



River Protection Project  
Waste Treatment Plant

# MECHANICAL DATA SHEET ACTIVATED CARBON ADSORBER

ISSUED BY  
RPP-WTP PDC

R11459606

PLANT ITEM No.

24590-LAW-MV-LVP-ADBR-00001A

24590-LAW-MV-LVP-ADBR-00001B

Data Sheet No.

24590-LAW-MVD-LVP-00003

Rev.

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Project:	RPP-WTP	Description:	Activated Carbon Adsorber for Mercury Abatement (LVP-SKID-00001)
Project No:	24590	Mech. Drawing:*	24590-QL-POA-MWK0-00001-05-00197
Site:	Hanford	P&ID:	24590-LAW-M6-LVP-00004001 24590-LAW-M6-LVP-00004002 24590-LAW-M6-LVP-00004003
System:	LVP	Process Calculations:	24590-LAW-MKC-LVP-00005 24590-LAW-M4C-LOP-00001
Process flow diagram:	24590-LAW-M5-V17T-00011	Specification:	24590-WTP-3PS-MWK0-T0001

### General Data

Quality Level	Q	Code Stamp	N/A
Seismic Category	SC-III	NB Registration	N/A
Design Code	General Note 2	Design Life	40 years (Process Note 4)

### Process Data (General Note 5 and 10)

Offgas Conditions (Inlet):					Offgas Composition (Inlet):		
Parameter		Actual Conditions (Process Note 10)			Major Offgas Components	Actual Composition (Process Note 10)	
		Nominal	Maximum	Design		Nominal, Volume %	Maximum, Volume %
Volume Flow	SCFM	2,890	2,976	N/A	N <sub>2</sub>	68.1	67.5
	ACFM	4,298	4,717	5,200			
Mass Flow	lb/hr	12,580	12,950	N/A	O <sub>2</sub>	18.3	18.1
Temperature	°F	(Process Note 9) 160	162	(Process Note 8)	H <sub>2</sub> O	11.1	11.5
Pressure	in-w.g.	-77.2	-96.0	(Process Note 6)	CO <sub>2</sub>	1.11	1.19
Density	lb/ft <sup>3</sup>	0.0488	0.0458	N/A	Ar	0.81	0.81
Relative Humidity	%	(Process Note 12) 27.4	25.4	N/A			
Allowable Pressure Drop (Process Note 2)			in-w.g.	14	Minor Offgas Components	Nominal	Maximum (Process Note 11)
						kg/hour	kg/hour
<p><b>Process Notes:</b></p> <ol style="list-style-type: none"> <li>Carbon beds shall be operated in series during normal operation.</li> <li>Allowable pressure drop is for a single carbon adsorber. Allowable pressure drop shall be based on end of bed life. Carbon change out frequency of 24 months shall take precedence over allowable pressure drop requirement.            Delta P (single adsorber) = _____ in-w.g.            Delta P (two adsorbers in series) = _____ in-w.g.</li> <li>Delete.</li> <li>Design life for each of the Activated Carbon Adsorber Primary Beds shall be, at a minimum, for two years at the Nominal condition of Mercury with two adsorbers operating in series. Design life of the Activated Carbon Adsorber Guard Beds shall be for two years at Nominal conditions of HCl, HF, I<sub>2</sub>, SO<sub>2</sub>, HNO<sub>3</sub> and HNO<sub>2</sub> with two adsorbers operating in series.</li> <li>The minimum flowrate is 0 (based on 100% turndown).</li> <li>Equipment design positive pressure shall be determined by Seller. Design positive pressure shall be based upon pressures generated during a carbon bed fire and activation of the fire suppression water but shall not be less than +4 psig. Equipment design negative pressure shall be full vacuum.</li> <li>Personnel Protection insulation is required for surfaces with</li> </ol>					NH <sub>3</sub>	3.09E-02	2.03E-01
					NO	1.49E+01	3.24E+01
					N <sub>2</sub> O	3.97E+00	1.02E+01
					NO <sub>2</sub>	1.98E+01	7.23E+01
					CO	1.07E+00	3.73E+00
					H <sub>2</sub>	3.83E-02	1.61E-01
					HCl	5.11E-02	1.37E-01
					HF	2.77E-03	4.07E-03
					I <sub>2</sub>	5.56E-03	5.56E-03
					SO <sub>2</sub>	3.16E-02	6.13E-02
					HNO <sub>2</sub> (General Note 13)	2.83E-01	5.55E-01
					HNO <sub>3</sub> (General Note 13)	7.12E-02	5.61E-01
					VOC	5.63E-01	3.12E+00
Particulate	1.24E-05	8.19E-05					



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<p>temperature of 140 °F and above.</p> <p>8. The activated carbon adsorbers design temperature of 300 °F is used to account for exothermic reactions within the carbon beds. This provides a contingency of 138 °F above the maximum gas inlet temperature.</p> <p>9. Activated carbon shop testing will be at the nominal temperature.</p> <p>10. Values listed are representative of specific offgas conditions as a whole and not as individual parameters. For example, the Nominal Relative Humidity is dependent upon the Nominal Temperature. For this reason, some values in the Maximum Condition column may actually be less than those listed in the Nominal Condition.</p> <p>11. Maximum component rates are based on Bounding Conditions, except for Hg, HCl, HF, I<sub>2</sub>, SO<sub>2</sub>, HNO<sub>2</sub> &amp; HNO<sub>3</sub>, which are based on the Maximum Condition. Bounding/ maximum conditions are used to assess the maximum credible impact on bed life due to potential competitive effects during Appendix B and C testing (refer to Engineering Specifications, 24590-WTP-3PS-MWK0-T0001).</p> <p>12. The abnormal operating condition is isolation of the carbon bed adsorbers without purge of moisture from the interior gas spaces. As the offgas cools the relative humidity increases to 100%. Further cooling of the offgas results in * negligible levels of adsorption within the primary and guard beds and * negligible condensation on the internal walls of the adsorbers.</p>	Mercury Concentration:				
	Parameter	Condition			
		Nominal		Maximum (Process Note 11)	
		ug/dscm	kg/hour	ug/dscm	kg/hour
	Hg Mass Flow	<b>320</b>	<b>1.40E-03</b>	<b>23,600</b>	<b>0.105</b>
	Required Decontamination Factor (DF) for Hg to comply with <45 ug/dscm			<b>≥ 450</b>	
	Removal Efficiency for HCl or HF			<b>≥ 97%</b>	
	Removal Efficiency for I <sub>2</sub>			<b>≥ 99%</b>	
	Minimum time between Carbon Media change-out			(Process Note 4) <b>24 months</b> <b>24 months</b>	
				<div style="display: flex; justify-content: space-around;"> <span>Primary Bed</span> <span>Guard Bed</span> </div>	

#### Material Data

Process Pipe and Housing Fabrication:			
Pipe Class	<b>S11N</b>	Valve Material	<b>316/316L SS</b>
Inlet Piping Size	<b>18 inches</b>	Valve Trim	<b>TRIM 12</b>
Outlet Piping Size	<b>18 inches</b>	Flange Material	<b>316L SS</b>
Housing	<b>316L SS</b>	Gasket Material	<b>316SS Spiral-Wound/B16.20</b>
Activated Carbon Beds Screens	<b>316L SS</b>	Flange Rating	<b>CL 150 RF B16.5</b>
Pipe schedule	<b>80s</b>	Housing Insulation / Jacket	<b>Calcium Silicate ASTM C533, Type I / 0.024" thk. SST ASTM A240</b>
Pipe Material	<b>316L SS</b>	Pipe Insulation / Jacket	<b>Calcium Silicate ASTM C533, Type I / 0.024" thk. SST ASTM A240</b>

Fire Protection Pipe -			
Pipe Class	<b>S11N</b>	Valve Trim	<b>Trim 12</b>
Inlet Piping Size	<b>* 3 inches</b>	Flange Material	<b>316L SS</b>
Pipe schedule	<b>80S</b>	Gasket Material	<b>316SS SP-WND/Graphite Filled</b>
Pipe Material	<b>316L SS</b>	Flange Rating	<b>CL150 RF B16.5</b>
Valve Material	<b>316 / 316L SS</b>		

Appurtenances and Other items -			
Support Frames	<b>Carbon Steel</b>	Drain Line Flange Material	<b>316L SS</b>
Pipe Supports	<b>Carbon Steel</b>	Drain Line Flange Rating	<b>CL150 RF B16.5</b>
Maintenance Platforms	<b>Carbon Steel</b>	Radar Guide Design	<i>(General Note 12)</i>
Monorail	<b>Carbon Steel</b>	Radar Guide Pipe/Flange Material	<b>316L SS</b>
Flange Bolts / Nuts	<b>ASTM F593 / ASTM F594</b>	Radar Guide Pipe Size	<b>* 1 - 1/2 inches</b>
Fire Suppression Drain Pipe Material	<b>316L SS</b>	Radar Guide Pipe Schedule	<b>*80S</b>
Fire Suppression Drain Pipe Schedule	<b>* 80S</b>	Radar Guide Pipe Flange	<b>CL150 RF B16.5</b>
Drain Line on/off valve	<b>* 2 inch Manual Ball Valve</b>		

#### Bed Fire Suppression System

Fire Detection Method	<b>Differential CO<sub>2</sub> Monitor</b>	Information on Fire Suppression by Flooding Carbon Beds:	
Primary Fire Suppression Method:	<b>Isolate Carbon Beds</b>	Flowrate:	<b>* 40 gpm per unit</b>
Primary Fire Suppression Activation Method:	<b>Automatic</b>	Pressure:	<b>* 50 psig</b>
Secondary Fire Suppression Method:	<b>Flood Carbon Beds</b>	Total Volume of Water:	<b>* 6800 gal</b>
Secondary Suppression Activation Method:	<b>Manual</b>	Total Time to Fill Vessel:	<b>* 170 minutes</b>
Fluid Type for Carbon Bed Flooding	<b>Fire Water</b>	Drain Pipe Line Size:	<b>* 2 inches</b>



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Liquid Level Control Method **Radar Liquid Level Indication with Manual Shut-off**

Liquid Level Control Logic **Radar level instrument provides indication of action level for manual shutoff of Fire Water supply at a pre-determined liquid level. Fire Water connection size limits the fill rate (> 2 hours).**

**Design Data**

**Nozzle Loads at Buyer Interface (General Note 6):**

**Inlet Nozzle:**

Nozzle #	Nozzle Size	Orientation	Load Case	F <sub>x</sub> (lbs)	F <sub>y</sub> (lbs)	F <sub>z</sub> (lbs)	M <sub>x</sub> (ft-lbs)	M <sub>y</sub> (ft-lbs)	M <sub>z</sub> (ft-lbs)
N01	18 in	Horizontal	Weight	500	1000	500	1500	1500	1500
			Thermal	3000	6000	6000	15000	5000	5000
			Seismic	3000	3000	9000	10000	6000	6000

**Outlet Nozzle:**

Nozzle #	Nozzle Size	Orientation	Load Case	F <sub>x</sub> (lbs)	F <sub>y</sub> (lbs)	F <sub>z</sub> (lbs)	M <sub>x</sub> (ft-lbs)	M <sub>y</sub> (ft-lbs)	M <sub>z</sub> (ft-lbs)
N02	18 in	Vertical	Weight	500	1000	500	1500	1500	1500
			Thermal	3000	3000	3000	8000	12000	6000
			Seismic	3000	3000	3000	12000	6000	6000

**Note:** Values are x = North/South, y = elevation (+ = up), z = East/West (global coordinates).

**Support Reactions (General Note 7):**

Support:	Load Case	F <sub>x</sub> (kips)	F <sub>y</sub> (kips)	F <sub>z</sub> (kips)	M <sub>x</sub> (kips-in)	M <sub>y</sub> (kips-in)	M <sub>z</sub> (kips-in)
<b>LAW-LVP-H30081</b> (w/ Child Support LAW-LVP-H30088)	Normal	0.315	0.133	0.128	2.728	2.385	8.204
	Occasional	0.697	0.260	0.047	0.865	0.926	17.429
<b>LAW-LVP-H30083</b> (w/ Child Support LAW-LVP-H30090)	Normal	0.010	0.135	0.040	1.008	0.639	2.067
	Occasional	0.346	0.255	0.036	0.695	0.419	11.033
<b>LAW-LVP-H30085</b> (w/ Child Support LAW-LVP-H30092, -H30095, -H30098)	Normal	0.195	0.258	0.105	2.871	1.265	6.624
	Occasional	0.664	0.498	0.069	1.591	0.821	19.498

**Note:**

- Vendor shall apply the footprint loads on the equipment's attachment per the location on the sketch provided. To eliminate conservatism, the footprint loads are provided at each attachment point using actual piping loads.
- Load Case Normal = *Weight + Live + Thermal*. Friction force is included in Normal Load.
- Load Case "Occasional" = *Normal + Earthquake (double acting = +/-)*.
- Values are x = North/South, y = elevation (+ = up), z = East/West (global coordinates).
- See sketches 2 through 5 for pipe support detail.

**Thermal Information:**

Room #	<b>L-0304F</b>	Maximum Heat Loss:	<b>0.5 KW</b>
Room Temperature:	<b>59 to 95</b> °F	Thermal Cycling Frequency: (General Note 9)	<b>For design purposes, use a thermal cycle frequency of once every two (2) months for the life of the plant (40 years).</b>
Room Temperature Beneath Floor:	<b>59 to 95</b> °F (Fixed)		
Concrete Slab Base Thickness:	<b>12</b> Inches		
Thermal Conductivity of Concrete Slab:	<b>12</b> BTU in./hr ft °F		



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Activated Carbon Data -	Primary Bed	Guard Bed
Manufacturer	* Donau Carbon	*
Model	* Kombisorb BAT 37	*
Description	* A mixed product composed by inert material and impregnated, cylindrically shaped activated carbon (ratio of mixture 30:70).	*
Activation element/ % Loading	* Sulfur Compounds/ * Approx 9% Sulfur	* / *
Media form (granular, pellet, etc.)	* Extruded & Granular	*
Size of carbon media (mm)	* 3-5	*
Bulk density	* 0.5 g/cc (37.5 lb/ft <sup>3</sup> )	*
Total Bed Loading, lbs Mercury / lbs Media	* 309 lbs / 5886 lbs	* (Iodine) * (Acid Gases)
Number of beds per vessel	* One	* One
Arrangement	* Rectangular parallel beds	* Rectangular parallel beds
Residence time, sec	* 2.85	*
Thickness of bed, in	* 30	* 30
Total media volume, ft <sup>3</sup>	* 250	* 250
Total media weight, lbs	* 7800	*
Spacing between beds, in	* 4	* 4
Face velocity thru carbon, fpm	* 52.7	*
Max. allowable temp, °F	*	*
Min. allowable temp, °F	* ambient	* ambient

House/vessel -	
Material/Thickness	* 0.50 stainless steel with external stiffeners
Vessel dimensions, (L x W x H)	* 239 inches x 96 inches x 114 inches
Total weight of vessel	* Est. 31,000 lbs
Weight of vessel with carbon, lbs	*
Design pressure,	* +4 psig/Full Vacuum (111 in-w.g./FV)
Operating pressure,	* -3.5 psig (-96 in-w.g.)
Design temperature, °F	* 300
Recommended housing insulation:	* Calcium silicate and/or foam glass
Material/Thickness, in	* 4-6
Thermal Cond, Btu-in/hr ft <sup>2</sup> °F	* 0.39
Method of Attachment	* Mechanical support via outer jacket and/or straps
Unloading on/off valve	* 6 each per vessel, each 8 inches size

Discharge Filter -	
Manufacturer	* American Air Filter
Type of filter	* Extended surface area mini-pleat with metal sides
Filter material	* Microglass fibers
Filter frame material	* Stainless steel, type 316
Dimensions of filter, (L x W x H)	* 23-3/8 inches x 23-3/8 inches x 3-3/4 inches
Weight of filter, lbs	* 25 lbs
Number of filters per vessel	* 6
Filter rating (efficiency, particle size)	* 99% on 5 micron particles
Flowrate capacity, scfm	* 2000 per filter
Max. allowable temp, °F	* 500
Min. allowable temp, °F	* ambient

Connecting Pipe -	
Pipe size, in	* 18
Material/Thickness, in	* 0.25
Total length of piping, ft	* 80
Valve type, (gate, butterfly, etc.)	Butterfly
Weight of valve, lbs	TBD
Valve manufacturer (Buyer)	TBD (triple offset API 609 wafer, short flanges to ISO 5752)
Total number of valves (Buyer)	6
Actuators (air operated, rack and pinion, FC)	Air operated



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Connecting Pipe -	
Actuator manufacturer	TBD
Weight of actuator	TBD
Actuator operating pressure (min. and max.)	TBD
Opening time, seconds	TBD
Total number of Actuators	2 ea. pneumatic, 4 ea. manual per activated carbon bed adsorber unit
Required instrument air supply, SCFM	TBD
Recommended piping insulation:	* Calcium silicate or foam glass
Material/Thickness, in	* 1
Thermal Cond, Btu-in/hr ft <sup>2</sup> °F	* 0.39
Method of Attachment	* straps

Loading Equipment -			
Electric Hoist:			
Manufacture:	* Allied Power Products, Inc.	Motor Horsepower:	* 0.5 HP
Capacity:	* ~ 1000 lbs (1 Super Sack)	Full Load Current:	* TBD Amps
Lift:	* 20 ft	Voltage:	* 115/230 VAC
Speed:	* 11.8 FPM First Layer	Service (1ph or 3ph):	* 1 ph
Mounting:	* W6x25 ASTM A36 Beam	Hz:	* 60 Hz

Construction Data: (To be determined by the supplier when not specified by the buyer)					
Dimensions ( L x W x H)	ft	42'-2" x 12' x 18'-4"	Shipping Dimensions (L x W x H)	ft	* Four (4) trailers Each load 25' x 10'
Operating Weight of unit (two vessels)	lbs	*	Shipping Weight	lbf	* 90,000
Full Water Flood Weight of unit (two vessels)	lbs	*			

Corrosion Data:	
Corrosion Allowance, in	0.010 (General Note 11)

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**General Notes:**

1. Data marked with an asterisk (\*) has been or is to be provided by Vendor.
2. The adsorber housing pressure boundary is designed and fabricated to ASME BPVC, Sec VIII, Div 1, the adsorbers and fire protection system are designed and fabricated to applicable ASME AG-1 requirements and the interconnect piping and valves are designed and fabricated to ASME B31.3 - 1996. The packaged unit is tested to ASME AG-1 with ASME AG-1a-2000 Addenda, and the pressure boundary pneumatically tested per ASME BPVC, Sec VIII, Div 1.
3. Contents of this document are Dangerous Waste Permit affecting.
4. Delete.
5. Ref. 24590-LAW-M4C-LOP-00001, *LAW Melter Offgas System Design Basis Flowsheets*. Unless otherwise noted, Nominal values represent 2-Melter Nominal Offgas Condition. Maximum values represent the 2-Melter Maximum Offgas Condition.
6. Ref. CCN 172486 for nozzle design loads for LVP-ADBR-00001A/B.
7. Ref. CCN 175315. WTP will fabricate and install Pipe Supports LAW-LVP-H30081, -H30083, & -H30085, and associated Radar Guide Tubing. See Sketches 2 - 5. Supplier to include pipe supports, support loads, and listed piping in analysis of Carbon Bed Adsorbers.
8. Unless otherwise specified on this Mechanical Data Sheet, utilize the minimum nozzle loads specified in 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication*.
9. Ref. 24590-WTP-MVC-50-00009, *LAB, BOF, LAW Vessel Cyclic Datasheet Inputs*.
10. Ref. 24590-LAW-MKC-LVP-00005, *LAW Activated Carbon Bed Operating Conditions and Process Design Requirements*.
11. Ref. 24590-LAW-N1D-LVP-00004, *Corrosion Evaluation*. A value of 0.010 is used for conservatism.
12. Ref. 24590-WTP-J8-50-00001, *Radar Installation Wave Guide Spool Joining Details (Detail 2)*.
13. Ref. 24590-LAW-M4E-LOP-00003, *Add Acid Mass Flow*.



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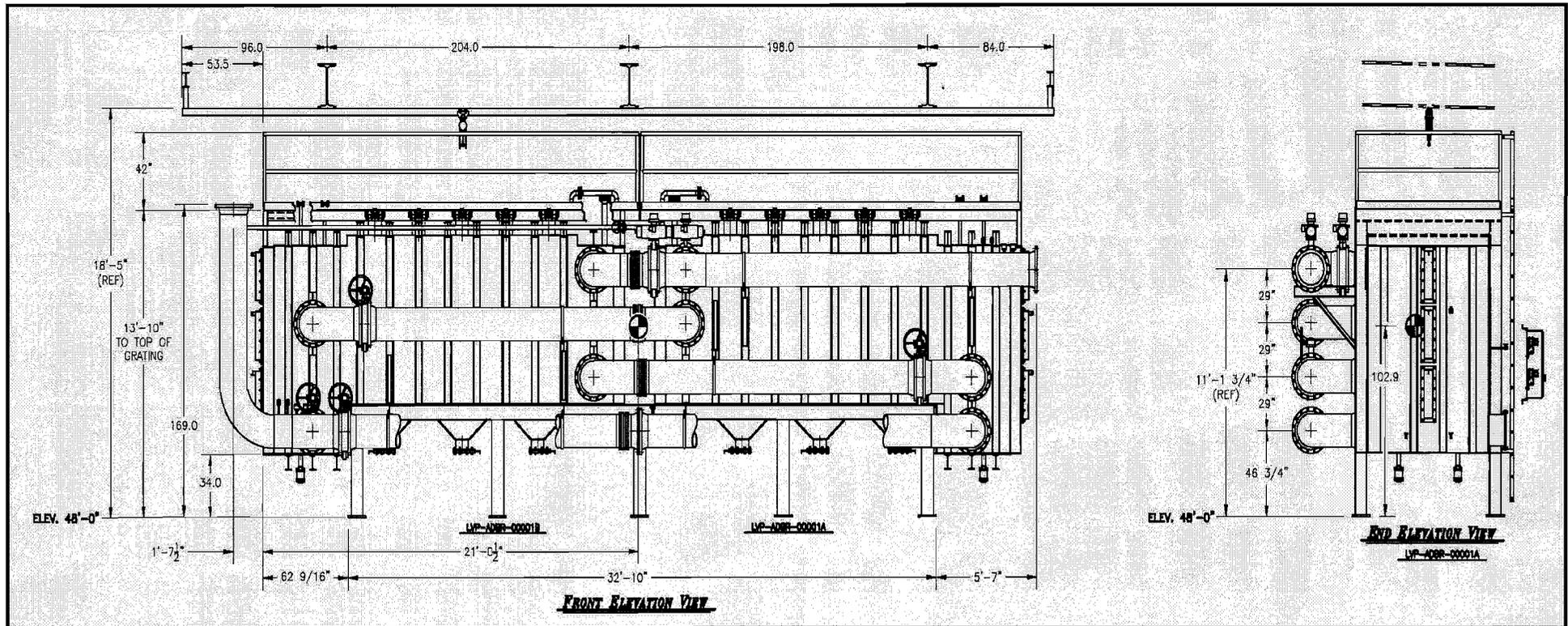
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## Sketch # 1: LAW Adsorber Sketch:

Note: Dimensions provided below are for reference only. See supplier detail drawings for actual dimensions.





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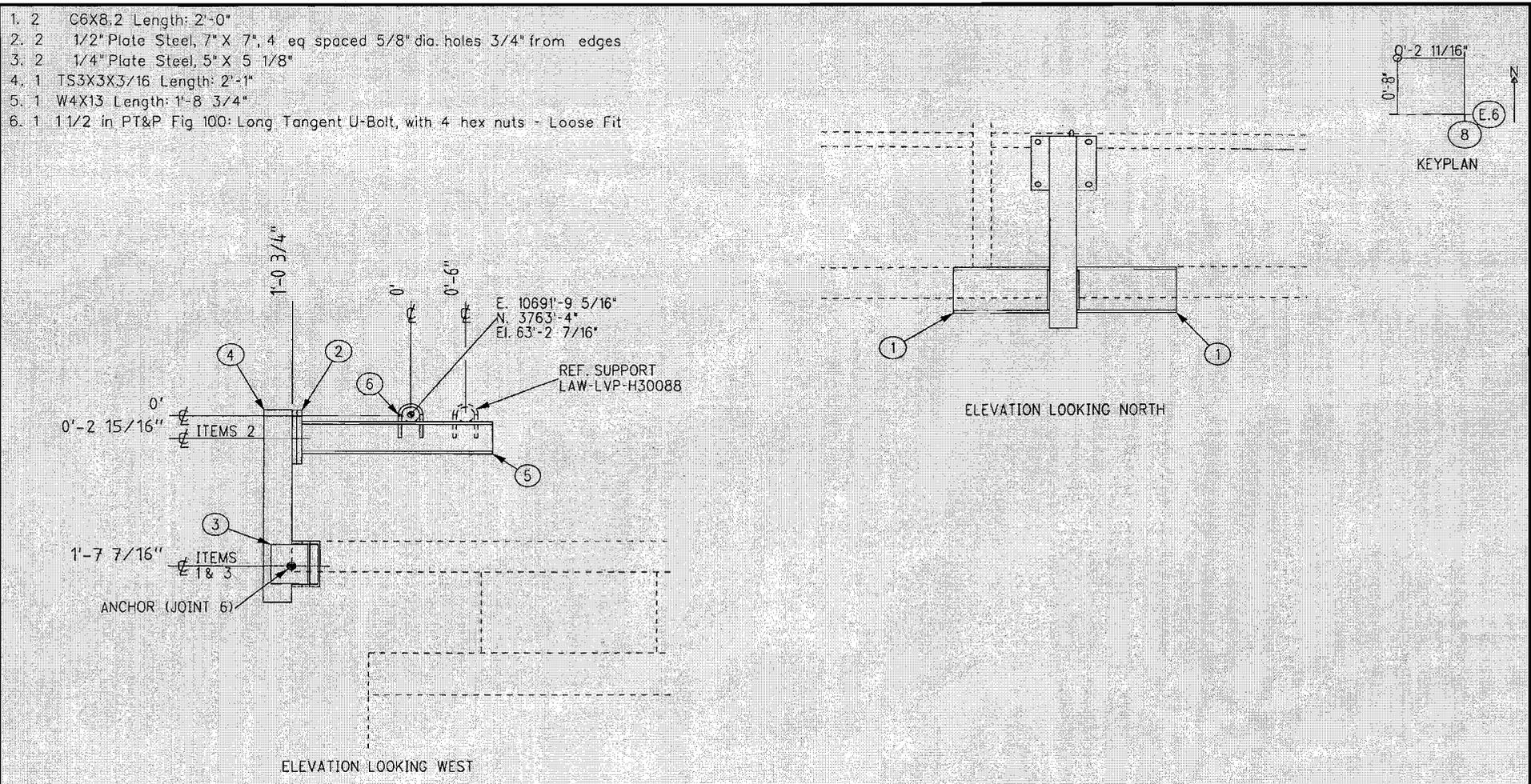
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## Sketch # 2: LAW-LVP-H30081 Pipe Support Sketch (General Note 7):

1. 2 C6X8.2 Length: 2'-0"
2. 2 1/2" Plate Steel, 7" X 7", 4 eq spaced 5/8" dia. holes 3/4" from edges
3. 2 1/4" Plate Steel, 5" X 5 1/8"
4. 1 TS3X3X3/16 Length: 2'-1"
5. 1 W4X13 Length: 1'-8 3/4"
6. 1 1 1/2 in PT&P Fig 100: Long Tangent U-Bolt, with 4 hex nuts - Loose Fit





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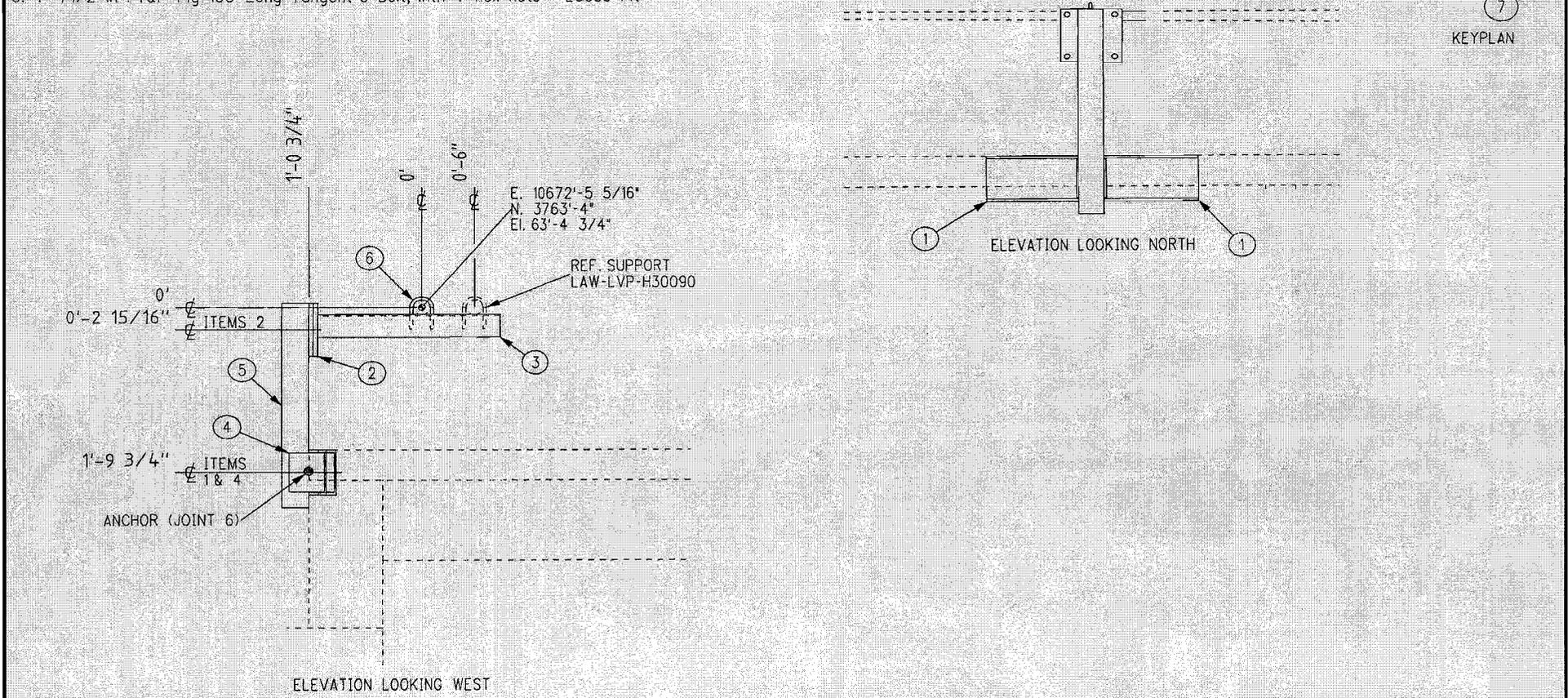
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## Sketch # 3: LAW-LVP-H30083 Pipe Support Sketch (General Note 7):

- 2 C6X8.2 Length: 2'-0"
- 2 1/2" Plate Steel, 7" X 7", 4 eq spaced 5/8" dia. holes 3/4" from edges
- 1 L3X3X3/8 Length: 1'-8 3/4"
- 2 1/4" Plate Steel, 5" X 5 1/8"
- 1 TS3X3X3/16 Length: 2'-3"
- 1 1 1/2 in PT&P Fig 100: Long Tangent U-Bolt, with 4 hex nuts - Loose Fit





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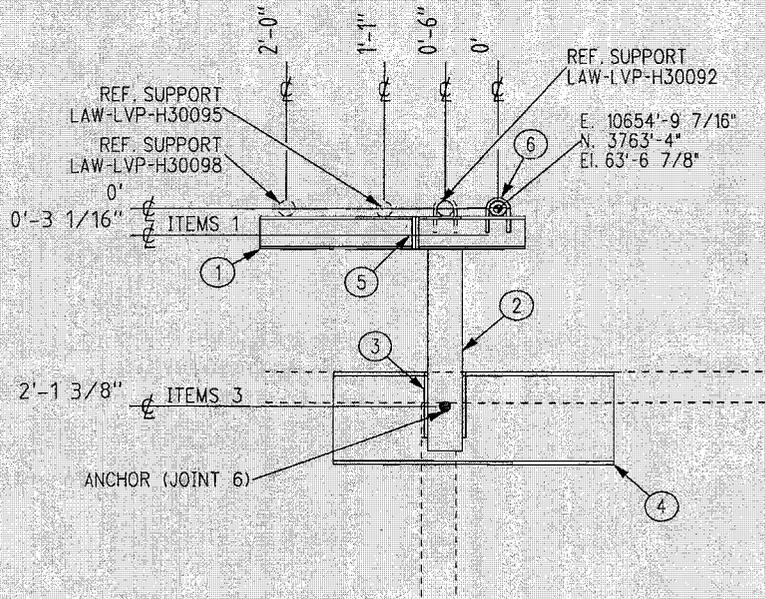
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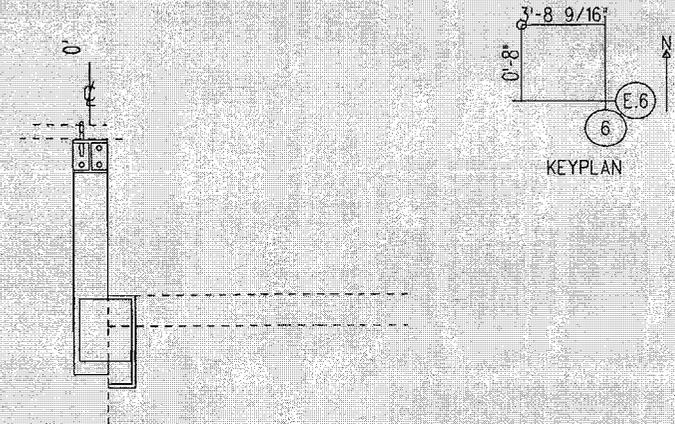
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**Sketch # 4: LAW-LVP-H30085 Pipe Support Sketch (General Note 7):**

1. 1 W4X13 Length: 2'-6"
2. 1 TS4X4X1/4 Length: 2'-2"
3. 2 3/8" Plate Steel, 6" X 8"
4. 1 C12X25 Length: 2'-8"
5. 2 3/8" Plate Steel, 4 1/8" X 4 1/16", 4 eq spaced 5/8" dia. holes 1" from edges
6. 1 1 1/2 in PT&P Fig 100: Long Tangent U-Bolt, with 4 hex nuts - Loose Fit



ELEVATION LOOKING EAST



ELEVATION LOOKING NORTH



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**24590-LAW-MV-LVP-ADBR-00001B**

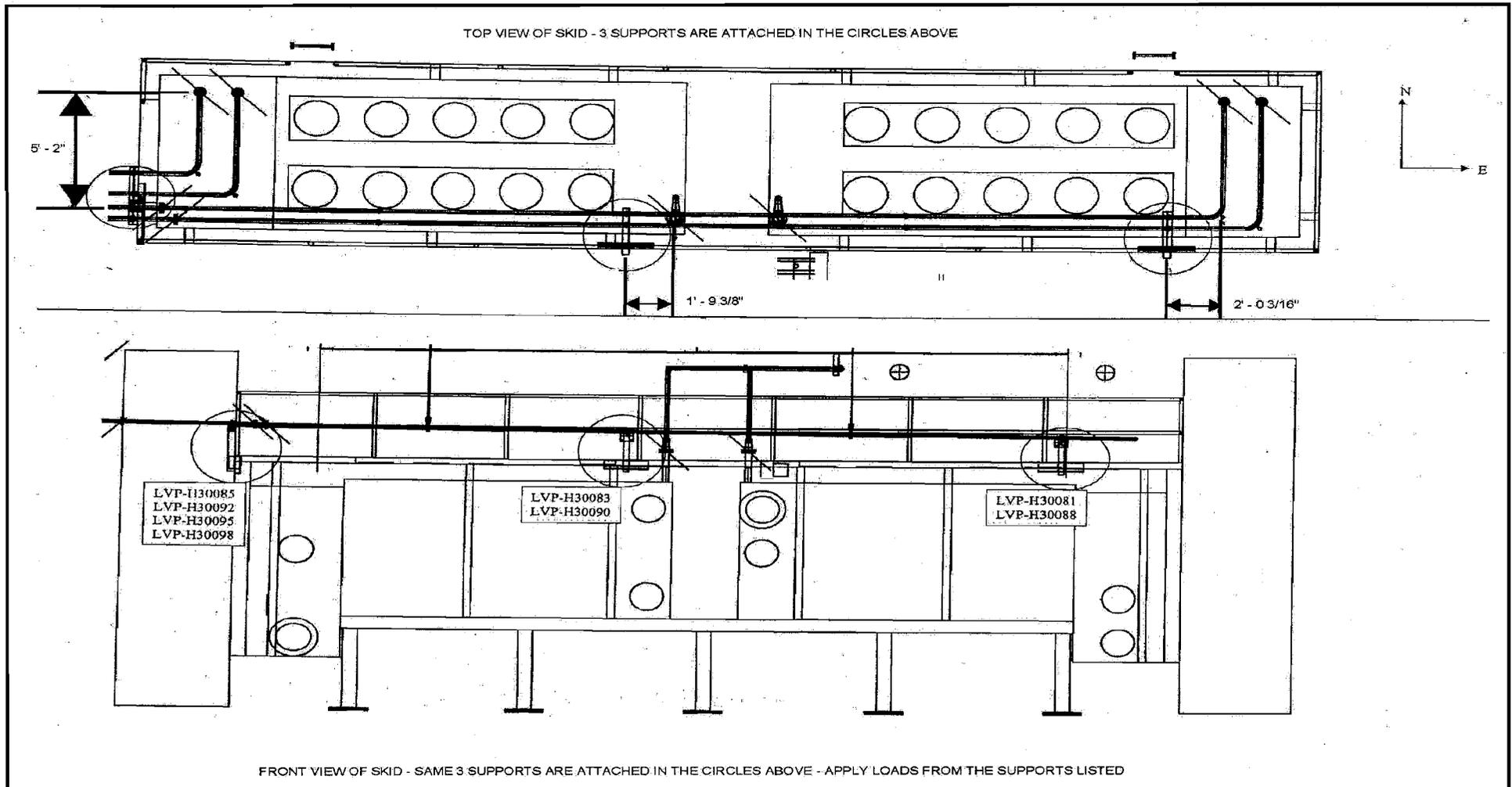
**Data Sheet No.**

**24590-LAW-MVD-LVP-00003**

**Rev.**

**6**

**Sketch # 5: Pipe Support Sketch (General Note 7):**





River Protection Project  
Waste Treatment Plant

**MECHANICAL DATA SHEET**  
**ACTIVATED CARBON ADSORBER**

PLANT ITEM No.

24590-LAW-MV-LVP-ADBR-00001A

24590-LAW-MV-LVP-ADBR-00001B

Data Sheet No.

24590-LAW-MVD-LVP-00003

Rev.

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Safety Screening required?: Yes X No \_\_\_ (If yes per 24590-WTP-GPP-SREG-002, E&NS signature required below.)

6	Updated with vendor provided information including those associated with 24590-WTP-SDDR-MS-11-00167, changes to general notes, and Equipment Qualification Datasheet updated to reflect latest data as well as incorporation of new template format. Major Revision. Revision triangles not used.							1/10/12
5	Major Revision. Revision triangles not used.	M. O'Neill	R. Brown	T. Valenti	M. Sanvictores	D. Krahn	J. Roth	2/17/10
4	Added Radar Guide Pipe and Monorail material data. Corrected Primary and Secondary Fire Suppression Activation Method. Corrected Nozzle N01 load. Added pipe support reaction loads, sketches, and General Note to reference document (CCN 175315) for LAW-LVP-H30081, -H30083, -H30085. Changed connecting pipe valve information. Added Hoist data to Loading Equipment table.	M. O'Neill	R. Jablonski	N. Whitcomb	G. Goolsby	D. Carlstrom	J. Julyk	9/17/08
3	Revised Process Data. Updated Material Data, Bed Fire Suppression System, Design Data, & Activated Carbon Data. Added Equipment Environmental Qualification Data. Updated Layout Note and Added General Note. Added equipment sketches. Incorporated seller provided information. Incorporated SDDR 24590-WTP-SDDR-M-06-00287 by Reference.	M. O'Neill	R. Jablonski	C. Knauss	G. Goolsby	C. Meng	J. Julyk	4/8/08
2	Updated P&ID reference and corrected connecting pipe size.	B. Hanson	D. Pease	D. Reinemann C. Morley	-	-	John Julyk	2/23/06
1	Revised to comply with CODE 1 vendor submittal (24590-QL-POA-MWK0-00001-09-00023), in accordance with CAR 24590-WTP-CAR-QA-05-120. Added Environmental Qualification.	B. Hanson	D. Pease	C. Morley	-	-	John Julyk	12/6/05
0	Issued for Purchase.	B. Hanson	D. Pease	C. Morley	-	-	M. Hoffmann	10/31/04
Rev.	Reason for Revision	Systems Engineer	Equipment Engineer	Checked	Reviewed	E&NS	Approved	Date



# EQUIPMENT QUALIFICATION DATASHEET (EQD)

24590-LAW-MVD-LVP-00003  
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Equipment Identification					
1 - Equipment Tag	Stock Code	Originating Document	Location A	Location B (thru wall)	Note
24590-LAW-MV-LVP-ADBR-00001A	N/A	24590-LAW-M6-LVP-00004002 & -00004003	L-0304F	N/A	
24590-LAW-MV-LVP-ADBR-00001B	N/A	24590-LAW-M6-LVP-00004002 & -00004003	L-0304F	N/A	
				N/A	
				N/A	
				N/A	

**2 - Description:**

Activated Carbon Adsorber Skid (24590-LAW-MX-LVP-SKID-00001) consisting of 24590-LAW-MV-ADBR-00001A and 24590-LAW-MV-ADBR-00001B and all vendor-supplied SSCs. Equipment is located in LAW Room L-0304F at the 48'-0" elevation.

**3 - Requisition No.:** 24590-QL-MRA-MWK0-00001

**4 - Safety Function:**

Per Section 4.4 of 24590-WTP-PSAR-ESH-01-002-03:

- Carbon Bed Vessels and Associated Piping: Boundary must provide a confinement boundary for melter offgas and an unobstructed flow path (no blockage) to the exhaust stack.

<b>5 - Safety Classification</b>	<input type="checkbox"/> SC	<input checked="" type="checkbox"/> SS	<input type="checkbox"/> Post Accident Monitoring (PAM)
<b>6 - Equipment Safety Function Type</b>	<input type="checkbox"/> Electrical	<input type="checkbox"/> Active Mechanical	<input checked="" type="checkbox"/> Passive Mechanical
<b>7 - Seismic Category</b>	<input type="checkbox"/> SC-I	<input type="checkbox"/> SC-II	<input checked="" type="checkbox"/> SC-III <input type="checkbox"/> SC-III seismic interaction only <input type="checkbox"/> SC-IV
<b>8 - Seismic Safety Function</b>	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	
<b>9 - Seismic Operability Requirements</b>	<input type="checkbox"/> During Seismic Event	<input type="checkbox"/> After Seismic Event	<input checked="" type="checkbox"/> None

### Equipment Environmental Qualification (EEQ)

*(Parameter values stated do not include internal process conditions)*

<b>10 - Classification of Environment</b>	<input type="checkbox"/> Harsh	<input checked="" type="checkbox"/> Mild	<input type="checkbox"/> To be determined by Vendor
<b>11 - Qualified Life</b>	<input checked="" type="checkbox"/> 40 years	<input type="checkbox"/> Other	<input type="checkbox"/> To be determined by Vendor
<b>12 - Normal Plant/Process Induced Vibration</b> Note 1	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	
<b>13 - Abnormal Wet Sprinkler</b> Note g	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	Duration: 2 hr
<b>14 - Design Basis Event (DBE) Submergence</b>	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	Duration: 12.5 hr Flood height: 0.92 ft
<b>15 - Design Basis Event (DBE) Steam Break</b>	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	Duration: N/A Temp: N/A

### 16 - Indoor Environmental Ambients

	Normal		Abnormal		Design Basis Event (DBE)	
	High	Low	High	Low	High	Low
<b>Temperature</b>	95 °F	59 °F	151 °F	40 °F	136 °F	40 °F
<i>Note / Ref</i>	<i>Ref 9</i>	<i>Note b, Ref 9</i>	<i>Ref 9</i>	<i>Note b, Ref 9</i>	<i>Ref 9</i>	<i>Note b</i>
<b>Duration</b>	40 yr	N/A	8 hrs/yr	N/A	2 hr	N/A
<i>Note / Ref</i>	<i>Note a, Ref 9</i>	<i>Note b</i>	<i>Note a, Ref 9</i>	<i>Note b</i>	<i>Ref 9</i>	<i>Note b</i>



# EQUIPMENT QUALIFICATION DATASHEET (EQD)

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<b>16 - Indoor Environmental Ambients</b>						
	Normal		Abnormal		Design Basis Event (DBE)	
	High	Low	High	Low	High	Low
<b>Relative Humidity</b>	90 %	10 %	100 % Cond	4 %	100 % Cond	5 %
<i>Note / Ref</i>	<i>Note c, Ref 9</i>	<i>Note c, Ref 9</i>	<i>Note c, Ref 9</i>	<i>Note c, Ref 9</i>	<i>Note c, Ref 9</i>	<i>Note c, Ref 9</i>
<b>Duration</b>	N/A	N/A	N/A	N/A	2 hr	2 hr
<i>Note / Ref</i>	<i>Note c</i>	<i>Note c</i>	<i>Note c</i>	<i>Note c</i>	<i>Ref 9</i>	<i>Ref 9</i>
<b>Pressure</b>	0 in-w.g.	-0.4 in-w.g.	4 in-w.g.	-2.4 in-w.g.	4 in-w.g.	-2.4 in-w.g.
<i>Note / Ref</i>	<i>Note d, Ref 9</i>	<i>Note d, Ref 9</i>	<i>Note d, Ref 9</i>	<i>Note d, Ref 9</i>	<i>Note d, Ref 9</i>	<i>Note d, Ref 9</i>
<b>Duration</b>	N/A	N/A	N/A	N/A	2 hr	2 hr
<i>Note / Ref</i>	<i>Note d</i>	<i>Note d</i>	<i>Note d</i>	<i>Note d</i>	<i>Ref 9</i>	<i>Ref 9</i>
<b>Radiation Dose Rate</b>	10 mRad/hr		10 mRad/hr		10 mRad/hr	
<i>Note / Ref</i>	<i>Ref 9</i>		<i>Ref 9</i>		<i>Ref 9</i>	
<b>Duration</b>	40 yrs		0 hr		0 hr	
<i>Note / Ref</i>	<i>Notes 3 and e, Ref 9</i>		<i>Notes 3 and e, Ref 9</i>		<i>Notes 3 and e, Ref 9</i>	
<b>Additional Information</b>	Note h		Note h		Notes f, h	

## 17 - Outdoor Environmental Ambients - N/A

<b>Spray Exposure</b>						
<b>18 - Normal</b>						
Chemical		Concentration (M)		Duration (hr)		
N/A		N/A		N/A		
				<i>Note / Ref.</i>		
<b>19 - Design Basis Event (DBE)</b>						
Chemical		Concentration (M)		Duration (hr)		
Ammonia Vapor		Anhydrous		12.5 hr		
				<i>Note / Ref.</i>		
Chemical		Flowstream	pH	Temp (° F)	Duration (hr)	
Water		N/A	N/A	N/A	12.5	
Fire Water		N/A	N/A	N/A	2	
						<i>Note / Ref.</i>
						<i>Note / Ref.</i>

<b>20 - Electrical Interfaces Supporting the Safety Function</b>	
<b>Power Supply Voltage (VAC, VDC):</b> (Seller) 120 VAC	
<b>Power Supply Frequency (Hz):</b> (Seller) 60 Hz	
<b>Power Connection Method:</b> (Seller) Terminal Blocks	
<b>I/O Signals to/from Equipment:</b> (Seller)	
<b>I/O Connection Method:</b> (Seller) Terminal Blocks	

<b>21 - Mechanical Interfaces Supporting the Safety Function</b>	
<b>Mounting Configuration (orientation):</b> See 24590-LAW-P1-P01T-00005 for WTP General Arrangement Drawing.	
<b>Mounting Method (bolts, welds, etc.):</b> Equipment welded to embeds. See 24590-BOF-DD-S13T-00001 for embed detail. See 24590-LAW-DB-S13T-00135 for embed quantity and location.	
<b>Auxiliary Devices:</b> COx Gas Analyzers; Acid Gas Analyzers; Mercury Monitor; 18" Isolation Valves and Actuators; Liquid Level.	



# EQUIPMENT QUALIFICATION DATASHEET (EQD)

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## 21 - Mechanical Interfaces Supporting the Safety Function

Instrumentation; Pressure Relief Devices; Temperature Sensors; Associated Interlocks.

## 22 - Equipment Seismic Qualification (ESQ)

**Design Specification:**

Document No.	Rev	Title	Remarks / Notes
24590-WTP-3PS-FB01-T0001	4	Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks	

**Load Parameters:**

Document No.	Rev	Title	Remarks / Notes
24590-WTP-3PS-FB01-T0001	4	Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks.	

## Equipment Qualification Notes

**23 - General EQD Notes:**

- a) For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.
- b) The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per item a) above. Therefore, no duration is assigned for the low temperatures.
- c) The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and the low normal and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.
- d) If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.
- e) (1) If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."  
 (2) If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."
- f) The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.
- g) Spray due to fire sprinkler actuation shall be taken to occur once over the entire qualified life duration for a period of 2 hours, even if the qualified life is a period less than 40 years. If spray qualification is provided for DBE conditions (whether for water or chemical spray), then separate qualification for the fire sprinkler spray need not be provided.
- h) The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.
- i) Deleted
- j) Deleted



# EQUIPMENT QUALIFICATION DATASHEET (EQD)

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## Equipment Qualification Notes

**24 - Specific Notes:**

- 1 Process induced vibration only consists of that transmitted through the embeds due to collocated equipment.
- 2 Equipment is hands-on maintained and requires servicing of bed media every two years.
- 3 For radiation, a TID of less than 10,000 Rad for an organic compound is not considered significant [Ref. 3, Section 3.4.5]. Therefore, radiation need not be considered a significant aging stressor for the LAW Activated Carbon Bed Adsorber units.
- 4 Ammonia piping is SC-III to prevent loss of confinement for this chemical hazard.

## 25 - Reference List -

No.	Document No.	Rev	Title
1	24590-WTP-3PS-FB01-T0001	4	Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks
2	24590-WTP-3PS-MV00-T0002	3	Engineering Specification for Seismic Qualification Criteria for Pressure Vessels
3	24590-WTP-3PS-G000-T0015	1	Engineering Specification for Environmental Qualification of Mechanical Equipment
4	24590-LAW-P1-P01T-00005	4	LAW VITRIFICATION BUILDING GENERAL ARRANGEMENT PLAN AT EL. 48'-0"
5	Not Used	N/A	N/A
6	24590-WTP-PSAR-ESH-01-002-01	4S	Preliminary Documented Safety Analysis to Support Construction Authorization; General Information
7	24590-WTP-SRD-ESH-01-001-02	5AE	Safety Requirements Document Volume II
8	24590-BOF-DD-S13T-00001	0	BALANCE OF FACILITIES CONCRETE EMBED PLATES
9	24590-LAW-U0D-W16T-00001	2	LAW Room Environment Data Sheet
10	24590-LAW-DB-S13T-00135	8	LAW VITRIFICATION BUILDING MAIN BUILDING PARTIAL CONC FORMING PLAN ZONE 5 @ EL (+) 48 FT - 0 IN
11	24590-WTP-PSAR-ESH-01-002-03	4P	Preliminary Documented Safety Analysis To Support Construction Authorization; LAW Facility Specific Information
12	24590-LAW-M6-LVP-00004002	0	P&ID - LAW - LAW SECONDARY OFFGAS/VESSEL VENT PROCESS SYSTEM MERCURY MITIGATION EQUIPMENT LVP-SKID-00001
13	24590-LAW-M6-LVP-00004003	0	P&ID - LAW - LAW SECONDARY OFFGAS/VESSEL VENT PROCESS SYSTEM MERCURY MITIGATION EQUIPMENT LVP-ADBR-00001/B
14	24590-QL-POA-MWK0-00001-16-00073	A	PLAN - ENVIRONMENTAL QUALIFICATION PLAN AND REPORT FOR LAW CARBON BED ADSORBER MECHANICAL EQUIPMENT