OFFICE OF RIVER PROTECTION
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

JUL 2 3 2013

13-ECD-0061

Ms. Jane A. Hedges, Program Manager
Nuclear Waste Program
Washington State
Department of Ecology
3100 Port of Benton Blvd.
Richland, Washington 99354

Ms. Hedges:

SUBMITTAL OF DANGEROUS WASTE PERMIT (DWP) PACKAGE LAW-026C, REVISION 0, FOR "MISCELLANEOUS UNIT SUBSYSTEM FOR LAW FACILITY LVP SYSTEM – LVP EXHAUSTERS"

Reference: WA7890008967, "Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit 10, 'Waste Treatment and Immobilization Plant.'"

This letter transmits the Low-Activity Waste (LAW) Vitrification Facility Permit Package LAW-026C, Revision 0, "Miscellaneous Unit Subsystem for LAW Facility LVP System – LVP Exhausters," and the updated Permit Table III.10.H.A – LAW Plant Miscellaneous Unit System Description.

A description of the LAW-026C, Revision 0, permit package is provided in Attachment 1. The permit package is provided in Attachment 2. This update incorporates the engineering drawing and specification numbers associated with the LAW-026C permit package. During the update of Table III.10.H.A, several errors or omissions of previously approved permit changes were identified and corrected. Changes are provided in redline/strikeout format. Bechtel National, Inc., and the U.S. Department of Energy, Office of River Protection certification statements are provided in Attachment 3.

The attached LAW vitrification facility permit package provides the information necessary for the Washington State Department of Ecology (Ecology) to confirm that the structures, equipment, and processes described in the permit package will comply with the Reference. This information will allow Ecology to permit the installation of the LAW secondary offgas/vessel vent process system melter offgas exhausters in the LAW Facility.

The DWP package submittals are certified coincident with issuance of the integrity assessment report contained in the package. Permit-affecting design changes not included in, or occurring after issuance of, the final integrity assessment report will be processed in accordance with DWP requirements for permit modification prior to construction or installation of affected equipment

and components. Installation of equipment and components will be done in accordance with permit packages approved and incorporated into the DWP by Ecology.

Ecology comments resulting from review of this design package have been dispositioned.

Due to the potential sensitivity of the attached engineering information, we request that Ecology place the data for public review in the standard information repositories, but not provide electronic dissemination of the information.

If you have any questions, please contact me, or your staff may contact Gae M. Neath, Environmental Compliance Division, (509) 376-7828.

Kevin W. Smith
Manager

ECD:GMN

Attachments: (3)

cc w/attachs:
B. L. Curn, BNI
B. G. Erlandson, BNI
P. A. Fisher, BNI
S. K. Murdock, BNI
F. M. Russo, BNI
Administrative Record (WTP H-0-8)
BNI Correspondence
Environmental Portal, LMSI

cc w/o attachs:
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S. G. Harris, CTUIR
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D. McDonald, Ecology
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A. S. Carlson, Ecology (8 hard copies)
T. Z. Gao, Ecology
M. E. Jones, Ecology
J. K. Perry, MSA
A. C. McKarns, RL
D. J. Sommer, SCS

Attachment 1
13-ECD-0061
(1 Page)

Dangerous Waste Permit Package Description

Gae M. Neath

Permit Package LAW-026C Description

LAW-026C, Rev. 0 "Miscellaneous Unit Subsystems for LAW Facility LVP System (LVP Exhausters)"

The LAW facility permit package, LAW-026C addresses the installation of LAW secondary offgas/vessel vent process system (LVP) miscellaneous unit subsystems at the 48 ft elevation. The purpose of the LVP system is to remove gases and particulates from the combined primary offgas and vessel vent streams. The LVP system consists of preheaters, high-efficiency particulate air (HEPA) filters, exhausters, mercury adsorbers, a catalytic oxidizer/reducer, a caustic scrubber, and a caustic collection tank. This permit package only addresses the exhausters.

There are three multi-stage exhausters (LVP-EXHR-00001A/B/C) with adjustable speed drives that are located downstream of the Caustic Scrubber. This location maintains the offgas at a negative pressure through all of the abatement processes. These exhausters will be high integrity multi-stage fans with double mechanical seals with purge to ensure that any seal leakage that may develop will be infiltration versus exfiltration. The exhausters provide the motive force for discharging treated offgas to the atmosphere through the LAW stack. Two exhausters will normally be running at a time with the third exhauster in standby. If one exhauster should fail, the standby exhauster is automatically started. If the standby exhauster fails to start, then the single remaining online exhauster has been adequately sized to maintain negative pressure in the melters.

Permit package LAW-026C consists of:

- A final assessment report signed by an Independent Qualified Registered Professional Engineer (IQRPE) certifying the LVP exhauster design
- Two "source" version Process Flow Diagrams plus associated change documents to replace "permit" versions of the LVP Process Flow Diagrams
- A Mechanical Data Sheet for the exhausters
- An Engineering Specification for exhausters and hoses
- A Technical Change Notice to the exhauster specification
- A Supplier Deviation Disposition Request to the exhauster specification
- A Corrosion Evaluation for the melter offgas exhausters

For incorporation into the Administrative Record:

- Two drawings of exhauster outline dimensions

The following components of this package are already included in the Dangerous Waste Permit, the Administrative Record, provided with other packages, or not applicable as listed in the Table of Contents:

- General Arrangement Plan
- Process Flow Diagram for the LVP system
- Piping and Instrumentation Diagrams for the LVP system
- Engineering Specification for Pressure Vessel Design and Fabrication
- Engineering Specification for Seismic Qualification Criteria for Pressure Vessels

- Engineering Specification for Positive Material Identification (PMI)
- Secondary Containment Design document
- LAW Vitrification Offgas System Bypass Analysis document
- Installation for Tank Systems and Miscellaneous Treatment Unit Systems document
- System Descriptions for LOP and LVP: LAW Melter Offgas
- Material and Energy Balance
- Toxic Vapors and Emissions From WTP Tank Systems and Miscellaneous Treatment Unit Systems
- Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems
- Two change documents associated with Process Flow Diagrams

Attachment 2
13-ECD-0061
(79 Pages – Mostly Double-Sided)

Dangerous Waste Permit Package LAW-026C, Revision 0

Table of Contents	3 Pages
24590-CM-HC4-HXYG-00240-02-00009/IA-3009093-000	15 Pages
24590-LAW-M5-V17T-00010, Revision 4	1 Page
24590-LAW-M5N-V17T-00015	2 Pages
24590-LAW-M5N-V17T-00017	1 Page
24590-LAW-M5-V17T-00011, Revision 5	1 Page
24590-LAW-3PS-MACS-T0001, Revision 2	72 Pages
24590-QL-MRA-MACS-00007-T0005	6 Pages
24590-WTP-SDDR-MS-12-00039	12 Pages
24590-LAW-MAD-LVP-00006, Revision 9	9 Pages
24590-LAW-N1D-LVP-00003, Revision 3	7 Pages
24590-QL-POA-MACS-00007-06-00008, Revision E (C-209355P)	1 Page
24590-QL-POA-MACS-00007-06-00018, Revision C (C-209355PC)	1 Page
Redline Permit Conditions Table	5 Pages

GMNeath

Gae M. Neath

Design Package No. LAW-026C, Rev. 0 CCN 255287
Miscellaneous Unit Subsystems for LAW Facility LVP System
(LVP Exhausters)
Table of Contents
For Incorporation into the Permit

June 26, 2013

Engineering Document Title	Document Number	Revision	Permit Conditions	Included	Remarks
IQRPE Independent Assessment Report	IA-3009093-000 / 24590-CM-HC4-HXYG-00240-02-00009	00A	III.10.H.5.c.i	Y	For incorporation into Appendix 9.11
Permit Drawings					
General Arrangement Plan	24590-LAW-P1-P01T-00005	4	III.10.H.5.c.ii	N	In Appendix 9.4 (24590-LAW-P1-P01T-00005, Rev. 4 provided in 24590-LAW-PCN-ENV-11-008
Process Flow Diagram	24590-LAW-M5-V17T-00010	4	III.10.H.5.c.ii	Y	For incorporation into Appendix 9.1
Process Flow Diagram Change Notices	24590-LAW-M5N-V17T-00012			N	In Appendix 9.1
	24590-LAW-M5N-V17T-00015			Y	For incorporation into Appendix 9.1
	24590-LAW-M5N-V17T-00017			Y	For incorporation into Appendix 9.1
	24590-LAW-M5N-V17T-00029			N	In Appendix 9.1
Process Flow Diagram	24590-LAW-M5-V17T-00011	5		Y	For incorporation into Appendix 9.1
Process Flow Diagram Change Notices	24590-LAW-M5N-V17T-00012			N	In Appendix 9.1
	24590-LAW-M5N-V17T-00019			N	In Appendix 9.1
	24590-LAW-M5N-V17T-00023			N	In Appendix 9.1
	24590-LAW-M5N-V17T-00029			N	In Appendix 9.1
Piping & Instrumentation Diagrams	24590-LAW-M6-LVP-00001004	0	III.10.H.5.c.ii	N	In Appendix 9.2
	24590-LAW-M6-LVP-00001005	0		N	
	24590-LAW-M6-LVP-00001006	0		N	
Mechanical Drawing					
Exhausters	See Remarks	N/A	III.10.H.5.c.ii III.10.H.5.c.vi	N (see remarks)	See Piping and Instrumentation Diagrams 24590-LAW-M6-LVP-00001004, 00001005, and 00001006, for physical attributes. In Appendix 9.2 Vendor drawings incorporated into administrative record

Design Package No. LAW-026C, Rev. 0 CCN 255287
Miscellaneous Unit Subsystems for LAW Facility LVP System
(LVP Exhausters)
Table of Contents
For Incorporation into the Permit

June 26, 2013

Engineering Document Title	Document Number	Revision	Permit Conditions	Included	Remarks
Engineering Specifications					
Exhausters and Hoses	24590-LAW-3PS-MACS-T0001	2	III.10.H.5.c.ii III.10.H.5.c.iii III.10.H.5.c.vi	Y	In Appendix 9.7
Technical Change Notice	24590-QL-MRA-MACS-00007-T0005	N/A		Y	Submittal requirements for Baldor Motors
Supplier Deviation Disposition Request	24590-WTP-SDDR-MS-12-00039	N/A		Y	Minor deviations to the motor specification and clarification for spare terminals
Pressure Vessel Design and Fabrication	24590-WTP-3PS-MV00-T0001	4		N	In Appendix 7.7
Seismic Qualification Criteria for Pressure Vessels	24590-WTP-3PS-MV00-T0002	3		N	In Appendix 7.7
Positive Material Identification (PMI) For Shop Fabrication	24590-WTP-3PS-G000-T0002	8		N	In Appendix 7.7
Mechanical Data Sheets					
Exhauster	24590-LAW-MAD-LVP-00006	9	III.10.H.5.c.ii III.10.H.5.c.vi	Y	For incorporation into Appendix 9.6
Underground Pipe Protection	Not applicable	-	III.10.H.5.c.iv	N	There are no underground pipes in the LAW facility El. 3 ft and above
Corrosion Evaluation					
Melter Offgas Exhauster	24590-LAW-N1D-LVP-00003	3	III.10.H.5.c.iii III.10.H.5.c.v	Y	For incorporation into Appendix 9.9
PER Documents					
LAW Vitrification Offgas System Bypass Analysis	24590-LAW-PER-PR-03-001	2	III.10.H.5.c.ix	N	In Appendix 9.18
Installation of Tank Systems and Miscellaneous Treatment Unit Systems	24590-WTP-PER-CON-02-001	6	III.10.H.5.c.x	N	In Appendix 7.12
Secondary Containment Design	24590-WTP-PER-CSA-02-001	10	III.10.H.5.c.ii	N	In Appendix 7.5

Design Package No. LAW-026C, Rev. 0 CCN 255287
Miscellaneous Unit Subsystems for LAW Facility LVP System
(LVP Exhausters)
Table of Contents
For Incorporation into the Permit

June 26, 2013

Engineering Document Title	Document Number	Revision	Permit Conditions	Included	Remarks
			III.10.H.5.c.iii		

For Incorporation into the Administrative Record

Engineering Document Title	Document Number	Revision	Permit Condition	Included	Remarks
Structural Support Calculations for Off Spec, Non-Standard or Field Fabricated Miscellaneous Treatment Subsystems	Not Applicable - See Remarks	-	III.10.H.5.c.iii	N	There are no Off Spec, Non-Standard or Field Fabricated Miscellaneous Treatment Subsystems in the LAW facility
System Description for LOP and LVP: LAW Melter Offgas	24590-LAW-3YD-LOP-00001	3	III.10.H.5.c.vii	N	In Administrative record - Incorporated in LAW-027
Material and Energy Balance	24590-WTP-RPT-PT-02-005	6	III.10.H.5.c.xi	N	In Administrative Record ORP letter 11-ESQ-224 dated 10/25/11 , Submittal of Mass and Energy Balance Information (CCN 241137)
	24590-WTP-RPT-PET-10-022	0			
	24590-WTP-MRR-PET-10-010	0			
Engineering Document Title	**Document Number**	**Revision**	**Permit Condition**	**Included**	**Remarks**
Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit Systems	24590-WTP-PER-PR-03-002	3	III.10.H.5.c.xi	N	In Administrative Record (CCN 161097) Class 1' modification to Administrative Record
Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems	24590-WTP-PER-PR-03-001	1	III.10.H.5.c.xii	N	Previously provided with LAW-029, Rev. 0 (CCN 067539) dated 8/26/2003, to document compliance with DWP Condition. Note: Revisions to the WTP HPAV strategy are in progress and will require future re-submittal of this document.
Vendor Outline Dimensions of 42" Outlet Driven 4B0B	24590-QL-POA-MACS-00007-06-00008	00E	III.10.H.5.c.vi	Y	To be placed in Administrative Record. Incorporated in LAW-026C.
Vendor Outline Dimensions of 42" Outlet Driven 4B0B	24590-QL-POA-MACS-00007-06-00018	00C	III.10.H.5.c.vi	Y	To be placed in Administrative Record. Incorporated in LAW-026C.

R11538348

ISSUED BY
BPP-WTP PDC

24590-CM-HC4-HXYG-00240-02-00009

REV 00A

SUBCONTRACT SUBMITTAL
REVIEW NOT REQUIRED

AFS-13-0118

AREVA

June 6, 2013

Mr. Gary Ellers
Subcontract Administrator
Bechtel National, Inc.
2435 Stevens Center Place
Richland, Washington 99354

Dear Mr. Ellers:

BECHTEL NATIONAL, INC. CONTRACT NO. 24590-CM-HC4-HXYG-00240 IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW LVP MISC UNIT EXHAUSTER HOUSINGS (LVP-EXHR-00001A/B/C) (IA-3009093-000)

The integrity assessment of the subject LVP Exhauster Housings has been completed per the contract requirements and is enclosed for your use. The assessment found that the design is sufficient to ensure that the LVP Exhauster Housings are adequately designed and have sufficient structural strength, compatibility with the waste(s) to be processed/stored/treated, and corrosion protection to ensure that they will not collapse, rupture, or fail.

If you have any questions, please contact Tarlok Hundal at (509) 371-1975, or via email at tarlok.hundal@areva.com.

Sincerely,

Elizabeth W. Smith, C.P.M
Subcontract Administrator
AREVA Federal Services LLC
Richland Office

Enclosure (1)

LK

cc: D. C. Pfluger, MS5-I w/enclosure (2)

24590-CM-HC4-HXYG-00240-02-00009, Rev. 00A

IA-3009093-000

IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR FOR LAW LVP MISC UNIT EXHAUSTER HOUSINGS (LVP-EXHR-00001A/B/C)

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts; that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

IA-3009093-000

IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT
FOR
FOR LAW LVP MISC UNIT EXHAUSTER HOUSINGS
(LVP-EXHR-00001A/B/C)

"I, Tarlok Singh Hundal, have reviewed and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the LAW LVP Misc. Unit Exhauster Housings, as required by the Washington Administrative Code, *Dangerous Waste Regulations*, Section WAC-173-303-640(3) (a) through (g) applicable components."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicates that the design fully satisfies the requirements of the WAC.

The attached review is eleven (11) pages numbered one (1) through eleven (11).

TARLOK SINGH HUNDAL
STATE OF WASHINGTON
20213
REGISTERED
PROFESSIONAL ENGINEER

T S Hundal

Signature

6/6/13

Date

Scope	Scope of this Integrity Assessment	The scope of this integrity assessment includes three LVP Exhauster Housings (LVP-EXHR-00001A/B/C), also known as Miscellaneous Units (MUs) or Plant Items associated with the LVP system as shown on Process Flow Drawings 24590-LAW-M5-V17T-00010, -00011; and in Figure 6-1 of the System Description document. The LAW LVP Exhausters are downstream from a series of pollution abatement equipment comprising of HEPA Filters, Carbon Bed Adsorbers, Thermal Catalytic Oxidizer/Reducer (TCO) unit, and Caustic Scrubber; all used for removal of toxic volatile oxide compounds (VOCs) and nitrite oxide (NO_x) emissions. The Exhausters provide the motive force to keep the LAW melters under vacuum and discharge the offgas effluent to environment via the exhaust stack. These Exhauster Housings (LVP-EXHR-00001A/B/C) inclusive of motors are mounted on the steel frame skids, which are anchored (welded) to the steel embed plates in concrete floor slab of Rooms L-0304C/D/E, respectively, at Elevation 48'-0" of the LAW facility as shown on General Arrangement Plan Drawings 24590-LAW-P1-P01T- 00005.
Summary of Assessment		For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design requirements and controls to ensure that the design fully satisfies the requirements of Washington Administrative Code (WAC), Chapter 173-303 WAC, *Dangerous Waste Regulations,* Section WAC-173-303-640 (3) (a) through (g) applicable elements of the *Tank Systems.*

References	Material Requisition, Specifications, and Plant Drawings	Material Requisition (MR): 24590-QL-MRA-MACS-00007, Rev. 1, Exhausters, Special Purpose/Process, including TCN # T0001 thru T0005. Specifications: The following Specifications with their respective revision and Specification Change Notices (SCNs) are listed in the above listed MR: 24590-LAW-3PS-MACS-T0001, Engineering Specification for Exhausters and Hoses; 24590-WTP-3PS-JQ06-T0005, Engineering Specification for Environmental Qualification of Control and Electrical Systems and Components; 24590-WTP-3PS-G000-T0001, Engineering Specification for Supplier Quality Assurance Program Requirements; 24590-WTP-3PS-G000-T0002, Engineering Specification for Positive Material Identification (PMI) for Shop Fabrication; 24590-WTP-3PS-G000-T0003, Engineering Specification for Packaging, Handling, and Storage Requirements; 24590-WTP-3PS-G000-T0014, Engineering Specification for Supplier Design Analyses; 24590-WTP-3PS-G000-T0019, Engineering Specification for Acquisition of Commercial Items and Services for use in Safety Applications at WTP; 24590-WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks; 24590-WTP-3PS-SS00-T0001, Engineering Specification for Welding Structural Carbon Steel; 24590-WTP-3PS-SS00-T0002, Engineering Specification for Welding Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel. Plant Drawings: 24590-LAW-P1-P01T-00005, Rev. 4, LAW Vitrification Building General Arrangement Plan at El. 48'-0"; 24590-LAW-P1-P23T-00052, Rev. 3, LAW Vitrification Building Equipment Location Plan El. 48'-0"/Area 5; 24590-WTP-D0-S13T-00003, Rev. 3, Civil/Structural Standards-Abbreviations and Legend; 24590-BOF-DD-S13T-00001, Rev. 0, Balance of Facilities-Concrete Embed Plates; 24590-LAW-DD-S13T-00305, Rev. 4, LAW Vitrification Building Main Building ACU, ASD & Exhauster Anchorage Plan at El. 48'-0"; 24590-LAW-DB-S13T-00135, Rev. 9, LAW Vitrification Building Main Building Partial Conc. Forming Plan Zone 5 @ El. (+) 48'-0"; 24590-LAW-DB-S13T-00136, Rev. 10, LAW Vitrification Building Main Building Partial Conc. Forming Plan Zone 6 @ El. (+) 48'-0"; 24590-LAW-M5-V17T-00010, Rev. 4, Process Flow Diagram LAW Secondary Offgas Vessel Vent Process System, including DCNs # 00012, 00015, 00017, and 00029; 24590-LAW-M5-V17T-00011, Rev. 5, Process Flow Diagram LAW Vit Secondary Offgas Treatment (System LVP), including DCNs # 00012, 00019, 00023, and 00029; 24590-LAW-M6-LVP-00001004, Rev. 0, P&ID-LAW LAW Secondary Offgas/Vessel Vent Process System Offgas Exhausters LVP-EXHR-00001A; 24590-LAW-M6-LVP-00001005, Rev. 0, P&ID-LAW LAW Secondary Offgas/Vessel Vent Process System Offgas Exhausters LVP-EXHR-00001B; 24590-LAW-M6-LVP-00001006, Rev. 0, P&ID-LAW LAW Secondary Offgas/Vessel Vent Process System Offgas Exhausters LVP-EXHR-00001C; 24590-LAW-M6-LVP-00002006, Rev. 0, P&ID-LAW LAW Secondary Offgas/Vessel Vent Process System Stack Discharge Monitoring System.

References (cont'd)	Vendor Drawings, Exhauster Data Sheet, and System Description	Vendor Fabrication Drawings (*Bechtel Status Code 1 Drawings): 24590-QL-POA-MACS-00007-06-00008, Rev. 00E, Outline Dimensions of 42" Outlet Driven 4BOB (LVP-EXHR-00001A); 24590-QL-POA-MACS-00007-06-00009, Rev. 00A, Cross Section of 42" Outlet Driven 4BOB (LVP-EXHR-00001A/B/C); 24590-QL-POA-MACS-00007-06-00015, Rev. 00H, LAW Exhausters Embed Plate Layout/Welding; 24590-QL-POA-MACS-00007-06-00016, Rev. 00C, LAW Exhausters Additional Surface Mounted Plate; 24590-QL-POA-MACS-00007-06-00017, Rev. 00B, Outline Dimensions of 42" Seismic Test Unit (LVP-EXHR-00001TEST); 24590-QL-POA-MACS-00007-06-00018, Rev. 00C, Outline Dimensions of 42" Outlet Driven 4BOB (LVP-EXHR-00001B/C); 24590-QL-POA-MACS-00007-06-00019, Rev. 00B, LAW Exhausters Bolt Plate; 24590-QL-POA-MACS-00007-07-00001, Rev. 00B, Duty Master Alternating Current Motors (LVP-MTR-00001A/B/C). * Bechtel Status Code 1 Drawing is an "as fabricated vendor drawing" approved/accepted by Bechtel. Exhauster Data Sheet: 24590-LAW-MAD-LVP-00006, Rev. 9, LAW Offgas Exhauster (LVP-EXHR-00001A/B/C). System Description: 24590-LAW-3YD-LOP-00001, Rev. 3, System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems, (including SDCNs # 24590-LAW-3YN-LOP-00011, -00012, and -00013).

	Information Assessed	Source of Information	Assessment
Design	Plant Item design standards are appropriate and adequate for the vessel's intended use.	Specifications, Drawings, Exhauster Data Sheet, and Material Requisition listed above under References; AWS Codes, (AWS D1.1) Structural Welding Code, (AWS D 1.3) Steel, Structural Welding Code, Sheet Steel, (AWS D1.6) Structural Welding Code, (AWS D9.1) Stainless Steel, Sheet Metal Welding Code, and (AWS D14.6) Welding of Rotating Elements of Equipment, American Welding Society; ASME Boiler and Pressure Vessel (B&PV) Code, Section IX, Welding and Brazing Qualifications, American Society of Mechanical Engineers; ASME PTC-10-1997, Performance Test Code on Compressors and Exhausters, American Society of Mechanical Engineers.	The LAW Exhauster Housings (LVP-EXHR-00001A/B/C) are MUs assessed as vessels. They are also interchangeably termed herein as Plant Items. The Engineering Specification for Exhausters and Hoses and Exhauster Data Sheet require that the design and fabrication be per AWS Codes and ASME B&PV Code, Section IX. This specification also states that the Exhausters shall be qualified to be compliant with ASME-PTC-10-1997 Performance Test code requirements. Supplemental detailed requirements for the Exhauster Housings design and fabrication combined with aforementioned documents are specified in various engineering specifications (inclusive of the sister documents) listed under Material Requisition in the References section herein. These requirements include items such as, positive material identification, fabrication tolerances, welding procedures, welder qualifications, and testing records, NDE inspections and records, packaging, handling, and storage requirements. The Exhauster Data Sheet (EDS) for these MUs lists their Safety Class as Safety Significant (SS), Quality Level (Q), and Seismic Category (SC-III). The Vendor fabrication drawings show that each Exhauster Housing unit including many components are built with 316L stainless steel materials (max. 0.3% Carbon, dual certified) with its shaft made up of 410 stainless steel. Each unit's structural support frame is built with A36 carbon steel material. The design requirements specified in the codes and specifications listed above are appropriate and adequate for the intended use of these MUs.

	Information Assessed	Source of Information	Assessment
Design (cont'd)	If a non-standard Plant Item is to be used, the design calculations demonstrate sound engineering principles of construction.	Material Requisition and Engineering Specifications listed above under References; AWS Codes, (AWS D1.1) Structural Welding Code, (AWS D 1.3) Steel, Structural Welding Code, Sheet Steel, (AWS D1.6) Structural Welding Code, (AWS D9.1) Stainless Steel, Sheet Metal Welding Code, and (AWS D14.6) Welding of Rotating Elements of Equipment, American Welding Society; ASME Boiler and Pressure Vessel (B&PV) Code, Section IX, Welding and Brazing Qualifications, American Society of Mechanical Engineers; ASME PTC-10-1997, Performance Test Code on Compressors and Exhausters, American Society of Mechanical Engineers: 24590-QL-POA-MACS-00007-13-00001, Rev. 00F, Exhauster Component Attachment Seismic Analysis and Skid Anchorage Design (LVP-EXHR-00001A/B/C) (Design Calculation); 24590-QL-POA-MACS-00007-03-00008, Rev. 00E, Seismic Equipment Qualification for WTP LAW Offgas Exhausters (LVP-EXHR-00001A/B/C/TEST).	The Exhauster MUs in the LAW Secondary Offgas System (LVP) listed above are non-standard offgas handling assemblies and are commercial grade items procured per Engineering Specification for Exhausters and Hoses, Engineering Specification for Acquiring Commercial Items, and other applicable Specifications listed under Material Requisition in the References section herein. The referenced Material Requisition and Specifications require that the AWS Codes, ASME B&PV Code, Section IX, and ASME-PTC-10-1997 Code assemblies be delivered after design, fabrication, inspection, and testing. Review of the Design Calculation, Seismic Equipment Qualification, and related documentation shows that sound engineering principles were used for the design, construction, and the acceptance test qualification of the Exhauster Units.

	Information Assessed	Source of Information	Assessment
Design (cont'd)	Plant Item has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.	Specifications, Exhauster Data Sheet, and Material Requisition listed above under References; AWS Codes, (AWS D1.1) Structural Welding Code, (AWS D 1.3) Steel, Structural Welding Code, Sheet Steel, (AWS D1.6) Structural Welding Code, (AWS D9.1) Stainless Steel, Sheet Metal Welding Code, and (AWS D14.6) Welding of Rotating Elements of Equipment, American Welding Society; ASME Boiler and Pressure Vessel (B&PV) Code, Section IX, Welding and Brazing Qualifications, American Society of Mechanical Engineers; ASME B31.3, Process Piping, ASME Code for Process Piping, American Society of Mechanical Engineers; ASME PTC-10-1997, Performance Test Code on Compressors and Exhausters, American Society of Mechanical Engineers; 24590-LAW-N1D-LVP-00003, Rev. 3, Corrosion Evaluation of Melter Offgas Exhauster (LVP-EXHR-00001A/B/C); UBC 1997, Uniform Building Code, International Conference of Building Officials; 24590-QL-POA-MACS-00007-13-00001, Rev. 00F, Exhauster Component Attachment Seismic Analysis and Skid Anchorage Design (LVP-EXHR-00001A/B/C) (Design Calculation); 24590-QL-POA-MACS-00007-03-00008, Rev. 00E, Seismic Equipment Qualification for WTP LAW Offgas Exhausters (LVP-EXHR-00001A/B/C/TEST).	The LAW Engineering Specification for Exhausters and Hoses and Exhauster Data Sheet require that these MUs including all related components and appurtenances be designed, fabricated, and/or tested in accordance with the applicable sections of AWS Codes, ASME B&PV Code, Section IX, ASME B31.3 Code, and ASME PTC-10-1997 Code. These codes and specifications listed under Material Requisition in the References section herein require specific consideration of operating pressures, temperatures, corrosion allowance, and seismic loads in the design process. The Exhauster Data Sheet identifies the operating pressure and temperature ranges and seismic categories for the subject MUs. Corrosion allowances of 0.04" is recommended for these MUs as identified in the Corrosion Evaluation document. The UBC 1997 Code specifies the seismic loads for the SC-III equipment. The review of Design Calculation and Seismic Equipment Qualification documents shows that the applicable loading parameters including the applicable Technical Change Notices (TCNs) and Supplier Deviation Disposition Requests (SDDRs) listed in the MR, were appropriately considered in the design and qualification process. Furthermore, the required qualification documentation submitted by Exhausters vendor was reviewed, accepted, and approved by BNI to comply with specification stated parameters and hence the MUs will have adequate strength to sustain applicable loadings during their design-life.

	Information Assessed	Source of Information	Assessment
Foundation	Plant Item foundation will maintain the load of a full unit.	Specifications and Exhauster Data Sheet listed above under References; AWS Codes, (AWS D1.1) Structural Welding Code, (AWS D 1.3) Steel, Structural Welding Code, Sheet Steel, (AWS D1.6) Structural Welding Code, (AWS D9.1) Stainless Steel, Sheet Metal Welding Code, and (AWS D14.6) Welding of Rotating Elements of Equipment, American Welding Society; ASME Boiler and Pressure Vessel (B&PV) Code, Section IX, Welding and Brazing Qualifications, American Society of Mechanical Engineers; 24590-WTP-DB-ENG-01-001, Rev. 1Q, Basis of Design; 24590-QL-POA-MACS-00007-13-00001, Rev. 00F, Exhauster Component Attachment Seismic Analysis and Skid Anchorage Design (LVP-EXHR-00001A/B/C) (Design Calculation); 24590-LAW-DDC-S13T-00049, Rev. 2, Design of Embeds for Support of LAW Off-Gas Exhausters (LVP-EXHR-00001A/B/C) (Design Calculation).	The LAW Engineering Specification for Exhausters and Hoses requires the use of AWS Codes and ASME B&PV Code, Section IX code, for their design and fabrication processes. The above listed documents in combination with the Specifications (inclusive of daughter documents) listed under Material Requisition in the Reference section herein, have adequate structural design requirements to ensure proper design of the MUs support system. The Basis of Design document requires that the supports and foundations shall be designed adequately to sustain all applicable loads including the full weight of the Plant Item. The review of Design Calculation reports show that the structural components (panels and structural framing members) of the Exhauster Housings have been designed adequately to handle the applicable full loads of the units. It should be noted that the evaluation of the Exhauster Housings foundation (concrete floor slab @ Elev. 48'-0") is not in the scope of this report. However, it is covered under separate integrity assessment report.

	Information Assessed	Source of Information	Assessment
Foundation (cont'd)	If in an area subject to flooding, the Plant Item is anchored.	Drawings, Specifications, and Exhauster Data Sheet listed above under References; 24590-QL-POA-MACS-00007-13-00001, Rev. 00F, Exhauster Component Attachment Seismic Analysis and Skid Anchorage Design (LVP-EXHR-00001A/B/C) (Design Calculation); 24590-LAW-DDC-S13T-00049, Rev. 2, Design of Embeds for Support of LAW Off-Gas Exhausters (LVP-EXHR-00001A/B/C) (Design Calculation).	As shown on the referenced drawings, the MUs included in this assessment are located on the 48'-0" floor elevation of the LAW facility. The Exhauster Data Sheet lists that Rooms L-0304 C/D/E may be subjected to 0.92 ft (11") of flood height. The units component are mounted on steel beams skids with their top flanges about 10.5" high above the floor slab elevation. Therefore, the units may experience small amount of buoyancy forces. The Design Calculations do not take into account these forces. However, in order to sustain any other applicable loads such as seismic loads are considered which will envelope the above mentioned buoyant forces due to the design margins indicated by the resultant low demand/capacity (D/C) ratio values. These units mounted on the steel beams are adequately welded (anchored) to the embed plates in the concrete floor slab as shown on the drawings and in the Design Calculation documents.
	Plant Item system will withstand the effects of frost heave.	Drawings listed above under References; 24590-WTP-DC-ST-01-001, Rev. 13, Structural Design Criteria.	The Structural Design Criteria document requires that all structural foundations extend into the surrounding soil below the 30-inch frost line in order to preclude frost heave. As shown on the referenced general arrangement drawings, the MUs considered in this assessment are installed in the LAW facility at Floor Elev. 48'-0" which is not subject to frost heave. Therefore, the subject MUs are not subject to the frost heave effects.

	Information Assessed	Source of Information	Assessment
Waste Characteristics	Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, storage temperature)	System Description and Exhauster Data Sheet listed above under References; 24590-WTP-PER-PR-03-002, Rev. 3, Control of Toxic Vapors and Emissions from WTP Tank and Miscellaneous Unit Systems; 24590-WTP-PER-PR-03-001, Rev. 1, Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems; 24590-WTP-M4C-V11T-00004, Rev. C, Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP.	The Exhauster Data Sheet presents the operating temperatures and pressures for MUs within the scope of this assessment. The System Description document identifies the offgas being handled by the MUs as hazardous, but not ignitable or flammable. The main safety function of the LVP system MUs is to prevent the escape of toxic and hazardous gas vapors to the environment from the LAW Secondary Offgas System. MU components design is required to provide an intact housing pressure boundary during normal and abnormal operations and during and after design level seismic events. Waste characteristics that are hazardous, such as ignitability, reactivity, and toxicity are appropriately addressed in the Control of Toxic Vapors and Emissions document and Prevention of Hydrogen Accumulation document. The System Description and Control of Toxic Vapors and Emissions documents describe that the LAW LVP Exhausters are downstream from a series of pollution abatement equipment comprising of HEPA Filters, Carbon Bed Adsorbers, Thermal Catalytic Oxidizer/Reducer (TCO) unit, and Caustic Scrubber: all these equipment are for removal of toxic VOCs and Nitrite Oxide emissions prior to exhausting the offgas effluent to the exhaust stack. The Prevention of Hydrogen Accumulation document indicates that MUs in the LAW facility are not expected to generate hydrogen gas. Therefore, they do not pose any hydrogen accumulation hazard. It is also substantiated in the Calculation for Hydrogen Generation Rates document that hydrogen generation is a liquid-phase phenomenon and since these MUs are a dry offgas system, hydrogen generation should not be an issue.
	Plant Item is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.	Exhauster Data Sheet and System Description listed above under References.	The Exhauster Data Sheet adequately demonstrates the incorporation of identified waste characteristics into the MU design. Normal and abnormal operating conditions are discussed in the System Description. Under normal conditions ammonia is injected into the offgas system in order to treat the offgas and under abnormal conditions untreated offgas could pass through the exhausters.

	Information Assessed	Source of Information	Assessment
Compatibility	The waste types are compatible with each other.	System Description listed above under References.	The MUs herein assessed draw gases from the LAW melters and the process vessels after the upstream removal of toxic and radioactive particulates and aerosols from the offgas constituents to protect the downstream equipment from contamination. The System Description document does not identify any compatibility issues relating to the offgas constituents listed above. Therefore, there are no concerns for compatibility of waste types.
Compatibility	Plant Item material and protective coatings ensure the vessel structure is adequately protected from the corrosive effects of the waste stream and external environments (expected to not leak or fail for the design life of the system).	Exhauster Data Sheet, Drawings, and System Description listed above under References; 24590-LAW-N1D-LVP-00003, Rev. 3, Corrosion Evaluation of Melter Offgas Exhauster (LVP-EXHR-00001A/B/C); 24590-QL-POA-MACS-00007-03-00008, Rev. 00E, Seismic Equipment Qualification for WTP LAW Offgas Exhausters (LVP-EXHR-00001A/B/C/TEST).	The stainless steel material selected as indicated in the Corrosion Evaluation and Exhauster Data Sheet documents serves its purpose being corrosion resistant for the anticipated environment. Based upon these considerations, 316L stainless steel material was chosen for the Exhausters components directly exposed to the offgas stream and the drawings show that this material is used for fabrication. As these units operate in generally dry and actively ventilated conditions, external corrosion is not considered to be an issue. Therefore, the materials selected are adequate to provide the required 40-year service life as specified in System Description and Exhauster Data Sheet documents. In addition, the documented test results in Seismic Equipment Qualification report are adequate proof that the Exhauster housing will not leak or fail during their design life.
Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the Plant Item.	24590-LAW-N1D-LVP-00003, Rev. 3, Corrosion Evaluation of Melter Offgas Exhauster (LVP-EXHR-00001A/B/C).	The Corrosion Evaluation document describes that Exhauster Housing units consist of various assembled components including housing, structural frame, rotor, shaft, bearings, seals, and cooling system. It describes that each unit element is affected by the corrosion and/or wear. It specifies 316L stainless steel material for housing and impellor and 410 stainless steel material for shaft; both materials with corrosion allowance of 0.04" for 40-year service life of the Exhauster Units. This is appropriate for the equipment built with stainless steel materials specified operating under identified conditions.

	Information Assessed	Source of Information	Assessment
Pressure Controls	Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the Plant Item are exceeded.	System Description listed above under References.	The System Description provides a discussion of Normal and Off-Normal operations of the LAW Secondary Offgas LVP System. During normal operations the system is expected to run with two Exhausters and the third one is on standby. However, during Off Normal operation, if one of the two Exhausters fails, the standby backup Exhauster is automatically activated. The pressure monitors and controls described for various components of LVP system in the System Description document are adequate to prevent exceeding the pressure design limits of the Exhauster Housing units.

PLANT ITEM NUMBER
DESCRIPTION

OPERATING DUTY
BATCH/OPERATING CAPACITY (4)

ES:

ETED)

OR INDICATION AND CONTROL INSTRUMENTATION ONLY SHOWN

VES SHOWN ONLY TO INDICATE PROCESS INTENT

ETED)

ETED)

ETED)

T HEADER HAS FLUSH CAPABILITY

TENTS OF THIS DRAWING ARE DANGEROUS WASTE PERMIT ECTING

CONVERT ACFM TO M3/HR MULTIPLY BY 1.7

EAM TABLE REMOVED IN ACCORDANCE WITH STANDARD 3 TION (C)(8) OF THE STATEMENT OF WORK, WTP CONTRACT DE-AC27-01RV14136

H/OPERATING CAPACITY VALUES ARE MINIMUM DESIGN ES; ACTUAL VALUES IMPLEMENTED (IN OTHER DESIGN MEDIA) BE GREATER.

AMMONIA RECYCLE
TO DELIVERY TRUCK

ERENCES:

90-LAW-3YD-LOP-00001, "SYSTEM DESCRIPTION FOR LOP AND LAW MELTER OFFGAS"

ETED)

90-PTF-M5-V17T-00001, "PROCESS FLOW DIAGRAM LEGEND YMBOLS"

90-WTP-RPT-PR-01-008, "PROCESS STREAM NUMBERS"

90-WTP-RPT-ENG-02-009, "SYSTEM AND AREA LOCATORS LIST SYSTEM DIVISION OF RESPONSIBILITY"

90-WTP-RPT-ENG-02 010, "COMPONENT IDENTIFIERS LIST"

90-LAW MEC-LVP-00004, "LAW OFFGAS PREHEATER (LVP-HTR 001 A/B) HEAT DUTY"

PROCESS FLOW DATA: 24590-LAW-MAC-LVP-00007, "LAW GAS SYSTEM PRESSURE DROP DETERMINATION"

90-LAW-MVC-AMR-00001, "PROCESS DATA SHEET INPUT FOR VITRIFICATION ANHYDROUS AMMONIA VESSELS, -VSL-00001/2"

90-LAW-MOC-AMR-00001, "ANHYDROUS AMMONIA VAPORIZATION TER SIZING, AMR-VAP-00001

AMMONIA LIQUID
VIA TRUCK DELIVERY
AVR01

DS:

ING APPROVAL OF ABAR: 24590-WTP-SE-ENS-04-003, REV. 0

WESP OFFGAS
FROM LOP-WESP-00001
3E LAW-00007 LOP08

WESP OFFGAS
FROM LOP-WESP-00002
3E LAW-00008 LOP08

VENT HEADER
FROM VARIOUS VESSELS (4)
LVP01
NOTE 7

DESCRIPTION	DRG	CHK	RVW	DAP	PVD	DATE
UPDATED NOTES & EQUIPMENT DATA. REMOVED STREAM TABLE. CHANGES PER 24590-LAW-DCN-PR-02-004, 24590-LAW-DCA-PR-C3-004 & 24590-LAW-DCA-M-02-009, 24590-WTP-DCN-M-02-001, REV. 0 PER 24590-WTP-CAR-QA-03-075, REV. 0						
DOCUMENT ON REVIEW OF PFD	JRH	TDA		AGD	GD	9-16-02
UPDATED EQUIPMENT DATA, FAN NAME, AND REFERENCES. DESIGN CHANGES ARE INCLUDED FOR 24590-LAW-DCN-PR-02-003.	BWJ	TDA	N/A		GD	8-19-02
UPDATED EQUIPMENT NUMBERING, PROCESS STREAM NUMBERING, AND STREAM TABLE. VESSEL OPERATING CAPACITY CHANGED TO BATCH CAPACITY. DESIGN CHANGES ARE INCLUDED FOR: DCA-24590-01-00002, REV. 0	TH	TA	N/A	AGD		12-5-01
THIS DRAWING SUPERSEDES DWG-W375LV-PR01005, REV. 3.	TH	TLV	N/A	AGD		8-16-01

REVISION HISTORY

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99352

CONTRACT No. DE-AC27-01RV14136

DATE
8/16/01
8/16/01
8/16/01
N/A

PROCESS FLOW DIAGRAM
LAW VITRIFICATION
AMMONIA & SECONDARY OFFGAS
(SYSTEM AMR & LVP)

SCALE NTS | 24590-LAW-M5-V17T-00010 | REV 4

24590-LAW-M5-V17T-00010

Drawing Change Notice

R10434586

CHANGE DOCUMENT NO.
24590-LAW-M5N-V17T-00015

JOB NO.	TITLE FOR CHANGE NOTICE	ISSUED BY
24590	Change HEPA Filter Configuration, Renumber Ammonia Holding Vessels	RPP-WTP PDC

DESIGN DOCUMENT NUMBER	REV NO	TITLE OF DESIGN DOCUMENT
24590-LAW-M5-V17T-00010	4	Process Flow Diagram LAW Vitrification Ammonia & Secondary Offgas (System AMR & LVP)

JUSTIFICATION FOR CHANGE	TREND CODE-NUMBER
The HEPA filter configuration was changed from four of a six-pack type to five of a four-pack type due to a lack of physical space. The ammonia holding vessels are being renumbered because they are being reassigned to the BOF facility.	N/A

Supersedes Change Document ☒ No ☐ Yes

REQUIREMENTS REVIEW

Client Approval Required	☐ Yes	☒ No	Safety Screening / Evaluation Required Documents identified in 24590-WTP-GPP-SREG-002 must be checked "Yes" regardless of the change being made, and E&NS signature is required below.	☒ Yes ☐ No
Interface Resolution Required	☐ Yes	☒ No		
Design Reverification Required	☐ Yes	☒ No		
Permit Review by E&NS Required	☒ Yes	☐ No	Address any "yes" answers in the description	

DESCRIPTION OF CHANGE

PFDs are identified in 24590-WTP-GPP-SREG-002 as requiring a safety screening.

These changes affect the environmental permit version of this drawing and require a permit review by E&NS.

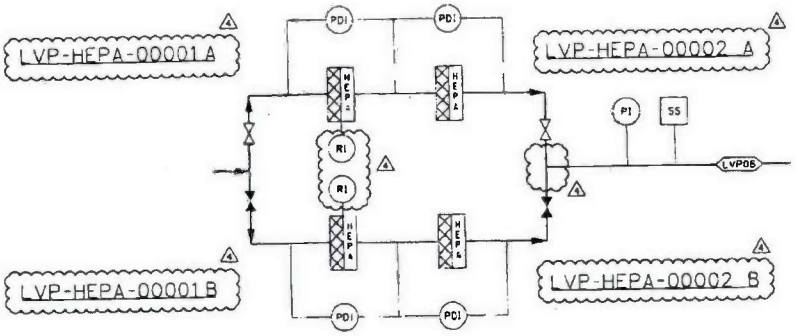
Change the Plant Item Number of the ammonia holding vessel AMR-VSL-00001 to AMR-VSL-00003.

Change the Plant Item Number of the ammonia holding vessel AMR-VSL-00002 to AMR-VSL-00004.

Add Note 12, "AMR-VSL-00003 & -00004 are located in the BOF Facility."

In Sector D-5, reconfigure the HEPA filters as follows:

BEFORE



Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

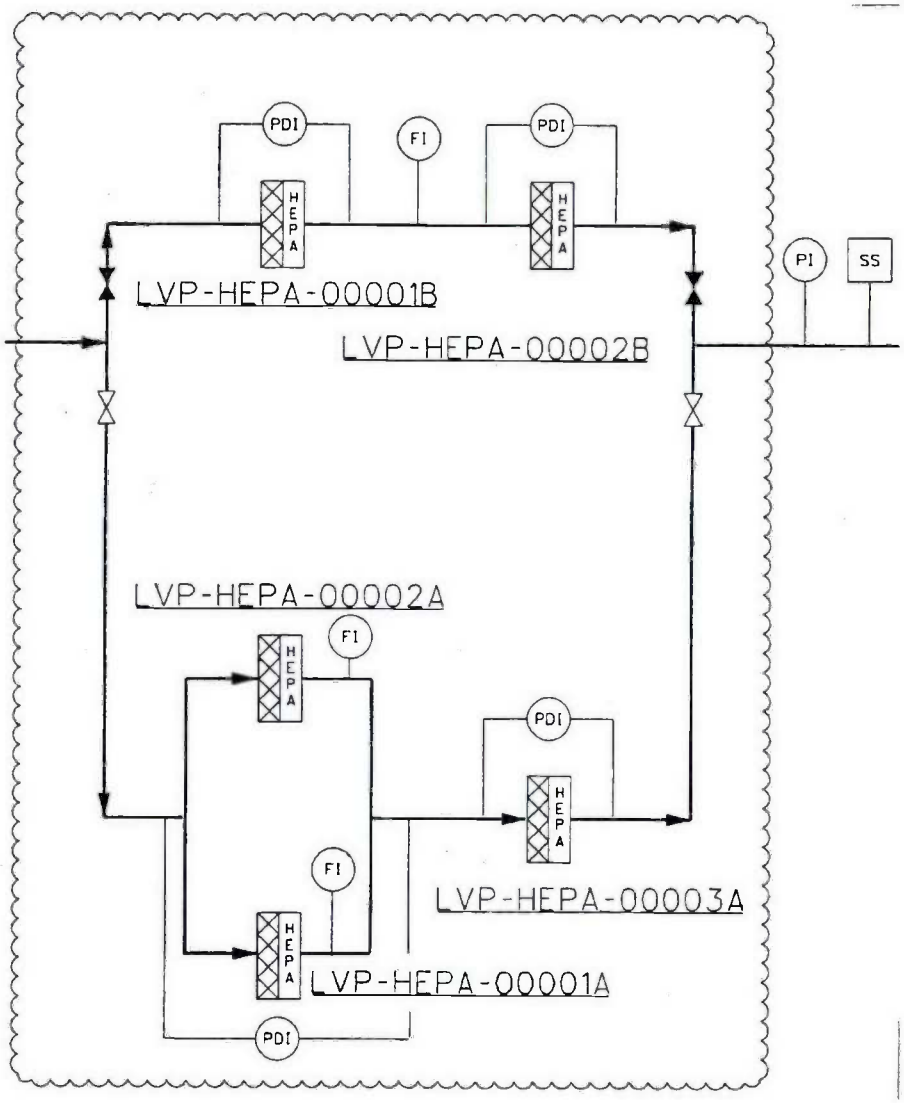
Drawing Change Notice

CHANGE DOCUMENT NO.
24590-LAW-M5N-V17T-00015

JOB NO.	TITLE FOR CHANGE NOTICE
24590	Change HEPA Filter Configuration, Renumber Ammonia Holding Vessels

DESCRIPTION OF CHANGE

AFTER



ORIGINATOR	CHECKER	REVIEWER (when applicable)
N. Wilkins	R. Hanson	G. Chiaramonte

QA (when applicable)	E&NS (when applicable)	APPROVER(S)	APPROVAL DATE
N/A	D. Krahn for D. Krahn 3/27/06	R. Voke / J. Roth for R. Voke	3-28-06

R10706311

Drawing Change Notice

CHANGE DOCUMENT NO.
24590-LAW-M5N-V17T-00017

ISSUED BY
RPP-WTP PDC

JOB NO.	TITLE FOR CHANGE NOTICE
24590	Rename NH3 Vaporization Heater, Change Batch Capacity for AMR-VSL-00003 & -00004, Change Offsheet Connector to LAW Selective Catalytic Reducer

DESIGN DOCUMENT NUMBER	REV NO	TITLE OF DESIGN DOCUMENT
24590-LAW-M5-V17T-00010	4	Process Flow Diagram LAW Vitrification Ammonia & Secondary Offgas (System AMR & LVP)

PART OF DESIGN CHANGE PACKAGE (DCP)? ☒ No ☐ Yes DCP No.: Rev:

JUSTIFICATION FOR CHANGE	TREND CODE-NUMBER
This drawing is being updated to reflect current vendor design. The vessel batch capacity was changed per 24590-LAW-MVE-AMR-00002 to reflect current vendor design.	N/A

Supersedes Change Document ☒ No ☐ Yes

REQUIREMENTS REVIEW

Client Approval Required	☐ Yes	☒ No	Safety Screening / Evaluation Required Documents identified in 24590-WTP-GPP-SREG-002 must be checked "Yes" regardless of the change being made, and E&NS signature is required below. ☒ Yes ☐ No
Interface Resolution Required	☐ Yes	☒ No	
Design Reverification Required	☐ Yes	☒ No	
Permit Review by E&NS Required	☒ Yes	☐ No	Address any "yes" answers in the description

DESCRIPTION OF CHANGE

PFDs are identified in 24590-WTP-GPP-SREG-002 as requiring a safety screening. These changes affect the environmental permit version of this drawing and require a permit review by E&NS.

In Sector E-3, change "AMR-VPR-00001" to "AMR-VPR-00002/3".

In Sectors H-5 and H-6, change the batch/operating capacity of AMR-VSL-00003 & -00004 to 5100 gallons (from 6000 gallons).

In Sector G-3, on the AMR03 stream, change the offsheet connector description from "Ammonia Vapor to LVP-SCR-00001/2" to "Ammonia Vapor to LVP-SCR-00001" Change the coordinate in the connector to B8.

Remove Hold 1 per CCN 129270.

In Sector G-8, on the offsheet connector that says, "Ammonia Recycle to Delivery Truck", replace the word "Recycle" with "Vapor".

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

ORIGINATOR	CHECKER	REVIEWER (when applicable)
N. Wilkins	R. Hanson	G. Chiaramonte

QA (when applicable)	E&NS (when applicable)	APPROVER(S)	APPROVAL DATE
N/A	D. Krahn	R. Voke J. Roth	8/31/06

Doc: 13-ECD-0061

Drawing:

24590-LAW-M5-V17T-00011 REV 5

Has been scanned as a separate attachment due to size and printing capabilities

ISSUED BY
RPP-WTP PDC

R11456902

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

Exhausters and Hoses

Content applicable to ALARA? ☐ **Yes** ☒ **No**

ADR No. **Rev**

Quality Level
Q
DOE Contract No. DE-AC27-01RV14136

NOTE: Contents of this document are Dangerous Waste Permit affecting.

REV	DATE	BY	CHECK	REVIEW	E&NS	DPEM/EM
2	12/15/11	D Rickettson	M O'Neill	P Snider	D Krahn 12-15-11	D Mildon
1	08/24/10	D Rickettson	N Whitcomb	G Goolsby	D Krahn	T Hughes
0	03/10/10	D Rickettson	N Whitcomb	N Whitcomb	R F Carlstrom	T Hughes

SPECIFICATION No. 24590-LAW-3PS-MACS-T0001 **Rev** 2

Revision History

Revision	Reason for Revision
0	Issue for Purchase
1	Specification revised to conform to suppliers proposal, deleted silencers, added seal purge control panels, seal purge instrumentation, seal purge hoses and exhauster heat trace.
2	Incorporate TCNs, 24590-QL-MRA-MACS-00007-T0001, 24590-QL-MRA-MACS-00007-T0002, 24590-QL-MRA-MACS-00007-T0003, 24590-WTP-SDDR-MS-11-00113 and 24590-WTP-SDDR-MS-11-00258. References to vibration isolators have been deleted from specification. References to shims have been deleted. Defined storage requirements for the sacrificial test unit. Appendix E was updated to incorporate later specification editions per CCN 235970. Minor editorial changes.

Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Contents

Notice iii

1 Scope 1

1.1 Project Description and Location 1

1.2 Equipment, Material, and Services Required 1

1.3 Work by Others 3

1.4 Definitions 3

1.5 Safety/Quality Classifications 4

1.6 Acronyms 4

2 Applicable Documents 7

2.1 Codes 7

2.2 Implemeuting Standards 7

2.3 Industry Standards 8

2.4 Occupational Safety & Health Act (OSHA) 9

2.5 Reference Documents/Drawiugs 9

3 Design Requirements 10

3.1 General 10

3.2 Basic Function 10

3.3 Performance 11

3.4 Lifting and Handling Requirements 11

3.5 Sound Ratings 11

3.6 Design Conditions 11

3.7 Environmental and Seismic Qualification 12

3.8 Mechanical Requirements 13

3.9 Balance and Vibration Standards 14

3.10 Bcarings 14

3.11 Shaft Seals and Seal Purge Control 14

3.12 Safety Guards 14

3.13 Loadings 15

3.14 Electrical Requirements 15

3.15 Instrumentation and Control Requirements 17

3.16 Accessibility and Maintenance 19

3.17 Deleted 20

3.18 Flexible Connectors, Inlet and Outlet Hoses 20

3.19 Sacrificial offgas skid-mounted exhauster LVP-EXHR-00001TEST 20

4 Materials 20
4.1 Construction 20
4.2 Electrical 20
4.3 Prohibited Materials 22
5 Fabrication 23
5.1 Exhauster Welding 23
5.2 Inlet/Outlet Hose Welding 23
6 Tests and Inspections 23
6.1 General 23
6.2 Environmental Equipment Qualification 23
6.3 Seismic Equipment Qualification 24
6.4 Personnel Qualifications 24
6.5 Non-Destructive Examinations 24
6.6 Shop Tests 24
6.7 Site Tests 25
7 Preparation for Shipment 25
7.1 General 25
7.2 Cleanliness 25
7.3 Painting and Special Protective Coatings 26
7.4 Tagging 26
7.5 Shipping 26
8 Quality Assurance 27
8.1 QA Requirements Specific to Item(s) or Service 27
8.2 Commercial Grade Dedication 27
9 Configuration Management 27
10 Documentation and Submittals 27
10.1 General 27
10.2 Drawings 27
10.3 Procedures 28
10.4 Inspection and Test Reports 28
10.5 Calculations 29
10.6 Manuals 29
10.7 Certificates of Conformance 29
10.8 Lists and Schedules 30
10.9 Materials Certifications 30

10.10 Data 30

Appendices

Appendix A - Deleted 31

Appendix B - C.37 ASME NQA-1-2000, Quality Assurance Requirements for Nuclear Facilities 32

Appendix C - Implementing Standards 33

Appendix D - 26.0 ASME B31.3-1996, Process Piping 34

Appendix E - Reference Standards 35

Appendix F - Preferred Instrument Supplier List 36

Appendix G- NRTL Certificate of Conformance

Tables

Table 1 Quality Program Implementing Standards 4

1 Scope

1.1 Project Description and Location

The Hanford Tank Waste Treatment and Immobilization Plant (WTP) is a complex of waste treatment facilities where the Department of Energy's (DOE) Hanford site tank waste will be put into stable glass form. The WTP Contractor will design, build, and start up the WTP pretreatment and vitrification facilities for the US Department of Energy's (DOE) Office of River Protection (ORP). The waste treatment facilities will pretreat and immobilize the mixed waste, low-activity waste (LAW) and high-level waste (HLW) currently stored in underground storage tanks at the Hanford Site.

The Hanford Site occupies an area of about 560 square miles and is located along the Columbia River, north of the city of Richland, Washington. The WTP Facility will be constructed at the east end of the 200 East Area of the Hanford Site. Benton, Franklin, and Grant counties surround the Hanford Site.

1.2 Equipment, Material, and Services Required

Design, furnish materials, fabricate, test, package the exhausters and hoses in accordance with this specification including:

- One sacrificial offgas skid-mounted exhauster used during the shake-table testing, including:
  - Motor coupling
  - Deleted
  - Deleted
  - Electrical enclosure(s)
  - Exhauster shaft speed sensor/transmitter
  - Exhauster bearing resistance temperature detectors (RTD) / transmitters
  - Deleted
  - Exhauster heat trace
  - Removable exhauster insulation
  - Removable exhauster hose insulation
  - Inlet / outlet hoses
  - Seal purge control panel
  - Motor

  Associated equipment tags:

  LVP-EXHR-00001TEST
  LVP-MTR-00001TEST
  SE 0120TEST / ST 0120TEST

TE 0121TEST / TT 0121TEST
TE 0122TEST / TT 0122TEST

LVP-HOSE-00003TEST
LVP-HOSE-00004TEST
LVP-HOSE-00012TEST

- Three offgas skid mounted exhausters, including:
  - Motor coupling
  - Deleted
  - Deleted
  - Electrical enclosure(s)
  - Exhauster shaft speed sensor/ transmitter
  - Exhauster bearing RTDs / transmitter
  - Deleted
  - Exhauster heat trace
  - Removable exhauster insulation
  - Seal purge control panel
  - Motor

  Associated equipment tags:

  LVP-EXHR-00001A, 00001B & 00001C
  LVP-MTR-00001A, 00001B & 00001C
  SE 0120 / ST 0120, SE 0123 / ST 0123 & SE 0126 / ST 0126
  TE 0121 / TT 0121, TE 0124 / TT 0124 & TE 0127 / TT 0127
  TE 0122 / TT 0122, TE 0125 / TT 0125 & TE 0128 / TT 0128

- Deleted

- Six hoses with removable insulation for exhausters
  - LVP-EXHR-00001A
  - LVP-EXHR-00001B
  - LVP-EXHR-00001C

  Associated equipment tags:

  LVP-HOSE-00003, LVP-HOSE-00005 & LVP-HOSE-00007
  LVP-HOSE-00004, LVP-HOSE-00006 & LVP-HOSE-00008

- Special tools required for installation and maintenance, if any.
- Seal purge hoses, LVP-HOSE-00010, 00011 and 00012

1.3 Work by Others

The following items and services will be supplied by the Buyer and are not included in SELLER'S scope of work:

- Manual unloading and storage at the jobsite
- Installation labor at WTP
- Foundation (concrete floor with embed plates)
- Piping external to the inlet and outlet hoses, LVP-HOSE-00003 to 00008
- Deleted
- Deleted
- Electrical power supply to the exhauster motors and instrumentation
- Wiring external to the exhausters and adjustable speed drives
- Field testing, start up, commissioning and inspection at WTP
- Adjustable speed drives LVP-ASD-00001A, 00001B & 00001C for exhausters motors LVP-MTR-00001A, 00001B & 00001C

1.4 Definitions

1.4.1 **Commercial Grade Item** - The WTP definition of commercial grade item (CGI) is contained in Appendix B.

1.4.2 **Commercial Grade Dedication** - The WTP definition of commercial grade dedication (CGD) is contained in Appendix B.

1.4.3 **Commercial Grade Services** - The WTP definition of commercial grade services (CGS) is contained in Appendix B.

1.4.4 **Critical Characteristics** - The WTP definition of critical characteristics is contained in Appendix B.

1.4.5 **Dedication** - The WTP definition of dedication is contained in Appendix B.

1.4.6 **Dedicating Entity** - The WTP definition of dedicating entity is contained in Appendix B.

1.4.7 **NQA-1-2000, Requirement 7, *Control of Purchased Items and Services*** - The WTP definition of NQA-1-2000, Requirement 7, *Control of Purchased Items and Services*, is contained in Appendix B.

1.4.8 **Quality Level** - The quality level identifies the quality requirements to be applied to items, services, and activities. A quality level is determined by cross-referencing the safety classification and the systems, structures, and components (SSCs) characteristics.

Identified quality levels in this specification are Q. Applicable ASME NQA-1 Program Requirements are shown on the Q Datasheet of ANSI/ ASME NQA-1 (2000) *Quality Assurance Program Requirements* attached to the MR.

See Table 1 for additional detail on Quality Program Implementing Standards.

Table 1 Quality Program Implementing Standards

SSCs Characteristics		Quality Program Implementing Standard	Relevant Supplier QA Program Requirements Datasheet
Safety Classification	Quality Level	Supplier/ Subcontractor	
SC or SS	Q	NQA-1 (2000)	Q Datasheet of ANSI/ASME NQA-1 (2000) Quality Assurance Program Requirements

1.4.9 **Safety Class (SC)** - These are SSCs, including portions of process systems, whose preventive or mitigation function is necessary to limit radioactive hazardous material exposure to the public, as determined from safety analyses. This specification does not contain any material with a safety classification of SC.

1.4.10 **Safety Function** - The WTP definition of safety function is contained in Appendix B.

1.4.11 **Safety Significant (SS)** - These are SSCs that are not designated as safety class (SC) SSCs, but whose preventive or mitigative function is a major contributor to defense in depth and/or worker safety as determined from safety analyses. This specification is for material with a safety classification of SS.

1.4.12 **Q** - A quality level that includes safety class (SC), safety significant (SS) and air permit (AP) affecting SSCs.

1.4.13 **Seismic Category** - WTP's seismic classification of SSCs based on their safety function. Seismic categories utilized in this specification are Seismic Category-III (SC-III).

1.5 Safety/Quality Classifications

1.5.1 The safety classification for the exhausters is SS with a quality level of Q.

1.5.2 The safety classification for the inlet/outlet hoses is SS with a quality level of Q.

1.5.3 The safety classification for the seal purge instrumentation and hose is SS with a quality level of Q.

1.6 Acronyms

ABMA	American Bearing Manufacturers Association
AEA	Atomic Energy Act
AHJ	Authority Having Jurisdiction
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
ASTM	American Society for Testing and Materials
AWG	American wire gauge
AWS	American Welding Society
CGD	commercial grade dedication
CGI	commercial grade item
CGS	commercial grade service
DOE	US Department of Energy
HEPA	high efficiency particulate air (filter)
HLW	high-level waste
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Standards Organization
LAW	low-activity waste
LVP	LAW secondary offgas/vessel vent process system
MR	material requisition
NDE	nondestructive examination
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NRTL	nationally recognized test laboratory
OEM	original equipment manufacturer
ORP	Office of River Protection
OSHA	Occupational Safety & Health Act
PMI	positive material identification
PVC	polyvinyl chloride
PW	radioactive gas/vapor
QA	quality assurance
RPP-WTP	River Protection Project-Waste Treatment Plant
RTD	resistance temperature detector
SC	safety class

SDDR	supplier deviation disposition request
SRD	Safety Requirements Document
SS	safety significant
SSC	structure, system, or component
UL	Underwriters Laboratory
UPS	uninterruptible power supply
WTP	Hanford Tank Waste Treatment and Immobilization Plant

2 Applicable Documents

The following documents form a part of this specification to the extent specified herein. In the event of conflict between the document referenced herein and the contents of this specification, SELLER shall notify Buyer and obtain approval for its disposition.

2.1 Codes

2.1.1 American Society of Mechanical Engineers (ASME)

ASME Boiler & Pressure Vessel Code - 2007, Section IX	Welding and Brazing Qualifications
ASME NQA-1-2000	*Quality Assurance Program Requirements for Nuclear Facility Applications* as tailored in Appendix C of 24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document Volume II* (see Appendix B of this specification)
ASME B31.3-1996	*Process Piping*, as tailored in Appendix C of 24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document Volume II* (see Appendix D of this specification)
ASME PTC-10-1997	*Performance Test Codes on Compressors and Exhausters*

2.1.2 American Welding Society (AWS)

AWS D1.1-2008	*Structural Welding Code, Steel*
AWS D1.3-2008	*Structural Welding Code, Sheet Steel*
AWS D1.6-2007	*Structural Welding Code, Stainless Steel*
AWS D9.1-2006	*Sheet Metal Welding Code*
AWS D14.6-2005	*Welding of Rotating Elements of Equipment*

2.1.3 National Fire Protection Association (NFPA)

NFPA 70 (1999)	National Electric Code (NEC)

2.2 Implementing Standards

2.2.1 Appendix C, Implementing Standards, 24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document Volume II* (SRD) contains a list of WTP implementing standards (see Appendix C of this specification).

2.2.2 WTP implementing codes/standards are those referenced directly by the SRD or the preliminary documented safety analysis, and are also referred to as "parent codes/standards". "Daughter codes/standards" are those referenced by the parent codes/standards.

2.2.3 ASME B31.3-1996 is a parent code as defined above. Appendix E of ASME B31.3-1996 (see Appendix E of this specification) contains a list of daughter codes and an edition year. Several codes have been pre-approved for later years by WTP in Appendix E. If SELLER wants to use a later edition or addenda of a referenced daughter code, standard, or specification on Appendix E, then SELLER shall submit a supplier deviation disposition request (SDDR).

2.3 Industry Standards

2.3.1 American Bearing Manufacturers Association (ABMA

ABMA 9-1990	*Load Ratings and Fatigue Life for Ball Bearings*
ABMA 11-1990	*Load Ratings and Fatigue Life for Roller Bearings*

2.3.2 International Organization for Standardization (ISO)

ISO 1940-1:2003	*Mechanical Vibration Balance Quality Requirements For Rotors In A Constant (Rigid) State* Part 1: Specification and Verification Of Balance Tolerances

2.3.3 American Society for Nondestructive Testing (ASNT)

ASNT-SNT-TC-1A-2001	*ASNT Recommended Practice*

2.3.4 Institute of Electrical and Electronics Engineers (IEEE)

IEEE Std 841-2009	*IEEE Standard for Petroleum and Chemical Industry-Premium-Efficiency, Severe-Duty, Totally Enclosed Fan Cooled (TEFC) Squirrel Cage Induction Motors Up to and Including 370kW (500 hp)*
IEEE 1050-1996, Section 5.3.1	*IEEE Guide for Instrumentation Control Equipment Grounding in Generation Stations*

2.3.5 National Electrical Manufacturers Association (NEMA)

NEMA MG-1 Part 31	Definite-Purpose Inverter-Fed Polyphase Motors

2.3.6 UL Standards

UL 508A	Industrial Control Panels

2.4 Occupational Safety & Health Act (OSHA)

OSHA 29 CFR 1910 Subpart O	*Machinery and Machine Guarding*
OSHA 29 CFR 1910 Subpart S	*Electrical*

2.5 Reference Documents/Drawings

24590-BOF-DD-S13T-00001, Balance of Facilities Concrete Embed Plates.

24590-LAW-DB-S13T-00135, *LAW Vitrification Building Main Building Partial Conc Forming Plan Zone 5 @ EL (+) 48 ft-0 in.*

24590-LAW-DB-S13T-00136, *LAW Vitrification Building Main Building Partial Conc Forming Plan Zone 6 @ EL (+) 48 ft-0 in.*

24590-LAW-M6-LVP-00001, *P&ID-LAW Secondary Offgas/Vessel Vent Process System Melters Secondary Offgas.*

24590-LAW-MAD-LVP-00006, *Exhauster Data Sheet.*

24590-WTP-3PS-AFPS-T0001, *Engineering Specification for Shop Applied Special Coatings for Steel Items and Equipment.*

24590-WTP-3PS-FB01-T0001, *Structural Design Loads for Seismic Category III/IV Equipment and Tanks.*

24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

24590-WTP-3PS-G000-T0002, *Engineering Specification for Positive Material Identification (PMI) for Shop Fabrication.*

24590-WTP-3PS-G000-T0003, *Engineering Specification for Packaging, Handling and Storage Requirements.*

24590-WTP-3PS-G000-T0014, *Engineering Specification for Supplier Design Analyses.*

24590-WTP-3PS-G000-T0019, *Engineering Specification for Acquisition of Commercial Items and Services for Use in Safety Applications at WTP.*

24590-WTP-3PS-JQ00-T0004, *Engineering Specification for Management of Supplier Software.*

24590-WTP-3PS-JQ06-T0005, *Engineering Specification for Environmental Qualification of Control and Electrical Systems and Components.*

24590-WTP-3PS-MUMI-T0002, *Engineering Specification for Low Voltage Induction Motors.*

24590-WTP-3PS-SS00-T0001, *Engineering Specification for Welding of Structural Carbon Steel.*

24590-WTP-3PS-SS00-T0002, *Engineering Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel.*

24590-WTP-DC-E-06-001, *Design Criteria for Approval of Electrical Equipment.*

24590-WTP-LIST-CON-08-0001, *Restricted Materials List.*

3 Design Requirements

3.1 General

3.1.1 Exhausters, each complete with electric motors and accessories specified in the exhauster data sheet attached to the material requisition (MR). Each offgas skid-mounted exhauster/motor assembly shall include all components and accessories fully assembled, wired, and skid-mounted requiring only connection to the Buyer's control systems, 480V /120V electrical power supply, and piping.

3.1.2 The following types of blowers/exhausters will be considered to meet the performance requirements of this specification:

- Multistage centrifugal blowers / exhausters
- Positive displacement blowers and vacuum pumps
- Custom engineered and fabricated blowers/exhausters

3.2 Basic Function

3.2.1 Three variable-speed exhausters are downstream of the high efficiency particulate air filters (HEPA) in separate rooms. Each exhauster train has a discharge check valve providing backflow prevention to preclude recirculation loops within the system. The exhausters provide the motive force to keep melters under vacuum. Two exhausters will normally be running at a time, with the third exhauster in standby. If one exhauster should fail, the standby exhauster is started automatically.

3.2.2 The melter offgas exhausters are supplied by an uninterruptible power supply (UPS) so that flow is maintained if normal power is lost. Upon detection of a loss of power, the exhausters run at a predetermined setting, thus ensuring that for a known melter offgas configuration, the exhausters can be operated by the UPS for a period of no less than 2 hr.

3.2.3 The melter offgas exhausters shall remain functional (i.e., able to support their required safety function) following an SC-III event.

3.2.4 The LAW secondary offgas system contains a thermal catalytic oxidizer/reducer for the removal of volatile organic compounds and NO_x emissions. This pollution abatement equipment is located upstream from the exhausters. The selective catalytic reduction section of the thermal catalytic oxidizer/reducer for the destruction of NO_x will perform with a reduction efficiency of 95 %. Roughly 5% of the toxic NO_x in the process stream may pass through the exhausters and later be expelled out the exhaust stack.

3.2.5 The LAW secondary offgas system contains banks of HEPAs for the removal of radioactive material. The removal efficiency of the HEPAs is 99.95 %. After radioactive operations begins in the LAW Facility, it is anticipated that the exhausters may become internally contaminated with radioactive material over the 40 year life of the plant. This amount of internal radioactive contamination is small enough to allow for hands-on maintenance to the exhausters.

3.3 Performance

3.3.1 See exhauster data sheet 24590-LAW-MAD-LVP-00006 contained in the MR.

3.3.2 Exhauster performance ratings are to be based on testing in accordance with ASME PTC-10-1997, *Performance Test Code on Compressors and Exhausters*. Exhausters shall be capable of performing at conditions shown on the exhauster data sheets.

3.4 Lifting and Handling Requirements

3.4.1 For lifting and handling requirements, see specification 24590-WTP-3PS-G000-T0003.

3.4.2 SELLER shall provide lifting eyes or lugs to facilitate lifting and handling of the exhausters. Lifting eyes or lugs shall be certified suitable for the safe, balanced lifting and handling of the equipment.

3.4.3 Metal tags that identify the maximum design load (excluding dynamic load factor) shall be provided for all lifting lugs, bails, and other lifting points.

3.4.4 Deleted

3.5 Sound Ratings

3.5.1 Exhauster sound pressure level goal is less than 93 dB(A) at 3 feet.

3.6 Design Conditions

3.6.1 Design basis performance and capacity data are as listed on the exhauster data sheet, 24590-LAW-MAD-LVP-00006.

3.6.2 Gas stream properties are shown on exhauster data sheets. Materials of construction used shall be compatible with the effluent being handled.

3.6.3 SELLER to provide an estimated useful life for the exhausters.

3.6.4 DELETED

3.6.5 DELETED

3.6.6 DELETED

3.6.7 DELETED

3.6.8 DELETED

3.6.9 Inlet and outlet hoses LVP-HOSE-00003 to 00008, shall be designed for a positive pressure of 15 psig and full vacuum. Inlet and outlet hoses shall be designed for a temperature of 450 °F. The inlet and outlet hoses shall include a 0.04 inch corrosion allowance. The corrosion allowance does not apply to the thin wall bellows / corrugated metal hose section.

3.6.10 Inlet and outlet hoses are passive mechanical equipment performing a confinement function. Inlet and outlet flanges shall be raised face.

3.6.11 Inlet and outlet hose support will be a Buyer responsibility.

3.6.12 Inlet and outlet hoses shall be designed and tested in accordance with ASME B31.3-1996, Process Piping.

3.6.13 Inlet seal purge hoses, LVP-HOSE-00010, LVP-HOSE-00011 and LVP-HOSE-00012 shall be designed for a positive pressure of 250 psig and a temperature of 300 F. A corrosion allowance for the inlet seal purge hoses is not required.

3.6.14 The WTP plant interface for the inlet seal purge hoses, LVP-HOSE-00010, LVP-HOSE-00011 and LVP-HOSE-00012 is located near the motor end of the exhauster skid. The WTP plant supply for the seal purge will drop vertically from the ceiling. The WTP plant supply piping for the seal purge will end with a 1/2 inch, 150 pound, raised face flange. The flange face will be at elevation 54 feet 8 inches (approximately 6 feet- 8 inches from the exhauster base).

3.7 Environmental and Seismic Qualification

3.7.1 Exhausters and hoses shall be qualified in accordance with the following engineering specifications:

- 24590-WTP-3PS-JQ06-T0005, *Engineering Specification for Environmental Qualification of Control and Electrical Systems and Components*
- 24590-WTP-3PS-FB01-T0001, *Structural Design Loads for Seismic Category III/IV Equipment and Tanks*

3.7.2 The environmental conditions for the plant rooms in which the exhausters are located are listed on the environmental qualification data sheets attached to the exhauster data sheet, 24590-LAW-MAD-LVP-00006.

3.7.3 The equipment qualification requirements are contained in the exhauster data sheet, 24590-LAW-MAD-LVP-00006. The exhausters and the inlet and outlet hoses are designated "Electrical" with seismic operating requirements during and after the seismic event. It is anticipated that the skid-mounted exhausters will be seismically qualified using the methodology of AC 156 (shake-table); reference Section 4.3.4, of 24590-WTP-3PS-FB01-T0001.

3.7.4 It is anticipated that one skid-mounted exhauster including: motor coupling, electrical enclosure(s), exhauster shaft speed sensor/transmitter, exhauster bearing RTDs/transmitters,

electric heat trace, seal purge control instrumentation, removable exhauster and hose insulation, inlet / outlet hoses and motor will be shake-table tested.

3.7.5 The exhauster, motor coupling, and hoses shall remain functional during and after the shake-table testing.

3.7.6 It is anticipated that the shake-table test will be approximately 2.5 hours long, proving the exhauster will perform for 2 hours after the SC-III seismic event.

3.7.7 The electrical enclosure(s), exhauster shaft speed sensor/ transmitter and exhauster bearing RTDs/transmitters do not have to function during or after the shake-table testing. However, these components can not fail in such a way as to prevent the exhauster from operating during or after the shake-table test.

3.7.8 The components subjected to the shake-table will not be used in the final operating plant. The WTP will take delivery of the shake-table tested items. The shake-table tested items will be stored on site and used as maintenance mock-ups in the future.

3.7.9 DELETED

3.8 Mechanical Requirements

3.8.1 See exhauster data sheet, 24590-LAW-MAD-LVP-00006 contained in the MR.

3.8.2 Exhauster inlets and outlets shall include allowances for the full dead weight of the inlet and outlet hoses.

3.8.3 Provide a minimum 1-in. pipe size, threaded drain coupling at the exhauster casing low point, with square-headed screwed drain plug. Provide one drain connection per stage or pressure chamber. Coupling shall be extra long length to allow extension through insulation, when required.

3.8.4 Inlet and outlet flexible connections are specified on the exhauster data sheets.

3.8.5 SELLER shall provide lifting eyes or lugs to facilitate lifting and handling of the exhausters. Lifting eyes or lugs shall be certified to be suitable for the safe, balanced lifting and handling of the equipment.

3.8.6 SELLER shall provide a grounding lug or boss on the exhauster housing or frame to facilitate attachment of grounding cable by the Buyer.

3.8.7 SELLER shall provide the design detailing how the exhausters are welded to the BUYERS embed plates.

- The embed plate design location and elevation for exhausters is shown on drawings 24590-LAW-DB-S13T-00135 & 00136, drawing coordinate (F-4) . The design elevation for the top of the embed plates is 48 feet - 0 inches, in plant elevation. To account for embed elevations and variations of the concrete floor the bottom elevation for the exhausters shall be set at + 48 feet, +1/2 inch in plant elevation.

- The BUYERS existing embed plates for the exhausters are coated carbon steel plates, stock code: EBPNS02CD, shown on drawing 24590-BOF-DD-S13T-00001. The carbon steel embed plates are coated with one layer of inorganic zinc primer. When attachments are welded to the existing embed plates, WTP site welding procedures require inorganic zinc primer to be removed within 2- 4 inches of the weld area. Only carbon steel can be welded to the carbon steel embed plates where the inorganic zinc primer has been removed.

- Deleted

- Deleted

- Deleted

3.9 Balance and Vibration Standards

3.9.1 Exhausters rotors shall be balanced to Quality Grade 2.5 of ISO 1940-1:2003, with results documented and submitted to Buyer.

3.10 Bearings

3.10.1 Bearings for exhausters shall have a minimum L-10 service rating life of 100,000 hours unless noted otherwise on the data sheet, 24590-LAW-MAD-LVP-00006. Bearing rating life shall be established in accordance with ABMA 9 or 11, as applicable.

3.10.2 For all exhausters, it shall be possible to replace the bearings without disconnecting any piping or disassembling the exhauster housing.

3.10.3 Extended lube lines and fittings shall be provided as required to permit lubrication during operation.

3.11 Shaft Seals and Seal Purge Control

3.11.1 Exhausters shall be furnished with shaft seals as specified on the exhauster data sheet, 24590-LAW-MAD-LVP-00006.

3.11.2 The exhauster shall be furnished with the shaft seal purge controls. The BUYER will supply dry instrument air for the seal purge at approximately 100 psig.

3.11.3 The SELLER's shaft seal purge control panel with instrumentation may include the following: stainless steel tubing, inlet isolation ball valve, pressure regulator, pressure gauge with root and bleed valves, flow meter / indicator for normal flow, flow meter / indicator for high flow, flow switch, pressure switch / pressure transmitter with 5-way isolation manifold and check valve.

3.12 Safety Guards

3.12.1 Exhausters shall be provided with bolted drive guards that cover the shaft and bearings. Provisions shall be made for access to lube fittings without removal of drive guards.

3.12.2 Guards shall cover moving parts on all sides where worker access may occur, including rear portions of moving parts.

3.12.3 The guards shall comply with the requirements of OSHA 29 CFR 1910 Subpart O - Machinery and Machine Guarding.

3.13 Loadings

3.13.1 The skid mounted exhauster / assembly shall be self-supporting, and capable of carrying the static and dynamic loads of the exhauster components and the stress imposed during shipment, installation, and operation.

3.14 Electrical Requirements

3.14.1 Provide conduit and cables from motor to skid edge. Terminate motor power cables in a junction box at the skid edge.

3.14.2 Enclosures with incoming power supply, shall have a manually actuated disconnecting means mounted on or close to the enclosure, in an easily accessible location. Disconnects shall include provisions for a lockable device.

3.14.3 SELLER shall provide a grounding lug or boss on the exhauster housing or frame to facilitate attachment of grounding cable by the Buyer.

3.14.4 Motor drive combination shall be suitable for operation for the design conditions shown on the exhauster data sheet, 24590-LAW-MAD-LVP-00006.

3.14.5 Induction motors shall be in accordance with specification 24590-WTP-3PS-MUMI-T0002, and as indicated on the motor data sheets appended to the exhauster data sheet, 24590-LAW-MAD-LVP-00006 with the following exception: Motor space heaters are required for the purpose of long term storage. The motor space heaters do not have to be removable. See specification 24590-WTP-3PS-MUMI-T0002, Section 3.4 for heater requirements.

3.14.6 See exhauster data sheet 24590-LAW-MAD-LVP-00006 for premium exhauster motors selection in accordance with IEEE Std 841.

3.14.7 Drive motors shall be specifically designed and constructed for use with adjustable-speed drives in conformance with NEMA MG-1 Part 31 criteria. Manufacturer shall provide certification to the Buyer that the motor is compatible with an adjustable-speed drive and will perform within the specified duty range without incident.

3.14.8 Transient voltage variations due to short circuits, disturbances from outside supplies, and their effect on plant operation cannot be avoided. The following criteria shall apply in such cases: Momentary voltage depression down to 80 % of rated equipment voltage shall not affect equipment operations.

3.14.9 Adjustable Speed Drives (by Buyer)

3.14.10 All electrical equipment and material including fittings, devices, apparatus, fixtures, appliances, utilization equipment, cabinets, and control panels shall be suitable for installation and use in conformity with NFPA 70.

3.14.11 Suitability of equipment shall be evidenced by listing or labeling by a nationally recognized testing laboratory (NRTL).

3.14.12 Criteria for Acceptability of Electrical Equipment

- All electrical equipment for facility and equipment wiring, as defined by the National Electrical Code NFPA 70-1999, shall be Approved. Approval will be in accordance with Article 90-4, "Enforcements", Article 90-7, "Examination of Equipment for Safety," and Article 110-3, "Examination, Identification, Installation, and Use of Equipment."
- Approved means "Acceptable to the Authority Having Jurisdiction" (AHJ), as defined in Article 100 of NFPA 70-1999. Only the WTP Electrical AHJ can provide the approval.
- "Equipment" is defined by the NFPA 70 as, "A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like used as a part of, or in connection with an electrical installation". As used here, the entire mechanical assembly is not considered an electrical installation, only the electrical and/or electronic components, and the interconnecting wiring.
- Listing and labeling by an OSHA Recognized NRTL is the primary means (Method 1 below) of obtaining WTP AHJ approval for electrical equipment, devices and materials.
- All Control Panels shall be UL labeled by a certified UL 508A shop.
- Electrical Equipment that is installed on (standard or custom fabricated) Mechanical Equipment shall comply with the requirements stated above.
- Electrical Equipment, that is part of Mechanical Packaged Equipment, being field-evaluated and Labeled at the factory by an NRTL is an alternate method of obtaining WTP AHJ approval.

3.14.12.1 Method 1 (Primary): Listed, Labeled or Certified (i.e. UL508A)

- The WTP AHJ shall approve and accept electrical equipment without additional examination if it is Listed, Labeled, or Certified by a US NRTL, as recognized by OSHA under 29 CFR 1910-Subpart S and is acceptable for the application, environment and other requirements of NEC Article 110. For a listing of and Typical Registered Certification Marks of US NRTL's recognized by OSHA go to http://www.osha.gov/dts/otpca/nrtl/nrtlmrk.html.
- (NRTL) listing or labeling is not required for the LAW exhauster motors.
- The supplier shall submit a certificate of Conformance (C of C) document for review and approval by the AHJ that lists all the electrical components listed or labeled by OSHA recognized NRTL, under 29 CFR 1910-Subpart S. These components are found, by the NRTL, to conform to all applicable OSHA recognized test standards and are acceptable for the application, environment and all requirements of NEC Article 110.3. The Certificate shall further certify that the UL-508A labeled cabinets have not been modified by non-UL 508A qualified workers.
- Appendix G Contains a sample document that meets the AHJ requirements for the C of C.

3.14.12.2 Method 2 (Alternate): Field Evaluation by a NRTL

- Electrical equipment that is part of an overall electrical or mechanical assembly having a NRTL safety evaluation or a field evaluation, which states the equipment has been accepted or otherwise deemed safe by the NRTL recognized by OSHA under 29 CFR 1910-Subpart S, using US standards, will be evaluated by the Buyer Electrical AHJ for acceptability. If found acceptable no further examination of the equipment is required.
- SELLER shall submit all field evaluation reports completed by an OSHA recognized NRTL for review and approval by the BUYER electrical AHJ. These field evaluation reports shall show compliance to the applicable USA Electrical Standard(s) recognized by OSHA that are listed on the OSHA website http://www.osha.gov/dts/otpca/nrtl/allstds.html. The NRTL Label will be as shown on the OSHA website with any additional markings that are necessary to indicate acceptability for use in the USA.

3.14.12.3 Instrument, Control and Electrical components that contain less than 50 volts are exempt from NRTL Labeling/Listing or Field Evaluation, and do not require inspection, examination, or analysis for safety by the BUYER Electrical AHJ, with the following exceptions: a. Components that require NRTL Certification for the purposes other then electrical safety (e.g. fire protection, fire detection, fire barriers, Hazardous/ Flammable Rated Devices, etc) are not exempted from NRTL Certification. b. Wiring external to components not exempted from NRTL Certification.

3.14.12.4 The exhauster shall be furnished with electrical heat trace to minimize the formation of condensate when the exhauster is in the standby mode.

3.15 Instrumentation and Control Requirements

3.15.1 Provide exhauster speed sensor and transmitter, bearing temperature detectors and transmitters. Provide wire and conduit from sensor to transmitter/ transducer. Locate transmitter/ transducer in an enclosure at the skid edge.

3.15.2 Specific manufactures have been identified for the purpose of quality and standardization of the instrumentation and control system throughout the WTP facility. Appendix F of this specification includes a list of instruments and ancillary components. This list also identifies multiple suppliers for many commodities. However, inclusion in Appendix F does not imply that a supplier has been approved as a supplier of Quality (Q) products.

3.15.3 Exhausters shall be provided with an exhauster shaft speed sensor. Any connecting cables or signal conditioners are required to provide a 4-20 mA signal output.

3.15.4 Exhausters shall be provided with three wire, dual element, 100 ohm platinum RTD to measure the temperature of each exhauster bearing. Temperature coefficient shall be 0.00385 ohms/ohm/°C. Generally, all RTDs shall be, spring loaded, and supplied with a connection head with internal grounding screw and external ground terminal. All elements shall be connected in the connection head. For applications where a connection head is not feasible, general purpose RTD probes will be allowed.

3.15.5 Deleted

3.15.6 Both temperature and speed wires shall be connected to terminal blocks provided by SELLER. Terminal blocks shall be installed in a separate electrical termination box for external connection to Buyer's cable(s). SELLER shall provide sufficient terminals to allow landing and continuation of conductor shields. Provide 10% spare terminals.

3.15.7 SELLER shall mount, connect, and wire each instrument or control device such that adjustment, maintenance, removal, and replacement may be accomplished in a safe manner, without interruption of service to adjacent but non-associated equipment, and without placing undue stress on installed wiring or devices. Accommodations for strain relief shall be made when routing wire to hinged enclosure doors and shall be wrapped with spiral wire wrap.

3.15.8 Safety signals shall be isolated from non safety controls / monitoring signals.

3.15.9 The Buyer will provide power for SELLER instruments. Each source will be delivered at 120 VAC, 1 phase, 60 Hz, grounded system. All other voltages required by SELLER shall be derived from the Buyer-supplied 120 VAC, 1 phase, 60 Hz, grounded system. SELLER to provide any step down transformer from 120 VAC to 24 VDC, if required. Interconnecting wiring or cabling for packaged units furnished by SELLER shall be terminated and tested according to this specification.

3.15.10 No more than two wires shall be connected to one terminal point. Internal wiring shall be continuous from terminal to terminal without splices (except devices with pig tails). Bridge or comb jumpers are preferred to wire jumpers on terminal strips. Jumpers shall not be installed on the field side of the terminal strip.

3.15.11 All internal enclosure wiring shall be neatly dressed in slotted PVC wire ways. The wire way shall be securely fastened to the enclosure back panel. SELLER shall provide PVC wire ways on the opposite side of field terminations to be used by the Buyer. Adequate space shall be provided around terminal blocks to allow the Buyer to train and terminate cables. The field side wire way shall be designed for multi-core field cables with conductor size of # 14 AWG.

3.15.12 Circuits of different voltages (service level) shall be terminated on physically separate terminal strips and clearly labeled to show the circuit voltage. Terminal blocks shall be segregated according to signal type.

3.15.13 AC power shall be routed through separate wire ways or separated with a divider from 24 VDC discrete and analog instrument signals within enclosures. Power and signal cabling shall not be run in parallel except in separate wire ways, and should cross at a 90-degree angle only.

3.15.14 Wires shall be tagged with SELLER'S cable designation number at both ends with (heat shrinkable or non-shrinkable) plastic sleeve type wire markers.

3.15.15 The Buyer will also supply an equipment list in MS Access format which lists each instrument and is arranged in numerical order. SELLER shall populate the instrument list. The fields required to be populated are as follows: Instrument tag number, SELLER's referenced tag number if applicable, Service description, Instrument type, Signal type, P&ID number, Data sheet number if applicable, Location drawing number if applicable, Instrument installation details, Manufacturer name, Model number, Calibration range of instrument, Set point, Wiring

diagram number, Schematic drawing number, Device address of serial communication link data, I/O address of serial communication link data, Shipped loose if applicable.

3.15.16 Software and Firmware for equipment shall be provided per engineering Specification 24590-WTP-3PS-JQ00-T0004.

3.15.17 All items, physical and electronic, required to operate and maintain all supplied software shall be provided per section 6.1 of Engineering Specification 24590-WTP-3PS-JQ00-T0004.

3.15.18 Each instrument shall have nameplate information that includes the following:

Applicable to ALL Instrumentation

- Manufacturer's Name
- Manufacturer's model and serial number
- Buyer's Purchase Order No.
- Buyer's Tag Number

Applicable to ELECTRONIC Components

- Power rating
- Electrical Area Classification
- Approvals and Listings per NEC

Where the combination of manufacturer's standard nameplate and instrument body stampings are unable to accommodate all of the required and applicable information, a separate stainless steel nameplate shall be provided to include the Buyer's tag number, PO number, and all of the applicable missing information. This separate stainless steel nameplate shall have the information impressed, stamped, or etched directly on the stainless steel surface. The nameplate, where physically possible, shall be secured to the body of the instrument by corrosion resistant screws tapped into a low stress area of the assembly, so the structural integrity and functional capability of the assembly are not impaired. If it is not physically possible to secure the nameplate to the body of the instrument, then the nameplate shall be attached using a stainless steel wire.

3.16 Accessibility and Maintenance

3.16.1 SELLER's recommended accessibility and recommended spares for each piece of equipment shall be included in SELLER'S submittal.

3.16.2 SELLER shall provide the inspection and maintenance requirements with the recommended intervals to be performed by Buyer.

3.17 Deleted

3.18 Flexible Connectors, Inlet and Outlet Hoses

3.18.1 When specified on the data sheet 24590-LAW-MAD-LVP-00006, SELLER shall provide flexible connectors for inlet and outlet hoses. SELLER shall specify the connector manufacturer and model number on the exhauster data sheet.

3.19 Sacrificial offgas skid-mounted exhauster LVP-EXHR-00001TEST

3.19.1 The sacrificial exhauster is not a piece of permanent plant equipment and can be stored indoors or outdoors. During storage at the WTP no maintenance will be required.

4 Materials

4.1 Construction

4.1.1 Materials of construction shall conform to the exhauster data sheet 24590-LAW-MAD-LVP-00006, as applicable.

4.1.2 Material test reports of chemical and physical properties shall be provided for pressure retaining components, including weld filler metal of the exhausters and hoses. Material test reports of chemical and physical properties for the exhauster impeller and exhauster shaft shall be provided.

4.1.3 ASME and/or ASTM material designations and grades shall be indicated on the fabrication drawings and in the material lists.

4.2 Electrical

4.2.1 **Low-voltage power and control cables which are located external to the enclosures** and not integral to the components shall be stranded copper, 600 V type XHHW-2 or Buyer-approved equivalent.

4.2.2 Internal enclosure wiring shall be stranded copper, flame-retardant, 600 V, synthetic heat resistant, or machine tool wire, or high-flexible thermoset.

4.2.3 Electrical equipment on the packaged unit shall be grounded to the package unit skid.

4.2.4 The wire insulation color for power wiring shall be as follows:

Color	Duty
Black	Ungrounded conductors more than 50 VAC
White	Grounded conductors more than 50 VAC
Green	Equipment grounding wire
Green/ Yellow tracer	Isolated instrument grounding wire
Light Blue	Ungrounded supply voltage less than 50 V (DC or AC)
Violet	Switched ungrounded voltage less than 50 V (DC or AC)
White/ Blue tracer	Grounded or return supply voltage less than 50 V (DC or AC)

4.2.5 The minimum size of conductor will be as follows (this requirement does not include cabling integral to components):

Duty	External Conductor Size (AWG)	Internal Wiring in enclosures Size (AWG)
Power and Lighting (480 V and below only)	12	14
Current Transformer Wiring	10	10
Control Circuits (120 V AC / 125 V DC) and Instrument power circuits	14	16
Instrumentation – Single pair or triad cable	16	18
Instrumentation – Multi-pair or triad cable	18	18
Communication cable (Fieldbus, Profibus)	18-22	18-22

4.2.6 Enclosures

4.2.6.1 SELLER shall furnish terminal boxes as follows:

4.2.6.2 Wiring for electronic, instrument, communication, and signal cables shall be segregated from both power and control cables. The 120 VAC power supply for instruments will be routed in the same panel as the instrument wires.

4.2.6.3 Enclosures shall be designed for front access only unless otherwise specified. All components and equipment in enclosures shall be accessible and removable from the front. Enclosures shall be stainless steel, NEMA Type 4X.

4.2.6.4 Access to enclosure internal components or equipment shall not require the use of hand tools, other than to open the cabinet. Access to any component within the enclosure for maintenance or replacement shall not be prevented by proximity to other components within the enclosure. Equipment mounted in the rear of the enclosure shall be on a back-panel and positioned to facilitate removal and replacement.

4.2.6.5 Where cables to the exhauster are to be supplied and installed by the Buyer, SELLER shall provide space for installing and terminating the cables.

4.2.6.6 All enclosures shall be provided with grounding means.

The enclosure grounding system shall be installed in conformance to IEEE Guide 1050-1996, section 5.3.1 "Single point grounding system". All instrumentation enclosures shall have an equipment safety ground bus and an isolated signal ground bus, except instrument junction box. Instrument junction box shall only have an equipment safety ground. The grounding bus shall be constructed with solid copper, and all connections shall be drilled and tapped. The ground bus shall be drilled and tapped for an additional 20 percent spare terminations.

The equipment safety ground bus shall be solidly bolted to the enclosure structure. Where enclosures are to be connected together after final installation, each end of the safety ground bus will include provisions for connection to the adjacent enclosure safety ground bus. A bolted compression type 2/0 terminal lug shall be installed at each end of the bus to facilitate connection of Buyer's 2/0 AWG stranded copper ground cable.

All removable metal components shall be connected to the equipment safety ground bus. Components shall not be grounded to each other via a common wire connecting the components to the equipment safety ground bus. Enclosure door and back-panel shall be bonded to the equipment ground.

4.2.6.7 Grounding for electrical devices and instruments, including signal and power supply shall be in accordance with manufacturer's recommendations and applicable NEC requirements.

4.2.7 Raceways

4.2.7.1 Liquid-tight flexible metallic conduit shall be used to isolate the transmission of vibration to the conduit system, and for connection to equipment which may be periodically removed.

4.2.7.2 Liquid-tight flexible metallic conduit shall be supported within 12 inches of each box, cabinet, conduit body, or other conduit termination and shall be secured at intervals not to exceed 4 1/2 ft.

4.2.7.3 Conduit connections to junction boxes shall be made using water-tight threaded hubs or factory threaded hubs.

4.3 Prohibited Materials

4.3.1 Bronze, copper, lead, zinc, tin, antimony, cadmium, or other low melting point metals, their alloys, or materials containing such metals as their basic constituents, or molybdenum and materials with halogen content of more than 200 ppm shall not be used in direct contact with stainless steel.

4.3.2 Asbestos shall not be used in any component of the exhausters or accessories.

4.3.3 Certain chemicals and materials are restricted from use at WTP. Restricted chemicals and materials are given in 24590-WTP-LIST-CON-08-0001, *Restricted Materials List*. Specification of these chemicals/materials requires specific authorization from the Buyer (WTP Safety Assurance).

5 Fabrication

5.1 Exhauster Welding

5.1.1 All fabrication, welding, inspection and repair procedures of exhauster wheels, exhauster housing, housing framing, and supports shall conform with the following, as applicable:

AWS D1.1-2008	*Structural Welding Code, Steel*
AWS D1.3-2008	*Structural Welding Code, Sheet Steel*
AWS D1.6-2007	*Structural Welding Code, Stainless Steel*
AWS D9.1-2006	*Sheet Metal Welding Code*
AWS D14.6-2005	*Welding of Rotating Elements of Equipment*

5.1.2 Repairs required as a result of weld rejection by either Buyer or SELLER's final inspection shall be fully documented in accordance with SELLER's quality assurance (QA) program. Weld repair records shall be included with the document package.

5.1.3 Welding procedures and procedure qualification records shall be submitted to Buyer for review and permission to proceed prior to use. Each procedure shall be prepared and qualified in accordance with the requirements of the above listed standards or ASME Boiler and Pressure Vessel Code, Section IX.

5.2 Inlet/Outlet Hose Welding

5.2.1 Welding procedures and procedure qualification records shall be submitted to Buyer for review and permission to proceed prior to use. Each procedure shall be prepared and qualified in accordance with the requirements of ASME Boiler and Pressure Vessel Code, Section IX.

6 Tests and Inspections

6.1 General

6.1.1 SELLER shall conduct and shall be responsible for the shop tests called for in this specification and in applicable standard and referenced documents. SELLER shall furnish all facilities necessary for the performance of such tests.

6.1.2 SELLER shall submit an inspection and test plan for Buyer review and approval.

6.1.3 Software testing shall be performed per section 3 of Engineering Specification 24590-WTP-3PS-JQ00-T0004

6.2 Environmental Equipment Qualification

6.2.1 Environmental equipment qualification of the exhausters, motors, instruments, and electrical accessories shall be conducted in accordance with specifications 24590-WTP-3PS-JQ06-T0005.

6.3 Seismic Equipment Qualification

6.3.1 Seismic qualification of the design of exhausters shall be in accordance with the methods and procedures described in specification 24590-WTP-3PS-FB01-T0001.

6.3.2 When SS equipment is qualified by testing, the sacrificial test unit shall not be used as permanent plant equipment.

6.4 Personnel Qualifications

6.4.1 Personnel performing nondestructive examination (NDE) or reviewing NDE results shall be certified to ASNT-SNT-TC-1A, Level II or Level III. Qualifications of personnel performing inspections and tests shall be verified by SELLER.

6.5 Non-Destructive Examinations

6.5.1 SELLER shall perform NDE in accordance with SELLER's procedures. NDE may include visual, radiographic and liquid penetrant examination procedures.

6.5.2 NDE procedures shall be submitted to Buyer for review and permission to proceed prior to use.

6.5.3 Exhauster pressure boundary welds shall be 100% visual tested and liquid penetrant tested as a minimum. Exhauster non-pressure boundary welds shall be 100% visual tested.

6.5.4 If the exhauster pressure boundary is stainless or a nickel based alloy, positive material identification (PMI) will be required in accordance with 24590-WTP-3PS-G000-T0002.

6.5.5 PMI will be required for the inlet/outlet hoses in accordance with 24590-WTP-3PS-G000-T0002. When using Table 2 in the PMI specification, the following apply: inlet and outlet hoses are System LVP, inlet and outlet hoses are Fluid code PW.

6.5.6 Inlet/outlet and seal purge hoses shall be tested and inspected in accordance with ASME B31.3-1996, Process Piping as follows:

- Hydrostatic or pneumatic pressure testing for normal service
- Visual examination for normal service
- 5 % radiographic examination for normal service (girth and miter welds)
- Bellows NDE per ASME B31.3-1996 Appendix X

6.6 Shop Tests

6.6.1 Exhauster performance testing shall be in accordance with ASME PTC-10-1997, Type 2 test.

6.6.2 SELLER shall perform standard factory tests, which, as a minimum, include the tests listed in Sections 6.6.1 through 6.6.9, as well as tests called out in referenced specifications for the motors.

6.6.3 All test results shall be certified, documented, and submitted to the Buyer for review and permission to proceed. All test reports shall be accepted by the Buyer based on the acceptance criteria outlined in SELLER'S test procedures.

6.6.4 Functional performance test for electrical equipment.

6.6.5 Exhauster casing pressure test.

6.6.6 Pressure testing of seal purge inlet and outlet hoses

6.6.7 Vibration performance shall be checked and reported over the entire operating range of the exhauster tests.

6.6.8 A meg-ohm test of all wires shall be performed prior to termination of all wires pulled into conduit. The meg-ohm test results shall be certified, documented, and submitted to Buyer for review.

6.6.9 A continuity check of all wiring shall be performed to verify conformance with SELLER's wiring schematics. The continuity check test results shall be certified, documented, and submitted to Buyer for review.

6.7 Site Tests

6.7.1 Buyer startup personnel will perform commission testing after initial installation at the WTP.

7 Preparation for Shipment

7.1 General

7.1.1 Exhauster and accessories shall be packaged, shipped, handled, and stored in accordance with ASME NQA-1 (2000), Part II, Subpart 2.2, Article 302, Levels of Packaging, at the following levels:

Level B:

- Exhauster assemblies with motors
- Motors in packages separate from the exhauster

Level C:

- Exhauster assemblies without motors
- Exhauster removable insulation
- Hoses and removable insulation

7.2 Cleanliness

7.2.1 SELLER's cleaning procedures shall be submitted to the Buyer for information. Prior to surface preparation and coating application, visually examine welds, the exhauster impeller,

air stream surfaces of the exhauster housing, and the air stream surfaces of all furnished accessories. Remove all dirt, oil, and grease, loose mill scale, weld spatter, and other foreign matter on surfaces to be painted in accordance with SELLER's cleaning and coating procedures.

7.3 Painting and Special Protective Coatings

7.3.1 All shop painting shall be in accordance with SELLER'S painting procedures. SELLER'S painting procedures shall be submitted to the Buyer. A list of surfaces to be coated, with manufacturer's names of coating materials to be used for each, shall also be submitted.

- Cast iron exhausters: Engineering Specification 24590-WTP-3PS-AFPS-T0001, Appendix C, Table 2, System Code MS, using a pre qualified coating product, P16, from Appendix C, Table 1.
- Stainless steel exhausters: no coating required.
- Carbon steel structural skid frame and supports: Engineering Specification 24590-WTP-3PS-AFPS-T0001, Appendix C, Table 2, System Code D, using one coat of P02 and one finish coat of P04, from Appendix C, Table 1
- Stainless steel structural skid frame and supports: no coating required.
- Motors: coating in accordance with the manufacturer's standard coating system.

7.3.2 Color of finish material shall be ANSI 70 Gray.

7.3.3 Appendix H, Manufacturer's Standard Coating Data Sheet, to 24590-WTP-3PS-AFPS-T0001 shall be completed and submitted to the Buyer for information.

7.4 Tagging

7.4.1 A stainless steel nameplate shall be attached to each exhauster showing the manufacturer's name, shop location, date of manufacture, serial number, equipment rating, equipment tag numbers, weight of assembly, and purchase order number. Instruments shall be identified with Buyer-provided tag numbers.

7.5 Shipping

7.5.1 SELLER shall comply with specification 24590-WTP-3PS-G000-T0003.

7.5.2 Exhauster inlet and discharge connections shall be provided with temporary protective covers. These covers will be removed prior to connection to Buyer's piping.

7.5.3 Inlet and outlet hoses shall be shipped loose for field installation.

8 Quality Assurance

8.1 QA Requirements Specific to Item(s) or Service

8.1.1 The quality assurance program requirements of this specification are those specified in the following documents:

- ASME-NQA-1, marked as applicable in Q data sheet of ANSI/ASME NQA-1 (2000) Quality Assurance Program Requirements, attached to the material requisition
- ASME NQA-1 (2000), Part II, Subpart 2.2, *QA Requirements for Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants*
- 24590-WTP-3PS-G000-T0001, Engineering Specification, *Supplier Quality Assurance Program Requirements*

8.2 Commercial Grade Dedication

8.2.1 The exhausters with accessories and hoses are anticipated to be items available in the commercial market. SELLER will be responsible for purchasing the commercial items and dedicating the CGIs using a CGD program.

8.2.2 Submittal drawings shall show locations for or placement of flexible connectors on the exhauster skid general arrangement drawing.

9 Configuration Management

9.1.1 Equipment and/or components covered by this specification are identified with Component Identification System numbers shown in exhauster data sheet 24590-LAW-MAD-LVP-00006 and drawing 24590-LAW-M6-LVP-00001. Each item shall be identified in accordance with Section 7.4, Tagging.

10 Documentation and Submittals

10.1 General

10.1.1 SELLER shall submit to Buyer engineering and quality verification documents in the forms and quantities shown in Form G-321-E, Engineering Document Requirements, and Form G-321-V, Quality Verification Document Requirements, attached to the MR.

10.2 Drawings

10.2.1 Drawings shall include:

- The outline dimensions of exhauster, including outline and detail drawings for each component (motor, etc). These drawings shall reflect the "as-shipped" configuration of

the equipment and instrumentation. As a minimum, interface control drawings shall contain overall dimensions of the exhauster and motor, materials of construction, instrumentation interfaces, and equipment mounting information including bolt hole sizes and quantities of bolts required.

- Exhauster skid general arrangement
- Mounting dimensions and information required for the design of supports and foundations, including any special assembly instructions
- Operating weights of exhauster assembly including motor components
- Center of gravity of assembled skid
- The space required for the removal of components
- The locations of access doors, if any
- The weights of individual components
- The locations and identification of parts that are included in the parts list
- Assembly drawings providing sufficient detail to facilitate assembly of the component parts of the exhauster
- Wiring schematic and control loop diagrams. Diagrams shall include wire gauges and fuse sizes applicable to the supplied units only.
- The ASTM or equivalent designation for materials
- Interconnection diagram and cable schedule showing details of all internal connections and Buyer external connections. SELLER'S furnished cable schedule shall include service voltage and Class of Circuit per NEC Articles 725, 760 and 800 for each cable.

10.3 Procedures

10.3.1 Procedures shall include

- Electrical component performance test procedures
- Test procedures for exhauster performance
- Test procedures for exhauster housing and shaft leakage tests
- Test procedures for sound, vibration, and mechanical running tests
- Test procedures for software testing shall be provided per section 7.2 of Engineering Specification 24590-WTP-3PS-JQ00-T0004.
- Environmental equipment qualification test procedures in accordance with specifications, 24590-WTP-3PS-JQ06-T0005.

10.4 Inspection and Test Reports

10.4.1 Inspection and test reports shall include:

- Deleted

- Deleted
- Exhauster housing and shaft seal leakage test reports
- Exhauster performance test reports, including exhauster curves
- Sound pressure levels
- Exhauster wheel/shaft vibration, and mechanical test reports

10.5 Calculations

10.5.1 Seismic analysis/calculations shall be submitted for Buyer's review and permission to proceed. Calculations shall be in accordance with 24590-WTP-3PS-G000-T0014.

10.5.2 DELETED

10.5.3 Exhauster estimated design life report shall be provided.

10.6 Manuals

10.6.1 The following manuals shall be provided:

- Erection and installation manuals that provide complete, detailed procedures for installing and placing equipment in initial operation. The manuals shall include all erection and installation drawings.
- Operation and maintenance manuals that provide complete, detailed descriptions of components and accessories with data sheets showing design, construction and performance data for equipment. Manuals shall include drawings required for operation, maintenance and repair, maintenance requirements, instructions and operational troubleshooting guides. All manuals/drawings shall include OEM part numbers.
- Instruction manuals that cover all major components such as exhausters, motors, controls, and instrumentation, including those purchased from a subcontractor. SELLER shall obtain such manuals and lists, and submit them to the Buyer.

10.6.2 SELLER shall provide instructions regarding site long and short term storage. Long term storage is considered up to 5 years.

10.6.3 Where manuals include information applicable to several components, sizes or models, non-applicable information shall be lined-out.

10.7 Certificates of Conformance

10.7.1 SELLER shall provide Certificates of Conformance demonstrating compliance with all applicable standards, specifications, and drawings.

10.7.2 SELLER shall certify lifting eyes or lugs and/or spreader bars are suitable for the safe, balanced lifting and handling of the equipment.

10.8 Lists and Schedules

10.8.1 The following lists and schedules shall be provided:

- Parts list, and cost for parts and items subject to deterioration and replacement. SELLER to state shelf life and storage requirements for spare parts.
- List of recommended spare parts

10.9 Materials Certifications

10.9.1 Material Certification for components of the exhausters shall be submitted as noted in paragraphs 4.1.1 and 4.1.2.

10.10 Data

The following data sheets shall be provided:

- Buyer's data sheets, completely filled out by SELLER, showing all information required to determine that the units are of the design and materials specified herein, including motor data sheets.
- Acoustic data report. Sound test data from similar equipment previously tested can be submitted in lieu of test for the purchased equipment.
- Exhauster performance curves at 60 %, 80 %, and 100 % design speed at design conditions specified on the data sheets.

Appendix A - Deleted

Appendix B - C.37 ASME NQA-1-2000, Quality Assurance Requirements for Nuclear Facilities

1.0 Scope

This Appendix to the specification covers the tailoring of ASME NQA-1-2000 which is required for use by the WTP project as an implementing standard to perform Commercial Grade Dedication (CGD) activities using ASME NQA-1-2004.

C.37 ASME NQA-1-2000, Quality Assurance Program Requirements for Nuclear Facilities

Revision: 2000

Sponsoring Organization: The American Society of Mechanical Engineers

WTP Specific Tailoring

The following tailoring of ASME NQA-1-2000 is required for use by the WTP project as an implementing standard to perform Commercial Grade Dedication activities using ASME NQA-1-2004.

NQA-1-2000, Part 1 Introduction

Replace the Commercial Grade Item definition with definition from NQA-1-2004, Part 1, Section 400:

Commercial Grade Item: a safety class/safety significant structure, system, or component (SSC), or part thereof, that affects its safety function, that was not designed and manufactured in accordance with the requirements of this Standard.

Justification: By tailoring NQA-1-2000 to incorporate elements of NQA-1-2004, the Commercial Grade Item definition is broadened to reflect current industry practices related to Commercial Grade Dedication. Currently there are gaps among NQA-1 qualified suppliers and utilization of NQA-1-2004 will enable WTP to employ technically acceptable suppliers not available under the provision of NQA-1-2000. The NQA-1-2000 standard was established primarily to provide for the purchase of replacement parts for nuclear-related facilities and is not sufficient to support the purchase of commodities and equipment needed for a new facility.

NQA-1-2000, Part 1 Introduction

Add to the reference section ASME NQA-1-2000, Section 400, Terms and Definitions, the following definitions from NQA-1-2004, Part 1, Section 400:

Commercial Grade Service: a service that was not provided in accordance with the requirements of this standard.

Critical Characteristics: important design, material, and performance characteristics of a commercial grade item or service that, once verified, will provide reasonable assurance that the item or service will perform its intended safety function.

Dedication: an acceptance process performed in accordance with this Standard to provide reasonable assurance that a commercial grade item or service will successfully perform its intended safety function and, in this respect, is deemed equivalent to an item or services provided under the requirements of this Standard.

Dedicating Entity: the organization that performs the dedication process.

Safety Function: a function that is necessary to ensure: 1) the integrity of the boundaries retaining radioactive materials or hazardous chemicals; 2) the capability to make and maintain the facility safe; or 3) the capability to prevent or mitigate the consequences of facility conditions that could result in radiological or chemical exposures to the general public or workers in excess of appropriate limits.

Justification: The tailoring of the NQA-1-2000, by adding definitions of Commercial Grade Service, Critical Characteristic, Dedication and Dedicating Entity, from NQA-1-2004, allows for the use of the Commercial Grade Dedication process to procure equipment requiring design services by the supplier. The definitions of Commercial Grade Service, Critical Characteristics, Dedication and Dedicating Entity incorporate definitions consistent with NQA-1-2004 text. The definition of Safety Function took the wording from DOE/RL-96-0003, -0004 & -0006 (subsequently cancelled) and added the requirement included in DOE/RL-96-0005 (subsequently cancelled) to take into account process safety in the WTP regulatory scope.

NQA-1-2000, Requirement 7 Control of Purchased Items and Services

Replace NQA-1-2000 Requirement 7, Section 700, Titled Commercial Grade Items in its entirety with NQA-1-2004, Requirement 7, Section 700.

Justification: NQA-1-2004 provides greater flexibility for implementing the Commercial Grade Dedication process while assuring that equipment acquired under these processes will support their safety functions.

Modify new Section 701 General as follows:

701 General

When Commercial Grade Items or Services are utilized, the dedicating entity can utilize the requirements of this section for procurement and acceptance of items or services as an acceptable alternative to Sections 200 through 600 of this Requirement, except that Supplier evaluation and selection, where determined necessary by the Purchaser, shall be in accordance with Section 200 of this Requirement. The applicable requirements of this Standard shall apply to dedication activities for acceptance.

Sampling plans utilized to select items for special test(s), inspection(s), and / or analysis should have an adequate technical basis based on established standards that consider lot traceability, homogeneity, and the complexity of the item (NQA-1-2004, Non-mandatory Appendix 7A-2).

Justification: Corrects the section numbers to correspond to the appropriate section of NQA-1-2000 and adds text from an NQA-1-2004 non-mandatory appendix that sampling plans shall have an adequate technical basis considering lot traceability and homogeneity and the complexity of the item.

Modify Section 704 Dedication as follows:

704 Dedication

(a) The dedicating entity shall provide reasonable assurance that the commercial grade item or service meets the acceptance criteria for the identified critical characteristics. "The four methods that can be used to accept commercial grade items or services are :

Method 1 - Special Tests, Inspections, and/or Analyses

Method 2 - Commercial Grade Survey of Supplier

Method 3 - Source Verification

Method 4 - Acceptable Supplier/Item Performance Record

The four acceptance methods provide, either individually or in combination, a means to reasonably ensure that a CGI, which is received, meets the requirements of the item specified. The results of employing each method should be documented by the purchaser" (EPRI Guide NP-5652).

Justification: The ASME NQA-1-2004 differs from the EPRI NP-5652 guidance in the description of how the four acceptance or dedication methods are to be selected and used. The intent of EPRI Report NP-5652 is to establish that no one methodology is superior to the other. ASME NQA-1-2004 places heavy reliance on tests, inspections, and analyses (Method 1) performed after delivery of material. The use of Method 1 after delivery could be less than optimal for RPP-WTP, as discovering quality issues following purchase, fabrication, and delivery may result in large cost and schedule implications for the project. The Nuclear Regulatory Commission (NRC) Generic Letter 89-02 conditionally endorses the use of the EPRI Guide NP-5652 methodology. Implementation of the EPRI Guide has become an industry standard. DOE G 414.1-2A lists EPRI NP-5652 as an acceptable method.

Acceptable Supplier/Item Performance Record: If this method is used, it shall be used in combination with one or more of the other commercial grade items or service acceptance methods described in Section 7.1.2.12.4.1.4 of the *Quality Assurance Manual* (24590-WTP-QAM-QA-06-001).

Appendix C - Implementing Standards

1.0 ASME B31.3-1996, Process Piping

2.0 ASME NQA-1-2000, Quality Assurance Program Requirements for Nuclear Facilities

3.0 UBC-97, Uniform Building Code

4.0 The above documents are from: River Protection Project-Waste Treatment Plant Safety Requirements Document Volume II, 24590-WTP-SRD-ESH-01-001-02, Rev 5ae

Appendix D - 26.0 ASME B31.3-1996, Process Piping

26.0 ASME B31.3-1996, Process Piping

Revision: 1996
Sponsoring Organization: ASME

WTP Specific Tailoring

The following tailoring of ASME B31.3, *Process Piping*, is required for use by the WTP contractor as an Implementing Standard for: (1) the fabrication and installation of those portions of the C5V ductwork that are being embedded in concrete, (2) the use of ASME B16.9 welding tees in accordance with ASME B31.3-2002, (3) use of vacuum box leak testing, (4) the ASME B31.3-1998, paragraph 345.2.3(c), allowance for not leak testing closure welds outside of a closed cell (black cell) and/or hard-to-reach area, (5) the test pressure that is used for piping systems subjected and designed to HPAV events, and (6) design for HPAV Detonation/Deflagration loads and associated thermal gradients.

- The tailored sections of ASME B31.3 applicable to embedded ductwork will only be utilized to the extent that it will cover the fabrication, installation, and inspection (and associated testing) of Category D fluid service piping being used as C5 ductwork. Air testing requirements for this ductwork will be compliant with ASME AG-1. Below is a description of those portions of ASME B31.3 that apply to fabrication, installation, and inspection of Category D fluid service piping and the sections of the SRD that they will apply to.
- The tailored sections of ASME B31.3 applicable to welding tees will only be used for ASME B16.9 welding tees. As long as the stress intensification factors from ASME B31.3-2002 are used in the stress analysis for the welding tees, welding tees fabricated to either the 1996 or the 2002 edition of ASME B31.3 can be used. Below is a description of those portions of ASME B31.3, Appendix D, Table D300, that apply to welding tees and the section of the SRD to which they will apply.
- The tailored paragraphs of ASME B31.3 applicable to vacuum box leak testing, in lieu of hydrostatic or pneumatic leak testing, will only be used to leak test full penetration circumferential piping field butt welds inside a closed cell (black cell) and/or hard-to-reach area as defined in Appendix M, out to the first isolation component outside the closed cell (black cell) and/or hard-to-reach area. Further, if the 100 % volumetric inspection using ultrasonic examination per ASME B31.3 paragraph 344.6, is conducted for welds to be vacuum box tested, then the ultrasonic examination shall be conducted using a method that creates and maintains a reproducible computerized image(s) of the entire weld in the axial and radial direction.
- The tailored paragraphs of ASME B31.3 adopting the provisions of ASME B31.3 (c) - 1998 Addendum paragraph 345.2.3(c) are applicable to all ASME B31.3 piping in all facilities except for closure welds in closed cells (black cell) and/or hard-to-reach areas.

Piping providing a confinement function in accordance with SRD 4.4-3 will comply with the following sections of ASME B31.3-1996, *Process Piping*. These sections of ASME B31.3 are applicable for embedded ductwork.

Chapter 3, Materials

Chapter 5, Fabrication

Table 341.3.2, Visual acceptance criteria for Category D fluid service piping

Justification: Due to wall thickness requirements of duct embedded in concrete, piping materials are required. ASME B31.3 will apply to materials, fabrication, and inspection standards as appropriate. Testing requirements for nuclear air treatment systems will be consistent with ASME AG-1.

Piping providing a confinement function in accordance with SRD 5.1-2 will comply with the following sections of ASME B31.3-1996, *Process Piping*. These sections of ASME B31.3 are applicable for embedded ductwork.

Chapter 3, Materials

Chapter 5, Fabrication

Table 341.3.2, Visual acceptance criteria for Category D fluid service piping

Justification: Due to wall thickness requirements of duct embedded in concrete, piping materials are required. ASME B31.3 will apply to materials, fabrication, and inspection standards as appropriate. Testing requirements for nuclear air treatment systems will be consistent with ASME AG-1.

Piping providing a confinement function in accordance with SRD 4.2-2 will comply with ASME B31.3-1996, *Process Piping*, with the following modification:

In Table D300, the description of welding tee per ASME B16.9 shall be revised so it is consistent with that shown in Table D300 of ASME B31.3-2002:

		Stress Intensification Factor [Notes (2), (3)]			
Description	**Flexibility Factor k**	**Out-of-Plane, i_0**	**In-Plane i_i**	**Flexibility Characteristic, h**	**Sketch**
Welded tee per ASME B16.9 [Notes (2), (4), (6), (11), (13)]	1	$\frac{0.9}{h^{2/3}}$	$3/4\ i_0 + 1/4$	$3.1\frac{\overline{T}}{r_2}$	Same as ASME B31.3-1996

This means that for welding tees per ASME B16.9, note 11 in Table D300 is also changed to:

(11) If $r_x \geq 1/8D_b$ and $T_c \geq 1.5\overline{T}$, a flexibility characteristic of $4.4\,\overline{T}/r_2$ may be used.

Justification: The use of a lower flexibility characteristic for welding tees per ASME B.16.9 in accordance with ASME B31.3-2002 will increase both the out-of-plane and in-plane stress intensification factors. The increased stress intensification factors will reduce the allowable out-of-plane and in-plane moments that can be applied to the welding tee and keep the calculated stress below the stresses allowable by ASME B31.3-1996.

Safety piping within the scope of SRD 4.2-2 shall comply with ASME B31.3-1996, Chapter V, Paragraph 345, using the following approach for vacuum box leak testing. Vacuum box leak testing, in lieu of hydrostatic or pneumatic leak testing, may be used to leak test full penetration circumferential piping, field butt welds inside a closed cell (black cell) and/or hard-to-reach area as defined in Appendix M, out to the first isolation component outside the closed cell (black cell) and/or hard-to-reach area, only under the following conditions:

Vacuum Box Leak Test Method - The vacuum box leak test shall be in accordance with a Bubble Test - Vacuum Box Technique method specified in ASME BPV Code, Section V, Article 10, Appendix II, subject to the requirements listed below:

(a) Sensitivity of the test shall be demonstrated to be not less than 1E-3 atm-ml/sec at 15 psig.

(b) The test pressure shall be a partial vacuum of at least 7 psi below atmosphere, applied to the outside of the weld.

(c) The required partial vacuum shall be maintained for at least 20 sec examination time.

In addition, the following limitations and restrictions shall apply to the application of vacuum box leak testing in lieu of a hydrostatic or a pneumatic leak test:

- Vacuum box leak testing will only be used to leak test circumferential piping field welds inside a closed cell (black cell) and/or hard-to-reach area (as defined in SRD Appendix M). This includes any welds in extensions of piping systems contained or originating in accessible areas between the closed cell (black cell) and/or hard-to-reach area boundary and the first isolation valve or device beyond the closed cell (black cell) and/or hard-to-reach area boundary;
- It shall only be used for piping field welds where required to avoid damage to components, ensure the safety to construction workers, perform leak tests of field welds where physical limitations prevent hydrostatie or pneumatic leak testing as prescribed in ASME B31.3-1996 paragraph 345.4 and paragraph 345.5 respectively;
- Pipe welds that are to be vacuum box leak tested will be assessed for suitability. The number of welds to be vacuum box leak tested shall be limited to a maximum of three welds between termination points (two termination or closure welds and one intermediate weld) on a given pipe system except where physical limitations prevent examination by hydrostatic or pneumatic leak testing. DOE will be informed of such exceptions, and may at its discretion and within 48 hours of being informed, respond to BNI on the suitability of the use of vacuum box leak testing for such instances. Termination points may be tanks, vessels, valves, etc. (Specifically excluded from the definition of termination points are junctions where the piping changes design class). This could be either the last two closure welds in a closed cell (black cell) and/or hard-to-reach area or the last

closure weld in the closed cell (black cell) and/or hard-to-reach area and the last closure weld outside the closed cell (black cell) and/or hard-to-reach area. In addition, vacuum box leak testing would be permitted for the connection welds between construction modules if this is limited to one module-to-module weld per piping run within the cells. This is in addition to termination welds on the piping run. A module is defined as a pre-leak-tested subassembly containing multiple pipe spools;

- Vacuum box leak testing shall be limited to full penetration girth butt welds, on straight pipe or between straight pipe and pipe components of the same nominal pipe size and same wall thickness on both sides of the weld at the weld location. The following configurations are candidates for vacuum box testing:

  (a) Straight pipe to straight pipe connection butt welds

  (b) Straight pipe to 90° elbow connection butt welds

  (c) Straight pipe to 45° elbow connection butt welds

  (d) Straight pipe to concentric reducer connection butt welds

  (e) Straight pipe to eccentric reducer connection butt welds

  (f) Straight pipe to butt welding tee connection butt welds

  (g) Straight pipe to butt welding reduced outlet tee connection butt welds

  (h) Straight pipe to valve nozzle connection butt welds

  (i) Straight pipe to tank or vessel nozzle connection welds

  (j) Straight pipe to safe-end of a weldolet connection butt welds - full penetration butt welded connection only

  (k) Straight pipe to pipe cap connection butt welds

  Prior to the application of vacuum box testing using any of the candidate configurations on piping butt welds at the WTP, the Contractor must successfully demonstrate to the DOE, for the candidate configuration, that (1) all portions of the weld to be inspected are visible and can be inspected in accordance with the ASME Boiler and Pressure and Vessel Code, Section V, Article 10, Appendix II - 1995; (2) the vacuum box can adequately maintain a partial vacuum of 7 psid; and (3) vacuum box leak testing can be accomplished in the time limits and other requirements established by this procedure. The DOE shall be advised at least 7 days in advance of any demonstration to qualify a new weld configuration so that they can witness the demonstration. The Contractor shall document any demonstration relied upon to justify the use of vacuum box leak testing on a new configuration. Further, vacuum box leak testing shall be conducted with a vacuum box that completely encapsulates the weld, at the test location;

- All welds shall be 100 % volumetrically inspected in accordance with ASME B31.3-1996, paragraphs 344.5 or 344.6. If the 100 % volumetric inspection is conducted using ultrasonic examination per ASME B31.3-1996 paragraph 344.6, then the ultrasonic examination shall be conducted using a method that creates and maintains a reproducible computerized image(s) of the entire weld in the axial and radial direction;

- It shall be limited to welds made using the Orbital welding machines. The only exception is that vacuum leak box testing may be used on manual welds if the 100 % volumetric inspection was conducted by radiography per ASME B31.3-1996 paragraph 344.5;

- The piping systems and or components on both sides of the weld to be vacuum box leak tested shall have been subjected to a hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.4, a pneumatic test in accordance with ASME B31.3-1996 paragraph 345.5, a combination pneumatic-hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.6, or in the case of components, leak tested in accordance with the Code or Standard applicable to the design of the component;
- At a minimum, a flexibility analysis in accordance with ASME B31.3-1996 paragraphs 319.4.2 (a) and (b) shall be required on any piping systems that contain welds that are to be vacuum leak box tested. In addition, a comprehensive flexibility analysis in accordance with ASME B31.3-1996 paragraphs 319.4.2 (c) and (d) shall be performed on any piping systems that contain welds that are to be vacuum box leak tested when the piping systems have a design temperature greater than or equal to 150 °F;
- For manual welds, the requirements of ASME B31.3-1996 paragraph 344.7.1 (a) through (g) shall be invoked on any weld to be vacuum box leak tested with the exception that the requirement of subparagraph 344.7.1 (e) "... aided by liquid penetrant or magnetic particle examination when specified in the engineering design" shall not be required. For welds made using Orbital welding machines, the requirements of ASME B31.3-1996 paragraph 344.7.1 (a), (b), (c), (d), and (g) shall be invoked. The requirements of 344.7.1 (e) and (f) shall not be required. The implementation of these requirements shall be documented in the weld inspection report;
- Pipe welds and the associated line numbers that are to be vacuum leak box tested shall be identified in advance of the testing. This identification shall be documented in the controlled document Weld List, which must include this information prior to the initiation of any vacuum box leak testing associated with those welds and line numbers. It is understood that the controlled document Weld List may need to be revised and updated periodically through the construction phase of the WTP Project; and
- The following special requirements shall be placed on the training programs used to certify the technicians that will be conducting the vacuum box leak tests:
  1. The BNI Construction Manager shall pre-approve the technician qualifying examination(s) for vacuum box leak testing;
  2. The BNI Construction Manager shall pre-approve the qualifications of each Level III technician preparing or giving the examinations for vacuum box leak testing;
  3. DOE ORP at their discretion shall reserve the right to observe any and/or all practical leak test examinations and review of the results of any and/or all written vacuum box leak test examinations;
  4. The minimum topical content of each Level II examination shall be specified by BNI, and approved by DOE;
  5. The 80 % correct criteria for passing the examination shall apply to each part of the three part examinations that are to be given;
  6. BNI shall provide reasonable assurance that they will take adequate measures to assure the integrity of written examination is maintained; and
  7. There shall be several versions of each examination in use to assure Level II knowledge and ability concerning vacuum box leak testing is confirmed.

Justification: The requirement for the vacuum box leak test sensitivity is consistent with the ASME B31.3 requirement for a sensitive leak test as given in ASME B31.3-1996 paragraph 345.8 and for at least 7 psi vacuum and an examination time of at least 20 seconds. The limitations in using vacuum box leak testing better define when this method can be used. DOE ORP may further change the definition and application of these special vacuum box leak testing criteria based on the Contractor's experience with their use, or the Contractor's request for a change.

Piping system closure welds outside of a closed cell (black cell) and/or hard-to-reach area as defined in SRD Appendix M, shall comply with the requirements of ASME B31.3-1998, subparagraph 345.2.3(c). When ASME B31.3-1998, subparagraph 345.2.3(c) is invoked the following restrictions shall apply:

- It shall not be invoked on any closure welds on piping systems in a closed cell (black cell) and/or hard-to-reach area as defined in SRD Appendix M. This includes any welds in extensions of piping systems contained or originating in a closed cell (black cell) and/or hard-to-reach area, between the closed cell (black cell) and/or hard-to-reach area boundary and the first isolation valve, or device beyond the closed cell (black cell) and/or hard-to-reach area boundary;
- It shall only be invoked on full penetration butt welds in straight pipe, full penetration butt welds at the safe-end of an equipment nozzle, or full penetration butt welds at the safe-end of branch connections. [The safe-end is defined as the piping to equipment nozzle connecting weld or the branch connection to branch piping connecting welds.];
- The requirements of ASME B31.3(c) - 1998, subparagraph 345.2.3 (c) shall be met;
- The piping systems and or components on both sides of the closure weld shall have been subjected to a hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.4, a pneumatic leak test in accordance with ASME B31.3-1996 paragraph 345.5, a combination pneumatic-hydrostatic leak test in accordance with ASME B31.3-1996 paragraph 345.6, or in the case of components leak tested in accordance with the Code or Standard applicable to the design of the component;
- For manual welds, the requirements of ASME B31.3-1996 paragraph 344.7.1 (a) through (g) shall be invoked with the exception that the requirement of subparagraph 344.7.1 (e) "...aided by liquid penetrant or magnetic particle examination when specified in the engineering design" shall not be required. For welds made using the Orbital welding machines, the requirements of ASME B31.3 -1996 paragraph 344.7.1 (a), (b), (c), (d), and (g) shall be invoked. The implementation of these requirements shall be documented in the weld inspection report;
- Piping welds and the associated line numbers for which the closure weld classification is invoked shall be documented in a controlled document Weld List;
- Piping components may include mechanical elements other than piping; and
- In addition, BNI shall incorporate these requirements into the appropriate specification. DOE-ORP may further change the definition and application on the use of closure welds based on the Contractor's experience with their use or the Contractor's request for a change.

Justification: This change does not change the safety function of any pressure boundary components. The requirement to leak test pressure boundary field welds is primarily to ensure the reliability of the welds in addition to the reliability provided by the other required examinations. The exception allowed

by ASME B31.3-1998, paragraph 345.2.3 that the final weld connecting piping systems or components which have been successfully tested in accordance with paragraph 345 need not be leak tested provided the weld is examined in-process in accordance with paragraph 344.7 (a), (b), (c), (d), and (g) and passes with 100 % radiographic examination in accordance with paragraph 344.5 or 100 % ultrasonic examination in accordance with paragraph 344.6 provides adequate assurance that the weld is reliable and leak tight. The change continues to provide adequate safety since it requires that all piping closure welds that are not leak tested are in-process examined and 100 % volumetrically examined which exceeds the requirements of ASME B31.3-1996 for closure welds that are leak tested. The inability to hydrostatically or pneumatically leak test these closure welds does not affect the soundness of the welds.

Design for Hydrogen Detonation/Deflagration Loads and Thermal Gradients

This section provides design criteria to determine the acceptable responses of piping systems and components to occasional loads that may result from HPAV events. Piping routes that fail to meet these criteria require preventive controls. The development of such criteria is permitted by B31.3 and is, therefore, not a deviation from it.

A best-estimate design tool may be used to determine the number of cycles for defined classes of HPAV events that differ in applicable structural design considerations for their accommodation subject to the following constraints to ensure consistency with safety analysis expectations:

1. The route specific factors that affect the potential for significant quantities of combustible gases to accumulate must be considered, including the maximum expected waste characteristics (i.e., combustible gas generation rate, temperature, viscosity), the proposed configuration of the route, and the related human and equipment failure rates.
2. An ignition probability of one is to be assumed at each maximum bubble size unless a technical basis for a lower probability is submitted to DOE-ORP and receives their concurrence.
3. The design tool shall not be used to exclude limiting events such as PRC-DDT that can occur for credible gas configuration conditions.
4. A defined class of events may be designated as structurally insignificant provided the included events are shown not to affect compliance with these Appendix C, B31.3 tailoring provisions.
5. Documentation of the model must be provided including the process for its application, the defined event classes, the parameters chosen, and the results.

For HPAV events, analysis will use 100/sec strain-rate dependent stress-strain curves for austenitic stainless steels (SS 304, 304L, 316 and 316L), which are used in the construction of WTP piping systems. Strain rate dependent properties will be developed based on a literature survey of academic, National Laboratory and industry information, covering the range of experimental test data to which the material in question will be subjected in service. Specifically, the experimental data requirements shall provide:

(a) A lower-bound estimate for strength over the strain rate and temperature regime of interest,

(b) Variation of yield strength with strain-rate and temperature,

(c) Variation of the rate of strain-hardening with strain-rate,

(d) Determination of a loading path-dependence to both the quasi-static (QS) and rate-dependent yield behavior,

(e) A loading path-dependence to both the quasi-static (QS) and rate-dependent strain-hardening behavior, and

(f) Development of an equation (or mathematical model) that describes the strength properties over the regime of interest.

(g) Scaled to the ASME Boiler and Pressure Vessel Code, Section VIII, Division 2, static, room temperature true stress-true strain curve.

Events Affecting Piping Located in Black Cells or Designated as Hard-To-Reach

Deflagrations events must meet the criteria of ASME B31.3-1996, *Process Piping*, and B31.3 Code Case 178, with appropriate consideration of deflagration pressure, sustained loads, and thermal gradients.

In evaluating Code Pressure Boundary for detonation events (including deflagration to detonation [DDT] transitions and reflected DDTs [PRC-DDT]), the straight pipe equivalent through-wall average strain will be limited to 0.2 % plastic strain using the 100/sec strain-rate dependent stress-strain curves, finite element time-history analysis, and end-of-life wall thickness.

For bends fabricated from straight pipe, the equivalent through-wall average strain will be limited to 0.2 % plastic strain using the 100/sec strain-rate dependent stress-strain curves, finite element time-history analysis, and end-of-life wall thickness.

Fittings (tees, elbows, reducers) manufactured in accordance with B31.3 Paragraph 303 and the standards listed in B31.3 Table 326.1 are considered to be as strong as the matching pipe, due to the burst test requirements of the standards. BNI will verify that burst test methods (in lieu of calculation methods) have been used to validate representative fitting designs.

Fatigue damage from high frequency oscillations, bar waves, thermal gradients, pressure changes, and traveling detonation waves must be evaluated.

B31.3 302.3.5 limits the sum of longitudinal stresses due to pressure, weight, and other sustained loads to S_h, the basic Code allowable at maximum temperature. Combining only longitudinal stresses, as is done in B31.3 paragraph 302.3.6, does not consider the possible combination of hoop and longitudinal (axial) effects. For highly dynamic pressures during a traveling wave detonation event, the axial and hoop effects due to pressure are not necessarily both tensile, so a departure from the normal B31.3 methods (sum of longitudinal stresses) must be made to allow for the possible combination of hoop and axial effects. Therefore, for traveling wave detonation events, the combination of hoop and axial effects must be considered without exceeding the 100/sec strain-rate dependent yield; the dynamic interaction ratio added to the dead weight interaction ratio shall not exceed 1. Since DDT and PRC-DDT events are point events, the requirement to combine hoop and axial effects does not apply.

Events Affecting Piping Not Located in Black Cells or Designated as Hard-To-Reach

Except as noted below, all HPAV requirements in the BC/HTR apply. The criteria below are limited to affected piping systems and components located in the HLW Process Cells, or in the Pretreatment facility Hot Cell and C3 area bulges that serve as extensions of the Hot Cell.

For HPAV events that are anticipated to result in a PRC-DDT, detonation, or DDT, the maximum pressure that produces a straight pipe (or 3D bend, whichever is limiting) equivalent through-wall average strain of 0.2 % plastic strain, as determined above for the BC/HTR, will be permitted to be 1.5 times higher. This results in a plastic through-wall average strain estimated to be less than 2.5 %.

Other Components

Stresses in the nozzle/vessel intersection or in the dipped line due to the traveling detonation wave loading will be combined with stresses due to normal loads (PJM operation, if applicable, thermal expansion, internal pressure, weight) and the primary results limited to 1.2 times the normal condition allowable stress for that type of stress, as permitted by the ASME Boiler and Pressure Vessel Code, Sections VIII-1 and VIII-2, for occasional loads.

Stresses in pipe supports inside BC/HTR areas under combined weight, thermal expansion, and detonation loading will be limited to B31.3 allowable stress (if a catalog support) or the AISC allowable stress (if a structural shape), for occasional loads.

Stresses in pipe supports outside BC/HTR areas under combined weight, thermal expansion, and detonation loading will be limited to 1.6 times the B31.3 or AISC normal condition allowable stress. The basis for the 1.6 is AISC N690, Table Q1.5.7.1 for extreme and higher loading.

In-line instrumentation, such as pressure transducers, will be shown to be acceptable up to DDT loading by limiting the maximum pressure to the maximum rated pressure of the instrumentation pressure boundary. Since these items are replaceable, i.e., there are none in Black Cells, their possible failure to function after a PRC-DDT is acceptable.

Components such as jumper connectors, valves, jet pump pairs, etc., whose function cannot be demonstrated by analysis alone may be qualified by a combination of analysis and test as follows:

1. Analyses per the criteria above as applicable for the component boundary.
2. Demonstrate other significant design aspects such as leak tightness of jumper connectors or valve operability, closure function and stem leakage by performing a bounding impulsive load test. Provide test acceptance criteria similar to those that would be used for the same functions in a seismic test.

Justification: ASME B31.3 does not address detonation pressure loading, but does permit the designer to perform detailed analysis for unusual situations, as indicated in Paragraphs 300(c)(3) and 304.7.2. The purpose of the criteria described above is to implement that provision.

Exception to B31.3 Paragraph 302.2.4

Piping subjected to HPAV events, as defined in Appendix A, Section 5.4, and designed to withstand those events without controls will be leak tested at a pressure equal to the system design pressure (from the Mechanical line list) multiplied by the applicable factors in Section 345 of ASME B31.3-1996, *Process Piping*. The HPAV pressure will be permitted to exceed the test pressure, which is an exception to Paragraph 302.2.4.

Justification: ASME B31.3 does not address highly impulsive pressure loading, and does permit the designer to perform detailed analysis for unusual situations, as indicated in Paragraph 304.7.2 for Unlisted Components. The design rules developed in Report 24590-WTP-RPT-ENG-07-011, Revision 2, ensure that the piping system will maintain pressure boundary under all conditions.

Appendix E - Reference Standards

APPENDIX E
REFERENCE STANDARDS[1, 2]

Standards incorporated in this Code by reference, and the names and addresses of the sponsoring organizations are shown in this Appendix. It is not practical to refer to a specific edition of each standard throughout the Code text; instead, the specific edition reference dates are shown here. Subsequent issues and revisions of these referenced standards and any new standards incorporated in the Code by reference in Code Addenda will be listed (after review and acceptance by the Code Committee) in revisions of this Appendix E.

A component ordinarily is not marked to indicate the edition date of the standard to which it is manufactured. It is therefore possible that an item taken from inventory was produced in accordance with a superseded edition, or an edition not yet approved by the Code (because it is of later date than that listed and is in use). If compliance with a specific edition is a requirement of the intended service, it usually will be necessary to state the specific requirement in the purchase specification and to maintain identification of the component until it is put in service.

ASTM Specifications

A 20-93a
A 36-93a
A 47-90
A 48-83 (R1990)

A 53-93a

A 105-93b
A 106-93
A 126-84 (R1991)
A 134-93
A 135-93
A 139-93

A 167-92b
A 179-90a
A 181-93a
A 182-93b TO 2011
A 193-93a
A 194-93a
A 197-87 (R1992)

A 202-93
A 203-93
A 204-93
A 210-91
A 211-75 (R1985)
A 216-89
A 217-91
A 234-92a
A 240-93b TO 2011

A 263-92
A 264-92
A 265-92
A 268-91a
A 269-92

ASTM Specifications (Cont'd)

A 276-92 TO 2010
A 278-85 (R1991)
A 283-93
A 285-90
A 299-90

A 302-93
A 307-92a
A 312-93 TO 2011
A 320-93
A 325-92a
A 333-91a
A 334-91
A 335-92b
A 350-93

A 351-91b
A 352-89
A 353-93
A 354-92a
A 358-92
A 369-92
A 370-92
A 376-93
A 381-93
A 387-90a
A 395-88

A 403-93 TO 2010a
A 409-92
A 420-92
A 426-92
A 430-91
A 437-92
A 451-93

ASTM Specifications (Cont'd)

A 452-88
A 453-92
A 494-91a

A 515-92
A 516-90
A 524-93
A 530-92a
A 537-91

A 553-93
A 570-92
A 571-84 (R1992)
A 587-93

A 645-87 (R1991)

A 671-93
A 672-93
A 675-90a
A 691-93

A 723-91

A 789-90
A 790-91

B 21-90
B 26-92a
B 42-93
B 43-91

B 61-93
B 62-93

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ASTM Specifications (Cont'd)

B 68-92a
B 75-92a
B 88-93
B 96-92a
B 98-93

B 127-93
B 133-92
B 148-92a
B 150-92

B 152-92
B 160-93
B 161-93
B 162-93
B 164-93
B 165-93
B 166-93
B 167-93
B 168-93
B 169-85a (R1991)
B 171-91a

B 209-93
B 210-93
B 211-93
B 221-93
B 241-93
B 247-93

B 280-93
B 283-91

B 333-92
B 335-89
B 337-83 (R1987)
B 338-94
B 345-92a

B 361-92
B 363-83 (R1987)
B 366-91
B 381-93

B 407-93
B 409-93
B 435-93
B 443-93
B 444-90
B 446-93

B 462-93
B 463-92a
B 464-89
B 466-86
B 467-88
B 493-83 (R1987)

ASTM Specifications (Cont'd)

B 514-85
B 517-93
B 523-92
B 550-92

B 551-92
B 564-93
B 574-91
B 575-92
B 581-93
B 582-92
B 584-93

B 619-92
B 620-93
B 621-89
B 622-93
B 625-93
B 649-93

B 658-92
B 675-90a
B 688-93
B 690-93

B 804-89

C 14-82
C 301-79
C 361-90

C 582-87
C 599-70 (R1984)

D 1527-89
D 1600-90
D 1694-87
D 1785-89

D 2104-89a
D 2235-88
D 2239-89
D 2241-89
D 2282-89
D 2310-80 (R1986)
D 2447-89
D 2464-90
D 2466-90a
D 2467-90
D 2468-89

D 2513-90b
D 2517-81 (R1987)
D 2564-88
D 2609-90
D 2657-90

ASTM Specifications (Cont'd)

D 2662-89
D 2666-89
D 2672-89
D 2683-90
D 2737-89
D 2837-90
D 2846-90
D 2855-90
D 2992-87
D 2996-88
D 2997-90
D 3000-89

D 3035-89a
D 3139-89
D 3140-90
D 3261-90
D 3309-89a

D 3517-88
D 3754-88
D 3839-89
D 3840-88

D 4024-87
D 4161-86

E 112-85
E 114-85
E 125-63 (R1985)
E 142-86
E 155-85
E 165-80 (R1983)
E 186-84
E 213-86 (R1990)
E 272-75 (R1984)
E 280-84
E 310-75 (R1984)
E 446-84

E 709-80 (R1985)

F 336-87
F 423-82
F 437-89b
F 438-90
F 439-90
F 441-89
F 442-89
F 491-84
F 492-85
F 493-89

F 546-84
F 599-83
F 781-82

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ASCE Standard

7-88-94

ASME Codes

*ASME Boiler and Pressure Vessel Code, 1995 Ed. TO 2007
*Section II, Part D
*Section V
*Section VIII, Division 1
*Section VIII, Division 2
*Section IX

ASME Standards

*B1.20.1-1983
*B1.20.7-1966 (R1983)

*B16.1-1989
*B16.3-1985
*B16.4-1985
*B16.5-1988
*B16.9-1986
*B16.10-1986
*B16.11-1991
*B16.14-1991
*B16.15-1985 LATEST

*B16.21-1992
*B16.22-1989
*B16.25-1986
*B16.26-1988
*B16.28-1986
*B16.34-1988
*B16.36-1988
*B16.39-1986

*B16.42-1987
*B16.47-1990

*B18.2.1-1981
*B18.2.2-1987

*B36.10M-1985
*B36.19M-1985

*B46.1-1985

*American National Standards

A21.14-1984
A21.52-1982

B1.1-1982 (A1984)
B1.20.3-1976 (R1982)

*American National Standards (Cont'd)

B16.18-1984
B16.20-1973
B16.24-1979

B93.11-1981

API Specifications

5B, 13th Ed., 1988
5L, 40th Ed., 1992
15LE, 1st Ed., 1985
15LP, 5th Ed., 1981
15LR, 5th Ed., 1986

API Standards

*526, 3rd Ed., 1984 (R1989)
590, 1st Ed., 1985 (R1990)
594, 4th Ed., 1991
599, 3rd Ed., 1988
600, 9th Ed., 1991

601, 7th Ed., 1988
602, 6th Ed., 1993
603, 5th Ed., 1991
605, 4th Ed., 1988
608, 1st Ed., 1989
609, 4th Ed., 1991

API Recommended Practice

RP 941, 4th Ed., 1990

ASNT Standard

SNT TC-1A-1984 TO 2007

AWS Standards

*A3.0-1989
*A5.1-1992
*A5.4-1992
*A5.5-1989R

AWWA Standards

*C110-1987
*C111-1990
*C115-1988
*C150-1991

AWWA Standards (Cont'd)

*C151-1986
*C200-1986
*C207-1986
C208-1983 (A1984) (R1989)
*C300-1989
*C301-1984
*C302-1987
*C500-1986

*C504-1987
*C600-1987
*C900-1989
*C950-1988

CDA Publication

Copper Tube Handbook, 1980

CGA Publication

G-4.1-1985

EJMA Publication

EJMA Standards, 6th Ed., (A1995)

ICBO Publication

Uniform Building Code, 1991 Edition

MSS Standard Practices

SP-6-1990
SP-9-1992
SP-25-1978 (R1988)

SP-42-1990
SP-43-1991
SP-44-1985
SP-45-1992
SP-51-1991
SP-53-1985 (R1990)
SP-55-1985 (R1990)
*SP-58-1988
SP-65-1990
SP-70-1990

SP-71-1990
SP-72-1992
SP-73-1991

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MSS Standard Practices (Cont'd)

SP-75-1988
SP-79-1992
SP-80-1987
SP-81-1981 (R1991)
SP-83-1987
SP-85-1985
SP-88-1993
SP-95-1986 (R 1991)
SP-97-1987

NACE Publication

Corrosion Data Survey, 1985
MR 0175-92
RP 0170-85
RP 0472-87

NBS Publication[3]

PS 15-69

NFPA Specification

*1963-1985

PFI Standard

ES-7-1962 (R1984)

PPI Technical Report

TR-21-1973

SAE Specifications

*J 513-1992
*J 514-1992
*J 518-1991

NOTES:

(1) The issue date shown immediately following the hyphen after the number of the standard (e.g., B16.9-1978, C207-1978, and A 47-77) is the effective date of the issue (edition) of the standard. Any additional number shown following the issue date and prefixed by the letter "R" is the latest date of reaffirmation [e.g., C101-1967 (R1977)]. Any edition number prefixed by the letter "A" is the date of the latest addenda accepted [e.g., B16.36-1975 (A1979)].

(2) *Indicates that the standard has been approved as an American National Standard by the American National Standards Institute.

(3) This standard has been discontinued and partially replaced by ASTM D 3299 and D 4097.

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Specifications and standards of the following organizations appear in Appendix E:

API American Petroleum Institute
Publications and Distribution Section
1220 L Street, N.W., Washington, DC 20005
202 682-8375

ASCE The American Society of Civil Engineers
345 East 47th Street
New York, New York 11710
212 705-7496

ASME The American Society of Mechanical Engineers
345 E. 47th Street, New York, New York 10017
212 705-7722

ASME Order Department
22 Law Drive
Box 2300
Fairfield, New Jersey 07007-2300
201 882-1167

ASNT American Society for Nondestructive Testing
P.O. Box 28518
4153 Arlingate Plaza, Columbus, Ohio 43228-0518
614 274-6003

ASTM American Society for Testing and Materials
1916 Race Street, Philadelphia, Pennsylvania 19103
215 299-5400

AWWA American Water Works Association
6666 W. Quincy Avenue, Denver, Colorado 80235
303 794-7711

AWS American Welding Society
550 N.W. LeJeune Road, Miami, Florida 33135
305 443-9353

CDA Copper Development Association
P.O. Box 1840
Greenwich Office Park 2, Greenwich, Connecticut 06836
203 625-8210

CGA Compressed Gas Association
1235 Jefferson Davis Highway
Arlington, Virginia 22202
703 979-0900

EJMA Expansion Joint Manufacturers Association
25 North Broadway, Tarrytown, New York 10591
914 332-0040

ICBO International Conference of Building Officials
5360 South Workman Mill Road
Whittier, California 90601
213 699-0541

MSS Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
127 Park Street, N.E., Vienna, Virginia 22180
703 281-6613

NACE National Association of Corrosion Engineers
P.O. Box 218340
Houston, Texas 77218
713 492-0535

NFPA National Fire Protection Association
Batterymarch Park
Quincy, Massachusetts 02269
617 770-3000

NIST National Institute of Standards and Technology
Publications available from
Superintendent of Documents
United States Government Printing Office,
Washington, DC 20402
202 783-3238

PFI Pipe Fabrication Institute
P.O. Box 173
Springdale, Pennsylvania 15144
412 274-4722

PPI Plastics Pipe Institute
250 Park Avenue, New York, New York 10017
212 687-2675

SAE Society of Automotive Engineers
400 Commonwealth Drive
Warrendale, Pennsylvania 15096
412 776-4841

GENERAL NOTE TO LIST OF ORGANIZATIONS:
Some of the organizations listed above publish standards which have been approved as American National Standards. Copies of these standards may also be obtained from:

ANSI American National Standards Institute, Inc.
11 W. 42nd Street, New York, New York 10036
212 642-4900

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Appendix F - Preferred Instrument Supplier List

RPP-WTP Project

Bechtel Job 24590

Date: Nov 22, 2010

Description	Subgroup	Preferred Supplier(s)	Comments
On / Off Actuators	Electric	Beck	
		ALUM	
		Flowserve (Limitorque)	
		Rotork	
	Hydraulic	GPE	
		MEA	
		Pantex	
		Moog	
	Pneumatic	Crane (Xomox)	
		Emerson (Bettis)	
		Hytork	Rad Tolerant. Part of Emerson
		Flowserve (Valtek)	
		Flowserve (Automax)	
		Tyco (Keystone)	
		Morin	
Alarms	Annunciator	Ronan	
		Panalarm	
	Beacon light	Federal Signal	
		Panalarm	
	Horn	Federal Signal	
		Panalarm	
Analytical Devices	Conductivity	ABB	
		Emerson (Uniloc)	
		Foxboro (Invensys)	Have Rad Tolerant Insert Version
		Tyco (Teledyne Analytical)	
		Yokogawa	
	Density	Endress+Hauser	
	Density, nuclear	Endress+Hauser	
		Ohmart	
		Texas Nuclear	

Description	Subgroup	Preferred Supplier(s)	Comments
		K – Ray	
	Environmental Rad	Eberline Instrument	
		EG & G Ortec	
		Lab Impex Systems	
		Ludlums	
		Nuclear Research Corp	
		Canberra	
	Lab Radiometric (swab)	Eberlene Instrument	
		EG & G Ortec	
		Lab Impex Systems	
		Ludlums	
		Nuclear Research Corp	
		Teledyne	
	Moisture	Ametek	
		Dupont	
		Panametrics	
		Emerson (Rosemount Analytical)	FF Compliant
		Shaw	
		Teledyne	
	NOx		FF Compliant
		Teledyne	
		Horiba	
	Oxygen	Ametek	
		Orbisphere	
		Panametrics	
		Teledyne	
		Servomex	
		Emerson (Rosemount Analytical)	FF Compliant
	Personnel Radiation	Eberline Instrument	
		E G & G Ortec	
		Lab Impex Systems	
		Sorrento	
		Victoreen	
	pH	ABB	FF Compliant
		Emerson (Uniloc)	
		Endress+Hauser	
		Foxboro (Invensys)	
		TBI-Bailey	

Description	Subgroup	Preferred Supplier(s)	Comments
		Tyco (Teledyne Analytical)	
		Yokogowa	FF Compliant
	Photo Absorbtion (IR, UV)	ABB Process Analytics	
		Ametek	
		Emerson (Rosemount Analytical)	
		Orbital	Was Foxboro
		Servomex	
		Teledyne	
	Process Radiological	Canberra	
		EG & G ORTEC	
		Lab Impex	
	Stack Discharge	Air Monitor	
		Ametek	
		Emerson (Rosemount Analytical)	
		Teledyne	
		Westinghouse	
	Vibration	Bently Nevada	
	Volatile Organic Compounds (VOC)	Ametek	
		Emerson (Rosemount Analytical)	
		Teledyne	
CCTV System		IST Rees	
Conductor Bar		Electromotive	
		Insul 8	
Control Enclosures	Marshalling Cabinets / Junction Boxes	Hoffman	
		Rittal	
DCS		ABB	
Flow Devices	Averaging Pitot Tubes	ABB (Taylor)	
		Air Monitor Corp.	
		Emerson (Dieterich Standard)	
	Coriolis meters	ABB	

Description	Subgroup	Preferred Supplier(s)	Comments
		Endress+Hauser	
		Emerson (Micro Motion)	
	Flow nozzles	Daniel	
		Fluidic Techniques	
		Vickery Simms	
	Magmeters	ABB (Fisher & Porter)	
		Emerson (Rosemount)	
		Foxboro	OK for Rad Service
		Krohne	OK for Rad Service
	Orifice plates	Daniel	
		Fluidic Techniques	
		Vickery Simms	
	Positive displacement meters	Badger	
		Emerson (Brooks)	
		Daniel Industries	
		FMC Energy Systems	
	Rotameters	ABB (Fisher & Porter)	
		Brooks	
		King	
		Krohne	
		Wallace & Tiernan	
	Thermal meters	Eldridge Products	
		Fluid Components Inc.	
		Kurz	
		Sierra	
	Turbine meters	Daniel	
		F & P	
		FMC Energy Systems	
		McCrometer	
	Venturi Tubes	Daniel	
		Fluidic Techniques	
		Kent	
	Vortex meters	ABB	
		Foxboro	
		Yokogawa	

Description	Subgroup	Preferred Supplier(s)	Comments
	Wedge meters	ABB (Taylor)	
Foundation® Fieldbus Wiring Components	Connector	Pepperl+Fuchs	V9-FA-M-S V9-FA-F-S V9-FA-M-S-R V9-FA-F-S-R
	Power Conditioner	Pepperl+Fuchs	
	Spur blocks	Pepperl+Fuchs	F2-JBSC-8.FF.7/8S F2-JBSC-4.FF.7/8S
	Terminator	Pepperl+Fuchs	V9-FT-S
Gas Detectors (AREA)	Ammonia	Bacharach	
		Det-Tronics	
		Drager (SKC)	
		General Monitor	
		Servomex	
		MSA	
		Emerson (Rosemount Analytical)	
	Carbon dioxide	Ametek	
		Bacharach	
		Drager	
		Det-Tronics	
		MSA	
		Servomex	
		Teledyne	
	Combustibles	Bacharach	
		Det-Tronics	
		Drager	
		General Monitors	
		MSA	
	Hydrogen	Bacharach	
		Emerson (Rosemount Analytical)	
		Foxboro	
		General Monitor	
		Teledyne	
		Zellweger	For vessels
		MSA	
	Nitrogen Oxides	Beckman	
		Drager	

Description	Subgroup	Preferred Supplier(s)	Comments
		Horibia	
		Lear Siegler	
		Emerson (Rosemount Analytical)	
		Servomex	
		Teledyne	
Gauges	Bullseye Sight glass	OPW	
		Brooks	
		Ernst Gage Co.	
		Jacoby-Tarbox	
		Kobold	
	D/P	ABB (Taylor)	
		Ashcroft	
		Dwyer	
		ITT Barton	
	Level Glass	Daniel	
		Jerguson	
		Penberthy	
		Kobold	
		Ernst	
	Pressure	Ashcroft	
		Marsh	
		U.S. Gauge	
		Weston	
	Temperature	Ashcroft	
		U.S. Gauge	
		Weston	
Instrument Bulks	2-5 Valve Manifolds	Hy-Lok	
		Swagelok	
		Parker-Hannifin	A-LOK Series
	Air Filter Regulator	Emerson (Fisher)	
		Moore Products	
		Norgren	
	Instrument Valves	Anderson-Greenwood	
		Swagelok	
		Parker-Hannifin	A-LOK Series
	Tube Fittings	Swagelok	
		Parker-Hannifin	A-LOK Series

Description	Subgroup	Preferred Supplier(s)	Comments
		Hy-lok	
		Tylok	
Intelligent Drive	ASD's	Mitsubishi Electric Automation	
		SEW Eurodrives	
		ABB	
		Electromotive Systems	
	Flux Vector Drive	Mitsubishi Electric Automation	
		SEW Eurodrives	
		ABB	
	Servos	Mitsubishi Electric Automation	
		Control Techniques	
Intelligent Positioning Device	Absolute Encoders	Stegmann	Magnetic/Profibus
		Dynapar	Optical/Profibus
	Incremental Encoders	Dynapar	For Mitsubishi drives
		SEW Eurodrives	For SEW drives
	Laser Positioning System	Moduloc	
		Trimble	
	Resolvers	Harowe	
		SEW Eurodrives	
Key Interlock System		Castell	
		Kirk Key	
		Allen Bradley	
Level Transmitter	Level, Displacer	Emerson (Fisher)	
		Magnetrol	
		Masoneilan	
	Nuclear	K-Ray	
		Ohmart-Vega	
		Texas Nuclear	
	Photoelectric	Banner	
		Allen Bradley	
		Honeywell	

Description	Subgroup	Preferred Supplier(s)	Comments
	Radar/RF	DrexelBrook	
		Enraf	
		Endress+Hauser	
		K-Tek	
		Khrone	
		Magnitrol	
		Ohmart-Vega	
	Ultrasonic	Allen Bradley	
		Consilium	
		Drexelbrook	
		Honeywell	
		Scientific Technologies	
Network Equipment	Current / Fieldbus	Smar	
	Ethernet Switch	Cisco	Industrial Rated
		Hieschmann	Industrial Rated
		Sixnet	Industrial Rated
	Fiber Optic Media Conversion	Hirschmann	
	Fiber Optic Enclosures, Housings, and Patch Plates	Corning	
	Fiber Optic Patch Cables	Corning	
	Fieldbus / Current	Smar	
	Temperature (E)	Acromag	
		Action Instruments	
		E & H	
		Foxboro	
		Honeywell	
		Moore Industries	
		Emerson (Rosemount)	
		Yokogawa	
Programmable Logic Controller (PLC)	Standard	ABB	
	TMR/ Safety	Triconex	

Description	Subgroup	Preferred Supplier(s)	Comments
Pressure Transmitter	Pressure / DP	Bailey	
		Emerson (Rosemount)	
		Foxboro	
		Honeywell	
		Yokogawa	
	Pressure / DP Draft Range	Air Monitor	
		Bailey	
		Druck	
		Emerson (Rosemount)	
		Yokogawa	
	Pressure / DP, Rad Tolerant	Druck	
		Emerson (Rosemount)	
		Weed	OK for Rad service
	Pressure / DP Draft Range, Rad Tolerant	Bailey / ABB	
		Druck	
		Emerson (Rosemount)	
		Solarton – Mobrey	
Power Supply	24V / 12V	Acopian	
		ABB	
		Phoenix Contact	
		SOLA Hevi Duty	
		Siemens	
Profibus DP®	Terminating Connector	Phoenix Contact	
		Siemens	
Purge System		Bebco Industries	
Pushbutton/ Indicating Lights		Allen-Bradley	800H series 800T series
		General Electric	
		Square D	
Relays	Electromagnetic	Allen-Bradley	700 series
		Omron	
		Potter & Brumfield	

Description	Subgroup	Preferred Supplier(s)	Comments
	Pneumatic	Moore Products	
	Timer Relay	Allen-Bradley	
		Omron	
Speed		Air-Pax	
Switches	Level, Capacitance	Drexelbrook	
		Endress+Hauser	
		Magnetrol	
	Level, Float	Bestobell	
		Hawker Automation	
		Magnetrol	
		Sigma Controls	
	Mechanical Limit switch	Allen - Bradley	
		Square D	
		Honeywell	
	Photoelectric	Allen - Bradley	
		Pepperl + Fuchs	
	Pressure / Differential Pressure	Ashcroft	
		Dwyer	
		ITT Neodyne	
		Static-O-Ring	
		United Electric	
		ITT Barton	
	Proximity Position Switch	GO	Magnetic for R5 areas
		Pepperl + Fuchs	With mini-connectors
		Turck	With mini-connectors
		Klaschka	Radiation Hardened for R5 Areas
		Namco	OK for Rad service
		Top Worx	GO Switch is UL Listed, but too small to label.
	Temperature	Ashcroft	

Description	Subgroup	Preferred Supplier(s)	Comments
		Custom Component	
		United Electric	
		Ashcroft	
	Thermal Flow	FCI	
Temperature Element	RTD	Daily Thermetrics	
		IST Conax Nuclear	ITS OK for Rad service
		Emerson (Rosemount)	
		Temp-Pro Inc.	
		Thermoelectric	OK for Rad service
		United Electric	
	Thermocouple	Daily Thermetrics	
		IST Conax Nuclear	ITS
		Emerson (Rosemount)	
		Temp-Pro Inc.	
		Thermoelectric	OK for Rad service
		United Electric	
	Thermowell	Daily Thermetrics	
		IST Conax Nuclear	ITS OK for Rad service
		Emerson (Rosemount)	
		Temp-Pro Inc.	
		Thermoelectric	OK for Rad service
		United Electric	
Temperature Transmitter	Temperature	ABB	
		Emerson (Rosemount)	
		Foxboro	
		Weed	
		Yokogawa	
Terminal Blocks		Allen - Bradley	
		Weidmuller	
		Phoenix Contact	
Transducers	E/I	Acromag	
		Action Instruments	
		Foxboro	
		Honeywell	
		Moore industries	

Description	Subgroup	Preferred Supplier(s)	Comments
	I/P	Emerson (Fisher)	
		Foxboro	
		Masoneilan	
		Moore Products	
	Isolators	ABB	
		Acromag	
		Action Instruments	
		Allen-Bradley	
		Emerson (Rosemount)	
		Moore Industries	
	Signal converters	Acromag	
		Action Instruments	
		Emerson (Rosemount)	
		Foxboro	
		Honeywell	
		Moore Industries	
Valves (valve, actuator & acc.)	Modulating	Emerson (Fisher)	
		Masoneilan	
		Valtek	
		Jamesbury	
		Argus	
		Samson	
	Process Regulator	Emerson (Fisher)	
		Masoneilan	
		Cashco	
	Pilot	ASCO	
		Skinner	
		Versa	
	Solenoid	ASCO	
		Versa	
		Automatic Valve	
Weight	Load Cells	Defiant	Rad Tolerant
		Sensotec	
		Mettler Toledo	

Appendix G - NRTL Certification of Conformance

We, (Supplier's name) hereby certify that the electrical components included in the table below are listed or labeled by an OSHA recognized NRTL, under 29 CFR 1910-Subpart S. These components are found, by the NRTL, to conform to all applicable OSHA recognized test standards and are acceptable for the application, environment and other requirements of NEC Article 110.3.

We further certify that the 508A labeled cabinets included below have not been modified by non-508A workers.

Author /Engineer _____ Date _____

Quality Assurance Representative _____ Date _____

Project Manager _____ Date _____

Tag (if Applicable)	Manufacturer	Model

Notes:
1) Typical registered Certification marks and test standards recognized by OSHA can be found on http://www.osha.gov/its/otpca/nrtl/nrtlmrk.html
2) Subcomponents located within a 508A labeled cabinet are not included in the 508A certification.

ISSUED BY
RPP-WTP PDC

R11476979

Technical Change Notice (TCN) – Part A

PROJECT: River Protection Project Waste Treatment Plant

JOB No.: 24590

A1. Date: 02/07/12 **RPP-WTP TCN No.:** 24590-QL-MRA-MACS-00007-T0005

Title for TCN: Add submittal requirements for Baldor motors

Supersedes Change Document ☐ Yes ☒ No

A2. Project Only Information

Part of DCP? ☐ Yes ☒ No ☐ N/A

ECN Needed? ☐ Yes ☐ No ☒ N/A

Cost and Schedule Impacts:

Not to exceed value: $25,000

No schedule impact

CAM Approval(s)

Print/Type Name	Signature	Date
P Porcaro		2-9-12

A3. BPS Update

Does the TCN include changes to Part 1 / Section 1 of the LFMR? ☐ Yes ☒ No

If yes, create a sub-revision to the LFMR in BPS and sign/date below.

Print/Type Name	Signature	Date

***** THIS PAGE NOT TO BE SENT TO SUPPLIER *****

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Technical Change Notice (TCN) – Part B

PROJECT: River Protection Project Waste Treatment Plant

JOB No.: 24590

Date: 02/07/12 **RPP-WTP TCN No.:** 24590-QL-MRA-MACS-00007-T0005

Title for TCN: Add submittal requirements for Baldor motors

Supersedes Change Document ☐ Yes ☒ No

B1. Affected RPP-WTP Documents

Identify by number and current revision the specifications, drawings (including data sheets and engineering lists), supplier documents provided to another supplier, and material requisitions, as applicable. Attach extra sheets, photographs, sketches, etc., as necessary to provide justification or describe the change.

B1.1 Long Form Material Requisition (LFMR) Number	Rev	LFMR Title
24590-QL-MRA-MACS-00007	1	Exhausters, Special Purpose / Process

Justification for Change

1 Engineering Specification for Acquisition of Commercial Items and Services for use in Safety Applications at WTP, 24590-WTP-3PS-G000-T0019, Rev 0, Section 4.2.4 states "The dedication packages compiled by the supplier in accordance with their CGD procedure and plans shall be submitted to the Buyer for review upon completion of dedication activities". This TCN clarifies the above specification requirement applies to (Baldor) a Q sub supplier to S.A. Technology, Inc..

Description of Change

1. Add technical note 2.4.10 to section 2.4. Submit "inspection characteristics" documentation for the Baldor motors as required on the G-321-V form, document category 33.0. This documentation may also be called "Configuration Control Record Sheets" by the supplier. Detailed mark up of the change attached.

Attachments (The following Material Requisition components, attached, are newly added or supersede any prior versions transmitted.)

N/A

B1.2 Added/Deleted Documents

Added Documents *(The following documents are newly added or supersede any prior revisions transmitted)*

Document Number	Rev	ECI	Document Number	Rev	ECI
N/A					

Deleted Documents *(The following documents are deleted and no longer valid)*

Document Number	Rev	Document Number	Rev
N/A			

B1.3 Change Document(s)

Document Number	Rev	Document Title	ECI
24590-LAW-3PS-MACS-T0001	2	Exhausters and Hoses	☐

Specification changes retroactive? ☐ Yes ☒ No

Justification for Change

In addition to material test reports, pressure retaining materials are verified using other methods. For example, these methods may include PMI or testing by a qualified laboratory. It is acceptable to accept either material test reports or a certificate of conformance since other methods have been employed to confirm materials of construction.

Technical Change Notice (TCN) – Part B

PROJECT: River Protection Project Waste Treatment Plant **JOB No.:** 24590

Date: 02/07/12 **RPP-WTP TCN No.:** 24590-QL-MRA-MACS-00007-T0005

Title for TCN: Add submittal requirements for Baldor motors

Description of Change

Section 4.1.2
Allow the supplier to provide either material test reports or Certificate of Conformance (C of C) for pressure retaining components.
A detailed mark up of this change is attached. This change is for reference and does not require incorporation into the specification.

B2. REQUIREMENTS REVIEW

Interface Resolution Required* ☐ Yes ☒ No *Address "yes" answer in the description.

B3. SIGNATURES AND DATES:

Originator	Checker
D J Rickettson	M Parker

Reviews

E&NS - Reviewer Name	R&S - G Scanlan	Mech & HVAC EGS - D Mildon Name M. SANDICTORS	Proc Engr - S Daw
R F CARLSTROM			

Approval(s)

LBL PEM/PE - T Hughes			

Date *(inserted by final approver)*: 2/9/12

B4. DISTRIBUTION:

E-mail Address/Recipient	Organization	E-mail Address/Recipient	Organization
WTP Acquisition Helpdesk	Procurement & Subcontracts		

2. EQ documentation includes:

   a) SELLER'S portion of EQ datasheet, (see data sheet 24590-LAW-MAD-LVP-00006)
   b) Submittals used to document EQ
   c) Certificate(s) of Conformance used to document EQ

2.4.3 Clarification of requirements for Environmental Qualification for line items 3-16

1. All line items are located in mild environments. All aging requirements for applicable components are to be addressed through analyses. Maintenance and replacement schedules for applicable components will be addressed in both the EQ reports and maintenance manuals.

2. Seismic test units will not require aging of applicable components to end of life conditions.

2.4.4 Requirements for Insulation Installation and Insulation Materials

Where the installation of insulation is specified on the mechanical datasheet, the Seller shall submit the procedures for the installation of the insulation. Procedure shall include technical details for insulation materials.

2.4.5 Quality Assurance Program Requirements

QAP submittal requirements in specification 24590-WTP-3PS-G000-T0001, Supplier Quality Assurance program Requirements, Sections 4.1 through 4.5 do not apply.

ADD 2.4.10 SEE INSERT 1 PAGE OF

Attachment A: Q Datasheet of ANSI/ASME NQA-1 (2000), Quality Assurance Program Requirements

Attachment B: Deleted

2.5 SUBSTITUTIONS AND DEVIATIONS

Source Controlled Items, Parts, or Subassemblies

When an item, part, or subassembly is identified as "Source Controlled" on a BUYER document, the term "Source Controlled" means that only that item, part, or subassembly manufactured by the named SELLER is approved by the BUYER for use in the application for this agreement. No substitution may be made or requested.

Specification Controlled Items, Parts, or Subassemblies

When an item, part, or subassembly is identified as "Specification Controlled" on a BUYER document, the term "Specification Controlled" means that only the item, part, or subassembly that meets or exceeds the named SELLER specifications is approved by BUYER for use in the application for this agreement. No replacement of items, parts, or subassemblies meeting lesser specifications may be made or requested. Should SELLER determine that such replacement is required, the replacement shall be considered a "Substitution" and the below "Parts Substitution Process" shall apply.

Substitutions

Brand names and part or model numbers when specified in BUYER's technical documents are illustrative of an approved type and unless otherwise identified as "Source Controlled" the substitution of an equivalent type of another manufacturer may be proposed by SELLER. SELLER shall be responsible to identify any potential part substitution. SELLER shall assure that the Parts Substitution Process (PSP) requirements herein are met by the SELLER's Preliminary Material Review Board and submit to BUYER all pertinent documents including Material Review Board documents for approval.

All parts substitutions must be approved. The following criteria must be met for PSP.

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Insert 1 to MR Technical Notes

2.4.6 Previously assigned technical note from TCN, 24590-QL-MRA-MACS-00007-T0001. No change to this technical note.

2.4.7 Previously assigned technical note from TCN, 24590-QL-MRA-MACS-00007-T0001. No change to this technical note.

2.4.8 Previously assigned technical note from TCN, 24590-QL-MRA-MACS-00007-T0002. No change to this technical note.

2.4.9 Previously assigned technical note from TCN, 24590-QL-MRA-MACS-00007-T0002. No change to this technical note.

Add technical note:

2.4.10 Submit "inspection characteristics" documentation for the Baldor motors as required on the G-321-V form, document category 33.0. This documentation may also be called "Configuration Control Record Sheets" by the supplier.

3.17 Deleted

3.18 Flexible Connectors, Inlet and Outlet Hoses

3.18.1 When specified on the data sheet 24590-LAW-MAD-LVP-00006, SELLER shall provide flexible connectors for inlet and outlet hoses. SELLER shall specify the connector manufacturer and model number on the exhauster data sheet.

3.19 Sacrificial offgas skid-mounted exhauster LVP-EXHR-00001TEST

3.19.1 The sacrificial exhauster is not a piece of permanent plant equipment and can be stored indoors or outdoors. During storage at the WTP no maintenance will be required.

4 Materials

4.1 Construction

4.1.1 Materials of construction shall conform to the exhauster data sheet 24590-LAW-MAD-LVP-00006, as applicable. OR CERTIFICATION OF CONFORMANCE (COFC)

4.1.2 Material test reports of chemical and physical properties shall be provided for pressure retaining components, including weld filler metal of the exhausters and hoses. Material test reports of chemical and physical properties for the exhauster impeller and exhauster shaft shall be provided. OR CERTIFICATION OF CONFORMANCE (COFC)

4.1.3 ASME and/or ASTM material designations and grades shall be indicated on the fabrication drawings and in the material lists.

4.2 Electrical

4.2.1 **Low-voltage power and control cables which are located external to the enclosures** and not integral to the components shall be stranded copper, 600 V type XHHW-2 or Buyer-approved equivalent.

4.2.2 Internal enclosure wiring shall be stranded copper, flame-retardant, 600 V, synthetic heat resistant, or machine tool wire, or high-flexible thermoset.

4.2.3 Electrical equipment on the packaged unit shall be grounded to the package unit skid.

24590-QL-MRA-MACS-00007-T0005
PAGE 5 OF 5

R11478790

☐ Yes ☒ No THIS DOCUMENT CONTAINS EXPORT CONTROLLED INFORMATION, SEE BASE DOCUMENT FOR FULL LABEL AND RESTRICTIONS

Supplier Deviation Disposition Request

PROJECT: River Protection Project Waste Treatment Plant JOB No.: 24590

FOR RPP-WTP USE		
RPP-WTP SDDR No.	Rev.	DATE RECEIVED
24590-WTP-SDDR-MS-12-00039	N/A	02/24/12

FOR SUPPLIER USE	
SUPPLIER SDDR No.	DATE SUBMITTED
645-SDDR-008 REV 1	24.FEB.12

1. Supplier Name	Address	City & State	Zip
S.A. TECHNOLOGY	3985 S. LINCOLN AVE.	LOVELAND, CO	80537

2. Supplier's Order No.	3. RPP-WTP P.O. or SC	Rev
N/A	24590-QL-POA-MACS-00007	2

4. Deviation Description (Attach extra sheets, photographs, sketches, etc. as necessary and identify quantity and serial numbers as applicable)

Reference 1:
24590-WTP-3PS-MUMI-T0002 Rev 3, Sec 3.5.1.2, "Where practical, the motor base shall be drilled for ground connection. A bolt shall be provided complete with nut and washers."
Deviation:
A nut is not provided.

Reference 2:
24590-WTP-3PS-MUMI-T0002 Rev 3, Sec 3.5.1.3, "Vertical jacking bolts shall be furnished on all horizontal motors 1000 lbs and heavier."
Deviation:
Vertical jacking bolts are not furnished.

Reference 3:
24590-WTP-3PS-MUMI-T0002 Rev 3, Sec 4.3, Nameplate data
Deviation:
Some items may be unclear or not listed as part of the motor nameplate data.

Reference 4:
24590-LAW-3PS-MACS-T0001 Rev 2, Sec 3.15.6, "Provide 10% spare terminals."
Deviation:
10% spare terminals are not evenly distributed.

4a. Was an NCR issued? ☒ No ☐ Yes Number:

5. Supplier's Proposed Disposition: ☒ Use As-Is ☐ Repair ☒ Modify RPP-WTP Requirement

NOTES:
1. Complete instructions provided at end of form.
2. Items 1 through 9 and 17 to be completed by Supplier
3. Items 10 through 16 to be completed by RPP-WTP.
4. Non applicable items to be marked "N/A"
5. Attach additional information whenever necessary
6. RPP-WTP must be notified within 5 days after detection of deviation
7. RPP-WTP selects "Yes", if the SDDR contains or references ECI documents.

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Supplier Deviation Disposition Request
Engineering Disposition

24590-WTP-SDDR-MS-12-00039

PROJECT: River Protection Project Waste Treatment Plant JOB NO.: 24590 SDDR: Rev. N/A

6. Supplier's Estimated Cost Impact: NONE	7. Supplier's Estimated Schedule Impact: NONE

8. Proposed Disposition and Technical Justification (plus Cost/Schedule if applicable): (Attach extra sheets, sketches, etc., as necessary.)

Reference 1:
The motor base has been drilled and threaded for ground connection, obsoleting the need for a nut. A bolt is provided in combination with the threaded base, complete with washers.

Reference 2:
Due to precision balancing and alignment of the exhausters and motors, vertical alignment of the motors is custom-tuned for each exhauster assembly by use of precision shims, obsoleting the need for vertical jacking bolts. Because of the precision balancing and alignment required, the manufacturer recommends against using vertical jacking bolts as they may result in a "soft foot" condition, leading to premature equipment failure.

Reference 3:
Time Rating: Listed on the nameplate as "DUTY CONT" (continuous duty).
Temperature Rise/Insulation Class: Listed on the nameplate as "INS CLASS H" (insulation class H).
Code Letter for Locked-rotor kVA: Listed on the nameplate as "CODE G".
Buyer's Driven Equipment Tag No: Not listed; since the motors are fabricated without knowledge of specific use and/or application, there is no way for the manufacturer to know customer-specific equipment tag numbers. Driven equipment tag numbers are easily located, as required, on the driven equipment attached to the motors.
Type of Enclosure: Not listed; the "FRAME 447TS" listing is tied to a single enclosure type of Totally Enclosed, Fan Cooled (TEFC).
Space Heater Voltage/Rating: Not listed; the space heaters are 120 VAC.

Reference 4:
Due to evolving project requirements and consultation with WTP, the signal current to the purge control panel pressure switches was decided to be 24 VDC. This decision required that these signal terminals occupy the limited number of available 24 VDC spares locations previously provided rather than using the surplus 120 VAC positions, reducing the available 24 VDC spare terminals to less than 10%. Total number of available Junction Box spare terminals (24 VDC and 120 VAC) remains at 10% spares.

9. Supplier's Authorized Representative	Signature
Robert Conde	
Title	Date
Project Manager	February 24, 2012

10. RPP-WTP Engineering Action ☒ Approved ☐ Disapproved ☒ See Below

Distribution: Procurement & Subcontracts Construction

NOTES:
1. Complete instructions provided at end of form.
2. Items 1 through 9 and 17 to be completed by Supplier
3. Items 10 through 16 to be completed by RPP-WTP.
4. Non applicable items to be marked "N/A"
5. Attach additional information whenever necessary
6. RPP-WTP must be notified within 5 days after detection of deviation
7. RPP-WTP selects "Yes", if the SDDR contains or references ECI documents.

Supplier Deviation Disposition Request
Engineering Disposition

PROJECT: River Protection Project Waste Treatment Plant **JOB NO.:** 24590 **SDDR:** 24590-WTP-SDDR-MS-12-00039 **Rev.** N/A

Title of SDDR: Minor deviations to the motor specification and clarification for spare terminals

11. (OPTIONAL) RPP-WTP Provisional Disposition Statement (Attach extra sheets, sketches, etc., as necessary).

N/A

RPP-WTP Provisional Disposition Justification (Attach extra sheets, sketches, etc., as necessary).

N/A

ATS Number: 24590-WTP-ATS-QAIS- -

RPP-WTP Provisional Disposition Approval:

	Print/Type Name	Signature	Date
RE/Originator:	N/A		
E&NS Review (when required):			
Approver:			

12. RPP-WTP Procurement & Subcontracts Action: Commercial Terms Impact:

☐ Yes *This SDDR grants relief from requirements or changes the requirements and; check each (consideration) item that applies:*

- ☐ Modifications to governing terms are required and/or;
- ☐ An increase in price is requested by Seller and/or;
- ☐ A price credit from the Supplier is due and/or;
- ☐ An increase/decrease in the Seller promise delivery date is required.
- ☐ Cost impact, if any is subject to a separate approval process as required by the changes clause.

☒ No *This SDDR grants relief from requirements or changes the requirements and all of the following apply:*

1-Mar-12 GL

- No commercial impact (No modification of governing commercial terms is required) and;
- No increase in price is requested by Seller and;
- No decrease in price is anticipated or required by Buyer and;
- No extension of promised shipment is required

NOTES:

1. Complete instructions provided at end of form.
2. Items 1 through 9 and 17 to be completed by Supplier
3. Items 10 through 16 to be completed by RPP-WTP.
4. Non applicable items to be marked "N/A"
5. Attach additional information whenever necessary
6. RPP-WTP must be notified within 5 days after detection of deviation
7. RPP-WTP selects "Yes", if the SDDR contains or references ECI documents.

Supplier Deviation Disposition Request
Engineering Disposition

PROJECT: River Protection Project Waste Treatment Plant **JOB NO.:** 24590 **SDDR:** 24590-WTP-SDDR-MS-12-00039 **Rev.** N/A

Title of SDDR: Minor deviations to the motor specification and clarification for spare terminals

13. Part of DCP? ☐ Yes ☒ No DCP Number: Rev

14. ACA Needed? ☐ Yes ☒ No ACA Number: Rev

15. RPP-WTP Final Disposition Statement (Attach extra sheets, sketches, etc., as necessary).

See provisional disposition above. Is the final disposition the same as the provisional disposition? ☐ Yes ☐ No ☒ N/A

Engineering concurs with the suppliers disposition in blocks 4 & 8 of this form. Use As-is.

References 1 to 4.2 attached for information.

E&NS screening is required because the MR and affected specifications are Q.

RPP-WTP Justification (Attach extra sheets, sketches, etc., as necessary).

Engineering concurs with the suppliers justification in block 8 of this form.

REQUIREMENTS REVIEW

Client Approval Required*	☐ Yes	☒ No	E&NS Screening Required	☒ Yes	☐ No
Interface Resolution Required*	☐ Yes	☒ No			

*Address these "yes" answers in the RPP-WTP Disposition Statement (above).

Affected RPP-WTP Documents:

Document Number	Rev	Remarks	Specification Retroactive? Yes	Specification Retroactive? No	Incorporation by Design Change	Incorporation by Reference
24590-WTP-3PS-MUMI-T0002	3	sections 3.5.1.2, 3.5.1.3 & 4.3	☐	☒	☐	☒
24590-LAW-3PS-MACS-T0001	2	section 3.15.6	☐	☒	☐	☒
			☐	☐	☐	☐

Affected Supplier Submittals:

Document Number	Rev	Document Number	Rev
N/A			

NOTES:

1. Complete instructions provided at end of form.
2. Items 1 through 9 and 17 to be completed by Supplier
3. Items 10 through 16 to be completed by RPP-WTP.
4. Non applicable items to be marked "N/A"
5. Attach additional information whenever necessary
6. RPP-WTP must be notified within 5 days after detection of deviation
7. RPP-WTP selects "Yes", if the SDDR contains or references ECI documents.

Supplier Deviation Disposition Request
Engineering Disposition

PROJECT: River Protection Project Waste Treatment Plant **JOB NO.:** 24590 **SDDR:** 24590-WTP-SDDR-12-00039-MS **Rev.** N/A

Title of SDDR: Minor deviations to the motor specification and clarification for spare terminals

Reference Documents:

Document Number	Rev	Document Number	Rev
N/A			

16. RPP-WTP Disposition Approval:

	Print/Type Name	Signature	Date
RE/Originator:	D J Rickettson	D J Rickettson	2/25/12
Checker:	M Parker	Maureen Parker	3/1/12
Reviewer(s):	B Brackensick	B Brackensick	3-1-12
Reviewer:	S Goad	Scott Goad	3/1/12
E&NS Review (when required):	RF CARLSTROM	R F Carlstrom	3/1/12
Procurement & Subcontracts Representative:	G Scanlan	Greg Scanlan	3/1/12
Approver(s):	D Mildon	D Mildon	3/1/12

NOTES:
1. Complete instructions provided at end of form.
2. Items 1 through 9 and 17 to be completed by Supplier
3. Items 10 through 16 to be completed by RPP-WTP.
4. Non applicable items to be marked "N/A"
5. Attach additional information whenever necessary
6. RPP-WTP must be notified within 5 days after detection of deviation
7. RPP-WTP selects "Yes", if the SDDR contains or references ECI documents.

Supplier Deviation Disposition Request
Engineering Disposition

PROJECT: River Protection Project Waste Treatment Plant **JOB NO.:** 24590 **SDDR:** 24590-WTP-SDDR-MS-12-00039 **Rev.** N/A

Title of SDDR: Minor deviations to the motor specification and clarification for spare terminals

Supplier Acknowledgement:

The Supplier accepts the RPP-WTP's disposition herein and agrees to implement the RPP-WTP's disposition accordingly. Return the signed SDDR to the RPP-WTP Project Document Control (PDC).

17. Supplier	*Print/Type Supplier Representative Name and Position*	*Signature*	*Date*

NOTES:

1. Complete instructions provided at end of form.
2. Items 1 through 9 and 17 to be completed by Supplier
3. Items 10 through 16 to be completed by RPP-WTP.
4. Non applicable items to be marked "N/A"
5. Attach additional information whenever necessary
6. RPP-WTP must be notified within 5 days after detection of deviation
7. RPP-WTP selects "Yes", if the SDDR contains or references ECI documents.

3.3.4 Locked Rotor Current

Unless otherwise approved by the Buyer, the locked rotor current of motors shall not exceed the values as shown in NEMA MG-1-1998, section 12.35.1 "Maximum Locked-Rotor Current for 60-Hz Design B, C, and D Motors at 230 Volts". The locked-rotor current of motors designed for voltage 460 shall be proportional to the ratio, 230/460.

3.3.5 Service Factor

The motor shall be sized so that it will not be loaded beyond its design power rating at service factor of 1.0.

3.3.6 Starting Duty

The motor shall be capable of two successive starts with the motor already at full load temperature, or three successive motor starts at ambient temperature, accelerating the load from zero up to full load speed with the motor terminal voltage between 80% and/or 110% of the rated voltage.

3.4 Space Heaters

3.4.1 Unless otherwise specified on the Data Sheet, all outdoor motors greater than 20 HP shall be provided with space heaters. All the space heaters shall be rated at 240 volt for 120 V AC single phase service. Supplier shall list the heater watts on the data sheet.

3.4.2 The heaters shall be readily accessible for inspection, maintenance, and removal without disconnecting the motor from its driven load or moving the motor from its fixed operating position. Space heater leads shall be preferably connected to terminal blocks.

3.5 Mechanical Requirements

3.5.1 General

3.5.1.1 All motors heavier than 50 lbs shall be supplied with an eye bolt for lifting.

REFERENCE 1 → 3.5.1.2 Where practical, the motor base shall be drilled for ground connection. A bolt shall be provided complete with nut and washers.

REFERENCE 2 → 3.5.1.3 Vertical jacking bolts shall be furnished on all horizontal motors 1000 lbs and heavier.

3.5.1.4 Vertical shaft motors for outdoor mounting shall include a steel rain shield, rigidly mounted to the motor frame, except where the end shield design is such as to make it unnecessary. The motor end shield shall be so shaped as to prevent water collecting in the region of the bearing housing.

3.5.1.5 Protection shall be provided against galvanic action between dissimilar metals by the use of gaskets, washers or other appropriate means.

24590-WTP-SDDR-MS-12-00039
PAGE 7 OF 12

4.3 Nameplates

Each motor shall have a non-corrosive stainless steel nameplate with no less than the minimum information called for in NEMA MG 1. The nameplates shall be attached with pins of the same materials, with the following data as a minimum:

1. Manufacturer's Type and Frame designation
2. Horsepower output
3. Time Rating
4. Temperature rise/Insulation Class
5. Speed at rated Load
6. Frequency
7. Number of Phases
8. Rated Voltage
9. Rated Load Current
10. Code Letter for Locked-rotor kVA
11. Service Factor

REFERENCE 3 → 12. Buyer's Driven Equipment Tag No.

Additional Nameplate Information

1. Type of Enclosure
2. Manufacturer's name
3. Serial number or date of manufacture
4. Space heater voltage/rating

4.4 Noise Level

4.4.1 Sound level shall be limited to values per NEMA MG-1, Table 9-1.

5 Tests and Inspections

5.1 Shop Tests

MS –

5.1.1 Unless with Buyer's prior written approval, all motors, size and type, shall be subjected to a "routine test". A complete or "full test" is required for motors if identified by the primary specification. All tests shall be performed in accordance with applicable National Codes and Industry Standards and/or Manufacturer Standard test procedures and acceptance. As required, all tests shall be performed at the manufacturer's facility. Certified test results shall be provided as identified in the primary specification.

24590-WTP-SDDR-12-00039
PAGE 8 OF 12

RELIANCE ELECTRIC CLEVELAND, OHIO 44117

R11304277

MADE IN U.S.A.

RELIANCE ELECTRIC

XT

DUTY MASTER® A-C MOTOR

FRAME	TYPE	DESIGN	IDENTIFICATION NO.	
447TS	P	B	B658247-010 T1 *	
HP 200	VOLTS 460		HZ 60	PHASE 3
RPM 3570	AMPS 215		S.F. 1.15	CODE G
AMB 50 °C	DUTY CONT		ENCL. TEFC	INS. CLASS H

DRIVE END BEARING 65BC03J30X

OPP. D.E. BEARING 6313/C3VL0241

XT - EXTRA TOUGH

MILD ENVIRONMENT MOTOR

VPI INSUL SUIT FOR 30-60HZ VT ON PWM @1.0 SF GG

613-5-CP

RELIANCE ELECTRIC COMPANY/GREENVILLE, SC 29615

WARNING

HIGH VOLTAGE AND ROTATING PARTS CAN CAUSE SERIOUS OR FATAL INJURY. INSTALLATION, OPERATION, AND MAINTENANCE OF ELECTRICAL MACHINERY SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. MAKE SURE THAT THE MOTOR AND EQUIPMENT ARE GROUNDED AND PROTECTED IN ACCORDANCE WITH THE NATIONAL ELECTRIC AND LOCAL CODES. SEE NEMA MG-2 SAFETY STANDARD.

692-FR

* DATE CODE AND MONTH/YEAR SHIPPED

Project	Hanford Tank Waste Treatment & Immobilization Plant (WTP)
Project Location	Richland, WA
Buyer's P.O. No.	24590-QL-POA-MACS-00007
Buyer's Equipment No.	LVP-EXHR-00001A/B/C
Buyer's Equipment Service	LAW Off-Gas Exhausters
Client Name	DOE
Spencer Sales Order No.	209355

CLASS 1E

692-MN

REFERENCE 3.1

GREASE LUBRICATION-NUCLEAR

LUBRICATE EVERY 3 MONTHS
USE EXXON POLYREX EM GREASE.
ADD 1.0 CUBIC IN GREASE.

692-VE

24590-WTP-SDDR-MS-12-00039
PAGE 9 OF 12

PO # 97716, L/I 1
ITEM # MOT 209355P
RIVER PROTECTION PROJECT-
WASTE TREATMENT PLANT
DOE CONT # DE-AC27-01RV14136

24590-QL-POA-MACS-00007-06-00011, Rev.00A

C/R

REV.0	MADE BY J. TSAO CHK.BY T. WILLIAMS APPROVED J. MARTIN DATE 01/07/11	B658247NP

REFERENCE 4

3.15.6 Both temperature and speed wires shall be connected to terminal blocks provided by SELLER. Terminal blocks shall be installed in a separate electrical termination box for external connection to Buyer's cable(s). SELLER shall provide sufficient terminals to allow landing and continuation of conductor shields. Provide 10% spare terminals.

3.15.7 SELLER shall mount, connect, and wire each instrument or control device such that adjustment, maintenance, removal, and replacement may be accomplished in a safe manner, without interruption of service to adjacent but non-associated equipment, and without placing undue stress on installed wiring or devices. Accommodations for strain relief shall be made when routing wire to hinged enclosure doors and shall be wrapped with spiral wire wrap.

3.15.8 Safety signals shall be isolated from non safety controls / monitoring signals.

3.15.9 The Buyer will provide power for SELLER instruments. Each source will be delivered at 120 VAC, 1 phase, 60 Hz, grounded system. All other voltages required by SELLER shall be derived from the Buyer-supplied 120 VAC, 1 phase, 60 Hz, grounded system. SELLER to provide any step down transformer from 120 VAC to 24 VDC, if required. Interconnecting wiring or cabling for packaged units furnished by SELLER shall be terminated and tested according to this specification.

3.15.10 No more than two wires shall be connected to one terminal point. Internal wiring shall be continuous from terminal to terminal without splices (except devices with pig tails). Bridge or comb jumpers are preferred to wire jumpers on terminal strips. Jumpers shall not be installed on the field side of the terminal strip.

3.15.11 All internal enclosure wiring shall be neatly dressed in slotted PVC wire ways. The wire way shall be securely fastened to the enclosure back panel. SELLER shall provide PVC wire ways on the opposite side of field terminations to be used by the Buyer. Adequate space shall be provided around terminal blocks to allow the Buyer to train and terminate cables. The field side wire way shall be designed for multi-core field cables with conductor size of # 14 AWG.

3.15.12 Circuits of different voltages (service level) shall be terminated on physically separate terminal strips and clearly labeled to show the circuit voltage. Terminal blocks shall be segregated according to signal type.

3.15.13 AC power shall be routed through separate wire ways or separated with a divider from 24 VDC discrete and analog instrument signals within enclosures. Power and signal cabling shall not be run in parallel except in separate wire ways, and should cross at a 90-degree angle only.

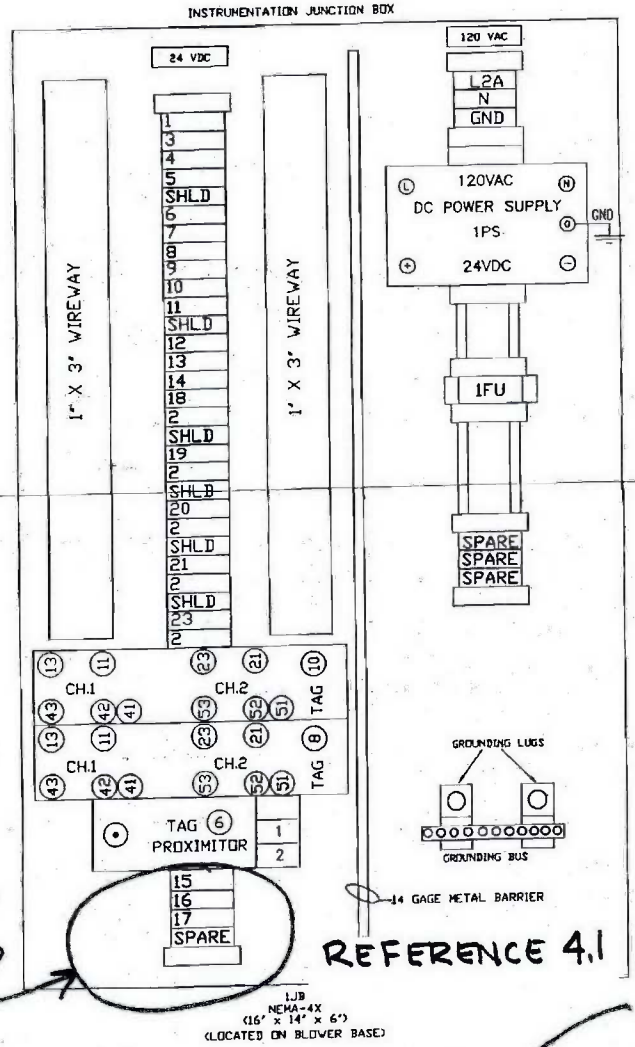
3.15.14 Wires shall be tagged with SELLER'S cable designation number at both ends with (heat shrinkable or non-shrinkable) plastic sleeve type wire markers.

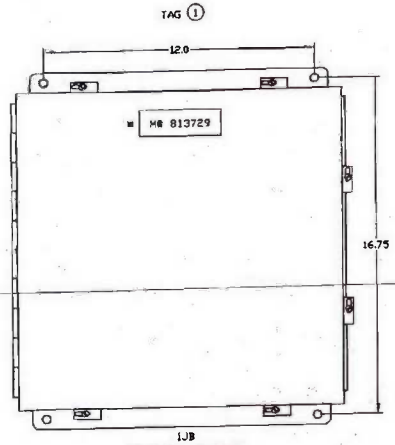
MS

3.15.15 The Buyer will also supply an equipment list in MS Access format which lists each instrument and is arranged in numerical order. SELLER shall populate the instrument list. The fields required to be populated are as follows: Instrument tag number, SELLER's referenced tag number if applicable, Service description, Instrument type, Signal type, P&ID number, Data sheet number if applicable, Location drawing number if applicable, Instrument installation details, Manufacturer name, Model number, Calibration range of instrument, Set point, Wiring

24590-WTP-SDDR-12-00039
PAGE 10 OF 12

REVISIONS					
NO.	DESCRIPTION	ECN	DATE	DR. BY	CK'D
1	PER ENG. COMMENTS		5-27-11	[illegible]	MCJ
2	AS BUILT		9-8-11	[illegible]	MCJ
3	CHG. P.S. WIRE COLOR & ADD GND LUGS		1-3-12	[illegible]	MCJ
4	CHG. WIRE #8 TO #4		1/31/12	[illegible]	MCJ





THE INFORMATION CONTAINED IN THIS DOCUMENT IS CERTIFIED TO BE CORRECT FOR CONSTRUCTION AND IN ACCORD WITH BECHTEL'S SPECIFICATIONS.

* NOTE: TYPICAL FOR M# 813729-813732.

CERTIFIED FOR
HANFORD TANK WASTE TREATMENT & IMMOBILIZATION PLANT (WTP)
Project
Customer S. & TECHNOLOGY
Engineer
Submitted by JBM Date 1-9-11

(4) THIS CONTROL PANEL SHALL BE BUILT IN STRICT ACCORDANCE WITH U.L. 508,UCI 508A, ISSUE 8

D PANEL TERMINALS
D JUNCTION BOX TERMINALS
FIELD WIRING

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THE SPENCER TURBINE CO.
WINDSOR, CT. 06095

TITLE
SCHEMATIC AND INSTRUMENTATION JB LAYOUT

SIZE D | DWG. NO. P209355-CP | REV 4

DR. BY [illegible] DATE 1-6-11 | CK'D BY [illegible] DATE 1-6-11 | APP'D BY [illegible] DATE 1-6-11

SCALE NONE | SHEET 3 OF 3

Project: Hanford Tank Waste Treatment & Immobilization Plant (WTP)
Project Location: Richland, WA
Buyer's P.O. No: 24590-QL-POA-MACS-00007
Buyer's Equipment No: LVP-EXHR-00001A/B/C
Buyer's Equipment Service: LAW Off-Gas Exhausters
Client Name: DOE
Spencer Sales Order No: 209353

CURRENT STATUS?

REFERENCE 4.1

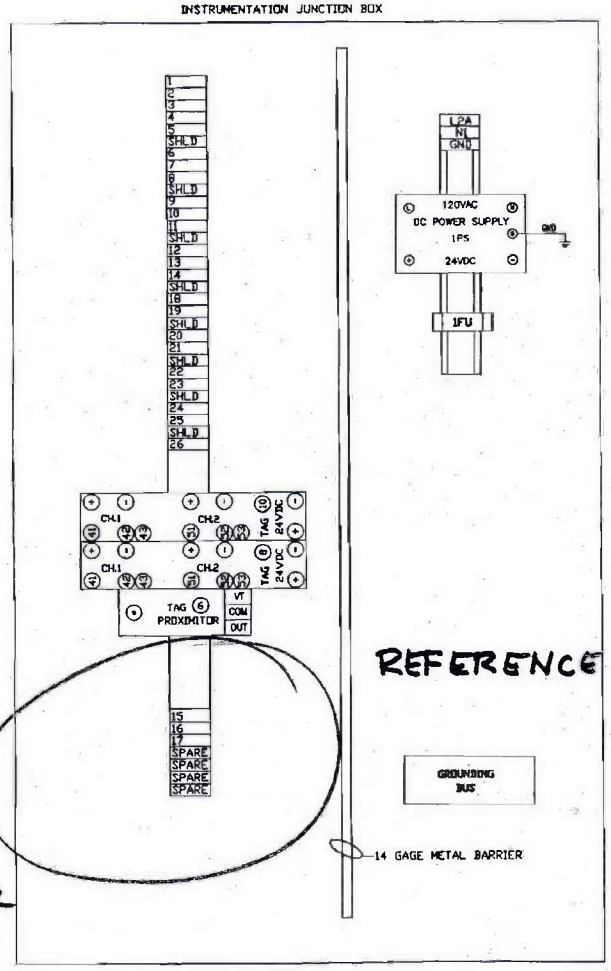
MS-

FROM 24590-QL-POA-MACS-00007-06-00012 REV 00D

24590-WTP SDDR-12-00039

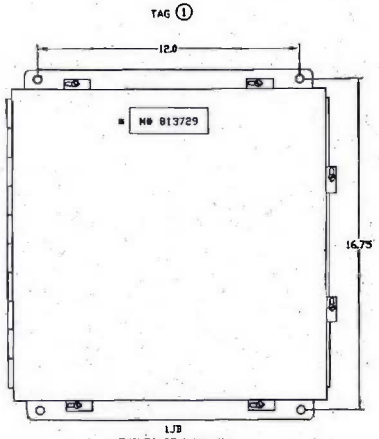
PAGE 11 OF 12

REVISIONS					
NO.	DESCRIPTION	ECN	DATE	DR. BY	CK'D
1	PER ENG. COMMENTS		5-27-11	BMH	MZ



REFERENCE 4.2

BEFORE



1JB
ENCLOSURE NEMA-4X
(16" X 14" X 6")
HAMMOND CAT #1414N4PHSSD6

* NOTE: TYPICAL FOR NW 813729-813732.

THE INFORMATION CONTAINED IN THIS DOCUMENT IS CERTIFIED TO BE CORRECT FOR CONSTRUCTION AND IN ACCORD WITH BECHTEL'S SPECIFICATIONS.

CERTIFIED FOR
HANFORD TANK WASTE TREATMENT & IMMOBILIZATION PLANT (WTP)

Project: _____
Customer: S.A. TECHNOLOGY
Engineer: _____
Submitted by: BMH Date: 1-5-11

(1) THIS CONTROL PANEL SHALL BE BUILT IN STRICT ACCORDANCE WITH U.L. SUBJECT 508A, ISSUE 2

- ○ PANEL TERMINALS
- ⊡ JUNCTION BOX TERMINALS
- ___ FIELD WIRING

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THE SPENCER TURBINE CO.

TITLE: SCHEMATIC AND INSTRUMENTATION JB LAYOUT

SIZE: D | DWG NO: P209355-CP | REV: 1

DR. BY: BMH | CHK'D BY: MZ | DATE: 1-5-11 | DATE: 6/4/11 | DATE: 1-5-11 | DATE: 6-6-11

SCALE: NONE | SHEET 3 OF 3

Project: Hanford Tank Waste Treatment & Immobilization Plant (WTP)
Project Location: Richland, WA
Buyer's P.O. No: 24590-QL-POA-MACS-00007
Buyer's Equipment No: LVP-EXHR-00001A/B/C
Buyer's Equipment Service: LAV Off-Gas Exhausters,
Client Name: DOE
Spencer Sales Order No: 209355

MS

FROM 24590-QL-POA-MACS-00007-06-00012 REV 00B

24590-WTP SDDR-12-00039

PAGE 12 OF 12

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ISSUED BY
RPP-WTP PDC

R11538045

	Exhauster Data Sheet:			MR No. **24590-QL-MRA-MACS-00007**			
	24590-LAW-MAD-LVP-00006			Plant Item No. **24590-LAW-MA-LVP-EXHR-00001A/B/C**			Rev. No. 9
1	Project	RPP-WTP	Bldg./Room #	LAW/ L-0304 C, D, E			
2	Project #	24590	Supporting Calculations	24590-LAW-M4C-LOP-00001			
3				24590-LAW-M6C-LVP-00004			
4	Site	DOE Hanford		24590-LAW-MEC-LVP-00003			
5	Safety Class	SS	Supporting Drawings	24590-LAW-M6-LVP-00001004,	Quantity Required		3
6	Seismic Category	SC-III		24590-LAW-M6-LVP-00001005, 24590-LAW-M6-LVP-00001006			
7	System No.	LVP	System Description	24590-LAW-3YD-LOP-00001	Quality Level		Q
8							
9	Description:	LAW Offgas Exhauster					
10	**EXHAUSTER LOCATION DESIGN CONDITIONS**						
11	Indoor Design Temperature	Minimum	50 °F	Maximum	113 °F	Relative Humidity	10% (min)
12	Contamination Classification Area	C2				Elevation	661 ft above MSL
13	Environmental Qualification	(See Attachment 2)		Hanford Standard Atmospheric Pressure		399	inches WC
14							
15	**EXHAUSTER DESIGN / MAXIMUM OPERATING CONDITIONS (FLOW CONDITIONS, EACH EXHAUSTER)**						
16	Design / Maximum Exhauster Inlet Flow (NOTE 19)	4,449/4,075	ACFM	Exhauster Design Temp		315	°F
17	Design / Maximum Pressure Relative to Atm (Inlet)	-166/-160	inches WC	Inlet Gas Temperature at Maximum Flow (Note 12)		122	°F
18	Design / Maximum Pressure Relative to Atm (Outlet)	+14/+14	inches WC	Design / Maximum Inlet Gas Density (Note 15)		0.037/ 0.037	lbs/cubic foot
19	Exhauster Efficiency at Design Conditions	*58	%	Power at Design Conditions		*186	BHP
20	Exhauster Speed at Design Conditions	*3425	RPM	Exhauster Motor Operating Weight		*2253	pounds
21	Maximum Discharge Temperature Note 9	*315	°F	Assembly Weight (Motor + Exhauster + Base) Note 17		*13,000	pounds
22	Discharge Temperature at Design Conditions Note 9	*290	°F	Natural Frequencies (Note 8)		* Note 8A	RPM
23				Deleted		*Deleted	°F
24	**EXHAUSTER NORMAL & MINIMUM OPERATING CONDITIONS (FLOW CONDITIONS, EACH EXHAUSTER)**						
25	Normal Exhauster Flow	3447	ACFM	Inlet Gas Temperature at Normal Flow (Note 12)		122	°F
26	Pressure Relative to Atm at Normal flow (Inlet)	-127	inches WC	Inlet Gas Density at Normal Conditions (Note 15)		0.042	lbs/cubic foot
27	Discharge Temperature at Normal Conditions Note 14	243	°F				
28	Minimum Exhauster Flow	1,516	ACFM	Inlet Gas Temperature at Minimum flow		107	°F
29	Pressure Relative to Atm at Minimum flow (Inlet)	-90	inches WC	Inlet Gas Density at Minimum Conditions (Note 15)		0.049	lbs/cubic foot
30	Discharge Temperature at Minimum Conditions	185	°F				
31							
32	**EXHAUSTER CONSTRUCTION**						
33	Exhauster Manufacturer	*Spencer Turbine		Exhauster Model Number	*GS 42307		
34	Drive Arrangement	*Coupled		Inlet Orientation	*Vertical up #5		
35	Motor Position	Direct drive		Discharge Orientation	*Vertical up #1		
36	Motor Rotation (Note 6)	*CW		Exhauster Type	*Multi-Stage Centrifugal Blower		
37	Dimensions (Note 11)	*168.25 x 69.42 x 77					
38	Exhauster RPM (Design)	*3550		Exhauster Shaft Diameter	*5 inch under fans		
39	Brake Horsepower (Design)	*200		Actual Brake Horsepower	*186		
40	Exhauster Bearing Type	*Deep Groove Ball		Exhauster Bearing Designator	*313 Tandem inlet end / 313 KS outlet end		
41							
42	**EXHAUSTER MATERIALS**						
43	Housing (Note 7)	316 L stainless steel (Note 18)		Impellor/ lobes / screw	316 L stainless steel (Note 18)		
44	Deleted			Mounting frame	*Structural Steel A36		
45	Shaft	410 stainless steel		Inlet check valve	None		
46	Deleted			Discharge check valve	By Buyer		
47	Inlet Screen	None		Bearing Special Feature (Note 4)	L10 service rating 100khr		
48	Shaft Coupling	*Carbon Steel with SS Disc Packs		Safety Guards	OSHA Compatible		
49							
50	**EXHAUSTER ACCESSORIES**						
51	Flanged Inlet	Yes		Flanged Inlet Dimensions	12 inch ANSI B16.5 RF 150#		
52	Flanged Discharge	Yes		Flanged Discharge Dimensions	12 inch ANSI B16.5 RF 150#		
53	Drain Connection	Yes		Drain Connection Size (Note 5)	*(8) 1 inch drains		
54	Shaft Seals	Yes		Seal Type	Double Mechanical w/ purge and control panel		

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

	Exhauster Data Sheet:			MR No. **24590-QL-MRA-MACS-00007**			
	24590-LAW-MAD-LVP-00006			Plant Item No. **24590-LAW-MA-LVP-EXHR-00001A/B/C**		Rev. No. **9**	
1	Project	RPP-WTP	Bldg./Room #	LAW/ L-0304 C, D, E			
2	Project #	24590	Supporting Calculations	24590-LAW-M4C-LOP-00001			
3				24590-LAW-M6C-LVP-00004			
4	Site	DOE Hanford		24590-LAW-MEC-LVP-00003			
5	Safety Class	SS	Supporting Drawings	24590-LAW-M6-LVP-00001004, 24590-LAW-M6-LVP-00001005, 24590-LAW-M6-LVP-00001006	Quantity Required	3	
6	Seismic Category	SC-III					
7	System No.	LVP	System Description	24590-LAW-3YD-LOP-00001	Quality Level	Q	
8							
9	Description:	LAW Offgas Exhauster					
55							
56	**EXHAUSTER ACCESSORIES (continued)**						
57	Isolation base	No	Isolation Pad Mfg and Model No	*N/A			
58	Vibration Isolation	* N/A					
59	Flexible Inlet Connection	Yes	Removable insulation (Note 13)	Yes			
60	Flexible Inlet Connection Type	Flexible Metal Hose	Metal Bellows				
61	Flexible Inlet Connection Material	*316L SS	316L flex hose, 12", ANSI 16.5 RF 150# 316 L flgs				
62	Flexible Connection Manufacturer	*DME, INC					
63	Flexible Outlet Connection	Yes	Removable insulation (Note 13)	Yes			
64	Flexible Outlet Connection Type	Flexible Metal Hose	Metal Bellows				
65	Flexible Outlet Connection Material	*316L SS	316L flex hose, 12", ANSI 16.5 RF 150# 316 L flanges				
66	Flexible Connection Manufacturer	*DME, INC					
67	Insulation (Note 13)	*Fiberglass Tape 1/8 inch	Thick Double wrapped with 50% overlap				
68	Silencer	No					
69	Seal purge hose	Flexible Metal Hose	316L flex hose, 1/2", ANSI 16.5 RF 150# 316 L flanges, 304 hose braid				
70	**EXHAUSTER MOTOR AND DRIVE REQUIREMENTS**						
71	Driven Equipment / Motor / ASD relationship is as follows::						
72	**Exhauster Tag Number**	**Motor Tag Number**	**ASD Tag Number**				
73	LVP-EXHR-00001A	LVP-MTR-00001A	LVP-ASD-00001A				
74	LVP-EXHR-00001B	LVP-MTR-00001B	LVP-ASD-00001B				
75	LVP-EXHR-00001C	LVP-MTR-00001C	LVP-ASD-00001C				
76	Variable Speed Drive	Yes	Provided by others				
77	Special Drive Features	1. ASD to operate motor from 30% to 100% of required RPM within a 30 second time frame (max). (Note 8)					
78							
79	**PROCESS OFFGAS STREAM COMPOSITION (TOTAL - 2 FANS IN OPERATION)**						
80		NOMINAL	MAXIMUM				
81	N_2	5.32E+03	5.40E+03	kg/hour			
82	O_2	1.60E+03	1.61E+03	kg/hour			
83	H_2O	8.93E+02	1.04E+03	kg/hour			
84	CO_2	1.01E+02	1.14E+02	kg/hour			
85	Ar	9.01E+01	9.11E+01	kg/hour			
86	NH_3	5.65E-01	9.36E-01	kg/hour			
87	NO	2.99E-01	4.25E-01	kg/hour			
88	N_2O	3.97E+00	6.38E+00	kg/hour			
89	NO_2	3.74E-01	7.76E-01	kg/hour			
90	CO	1.59E-01	5.46E-01	kg/hour			
91	H_2	3.83E-02	5.01E-02	kg/hour			
92	HCl	4.60E-05	1.23E-04	kg/hour			
93	HF	2.49E-06	3.66E-06	kg/hour			
94	I_2	5.56E-05	5.56E-05	kg/hour			
95	SO_2	9.49E-04	1.84E-03	kg/hour			
96	VOC	2.82E-02	5.85E-02	kg/hour			
97	Particulate	1.24E-05	3.65E-05	kg/hour			
98	Hg	1.97E-04	2.01E-04	kg/hour			
99	Total	8.01E+03	8.27E+03	kg/hour			
100	Gas Density	0.0424	0.0371	lbs/cubic foot			
101							

	Exhauster Data Sheet:			MR No. **24590-QL-MRA-MACS-00007**		
	24590-LAW-MAD-LVP-00006			Plant Item No. **24590-LAW-MA-LVP-EXHR-00001A/B/C**		Rev. No. 9
1	Project	RPP-WTP	Bldg /Room #	LAW/ L-0304 C, D, E		
2	Project #	24590	Supporting Calculations	24590-LAW-M4C-LOP-00001		
3				24590-LAW-M6C-LVP-00004		
4	Site	DOE Hanford		24590-LAW-MEC-LVP-00003		
5	Safety Class	SS	Supporting Drawings	24590-LAW-M6-LVP-00001004, 24590-LAW-M6-LVP-00001005, 24590-LAW-M6-LVP-00001006	Quantity Required	3
6	Seismic Category	SC-III				
7	System No.	LVP	System Description	24590-LAW-3YD-LOP-00001	Quality Level	Q
8						
9	Description:	**LAW Offgas Exhauster**				

102	**Notes**	
103	1)	* Denotes data to be provided / verified by SELLER
104	2)	N/A denotes "Not Applicable".
105	3)	TBD denotes "To Be Determined" at a later date.
106	4)	Provide each bearing pillow blocks with RTDs for remote indication
107	5)	See Specification 24590-LAW-3PS-MACS-T0001
108	6)	Rotation is listed as viewed from drive side
109	7)	Gaskets must withstand chemical constituents listed above.
110	8)	Natural frequencies within operating ranges to be blocked in ASD programming (A) Calculated Natural Frequencies: 1,348 RPM and 1,377 RPM Natural frequencies to be verified during factory testing
111	9)	Maximum Discharge Temperature is the maximum sustainable discharge temperature which is above the discharge temperature at design flow conditions.
112	10)	Contents of this document are dangerous waste permit (DWP) affecting.
113	11)	Bounding exhauster unit dimensions: 175 inches long X 70 inches wide X 84 inches high
114	12)	Normal and maximum temperatures are for material selection and corrosion analysis. Changes to these values are not required to be transmitted to the vendor.
115	13)	Removable insulation to be provided by SELLER
116	14)	Normal discharge temperature up to 282°F
117	15)	Normal, minimum, maximum and design gas densities are based on the density for air (Reference 24590-LAW-M6C-LVP-00004).
118	16)	Discharge pressure assumed to be 0.0 inches W.C. and minimum operating conditions
119	17)	Assembly WGT (motor + exhauster + base) is an estimate
120	18)	Maximum 0.030% C; dual certified.
121	19)	Required design inlet flow of 4,449 ACFM is bounded by supplied design inlet flow of 4760 ACFM as shown on vendor supplied performance curves and reflected on referenced P&Ids.

120	**SAFETY SCREENING**
121	**Safety Screening/Evaluation Required? If yes per 24590-WTP-GPP-SREG-002, E&NS Signature required below.** X Yes ___ No
122	

Rev	Reason for Revision	System Engineer	Responsible Engineer	E&NS	Checker	Reviewer	Approver	Date
9	Revised to update Supporting Drawings Field and to add Note 19.	M. O'Neill	D. J. Rickettson	D. Krahn 5-29-13	S. Austen	P. Snider	P. Omel	5/29/13
8	Revised to align normal and maximum data with referenced calculation and corrosion analysis. Design impacts negligible. Transmittal to vendor not required	M. O'Neill	D J Rickettson	D. Krahn	M. Sanvictores	P Snider	D Mildon	2/25/2013
7	Incorporated 24590-QL-MRA-MACS-00007-T0002, 24590-WTP-SDDR-MS-11-00072, 24590-QL-POA-MACS-00007-04-00001, 24590-QL-POA-MACS-00007-04-00002. Incorporated by reference: 24590-WTP-SDDR-MS-11-00047	M O'Neill	D J Rickettson	B Niemi	M O'Neill	P Snider	D Mildon	12/13/2011
6	Incorp supplier exceptions	M. O'Neill	D J Rickettson	D. Krahn	N Whitcomb	G Goolsby	J Roth	8/25/2010
5	DCN 24590-WTP-M6N-M80T-00005 incorporated. Reissue for purchase	M. O'Neill	D J Rickettson	D. Krahn	T Valenti	G Goolsby	J Roth	2/12/2010
4	Reissued for purchase. Incorp of Vendor exceptions.	M. O'Neill	S. E. Anderson	D. Krahn	C. Knauss	S. Kretzschmar	R. Stevens	9/8/2008
3	Re-issued with updated design conditions, reformatted mechanical datasheet for clarity, attached motor and EQ datasheets. This document supersedes 24590-LAW-MAD-LVP-00009	M. O'Neill	S. E. Anderson	D. Krahn	C. Knauss	S. Kretzschmar	R. Stevens	3/26/2008
2	Re-issued for purchase	SS	N/A	N/A	RLH	N/A	SS	2/1/2005
1	Issued for purchase	SS	N/A	N/A	RLH	N/A	ED	12/14/2004
0	Issued for bids	SS	N/A	N/A	RLH	N/A	ED	8/18/2004

ATTACHMENT 1 24590-LAW-MAD-LVP-00006 ELECTRICAL DATA SHEET LOW VOLTAGE INDUCTION MOTOR	MR No. 24590-QL-MRA-MACS-00007	
	Plant Item No. 24590-LAW-EM-LVP-MTR-00001A/B/C	Rev. No. 9

Motor Tag No.: 24590-LAW-EM-LVP-MTR-00001A/B/C

Driven Equipment No.: 24590-LAW-LVP-EXHR-00001A/B/C

Service: LAW Offgas Exhauster

Refer to "Primary Specification": 24590-LAW-3PS-MACS-T0001

LINE NO.	DESCRIPTION	USER SPECIFIED	SUPPLIER FURNISHED	UNITS
	BASIC DATA:		*N/A	
1	RATED HORSEPOWER	-	*200	HP
2	SYNCHRONOUS SPEED	-	*3600	RPM
3	VOLTAGE	460	*460	V
4	PHASE	3	*3	-
5	FREQUENCY	60	*60	Hz
6	INSULATION CLASS	F	*H	-
7	TEMPERATURE RISE ABOVE 40°C AMBIENT	80	*80	deg. C
8	NEMA DESIGN TYPE (B, C, OTHER)	B	*B	-
9	EFFICIENCY (STANDARD, PREMIUM)	PREMIUM	*PREMIUM	-
10	ENCLOSURE TYPE (TEFC - SEVERE DUTY PER IEEE Std. 841, TENV, WP1I)	TEFC IEEE Std. 841	*TEFC IEEE STD 841	-
11	SERVICE FACTOR	1.15	*1.15	-
12	COUPLED DRIVE (DIRECT, BELT, GEAR)	Direct	*Direct	-
13	BEARING (ANTI-FRICTION, SLEEVE)	Anti-Friction	*Anti-Friction	-
14	BEARING SEAL (ONE END, BOTH ENDS)	Both Ends	*Both Ends	-
15	SPACE HEATER (FOR MOTORS > 20 HP)	Yes	*Note 5	W
16	RTD FOR SLEEVE BEARING : 1 per bearing for Belt drive only	N/A	*N/A	Ω
17	TERMINAL BOX LOCATION		*F-1/ F-2	-
18	WARRANTY (2 YEARS, 3 YEARS, 5 YEARS)	2	*2	-
19	SHOP TESTS			
	- MFR STANDARD TEST (Yes / No)	Yes	*Yes	
	- ROUTINE TEST (Yes / No)	Yes	*Yes	
	- FULL TEST (Yes / No)	(Note 4)	*Yes (MTR)	
	UNUSUAL SERVICE CONDITIONS:	Inverter Duty	*VT@1.0SF	
20	FLAMMABLE OR EXPLOSIVE GASES	No	*Note 4	
21	COMBUSTIBLE, EXPLOSIVE, ABRASIVE OR CONDUCTIVE DUST	No	*Note 4	
22	WET OR DRY OPERATING CONDITIONS	Dry	*Note 4	
23	NUCLEAR RADIATION	0.5 mrad/hr.		
24	SPECIAL PAINTING REQUIREMENTS PER IEEE Std. 841		*Primer only	
25	OTHER (SC,SS, APC, Non-ITS)	SS	*SS	
26	OTHER (SEISMIC CATEGORY I , II, III or IV) Subject to shake-table test	SC-III	*SC-III	

ATTACHEMENT 1 24590-LAW-MAD-LVP-00006 ELECTRICAL DATA SHEET LOW VOLTAGE INDUCTION MOTOR	MR No. 24590-QL-MRA-MACS-00007	
	Plant Item No. 24590-LAW-EM-LVP-MTR-00001A/B/C	Rev. No. 9

Motor Tag No.: 24590-LAW-EM-LVP-MTR-00001A/B/C

Driven Equipment No.: 24590-LAW-LVP-EXHR-00001A/B/C

Service: LAW Offgas Exhauster

Refer to "Primary Specification": 24590-LAW-3PS-MACS-T0001

LINE NO.	DESCRIPTION	USER SPECIFIED	SUPPLIER FURNISHED	UNITS
27	MANUFACTURER	-	*Reliance	-
28	NEMA FRAME	-	*447TS	-
29	MODEL NUMBER	-	*N/A	-
30	SERIAL NUMBER / MANUFACTURER DATE	-	*B658247-010T1	-
31	FULL LOAD CURRENT	-	*215	A
32	FULL LOAD TORQUE	-	*294	ft-lb
33	POWER FACTOR : - @ 50 % LOAD	-	*87.7	%
34	- @ 75 % LOAD	-	*90.9	%
	- @ 100 % LOAD	-	*91.7	%
	EFFICIENCY : - @ 50% LOAD	-	*94.4	%
35	- @ 75% LOAD	-	*95.1	%
	- @ 100% LOAD	-	*95.1	%
	LOCKED ROTOR CURRENT @ 100 % of RATED VOLTAGE	-	*1423	A
36	LOCKED ROTOR CURRENT @ 80% of RATED VOLTAGE	-	*1140	A
37	ALLOWABLE STALL TIME @ FULL VOLTAGE	-	*27	SEC
38	ALLOWABLE STALL TIME @ 80% of VOLTAGE	-	*41	SEC
39	LOSSES @ FULL LOAD	-	*7642	W
40	ROTOR WK2 @ MOTOR SHAFT SPEED (For > 250 hp only)	-	*N/A	lb-ft²
41	STARTING POWER FACTOR (For > 75 hp only)	-	*30.9	-
42	SUB TRANSIENT REACTANCE AND X/R (For > 250 hp only)	-	*N/A	-
43	WEIGHT	-	*2253	lbs
44	ROTATION (CW, CCW, BI-DIR.) FACING DRIVEN EQUIPMENT	-	*BI-DIR	-
45	MEAN TIME BETWEEN FAILURE (MOTOR 100 HP AND ABOVE)		*N/A	
46	STARTING METHOD (FULL/REDUCED VOLTAGE, ASD APPLICATION)	ASD	*ASD	-
47				
48	RECOMMENDED BEARING LUBRICANT	-	*Exxon Polyrex EM	
49				

NOTES:

(1) DELETED

(2) Motor should be applied within its rating based on service factor of 1.0.

(3) Data Sheet Line no. from 34 to 46 are applicable for motor 100 HP and above.

(4) The exhauster and motor are subjected to the same environmental conditions.

(5) Equipped with 245w, 129v space heater. Not required for indoor applications.

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification		
Full Component Tag Number or BNI Stock Code Number	24590-LAW-MA-LVP-EXHR-00001A/B/C 24590-LAW-EM-LVP-MTR-00001A/B/C	Safety Classification ☐ SC ☒ SS ☐ APC-PAM
Equipment Datasheet Number	N/A	
Description	Secondary Offgas Exhausters	Seismic Category ☐ SC-I ☐ SC-II ☒ SC-III ☐ SC-IV ☐ SC-III Seismic Interaction only
Location (Facility / Building and Room No.)	LAW / Building 20/ Rooms L-0304 C/D/E / Elevation 48'-0"	
Safety Function(s)	Provide negative pressure on the LAW melters, primary and secondary offgas systems. Provides both confinement as well as motive force for offgas flow through all the offgas equipment up to and including discharge at stack. Exhausters shall remain functional (i.e., able to support their required safety function) following an SC-III event. Ref 24590-WTP-PSAR-ESH-01-002-03, rev 4o, Sect 4.4.3 & 5.6.3	

Equipment Safety Function Type	☒ Passive Mechanical	☒ Active Mechanical	☒ Electrical
	24590-LAW-MA-LVP-EXHR-00001A/B/C	24590-LAW-MA-LVP-EXHR-00001A/B/C	24590-LAW-EM-LVP-MTR-00001A/B/C

Seismic Safety Function	Seismic Operability Requirements		
☒ Yes ☐ No	☒ During Seismic Event	☒ After Seismic Event	☐ None

Equipment Environmental Qualification (EEQ)

(Parameter values stated in this section do not include process conditions or operation induced conditions)

Classification of Environment ☒ Mild ☐ Harsh

Qualified Life (years) ☒ 40 ☐ Other with required maintenance

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
High Temperature (°F)	95	Note 1a	Years	24590-LAW-U0D-W16T-00001, Rev 2
Low Temperature (°F)	50	Note 1b	N/A	Note 2
High Relative Humidity (%RH)	90	Note 1c	N/A	24590-LAW-U0D-W16T-00001, Rev 2
Low Relative Humidity (%RH)	10	Note 1c	N/A	24590-LAW-U0D-W16T-00001, Rev 2
High Pressure (in.-w.g.)	0	Note 1d	N/A	24590-LAW-U0D-W16T-00001, Rev 2
Low Pressure (in.-w.g.)	-0.4	Note 1d	N/A	24590-LAW-U0D-W16T-00001, Rev 2
Radiation Dose Rate (mRad/hr)	0.5	40	Years (Note 1e)	24590-LAW-P1N-P01T-00050, Rev N/A
Plant/Process Induced Vibration	☐ Yes ☒ No			
Additional Normal Ambient Information:	N/A			

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Abnormal Ambients				
High Temperature (°F)	113	8	hours / year	Note 3
Low Temperature (°F)	50	Note 1b	N/A	Note 2
High Relative Humidity (%RH)	95	Note 1c	N/A	24590-LAW-U0D-W16T-00001, Rev 2
Low Relative Humidity (%RH)	10	Note 1c	N/A	24590-LAW-U0D-W16T-00001, Rev 2
High Pressure (in.-w.g)	4	Note 1d	N/A	24590-LAW-U0D-W16T-00001, Rev 2
Low Pressure (in.-w.g)	-2.4	Note 1d	N/A	24590-LAW-U0D-W16T-00001, Rev 2
Radiation Dose Rate (mR/hr)	0.5	0	Years (Note 1e)	24590-LAW-P1N-P01T-00050, Rev N/A
Exposure to Wet Sprinkler System	☒ Yes ☐ No	2	hours	24590-LAW-U0D-W16T-00001, Rev 2
Additional Abnormal Ambient Information				
Design Basis Events (DBE) Ambients				
High Temperature (°F)	113	2	hours	Note 3
Low Temperature (°F)	50	Note 1b	N/A	Note 2
High Relative Humidity (%RH)	95	2	hours	24590-LAW-U0D-W16T-00001, Rev 2
Low Relative Humidity (%RH)	10	2	hours	24590-LAW-U0D-W16T-00001, Rev 2
High Pressure (in.-w.g)	4	2	hours	24590-LAW-U0D-W16T-00001, Rev 2
Low Pressure (in.-w.g)	-2.4	2	hours	24590-LAW-U0D-W16T-00001, Rev 2
Radiation Dose Rate (mR/hr)	0.5	Note 1e	hours	24590-LAW-P1N-P01T-00050, Rev N/A
Submergence	☒ Yes ☐ No Note 4	2	hours	24590-LAW-U0C-20-00001, Rev F
Chemical/Spray Exposure	☐ Yes ☒ No	N/A	hours	24590-LAW-U0D-W16T-00001, Rev 2
Additional DBE Information	Deleted text			

DBE Chemical Exposure Details	
DBE Chemical Types / Concentrations	None

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Electrical Interfaces Supporting the Safety Function	
Power Supply Voltage (VAC, VDC)	460 VAC
Power Supply Frequency (Hz)	60
Power Connection Method	By Seller
I/O Signals to/from Equipment	By Seller
I/O Connection Method	By Seller

Mechanical Interfaces	
Mounting Configuration (orientation)	Horizontal mounted
Mounting Method (bolts, welds, etc.)	Base to be welded to existing embeds or anchored into the concrete depending on the Seller's anchorage configuration. Reference drawings 24590-BOF-DD-S13T-00001, 24590-LAW-DB-S13T-00135 & 00136
Auxiliary Devices	Inlet and outlet hoses, LVP-HOSE-00003 to 00008

Equipment Seismic Qualification (ESQ)

Parameter	Title	Reference/Document Number	Version / Revision	Remarks
WTP Seismic Design Specification	Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks	24590-WTP-3PS-FB01-T0001	4	
Specified Seismic Load Parameters	Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks	24590-WTP-3PS-FB01-T0001	4	Active mech & elect testing per section 4.3.4 & Section 7.0

Equipment Qualification Notes and Additional Information

1.0 General 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) Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

2.0 The Normal, Abnormal, and DBE Low Temperature (F) is listed as **59 F** in 24590-LAW-U0D-W16T-000001, **Rev 2.** 50 F is per Basis of Design (BOD) Table

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Qualification Notes and Additional Information

12-1 (Plant Rooms), **24590-WTP-DB-ENG-01-001, Rev 1P. Rev 7**

3.0 The Abnormal and DBE High Room Temperature (F) is listed as 95 F in 24590-LAW-U0N-W16T-00001, Rev 2. 113 F is specified for the equipment qualification goal.4.0 Seller shall be responsible to locate any sensitive part of the exhauster, junction box or control panel above the flood height of 0.67 Feet.

CORROSION EVALUATION

R11600380

LVP-EXHR-00001A/B/C (LAW)
MELTER OFFGAS EXHAUSTER

ISSUED BY
RPP-WTP PDC

- Design Temperature (°F): 315
- Design Pressure (inches WC) (Inlet/Outlet): -166/+14
- Location: Rooms L-0304C/D/E; outcell

Contents of this document are Dangerous Waste Permit affecting

Operating conditions are as stated on attached Process Corrosion Data Sheet

Operating Modes Considered:

- Normal operations at temperature up to 282 °F
- Exposure to decontamination chemicals during maintenance shut-down
- Stand-by operations at room temperature at high relative humidity

Materials Considered:

Material (UNS No.)	Acceptable Material	Unacceptable Material
Type 304L (S30403)		X
Type 316L (S31603)	X	
6% Mo (N08367/N08926)	X	
Hastelloy® C-22® (N06022)	X	
Ti-2 (R50400)		X

Recommended Material:

Housing: Type 316 (max 0.030% C; dual certified)
Shaft: Type 410
Impeller: Type 316 (max 0.030% C; dual certified)

Recommended Corrosion Allowance: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)

Process & Operations Limitations:

- None

Concurrence NA
Operations

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	MET	APPROVER
3	5/21/13	Expand discussion throughout Correct sect i typo Correct typo in references Additional reference	DLAdler	JRDivine	NA	SWVail
2	11/15/12	Update design pressure Sect d—Remove mercury reference	DLAdler	RBDavis	NA	DJWilsey
1	7/18/12	Update wear allowance based on 24590-WTP-RPT-M-04-0008 Update design and operating temps Additional operating modes Add DWPA note Expand section d to discuss mercury and liquid metal embrittlement Incorporate revised PCDS Minor non-technical edits	DLAdler	RBDavis	NA	SWVail
0	8/11/04	Initial Issue	DLAdler	JRDivine	APR	APRangus

CORROSION EVALUATION

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

CORROSION EVALUATION

Corrosion Considerations:

The off-gas exhauster is an assembled component consisting of a structure, housing, impeller, shaft, bearings, seals, and cooling system. Corrosion, wear, and fatigue affect each part. Materials selection for these assembled components is based on the function, service environment, and material properties. Often a trade-off is required for availability and life attributes. Exhauster inlet, outlet, housing, and impeller are exposed to potentially aggressive and halogen-containing gases, variable humidity, and decontamination agents at low pressure. No condensation is expected.

The recommended material for the shaft is Type 410, a hardenable stainless steel commonly used for valve stems, motor shafts and mounting lugs and brackets. Type 410 combines the superior wear resistance of the chromium-carbon steels and excellent corrosion resistance of chromium stainless steel. Type 410 provides good corrosion resistance to mild atmospheres. It resists corrosion in many light industrial and domestic environments as well as potable and mine waters. Type 410 stainless steel exhibits good corrosion resistance to atmospheric corrosion, potable water, and to a lesser degree to corrosive chemical environments because of the ability to form a tightly adherent passive oxide film which protects their surfaces from further attack.

a General Corrosion
Standard exhauster/blowers can be fabricated with a manufactured (cut and welded) housing or cast housing. The materials as allowed by design code can be either carbon steel or stainless steel; although corrosion and erosion resistant alloys are required unless there is sufficient bulk to the carbon steel material to ensure integrity while corroding at a high rate. The required corrosion allowance should be adjusted depending on the material selected; carbon steel or corrosion resistant steel.

Carbon steel or low alloy steel does not have sufficient corrosion resistance in this environment. The shaft is recommended to be fabricated from a corrosion resistant material such as a martensite or precipitation-hardened stainless steel. Depending on how the attachments are made, the inlet and outlet material should match either the piping or the housing where the weld is made. Copper and aluminum alloys should be avoided for any part of this fabrication because of the corrosion caused by the decontamination acids and nitrogen compounds in the gas. If the housing is manufactured, the alloys need to be wrought carbon or stainless steel.

Conclusion:
Stainless and corrosion resistant alloys (such as 300 series stainless steel) are recommended and are required to have an allowance of 0.04 inch to allow for corrosion, erosion, and synergistic losses. If carbon steel is used in the same service conditions, it is required to have a corrosion allowance of greater than 0.125 inch for corrosion, erosion, and synergistic losses. All carbon steel cast materials require additional ductility to prevent fatigue and brittle fracture. A minimum of 15 % elongation is required for all materials fabricated from castings.

b Pitting Corrosion
Pitting corrosion will only be a concern if moisture is present during normal operation. Shut-down and heat-up thermal transients will likely condense vapors on the cold surfaces. Locations at crevices, at dead-legs, at low points, and under deposits will host conditions that support corrosion. The constituents in the off-gas vapor phase can be aggressive in oxidizing environments, when mixed with aqueous condensate, towards carbon steel and Type 304L stainless steel. Therefore, a material with a higher pitting corrosion resistance than Type 304L is necessary. Type 316L stainless steel, or better, is recommended for this application.

Conclusion
At the stated operating conditions, pitting corrosion is not a major concern. Type 316L is recommended.

c End Grain Corrosion
End grain corrosion only occurs in concentrated acid conditions at elevated temperatures. However, without the presence of liquid, such corrosion is not a concern.

Conclusion:
Not expected in this system.

d Stress Corrosion Cracking
At operations at the stated temperatures, aqueous stress corrosion cracking will only be a concern in the presence of moisture. It is assumed that there will be no condensation during normal operation, so stress corrosion cracking is not expected.

Conclusion
At the stated operating conditions, stress corrosion cracking is not considered a concern.

e Crevice Corrosion
See Pitting.

Conclusion:
See Pitting

f Corrosion at Welds
Providing correct weld procedures are followed, no preferential corrosion of weld beads or heat-affected zones occurs. Further, weld corrosion is not a concern because the alloy of the piping and alloy of the exhauster housing are similar (Type 316L), therefore the welding process and filler materials are compatible. No additional allowance is made for weld bead corrosion.

CORROSION EVALUATION

Conclusion:
Weld corrosion is not a problem for this system.

g Microbiologically Induced Corrosion (MIC)
The stated operating conditions are not suitable for microbial growth.

Conclusion:
MIC is not considered a problem.

h Fatigue/Corrosion Fatigue
Extreme temperature cycling or fluctuations are not expected.

Conclusions
Not expected to be a concern

i Vapor Phase Corrosion
Components essentially consist entirely of vapor space so general corrosion comments apply.

Conclusion:
See comments under general corrosion.

j Erosion
The conditions expected are not severe, the gas is relatively particulate free, and the flow through the exhauster is relatively low (based on 24590-LAW-M6C-LVP-00004). The impingement erosion is not likely when there are very low particulates and moisture in the gas stream.

Conclusion:
Not expected to be a concern

k Galling of Moving Surfaces
The corrosion evaluation is specific to the process fluid and the inside components of the exhauster. Although the rotating shaft will have a bearing set, the set should be on the outside of the seals. Inside the exhauster the metallic surfaces will not contact and therefore galling is not possible.

Conclusion:
Conditions which lead to galling are not present in this component.

l Fretting/Wear
The corrosion evaluation is specific to the process fluid and the inside components of the exhauster. Although the rotating shaft will have a bearing set, the set should be on the outside of the seals. Inside the exhauster the metallic surfaces will not contact and therefore fretting wear is not possible

Conclusion:
Conditions which lead to fretting are not present in this component.

m Galvanic Corrosion
No dissimilar metals are present.

Conclusion:
Not a concern.

n Cavitation
Cavitation is the formation and rapid collapse of cavities or bubbles of vapor or gas within a liquid resulting from mechanical or hydrodynamic forces. Cavitation is not likely in the offgas system components because the fluid density of the gas is too low.

Conclusion:
Conditions in this system do not lead to cavitation.

o Creep
The temperatures are too low to be a concern.

Conclusion:
Not applicable.

p Inadvertent Addition of Nitric Acid
Inadvertent introduction of nitric acid into the offgas system is not a plausible scenario. Nitric acid and decontamination agents may be used over short durations. Procedures will be used to control exposures and keep corrosion losses down.

Conclusion
Not applicable.

CORROSION EVALUATION

References:

1. 24590-LAW-M4C-LOP-00001, Rev. 003, *LAW Melter Offgas System Design Basis Flowsheets* with the change notice 24590-LAW-M4E-LOP-00009
2. 24590-LAW-M6C-LVP-00004, Rev. 1, *Offgas Pipe And Exhauster Sizing For LOP And LVP Systems*
3. 24590-WTP-RPT-M-04-0008, Rev. 3, *Evaluation Of Stainless Steel And Nickel Alloy Wear Rates In WTP Waste Streams At Low Velocities*
4. 24590-WTP-RPT-PR-04-0001, Rev. 0CD, *WTP Process Corrosion Data*
5. Deleted

Bibliography:

1. 24590-LAW-MAD-LVP-00006, *Mechanical Data Sheet, 24590-LAW-MA-LVP-EXHR-00001A/B/C - Law Offgas Exhauster Blower*
2. Berhardsson, S, R Mellstrom, and J Oredsson, 1981, *Properties of Two Highly corrosion Resistant Duplex Stainless Steels*, Paper 124, presented at Corrosion 81, NACE International, Houston, TX 77218
3. Davis, JR (Ed), 1987, *Corrosion, Vol 13*, In "Metals Handbook", ASM International, Metals Park, OH 44073
4. Davis, JR (Ed), 1994, *Stainless Steels*, In ASM Metals Handbook, ASM International, Metals Park, OH 44073
5. Hamner, NE, 1981, *Corrosion Data Survey*, Metals Section, 5th Ed, NACE International, Houston, TX 77218
6. Jones, RH (Ed.), 1992, *Stress-Corrosion Cracking*, ASM International, Metals Park, OH 44073
7. Koch, GH, 1995, *Localized Corrosion in Halides Other Than Chlorides*, MTI Pub No. 41, Materials Technology Institute of the Chemical Process Industries, Inc, St Louis, MO 63141
8. Phull, BS, WL Mathay, & RW Ross, 2000, *Corrosion Resistance of Duplex and 4-6% Mo-Containing Stainless Steels in FGD Scrubber Absorber Slurry Environments*, Presented at Corrosion 2000, Orlando, FL, March 26-31, 2000, NACE International, Houston TX 77218.
9. Sedriks, AJ, 1996, *Corrosion of Stainless Steels*, John Wiley & Sons, Inc., New York, NY 10158
10. Uhlig, HH, 1948, *Corrosion Handbook*, John Wiley & Sons, New York, NY 10158
11. Van Delinder, LS (Ed), 1984, *Corrosion Basics*, NACE International, Houston, TX 77084
12. Wilding, MW and BE Paige, 1976, *Survey on Corrosion of Metals and Alloys in Solutions Containing Nitric Acid*, ICP-1107, Idaho National Engineering Laboratory, Idaho Falls, ID

CORROSION EVALUATION

24590-WTP-RPT-PR-04-0001, Rev. 0CD
WTP Process Corrosion Data

PROCESS CORROSION DATA SHEET

Component(s) (Name/ID #) LAW melter offgas exhausters (LVP-EXHR-00001 A/B/C)

Facility LAW

In Black Cell? No

Chemicals	Unit[1]	Contract Maximum[2]		Non-Routine		Notes
		Leach	No leach	Leach	No Leach	
Aluminum	g/m^3					
HCl	g/m^3	1.7E-04	1.8E-04			
HF	g/m^3	4.4E-04	4.8E-04			
Iron	g/m^3					
NO	g/m^3	6.4E-02	6.7E-02			
NO2	g/m^3	1.1E-01	1.3E-01			
Phosphate	g/m^3					
SO2	g/m^3	1.7E-04	1.7E-04			Note 3
Mercury	g/m^3					Assumptions 2
Carbonate	g/m^3					
Particulate	g/m^3					
HNO_3	g/m^3					
HNO_2	g/m^3					
Relative Humidity	%	100%	100%			
Temperature	°F					Assumption 1

List of Organic Species:

References

System Description: 24590-LAW-3YD-LOP-00001
Mass Balance Document: 24590-WTP-M4C-V11T-00005, Rev A
Normally Associated Streams: LVP18, LVP08
Off Normal Input Stream # (e.g., overflow from other vessels):
P&ID: N/A
* PFD: 24590-LAW-M5-V17T-00011
Technical Reports: N/A

Notes:

1. Concentrations less than 1×10^{-4} g/m^3 do not need to be reported; list concentration values to three significant digits max.
2. Data developed from a mass balance model which has constituents in the plant feed which are important to corrosion, adjusted to contract maximum values, except as noted.
3. Source: 24590-LAW-M4C-LOP-00001, Rev 2A, pages 43 and 44

Assumptions:

** 1. Operating temperature ranges from 119 °F to 275 °F (pages 37, and 41, 24590-LAW-M4C-LOP-00001, rev 2A).
2. Mercury concentrations are an assumption based on inputs and assumptions identified in Attachment A of 24590-WTP-M4C-V11T-00005, Rev A.

* Error in PCDS Report. Referenced PFD should be 24590-LAW-M5-V17T-00010. This is supporting information for production of PCDS, but is not used in the development of the Corrosion Evaluation. Correction will be made at next revision of PCDS.

** Referenced document 24590-LAW-M4C-LOP-00001 has been revised. The nominal operating range is 122 °F at the inlet and 243 °F at the discharge. The maximum range is 122 °F at the inlet and 282 °F at the discharge.

6.4.9 LAW Melter Offgas Exhausters (LVP-EXHR-00001A/B/C)

Routine Operations

Three multistage centrifugal exhausters (blowers) (LVP-EXHR-00001A/B/C) each with adjustable speed drive, are located downstream of the caustic scrubber. Each exhauster is rated at 50 % of the full system capacity. The exhausters feed offgas to the offgas stack.

Non-Routine Operations that Could Affect Corrosion or Erosion

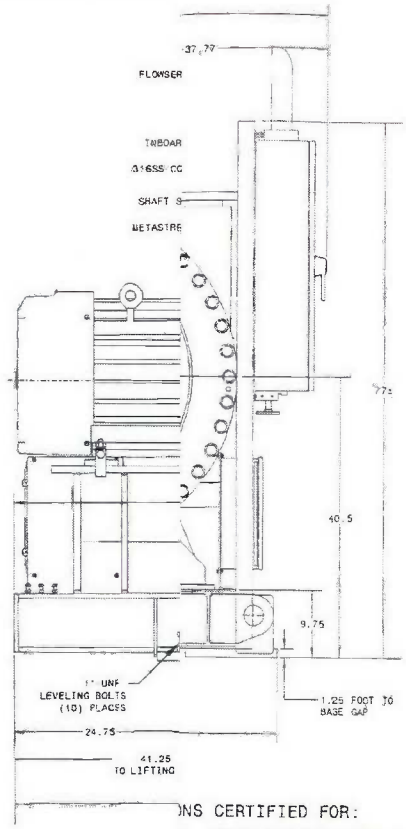
- **Loss of exhausters** - If an exhauster fails, the backup exhauster automatically activates.
- **General electrical failure** - Each exhauster is supplied with a separate UPS. Upon loss of offsite power, there is a seamless transfer to the UPS units for the exhauster(s) operation.

NOTES:

1. ALL DIMENSIONS ARE IN INC
2. DO NOT TRANSMIT EXTERNAL
3. FLANGED INLET AND OUTLET
4. BOLT HOLES IN FLANGES STR
5. INCLUDES HEAT TRACE WITH
6. UNIT EQUIPPED WITH (2) F
7. UNIT INCLUDES BEARING RTD
8. MOTOR GROUND, SEE MOTOR D
9. APPROXIMATE WEIGHT: 13000
   BLOWER WEIGHT: 6350 LBS.
   MOTOR WEIGHT: 2253 LBS.
   BASE WEIGHT: 4400 LBS.

SERIAL #
613731
MACH TAG#

021	24590-LAW-EJ-LVP-JB-00024
022	24590-LAW-EJ-LVP-JB-00025
019	24590-LAW-EK-LVP-PNL-00022
020	24590-LAW-EK-LVP-PNL-00023
021	24590-LAW-EK-LVP-PNL-00024



ONS CERTIFIED FOR:

N HANFORD TANK WTP, HANFORD, WA

S.A. TECHNOLOGY INC.

DER No. 17528-645

No. 209355

813730-731

2 GS42307-2

5 SIZE 12 (T/F): RESO

1 SIZE 12 (T/F): RESO

COUPLING DATA

MAKE

TYPE

MODEL/SIZE

MOTOR BORE 2.38

MOTOR DATA

MAKE

HORSEPOWER 200

RPM 3600

PHASE 3

ENCLOSURE TYPE

ND INFORMATION CONTAINED
IETARY TO THE SPENCER TURBINE CO.
BE USED, COPIED OR DISCUSSED
PT AS SPECIFICALLY AUTHORIZED IN
SPENCER TURBINE CO.

CER TURBINE COMPANY

WINDSOR, CT. 06095

NE DIMENSIONS OF
UTLET DRIVEN 4BOB

-209355PC

REV. 2

NO.	DESCRIPTION	BY	DATE
2	MODEL No. CHANG	JPP	10/18/2011
1	GROUNDING LUGS AD	JPP	10/6/2011

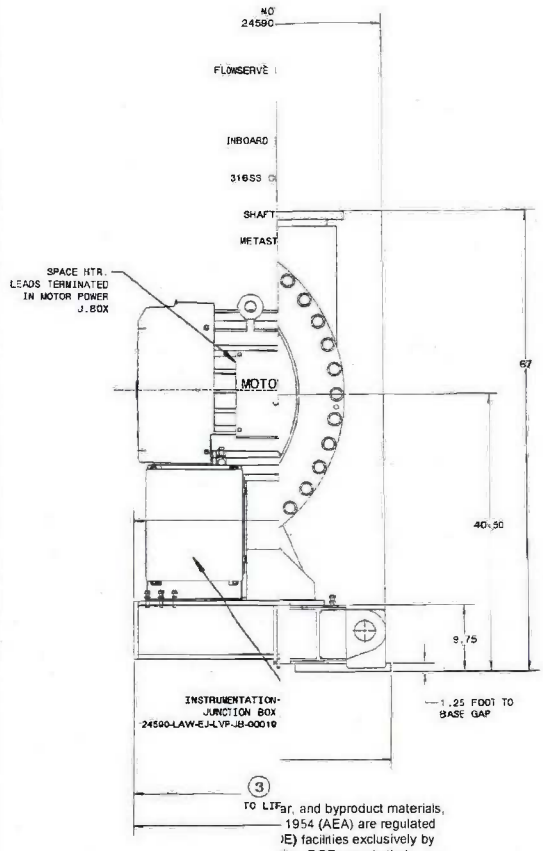
SHEET 1 OF 1

JEB 11-12
12/6/2011

NOTES:
1. ALL DIMENSIONS ARE IN IN
2. DO NOT TRANSMIT EXTERNAL
3. FLANGED INLET AND OUTLET
4. BOLT HOLES IN FLANGES S
5. INCLUDES HEAT TRACE WITH
6. UNIT EQUIPPED WITH (2) F
7. UNIT INCLUDES BEARING RT
8. MOTOR GROUND, SEE MOTOR
9. APPROXIMATE WEIGHT: 1300
BLOWER WEIGHT: 6350 LBS
MOTOR WEIGHT: 2253 LBS.
BASE WEIGHT: 4400 LBS.

S CERTIFIED FOR:

	HANFORD TANK WTP, HANFORD, WA
	S.A. TECHNOLOGY INC.
R No.	17528-645
o.	209355
	813729
	GS42307
5 SIZE	12 (T/F): RESO
1 SIZE	12 (T/F): RESO



ar, and byproduct materials,
1954 (AEA) are regulated
E) facilities exclusively by
ity. DOE asserts that
sive responsibility and
clear, and byproduct
ies. Information contained
process description

COUPLING DATA

MAKE METASTREAM
TYPE SPACER
MODEL/SIZE TSC-0135
MOTOR BORE 2.38 BLOWER BORE

INFORMATION CONTAINED
TARY TO THE SPENCER TURBINE CO.
USED, COPIED OR DISCUSSED
AS SPECIFICALLY AUTHORIZED IN
ENCER TURBINE CO.

MOTOR DATA

MAKE BALDOR
HORSEPOWER 200 FRAME SIZE
RPM 3600 VOLTAGE
PHASE 3 HERTZ
ENCLOSURE TYPE TEFC-XT

ER TURBINE COMPANY
WINDSOR, CT. 06095

E DIMENSIONS OF
LET DRIVEN 4BOB

NO.	DESCRIPTION
4	GROUNDING LUGS ADDED
3	MOUNTING PADS AND LIFTING TABS M
2	REVISED PER CHANGE ORDER #5 & #7, TAG #'s ADDED, DRAWING SIZE CH DRAIN HEIGHT CHANGED
1	REVISED PER CHANGE ORDER #

209355P

REV. 4

JPP	ENG JJI	JEP 1-4-12	
11/8/2010	11/8/2010	11-17-2010	

REVI

SHEET 1 OF 1

Table III.10.H.A - LAW Plant Miscellaneous Unit System Description

Sub-system Description	Sub-system Designation	Engineering Description (Drawing Nos., Specification Nos., etc.)	Narrative Description, Tables and Figures
LAW Melter Process System LMP-MLTR-00001 (LAW Melter 1) LMP-MLTR-00002 (LAW Melter 2)	LMP	**24590-LAW** -P1-P01T-00002, Rev 5	Section 4.1.3.2, Table C-8, and Figures C1-1, C1-3 and C1-21 in Operating Unit Group 10, Addendum C of this Permit.
LAW Primary Offgas Process System LOP-FCLR-00001 (Melter 1 Primary Film Cooler) LOP-FCLR-00002 (Melter 1Standby Film Cooler No. 2) LOP-FCLR-00003 (Melter 2 Primary Film Cooler) LOP-FCLR-00004 (Melter 2 Standby Film Cooler)	LOP	**24590-LAW** -P1-P01T-00002, Rev 5 -M6-LOP-P0001, Rev 2 -M6-LOP-P0002, Rev 2	Section 4.1.3.3, Table C-8, and Figures C1-1, C1-3 and C1-21 in Operating Unit Group 10, Addendum C of this Permit.
LAW Primary Offgas Process System (Cont.) LOP-SCB-00001 (Melter 1 Submerged Bed Scrubber) LOP-SCB-00002 (Melter 2 Submergered Bed Scrubber)	LOP	**24590-LAW** -M5-V17T-P0007, Rev 0 -M5-V17T-P0008, Rev 0 -M6-LOP-P0001, Rev 2 -M6-LOP-P0002, Rev 2 -MK-LOP-P0001001, Rev 0 -MK-LOP-P0001002, Rev 0 -MK-LOP-P0001003, Rev 0	Section 4.1.3.3, Table C-8, and Figures C1-1 and C1-3 in Operating Unit Group 10, Addendum C of this Permit.

Table III.10.H.A - LAW Plant Miscellaneous Unit System Description

Sub-system Description	Sub-system Designation	Engineering Description (Drawing Nos., Specification Nos., etc.)	Narrative Description, Tables and Figures
		-MKD-LOP-P0008, Rev 0 -NID-LOP-P0001, Rev 1 -P1-P01T-00002, Rev 5	
LAW Primary Offgas Process System (Cont.) LOP-WESP-00001 (Melter 1 Wet Electrostatic Precipitator - WESP) LOP-WESP-00002 (Melter 2 Wet Electrostatic Precipitator -WESP)	LOP	**24590-LAW** -M5-V17T-P0007, Rev 0 -M5-V17T-P0008, Rev 0 -M6-LOP-P0001, Rev 2 -M6-LOP-P0002, Rev 2 -NID-LOP-00003, Rev 3 -P1-P01T-00002, Rev 5 **24590-WTP** -3PS-MKE0-T0001, Rev 5	Section 4.1.3.3, Table C-8, and Figures C1-1 and C1-3 in Operating Unit Group 10, Addendum C of this Permit.
LAW Secondary Offgas/Vessel Vent Process System LVP-HEPA-00001A (Melter Offgas HEPA Filter) LVP-HEPA-00001B (Melter Offgas HEPA Filter) LVP-HEPA-00002A (Melter Offgas HEPA Filter) LVP-HEPA-00002B (Melter Offgas HEPA	LVP	**24590-LAW** ~~-M5-V17T-P0010, Rev 2~~ -M5-V17T-00010, Rev 4 -M5-V17T-00011, Rev 5 -M6-LVP-00003001, Rev 0 -P1-P01T-00005, Rev 4	Section 4.1.3.3, Table C-8, Figures C1-1 and C1-3 in Operating Unit Group 10, Addendum C of this Permit.

Table III.10.H.A - LAW Plant Miscellaneous Unit System Description

Sub-system Description	Sub-system Designation	Engineering Description (Drawing Nos., Specification Nos., etc.)	Narrative Description, Tables and Figures
Filter) LVP-HEPA-00003A (Melter Offgas HEPA Filter)			
LAW Secondary Offgas/Vessel Vent Process System (Cont.) LVP-SCO-00001 (Thermal Catalytic Oxidizer – located on LVP-SKID-00002)	LVP	RESERVED	Section 4.1.3.3, Table C-8, Figures C1-1 and C1-3 in Operating Unit Group 10, Addendum C of this Permit.
LAW Secondary Offgas/Vessel Vent Process System (Cont.) LVP-SCR-00001 (NOx Selective Catalytic Reduction Unit – located on LVP-SKID-00002)	LVP	RESERVED	Section 4.1.3.3, Table C-8, and Figures C1-1 and C1-3 in Operating Unit Group 10, Addendum C of this Permit.
LAW Secondary Offgas/Vessel Vent Process System (Cont.) LVP-ADBR-00001A (Offgas Mercury Adsorber – located on LVP-SKID-00001) LVP-ADBR-00001B (Offgas Mercury Adsorber – located on LVP-SKID-00001)	LVP	~~RESERVED~~ **24590-LAW** -M5-V17T-00011, Rev.5 -M6-LVP-00004001, Rev 0 -M6-LVP-00004002, Rev 0 -M6-LVP-00004003, Rev 0 -P1-P01T-00005, Rev 4	Section 4.1.3.3, Table C-8, and Figures C1-1 and C1-3 in Operating Unit Group 10, Addendum C of this Permit.

Table III.10.H.A - LAW Plant Miscellaneous Unit System Description

Sub-system Description	Sub-system Designation	Engineering Description (Drawing Nos., Specification Nos., etc.)	Narrative Description, Tables and Figures
LAW Secondary Offgas/Vessel Vent Process System (Cont.) LVP-SCB-00001 (Melter Offgas Caustic Scrubber)	LVP	**24590-LAW** -P1-P01T-000~~4~~5, Rev ~~3~~4 -M6-LVP-00002001, Rev 0 -M6-LVP-00002002, Rev 0 -M6-LVP-00002003, Rev 0 -M6-LVP-00002004, Rev 0 -M6-LVP-00002005, Rev 0 -M6-LVP-00002006, Rev 0	Section 4.1.3.3, Table C-8, and Figures C1-1 and C1-3 in Operating Unit Group 10, Addendum C of this Permit.
LAW Secondary Offgas/Vessel Vent Process System (Cont.) LVP-HTR-00001A (Melter Offgas HEPA Preheater) LVP-HTR-00001B (Melter Offgas HEPA Preheater) LVP-HTR-00002 (Catalytic Oxidizer Electric Heater – located on LVP-SKID-00002)	LVP	**24590-LAW** ~~-M5-V17T-P0010, Rev 2~~ -M5-V17T-00010, Rev 4 -M5-V17T-00011, Rev 5 ~~-M6-LVP-00001001, Rev 0~~ ~~-M6-LVP-00001002, Rev 0~~ ~~-M6-LVP-00001003, Rev 0~~ -M6-LVP-00001004, Rev 0 -M6-LVP-00001005, Rev 0 -M6-LVP-00001006, Rev 0 -M6-LVP-00005001, Rev 0 -M6-LVP-00005002, Rev 0	Section 4.1.3.3, Table C-8, and Figures C1-1 and C1-3 in Operating Unit Group 10, Addendum C of this Permit.
LAW Secondary Offgas/Vessel Vent Process System (Cont.)	LVP	RESERVED	Section 4.1.3.3, Table C-8, and Figures C1-1 and C1-3 in Operating Unit

Table III.10.H.A - LAW Plant Miscellaneous Unit System Description

Sub-system Description	Sub-system Designation	Engineering Description (Drawing Nos., Specification Nos., etc.)	Narrative Description, Tables and Figures
LVP-HX-00001 (Catalytic Oxidizer Heat Recovery Unit – located on LVP-SKID-00002)			Group 10, Addendum C of this Permit.
LAW Secondary Offgas/Vessel Vent Process System (Cont.) LVP-EXHR-00001A (Melter Offgas Exhauster) LVP-EXHR-00001B (Melter Offgas Exhauster) LVP-EXHR-00001C (Melter Offgas Exhauster)	LVP	**24590-LAW** ~~-M5-V17T-P0010, Rev 2~~ -M5-V17T-00010, Rev 4 -M5-V17T-00011, Rev 5 ~~-M6-LVP-00001001, Rev 0~~ ~~-M6-LVP-00001001, Rev 0~~ ~~-M6-LVP-00001002, Rev 0~~ ~~-M6-LVP-00001003, Rev 0~~ -M6-LVP-00001004, Rev 0 -M6-LVP-00001005, Rev 0 -M6-LVP-00001006, Rev 0 -P1-P01T-00005, Rev 4	Section 4.1.3.3, Table C-8, and Figures C1-1 and C1-3 in Operating Unit Group 10, Addendum C of this Permit.

Attachment 3
13-ECD-0061
(2 Pages)

Bechtel National, Inc. and U.S. Department of Energy,
Office of River Protection Certification Statements

Gae M. Neath

U.S. Department of Energy, Office of River Protection Certification

The following certification statement is provided for the submittal of permit package LAW-026C, Revision 0.

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.

K. W. Smith, Manager
U.S. Department of Energy,
Office of River Protection

Date 7/23/13

Bechtel National, Inc. Certification

The following certification statement is provided consistent with Contract No. DE-AC27-01RV14136, Section H.26, Environmental Permits, paragraph (g) for the submittal of the Hanford Facility Resource Conservation and Recovery Act Permit Package LAW-026C, Revision 0.

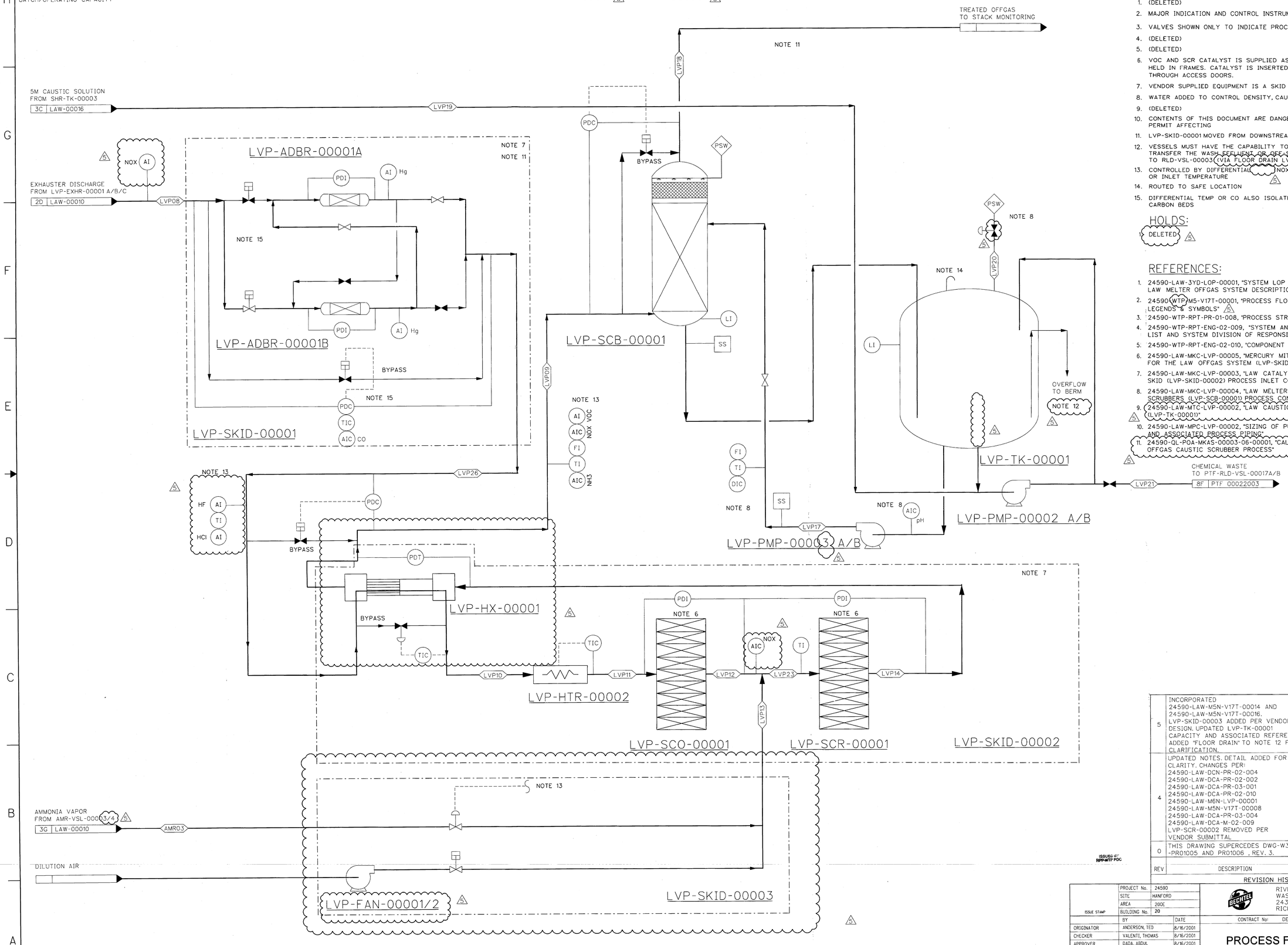
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage 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.

Joseph M. St Julian for FMR 7/2/13

F. M. Russo
Project Director

Date

PLANT ITEM NUMBER / DESCRIPTION	LVP-SKID-00001 MERCURY MITIGATION EQUIPMENT FOR THE LAW OFFGAS SYSTEM	LVP-SKID-00002 LAW CATALYTIC OXIDIZER/REDUCER SKID	LVP-SKID-00003 AMMONIA / AIR DILUTION SKID	LVP-SCB-00001 LAW MELTERS OFFGAS CAUSTIC SCRUBBER	LVP-PMP-00003 A/B CAUSTIC SCRUBBING SOL RECIRC PUMP	LVP-TK-00001 CAUSTIC COLLECTION TANK	LVP-PMP-00002 A/B CAUSTIC BLOWDOWN TRANSFER PUMP
OPERATING DUTY / BATCH/OPERATING CAPACITY	N/A	N/A 3500 ACFM	N/A	N/A 7200 ACFM	N/A 200 GPM	N/A 7700 GAL	N/A 120 GPM



NOTES:

1. (DELETED)
2. MAJOR INDICATION AND CONTROL INSTRUMENTATION ONLY SHOWN
3. VALVES SHOWN ONLY TO INDICATE PROCESS INTENT
4. (DELETED)
5. (DELETED)
6. VOC AND SCR CATALYST IS SUPPLIED AS A METAL MONOLITH HELD IN FRAMES. CATALYST IS INSERTED AND REMOVED THROUGH ACCESS DOORS.
7. VENDOR SUPPLIED EQUIPMENT IS A SKID MOUNTED UNIT.
8. WATER ADDED TO CONTROL DENSITY, CAUSTIC ADDED TO CONTROL PH
9. (DELETED)
10. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING
11. LVP-SKID-00001 MOVED FROM DOWNSTREAM OF LVP-SCB-00001
12. VESSELS MUST HAVE THE CAPABILITY TO BE WASHED AND TO TRANSFER THE WASH EFFLUENT OR OFF-SPECIFICATION MATERIAL TO RLD-VSL-00003 (VIA FLOOR DRAIN LVP-FD-00001).
13. CONTROLLED BY DIFFERENTIAL NOX ACROSS LVP-SKID-00002 OR INLET TEMPERATURE
14. ROUTED TO SAFE LOCATION
15. DIFFERENTIAL TEMP OR CO ALSO ISOLATES INLETS TO CARBON BEDS

HOLDS:

1. DELETED

REFERENCES:

1. 24590-LAW-3YD-LOP-00001, "SYSTEM LOP AND LVP: LAW MELTER OFFGAS SYSTEM DESCRIPTION"
2. 24590-WTP-M5-V17T-00001, "PROCESS FLOW DIAGRAM LEGENDS & SYMBOLS"
3. 24590-WTP-RPT-PR-01-008, "PROCESS STREAM NUMBERS"
4. 24590-WTP-RPT-ENG-02-009, "SYSTEM AND AREA LOCATORS LIST AND SYSTEM DIVISION OF RESPONSIBILITY"
5. 24590-WTP-RPT-ENG-02-010, "COMPONENT IDENTIFIERS LIST"
6. 24590-LAW-MKC-LVP-00005, "MERCURY MITIGATION EQUIPMENT FOR THE LAW OFFGAS SYSTEM (LVP-SKID-00001)"
7. 24590-LAW-MKC-LVP-00003, "LAW CATALYTIC OXIDIZER/REDUCER SKID (LVP-SKID-00002) PROCESS INLET CONDITIONS"
8. 24590-LAW-MKC-LVP-00004, "LAW MELTERS OFFGAS CAUSTIC SCRUBBERS (LVP-SCB-00001) PROCESS CONDITIONS AND REQUIREMENTS"
9. 24590-LAW-MTC-LVP-00002, "LAW CAUSTIC COLLECTION TANK SIZING (LVP-TK-00001)"
10. 24590-LAW-MPC-LVP-00002, "SIZING OF PUMPS LVP-PMP-00002A/B AND ASSOCIATED PROCESS PIPING"
11. 24590-QL-POA-MKAS-00003-06-00001, "CALCULATION FOR LAW MELTER OFFGAS CAUSTIC SCRUBBER PROCESS"

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
5	INCORPORATED 24590-LAW-M5N-V17T-00014 AND 24590-LAW-M5N-V17T-00016. LVP-SKID-00003 ADDED PER VENDOR DESIGN. UPDATED LVP-TK-00001 CAPACITY AND ASSOCIATED REFERENCE. ADDED "FLOOR DRAIN" TO NOTE 12 FOR CLARIFICATION.	NL	TJV	DAH	RV	9/15/06
4	UPDATED NOTES. DETAIL ADDED FOR CLARITY. CHANGES PER: 24590-LAW-DCN-PR-02-004, 24590-LAW-DCA-PR-02-002, 24590-LAW-DCA-PR-03-001, 24590-LAW-DCA-PR-02-010, 24590-LAW-M6N-LVP-00001, 24590-LAW-M5N-V17T-00008, 24590-LAW-DCA-PR-03-004, 24590-LAW-DCA-M-02-009, LVP-SCR-00002 REMOVED PER VENDOR SUBMITTAL	MK	SC	RH	KK	6-02-04
0	THIS DRAWING SUPERCEDES DWG-W375LV-PR01005 AND PR01006, REV. 3.	TH	TJV	N/A	AGD	8-16-01

REVISION HISTORY

ISSUED BY: RPP-WTP PDC

ISSUE STAMP		
PROJECT No.	24590	
SITE	HANFORD	
AREA	200E	
BUILDING No.	20	
	BY	DATE
ORIGINATOR	ANDERSON, TED	8/16/2001
CHECKER	VALENTI, THOMAS	8/16/2001
APPROVER	DADA, ABDUL	8/16/2001
REVIEWER	N/A	N/A

CONTENT APPLICABLE TO NUREG-0554 ☒ YES ☐ NO
ADR NO. (24590-LAW-ADR-M-02-023) REV: 1
SAFETY SCREEN REQUIRED? ☒ YES ☐ NO | EMS INITIAL IF YES DKK

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

PROCESS FLOW DIAGRAM LAW VIT SECONDARY OFFGAS TREATMENT (SYSTEM LVP)

SCALE: NTS

24590-LAW-M5-V17T-00011

REV 5

"E" SIZE - 44x34
COMPUTER GENERATED - MANUAL CHANGES NOT PERMITTED

SAFETY SCREEN IS REQUIRED FOR DRAWING TYPES IDENTIFIED IN 24590-WTP-GPP-SREG-002

R10706274

09/14/2006 01:33:59 PM

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

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