{pn} > N_u$
4) Concrete side-face blowout strength of anchor in tension: $\phi N_{sb} > N_u$

Factored seismic uplift load per bolt (N_u) = **0.19** k (see above)

Case (1): Steel strength of anchor in tension: $\phi N_s > N_u$

$\phi N_s = \phi A_{se} f_{ut}$ =	**12.56**	**k**	**> 0.19 k -- OK**
Where: ϕ =	0.65		
f_{ut} =	85.5	ksi	
ESR-1682 Test Results (for reference only):	**10.12**	**k**	**> 0.19 k -- OK**

Case (2): Concrete breakout strength of anchor in tension: $\phi N_{cb} > N_u$

$\phi N_{cb} = (\phi)(A_{Nc}/A_{Nco})(\psi_{ed,N})(\psi_{c,N})(\psi_{cp,N})(N_b)$ =	**4.40**	**k**	**> 0.19 k -- OK**
Where: ϕ =	0.65		
A_{Nc} =	81	in^2	
$A_{Nco} = 9h_{ef}^2$ =	81	in^2	
$\psi_{ed,N} = 0.7+(0.3c)/(1.5h_{ef})$ =	1.0		
$\psi_{c,N}$ =	1.4		
$\psi_{cp,N}$ =	1.0		
$N_b = k(f'_c)^{1/2}(h_{ef})^{1.5}$ =	4.8	k	
k =	17		

Case (3): Pullout strength of anchor in tension (see Hilti ESR-2322,4.1.4):

$\phi N_a = (\phi)(A_{Na}/A_{Nao})(\varphi_{p,Na} N_{ao})$ =	**2.85**	**k**	**> 0.19 k -- OK**
Where: ϕ =	0.65		
$\varphi_{p,Na}$ =	1.4		
A_{Na} =	81	in^2	
A_{Nao} =	125	in^2	
$N_{ao} = \pi \tau_{kcr} d h_{ef}$ =	4.84	k	

Case (4): Concrete side-face blowout strength of anchor in tension: $\phi N_{sb} > N_u$

$\phi N_{sb} = \phi 160c(A_{brg})^{0.5}(f'_c)^{0.5}$ = **N/A k**

Equation does not apply since bolts are post-installed & not headed.
Since edge distance is 6 in, side blowout is not an issue
(ref. edge distance requirements in Hilti data sheets).

<u>Therefore Anchors are OK for Tension Loads</u>

Tank Anchorage (Hilti Epoxy), cont.

Check anchor bolt shear:

Check following cases:
1) Steel strength of anchor in shear: $\phi V_s > V_u$
2) Concrete breakout strength of anchor in shear: $\phi V_{cb} > V_u$
3) Concrete pryout strength of anchor in shear: $\phi V_{cp} > V_u$

Factored seismic shear load per bolt (V_u) = **0.21** k (see above)

Case (1): Steel strength of anchor in shear: $\phi V_s > V_u$

Check #1:	$\phi V_s = \phi 0.6 A_{se} f_{ut}$ =	**6.96 k**	**> 0.21 k -- OK**
	Where: ϕ =	0.60	
	f_{ut} =	85.5 ksi	
Check #2:	ϕV_s =	**8.14 k**	**> 0.21 k -- OK**
	Where: V_s =	13.56 k (see Hilti ESR-2322, Table 7)	
ESR-1682 Test Results (for reference only):		**5.21 k**	**> 0.21 k -- OK**

Case (2): Concrete breakout strength of anchor in shear: $\phi V_{cb} > V_u$

$\phi V_{cb} = (\phi)(A_{Vc}/A_{Vco})(\varphi_{edV}\varphi_{cV}V_b)$ =	**2.25 k**	**> 0.21 k -- OK**
Where: ϕ =	0.60	
A_V =	90 in^2	(based on min dim's)
A_{Vo} =	162 in^2	
φ_{edV} =	1.0	
φ_{ecV} =	1.0	
$V_b = 7(\ell/d_o)^{0.2}(d_o)^{1/2}(f'_c)^{1/2}(c_1)^{1.5}$ =	6.8 k	
ℓ =	5.0 in	

Case 3) Concrete pryout strength of anchor in shear: $\phi V_{cp} > V_u$

Check #1:	$\phi V_{cp} = (\phi k_{cp} N_{cb})$ =	**8.13 k**	**> 0.21 k -- OK**
	Where: ϕ =	0.60	
	k_{cp} =	2.0	
	$N_{cb} = \phi N_{cb}/\phi$ =	6.8	
Check #2:	$\phi V_{cp} = (\phi k_{cp} N_a)$ =	**8.13 k**	**> 0.21 k -- OK**
	$N_a = (A_{Na}/A_{Nao})(\varphi_{pNa} N_{ao})$ =	6.77 k	
	$N_{ao} = \tau_{kcr}\pi d h_{ef}$ =	4.84 k	
	τ_{kcr} =	0.82	
	φ_{pNa} =	1.00	
	A_{Na} =	81 in^2	
	A_{Nao} =	81 in^2	

<u>Therefore Anchors are OK for Shear Loads</u>

Exhibit C – Hazardous Waste Characteristics

ATTACHMENT 1

WASTE CODES

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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 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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
K005	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF CHROME GREEN PIGMENTS
K006	WASTEWATER TREATMENT SLUDGE FROM PRODUCTION OF CHROME OXIDE GREEN PIGMENTS (ANHYDROUS AND HYDRATED)
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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 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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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 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)

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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-
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)
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)-

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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-

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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)
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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
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-

ATTACHMENT 1 -- HAZARDOUS WASTES RECEIVED AT THE PARKER FACILITY	
EPA WASTE CODE	**WASTE DESCRIPTION**
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 D - EPA Letter

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

MAR 2 0 2015

CERTIFIED MAIL: 7003 3110 0006 1998 6972
RETURN RECEIPT REQUESTED

In Reply: LND-4-2
Refer To: Evoqua Water Technologies
EPA ID # AZD 982 441 263

Mr. Monte McCue
Evoqua Water Technologies
2523 Mutahar St.
Parker, Arizona 85344

Re: Draft Hopper Designs dated February 20, 2015 (EPA ID # AZD 982 441 263)

Dear Mr. McCue:

The United States Environmental Protection Agency Region 9 (EPA) has completed its review of the Evoqua Water Technologies (Evoqua) Facility's hopper designs for hoppers (H-1) and (H-2). As submitted, the designs do not satisfy the requirement to have a means to detect leakage from the inner wall. Based on Evoqua's email dated March 3, 2015, Evoqua will install a ¾ inch valve on each of the hoppers once the hoppers are installed. The valve will enable Evoqua to detect leakage from the inner wall. With that addition, EPA will accept the hopper designs and find them sufficient to satisfy the requirements of 40 CFR 264.193 for double wall containment.

Per your request, we are also clarifying that hoppers H-1 and H-2 are ancillary equipment to tanks T-1, T-2, T-5, and T-6 under 40 CFR Part 264, Subpart J and are individual drain systems under 40 CFR Part 61, Subpart FF.

If you have questions or would like to discuss any issues, please contact me at 415-972-3972 or Mike Zabaneh at 415-972-3348.

Sincerely,

Barbara Gross, Manager
Permit Section
Land Division

cc: Mr. Wilfred Nabahe, Director, CRIT Environmental Protection Office

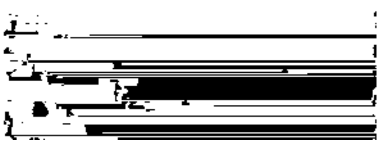
Exhibit E - Evoqua Leak Testing Letter

Date: April 18, 2018

From: Monte McCue
To: H-1 and H-2 Hopper File
Subject: Leak Test

Both hoppers, after installation were filled completely with city water to test for leaks. They were filled at approximately 2:00 pm on April 17, 2018 and let stand for 24 hours.

The were no leaks from either H-1 or H-2 during the 24-hour period. Water from both hoppers was pumped out at approximately 3:00pm on April 18, 2018



Plant Manager
Evoqua Water Technologies

PO Box 3308
Parker, AZ 85344 USA

Tel: +1 (928) 669-5758
Fax: +1 (928) 669-5775

FINAL PERMIT MODULE IV
HOPPER MODIFICATIONS

REDLINE

MODULE IV - STORAGE IN TANKS

IV.A. APPLICABILITY

IV.A.1. Except as otherwise specifically set forth in this Permit, all hazardous waste tank systems (Tank Systems) managed at the Facility must comply with the design, installation, and other requirements for "new tank systems" at 40 CFR § 264.192, incorporated herein by this reference, as opposed to the requirements for "existing tank systems" at 40 CFR § 264.191. [See 40 CFR §§ 260.10, 264.191 and 264.192.]

IV.A.2. Except as otherwise specifically set forth in this Permit, the requirements of 40 CFR Part 264, Subpart J, are applicable to the hazardous waste tanks systems (T-1, T-2, T-5, T-6, and T-18) that are used to store or treat hazardous waste at the Facility. A map of the Tanks Systems' locations can be found in the Permit Attachment Appendix III. In addition, the requirements of 40 CFR Part 264, Subpart BB (Subpart BB) or Subpart CC (Subpart CC) are applicable to various tanks, containers, and equipment located at the Facility. Certain air emission control requirements also apply to Tank T-11, as indicated in Permit Condition IV.G.1. and Table IV-2. [See Permit Attachment Section D, Permit Attachment Appendix XIX, Permit Attachment Appendix XX, and 40 CFR Part 264, Subpart J, Subpart BB and Subpart CC.]

IV.A.3. This module also contains Permit Conditions for the Hoppers H-1 and H-2, which are ancillary equipment to Tank Systems T-1, T-2, T-5 and T-6 and are used to transport or feed hazardous waste to these Tank Systems. These Hoppers are construed as "open-ended valves or lines" under RCRA's air emissions requirements found at 40 CFR Part 264, Subpart BB, and as "individual drain systems" under the Clean Air Act's air emission control requirements for individual drain systems found at 40 CFR Part 61, Subpart FF.

IV.A.4. Table IV-1 below provides descriptions of the hazardous waste Tank Systems that are discussed in this Module and that are subject to the permit conditions of this Module. ~~The information in Table IV-1 pertaining to Hoppers H-1 and H-2 reflects the current descriptions of the hoppers, and, in brackets, and the descriptions of the hoppers after implementation of the work described in Permit Condition IV.E.6. The~~

descriptions in brackets will apply only after new hopper construction is complete.

TABLE IV-1
INFORMATION ABOUT HAZARDOUS WASTE TANK SYSTEMS

Tank/Ancillary Equipment No. & Description	*Tank/Ancillary Equipment Materials of Construction*	*Tank/Ancillary Equipment Dimensions*	*Tank/Ancillary Equipment Design Capacity*	*Tank/Ancillary Equipment Maximum Allowable Design Vapor Pressure (kPa)*
T-1 spent carbon storage tank	300 Series Stainless Steel, Fixed Roof	16’-0” Straight Side 10’-0” Diameter 8’-0” 62° Bottom Cone	8,319 gal.	Atmospheric
T-2 spent carbon storage tank	300 Series Stainless Steel, Fixed Roof	16’-0” Straight Side 10’-0” Diameter 8’-0” 62° Bottom Cone	8,319 gal.	Atmospheric
T-5 spent carbon storage tank	300 Series Stainless Steel, Fixed Roof	16’-0” Straight Side 10’-0” Diameter 8’-0” 62° Bottom Cone	8,319 gal.	Atmospheric
T-6 spent carbon storage tank	300 Series Stainless Steel, Fixed Roof	16’-0” Straight Side 10’-0” Diameter 8’-0” 62° Bottom Cone	8,319 gal.	Atmospheric
T-18 RF-2 Feed Tank	300 Series Stainless Steel	7’-6” Straight Side 10’-4.5” Diameter 9’-4.75” 60° Bottom Cone	6,500 gal.	Atmospheric
(continued on next page)				

Tank/Ancillary Equipment No. & Description	*Tank/Ancillary Equipment Materials of Construction*	*Tank/Ancillary Equipment Dimensions*	*Tank/Ancillary Equipment Design Capacity*	*Tank/Ancillary Equipment Maximum Allowable Design Vapor Pressure (kPa)*
H-1 Outdoor spent carbon unloading hopper	~~Mild Steel~~ ~~[~~**300 Series** Stainless Steel~~]*~~	~~14' length x 8' width x 7' height~~ [14' length x ~~7~~**8'** width x ~~9~~**7**' height]*	~~5000 lb. capacity~~ ~~[~~270 cubic feet~~]*~~	Atmospheric
H-2 Indoor spent carbon unloading hopper	~~Mild Steel~~ ~~[~~**300 Series** Stainless Steel~~]*~~	~~4' length x 4' width x 4' height~~ ~~[~~6' length x 5' width x **4**~~5~~' height~~]*~~	~~5000 lb. capacity [~~50 cubic feet~~]*~~	Atmospheric

~~* The descriptions in brackets will apply only after new hopper construction is complete.~~

IV.B. GENERAL REQUIREMENTS FOR TANK SYSTEMS

IV.B.1. Tank design capacities for the tanks and the hoppers are shown in Table IV-1. This design capacity for each tank or hopper shall not be exceeded.

IV.B.2. Prior to the installation of any new hazardous waste Tank Systems or components, the Permittees shall submit to the Director the information required in a Part B permit application for new Tank Systems or components in accordance with 40 CFR §§ 264.192, along with an accompanying request for a permit modification in accordance with Permit Condition I.G.7. (See 40 CFR §§ 264.192 and 270.42.)

IV.B.3. Hoppers H-1 and H-2, described in Table IV-1, are ancillary equipment to Tanks T-1, T-2, T-5 and T-6. In meeting the obligations set forth in Permit Condition IV.A.2., the Permittees shall ensure that H-1 and H-2 meet each of the requirements applicable to ancillary equipment that are set forth in 40 CFR Part 264, Subpart J, which is incorporated herein by this reference. (See 40 CFR § 264.190 *et seq.*)

IV.B.4. **The Permittee has submitted written structural integrity assessments for Hoppers H-1 and H-2 that meet the requirements of 40 CFR § 264.192(a).** ~~The Permittees must obtain and submit written structural integrity assessments for Hoppers H-1 and H-2 that meet the requirements of 40 CFR § 264.192(a) as follows:~~

IV.B.4.a. Pursuant to Permit Condition IV.E., the Permittees must obtain and submit to the Director written assessments for Hopper H-1 – and any future Hopper H-1 replacements ~~in accordance with Permit Condition IV.E.6. --~~ that meet the requirements of 40 CFR § 264.192(a) and that demonstrate compliance with 40 CFR § 264.192. The Permittees must maintain a copy of these assessments on file at the Facility in accordance with 40 CFR § 264.192(g). [See 40 CFR § 264.192, including 40 CFR § 264.192(e) ~~and Permit Condition IV.E.6~~.]

IV.B.4.b. Pursuant to Permit Condition IV.E., the Permittees must obtain and submit to the Director written assessments for Hopper H-2 – and any future Hopper H-2 replacements ~~in accordance with Permit Condition IV.E.6. --~~ that meet the requirements of 40 CFR § 264.192(a) and that demonstrate compliance with 40 CFR § 264.192. The Permittees must maintain a copy of these assessments on file at the Facility in accordance with 40 CFR § 264.192(g). [See 40 CFR § 264.192, including 40 CFR § 264.192(e) ~~and Permit Condition IV.E.6~~.]

IV.C. COMPATIBILITY OF WASTE WITH TANK SYSTEMS

IV.C.1. Hazardous wastes or treatment reagents must not be placed in a tank system if they could cause the tank, its ancillary equipment, or the tank's containment system to rupture, leak, corrode, or otherwise fail. [See 40 CFR § 264.194(a).]

IV.D. MANAGEMENT OF TANK SYSTEMS

IV.D.1. The Permittees must use appropriate controls and practices to prevent spills and overflows from Tank Systems or containment systems. These controls and practices. include, at a minimum: appropriate spill prevention controls (*e.g.*, check valves, dry disconnect couplings), overfill prevention controls (*e.g.*, level sensing devices, high level alarms, automatic feed cutoff, or bypass to a standby tank), and maintenance of sufficient freeboard in uncovered tanks to prevent overtopping by wind action or by precipitation. [See 40 CFR § 264.194(b).]

IV.D.2. The Permittees shall ensure that the unloading and feeding of hazardous waste into H-1 and H-2 are done in a manner that prevents the migration of hazardous waste from these units. The Permittees may not use units H-1 or H-2 for hazardous waste storage and are required to pump any hazardous waste fed into H-1 or H-2 into Tanks T-1, T-2, T-5 or T-6 as soon as practical, even if carbon regeneration operations at the Facility have ceased or been curtailed.

IV.E. CONTAINMENT SYSTEMS

IV.E.1. The Permittees must maintain secondary containment in accordance with the requirements of 40 CFR § 264.193. [See 40 CFR § 264.193.]

IV.E.2. The secondary containment must be designed or operated to contain 100 percent of the capacity of the largest hazardous waste tank within its boundary, and must be designed and operated to prevent run-on or infiltration of precipitation into the secondary containment system unless the collection system has sufficient excess capacity to contain run-on or infiltration. [See 40 CFR §§ 264.193(e)(1)(i), (ii), (iii) and (iv) and Permit Attachment Appendix IX.]

IV.E.3. The Permittees shall maintain the secondary containment in a manner that will prevent any migration of wastes or accumulated liquid out of the system to the soil, groundwater, or surface water at any time during the use of the Tank Systems. The Permittees must ensure that the secondary containment is free from cracks or gaps by maintaining a sealant on any such areas that is compatible with the spent carbon. [See 40 CFR §§ 264.193(b)(1) and (e)(1)(iii).]

IV.E.4. The Permittees must retain the containment volume of secondary containment within the concrete pad that serves as the secondary containment for Tanks T-1, T-2, T-5 and T-6 at or above 9,847 gallons at all times that these tanks remain in service. The maximum spent carbon tank volume for each of Tanks T-1, T-2, T-5 and T-6 is 8,319 gallons and the calculated applicable rainfall volume for the secondary containment area for Tanks T-1, T-2, T-5 and T-6 is 1,528 gallons. The secondary containment volume in this area must therefore meet the total required volume of 9,847 gallons. [See 40 CFR § 264.193(e) and Permit Attachment Appendix IX.]

IV.E.5. The Permittees shall maintain the double walled tank T-18 in accordance with 40 CFR 264.193(e)(3). [See 40 CFR § 264.193(e)(3).]

IV.E.6. Spent Carbon Unloading Hoppers

~~**IV.E.6.a.** Hopper Containment. The Permittees shall submit to EPA for approval a work plan for implementation of the requirements for the secondary containment for Hopper H-1, and, at the Permittees' option, for Hopper H-2 (Hopper Work Plan), to the Director for approval in accordance with Permit Condition I.G.5. ***within ninety (90) days after the final Permit is effective***. The Hopper Work Plan shall include a schedule for providing secondary containment for the spent carbon unloading Hopper H-1 (and H-2, if appropriate) in accordance with 40 CFR § 264.193. This schedule shall provide for completion of implementation of the requirements for the secondary containment for Hopper H-1 (and H-2, if appropriate) no later than one (1) year from the effective date of this Permit. [See 40 CFR § 264.193.]~~

~~**IV.E.6.b.i.** Until such time as secondary containment that meets the requirements of 40 CFR § 264.193(f) and Permit Condition IV.E.6.a. is provided for Hopper H-1, the Permittees shall have the integrity of Hopper H-1 assessed by a professional engineer ***within one hundred and eighty (180) days after the final Permit is effective*** in accordance with Permit Condition IV.E.6.b.ii. [See 40 CFR §§ 264.191, 264.193(i), and 270.11(d).]~~

~~**IV.E.6.b.ii.** Until such time as the secondary containment for Hopper H-1 is provided in accordance with 40 CFR § 264.193(f) and Permit Condition IV.E.6.a., the Permittees must conduct a leak test, (or other integrity assessment that meets the requirements of 40 CFR § 264.191(a) and (b)(5)(ii)), to ensure the integrity of Hopper H-1 at least annually and maintain a record of the results of each such assessment in the Operating Record at the Facility and otherwise comply with the requirements of 40 CFR § 264.193(i)(3), incorporated herein by this reference. [See~~

40 CFR §§ 264.191, 264.193 and 270.11(d).]

IV.E.6.b.iii. If the secondary containment for Hopper H-1 is not implemented within a year from the effective date of this Permit, as provided in accordance with Permit Condition IV.E.6.a., the Permittees shall submit to the Director a contingent closure plan and proof of financial responsibility meeting the requirements of 40 CFR § 264.197(c), incorporated herein by this reference. If the secondary containment for Hopper H-1 is not implemented within a year from the effective date of this Permit, the contingent closure plan and proof of financial responsibility requirements of 40 CFR § 264.197(c) shall be implemented. [See also 40 CFR § 264.197(c).]

IV.E.7. Until such time as any changes are completed for Hopper H-2, in accordance with Permit Condition IV.E.6., the Permittees shall maintain the secondary containment for the spent carbon unloading Hopper H-2 in the container storage warehouse in accordance with 40 CFR § 264.193. The pad under H-2 serves as a liner external to the hopper, providing secondary containment. [See 40 CFR § 264.193.]

IV.E.86.a. **The Permittees shall maintain the secondary containment for H-1 and H-2 in accordance with 40 CFR § 264.193.** Once the Permittees have completed implementation of the requirements for secondary containment for spent carbon unloading Hopper H-1 (and H-2, if included in the approved Hopper Work Plan), in accordance with the approved Work Plan submitted pursuant to Permit Condition IV.E.6.a, the Permittees shall maintain the secondary containment for H-1 (and H-2, if included in the approved Hopper Work Plan), in accordance with 40 CFR § 264.193. [See 40 CFR § 264.193.]