The following General Program Elements are provided for information only. They provide a basic description of the overall scope related to the procurement to have the Seller fabricate Blender Modules. This provides preliminary requirements to determine interest in the procurement. Final requirements will be defined based upon project requirements and industry input to this Request for Interest (RFI).

There are two Blender modules included in this RFI. The module is defined as process equipment designed such that it can be installed in a preassembled configuration within a fabricated structure. Module fabrication will be at the Seller's facility and shall include all required testing. The completed module shipped to the project site for installation. Disassembly for shipment will be minimized to the maximum extent practicable

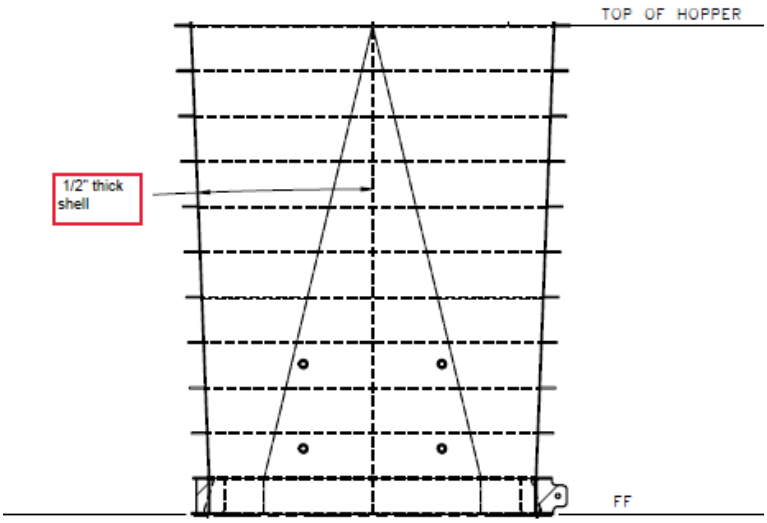
A clarification narrative of the components follows:

Blender – (may also be referred to as mixer)

- The two blenders can be identical except the main drive motors shall be set at opposite ends (to allow for enhanced maintenance access).
- An effort is underway to potentially reduce the size of the HLW recipe. Information for both a 460 ft^3 and a 390 ft^3 blender should be provided.
- A one inch connection for an air purge shall be provided for the blender.
- Two 1 1/2" connections (one for vent line and one spare) to be provided.

Expansion Joint – The custom flexible expansion joint with be provided with a 304 stainless steel liner, backing rings and bolting hardware

Hopper - The mass flow design of the hopper is dependent upon the dimensions of the specific blender selected. The selected blender outlet dimension flange will inform the design of the width and length of the hopper inlet and that will dictate the overall height of the hopper. The hopper will consist of a body fabricated from a 304 stainless steel Hot Rolled and Pickled (HRAP) plate with external stainless steel reinforcing. The inlet flange will be compatible with the expansion joint, and a template (bolt hole size and pattern) will be provided for the outlet of the hopper. For estimation purposes the shell is anticipated to be ½" thick with the external reinforcing bar to be 5/8" thick bar 5" wide on a 15" spacing. The inlet/outlet flanges are estimated to be 5/8" thick with external reinforcing plates attaching to the shell and the stiffener above. A representative image is provided below:



Dust Filters - All primary dust filters will be designed to be back pulsed. The effluent of the primary dust filters will exhaust thru a HEPA filter before discharging into the work space.

Available utilities

- Plant service air
- 480 V, 3 Phase power

Instrumentation – Instrument Data sheets are not available at this time. Materials in the process stream can be assumed to be 304 stainless steel.

Markups of the P&IDs are attached to help clarify the intended scope. Items in green are out of scope.

- MARKUP of 24590-BOF-M6-GFR-28004001Rev 001
- MARKUP of 24590-BOF-M6-GFR-28004002Rev 001
- MARKUP of 24590-BOF-M6-GFR-28004003 Rev 001
- MARKUP of 24590-BOF-M6-GFR-28004004 Rev 001

A markup of the datasheet 71831.108-20 Rev 0 is provided.

The desired bounding dimensional information for the blender, expansion joint and hopper is provided in the attached model views. The general location within the facility is also provided.

The specification is currently under revision and an in-process markup copy is provided. Sucrose has been replaced with a non-combustible blend of silica, boric acid and sucrose. No explosion suppression is required.

GFR-HEPA-28031
EAST
PADDLE BLENDER
HEPA FILTER
TBD ACFM
99.97% AT 0.30 MICRON
DIMENSIONS: TBD

GFR-FLTH-28031
EAST
PADDLE BLENDER
FILTER HOUSING
TBD ACFM
95 % AT 1 MICRON
DIMENSIONS: TBD

GFR-MXR-28001
EAST
PADDLE BLENDER
--
HORSE POWER 300 HP
CAPACITY 460 CUBIC FEET
DIMENSIONS: TBD

GFR-FLTH-28036
EAST
PADDLE BLENDER
FILTER HOUSING
TBD ACFM
95 % AT 1 MICRON
DIMENSIONS: TBD

GFR-FLTH-28037
EAST
PADDLE BLENDER
FILTER HOUSING
TBD ACFM
95 % AT 1 MICRON
DIMENSIONS: TBD

Out of Scope

SOUTH FUNNEL
BOF-M6-GFR-28003001 A6
GFR-CHT-28124

CENTRAL FUNNEL
BOF-M6-GFR-28003001 A4
GFR-CHT-28128

NORTH FUNNEL
BOF-M6-GFR-28003001 A3
GFR-CHT-28130

PLANT SERVICE AIR
BOF-M6-PSA-28001004 C4
PSA-GQ-28014-C12A-001/2
PSA-V-28445

PLANT SERVICE AIR
BOF-M6-PSA-28001005 D3
PSA-GQ-28144-C12A-01
PSA-V-28446

O/C A/M HS YC 6702
YY 6702
S
3/8" TUBING
PSA
VENT
PSA-V-28152
YV 6702
FC
ZSH 6702
ZSL 6702
ZI
HS O/C A/M
YC 6701
POSH 5807
YY 6701
S
3/8" TUBING
PSA
VENT
PSA-V-28151
FC
YV 6701
PCV 6703
SET @ 2 IN. H20
NOTE 10
ZSH 6701
ZSL 6701
ZI
PSA-GQ-28014-C12A-001/2
GFR
PSA

SET @ 1.0 PSIG (PRESSURE)
SET @ -0.1 PSIG (VACUUM)
PSV 5813
N06 6"

HEPA
N01
GFR-GZ-28098-S1IR-10
PSA-GQ-28145-C12A-001/2
PARTICLE AT 5810
003/4-B04
GFR-V-28109
003/4-B03
GFR-V-28108
10-B02
PSA-HOSE-28183
001/2-B01
PSA
GFR
PSA-HOSE-28336
001/2-B02
10-B01
PSA-HOSE-28337
PSA-HOSE-28041
N02 N01 N08
N02 N01 N012
N01 N02 N015
GFR-FLTH-28031 NOTE 4
GFR-FLTH-28036 NOTE 4
GFR-FLTH-28037 NOTE 4
N02 1"
GFR-MXR-28001
N03 12" GFR EXP-28049
N04 12" GFR EXP-28050
N05 12" GFR EXP-28051
AI 5810 HH
PDI 5807 HH
PDT 5807
GFR-V-28107
N01 3/4"
GFR-FX-28036-S1IR-003/4
PDT 5809 ATM
PDI 5809 HH L
001/2-B01
NOTE 3
N11 1/2"
PSA-V-28153
PSA-HOSE-28181
PSA GFR
N07 24" INSPECTION PORT
NOTE 3
N10 1/2"
GFR PSA

ST 5806
SE 5806
SI 5806
HS S/S A/M
YC 5806
ASD
PB
SDI 5806 H
SDSH 5806
II 5806 H
ISH 5806
HS L/R 5806A
HS START 5806B
HS STOP 5806C
NOTE 11
N09
NOTE 7
WE 5814 A
WE 5814 B
WE 5814 C
WE 5814 D
WT 5814 PB
WI 5814 H
HS TARE
WSL 5814
EAST ACCUMULATION HOPPER
BOF-M6-GFR-28004003 G5
HS S/S A/M
YC 5811
YY 5811
NOTE 12
ZSH 5811
ZI
ZSL 5811

NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00010001 THROUGH 24590-WTP-M6-50-00010008 FOR GENERAL NOTES, SYMBOLS AND LEGENDS, AND GENERAL SLOPE REQUIREMENTS.
2. ALL SYSTEMS, STRUCTURES, AND COMPONENTS SHOWN ON THIS DRAWING ARE QUALITY LEVEL CM AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
3. ALL APPURTENANCES REQUIRED FOR SEAL PURGING (SUCH AS PRESSURE AND FLOW DEVICES) ARE PROVIDED WITH BLENDERS, SCREW CONVEYORS, AND ROTARY VALVES.
4. EAST PADDLE BLENDER PULSE JET FILTER.
5. LINES WITHIN THE BOF GFR SYSTEM THAT USE GRAVITY AS THE MOTIVE FORCE ARE OUTSIDE THE SCOPE OF ASME B31.3 PROCESS PIPING AND CONSIDERED AS MATERIAL HANDLING CHUTES. SUCH LINES ARE DISTINGUISHED BY A CHUTE (CHT) COMPONENT TAG NUMBER IN LIEU OF A LINE NUMBER. THE TAGS FOR THESE CHUTES ARE ON DRAWING 24590-BOF-M6-GFR-28003001.
6. DELETED.
7. THE PADDLE BLENDER, EXPANSION JOINT, ACCUMULATION HOPPER, SCREW CONVEYOR, AND SLIDE GATE ARE SEALED TOGETHER WITHOUT ANY INTERMEDIARY CHUTEWORK. THE EQUIPMENT IS SPLIT ACROSS TWO DIFFERENT DRAWINGS FOR CLARITY.
8. DELETED.
9. DELETED.
10. PCV PROVIDED WITH INTEGRAL PRESSURE GAUGE.
11. MIXER TO BE PROVIDED WITH BOMB BAY DOORS.
12. BOMB BAY DOOR CAN BE REMOTELY OPERATED BY THE PCJ.
13. REVISION 1: MAJOR REVISION, NO CHANGE CLOUDS REQUIRED. ADDED BLIND FLANGE TO INSPECTION PORT, NOZZLE SIZES, FLOW ARROWS, DATALINKS, WSL AND NOTES. CORRECTED PIPE CLASS & DRAWING NUMBER ON OFF SHEET CONNECTOR. REMOVED HOLD 1. NOTE 6, NOTE 8, NOTE 9, YV-5803 AND ASSOCIATED TAGS. ADDED FILTER HOUSINGS. UPDATED RELIEF VALVE SETTINGS AND CORRECTED ROOT VALVE SIZES.

HOLD/OPEN ITEMS:

1. DELETED.
2. DELETED.

REFERENCES:

1. 24590-BOF-3ZD-GFR-00001, BOF GLASS FORMERS REAGENT SYSTEM (GFR) SYSTEM DESIGN DESCRIPTION AND GLASSFORMER BAGHOUSE FACILITY (GBF) FACILITY DESIGN DESCRIPTION.

DRAWING INDEX

DWG NO	TITLE
24590-BOF-M6-GFR-28004001	BOF GFR EAST PADDLE BLENDER
24590-BOF-M6-GFR-28004002	BOF GFR WEST PADDLE BLENDER
24590-BOF-M6-GFR-28004003	BOF GFR EAST ACCUMULATION HOPPER
24590-BOF-M6-GFR-28004004	BOF GFR WEST ACCUMULATION HOPPER

Originator | Checked | Reviewed N/A | Approved | Approved | Approved

CM QUALITY DESIGNATOR

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	ISSUED FOR CONSTRUCTION (SEE NOTE 13)	SEE STAMPS				
0	ISSUED FOR USE	GC	CK	N/A	PB/NG	12/19/24

REVISION HISTORY

ISSUED BY RPP-WTP PDC
ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	28

	BY	DATE
ORIGINATOR	CHAMOUN, GEORGE	12/18/24
CHECKER	KIRK, CHARLES	12/18/24
APPROVER	BANE, P./GERGELY, N.	12/18/24
REVIEWER	N/A	N/A
APPROVER	SHOEMAKER, J.	12/19/24

CONTENT APPLICABLE TO ALARA? ☐ YES ☒ NO
ADR NO. N/A REV: N/A

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
450 HILLS ST.
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - BOF GLASS FORMERS REAGENT SYSTEM EAST PADDLE BLENDER

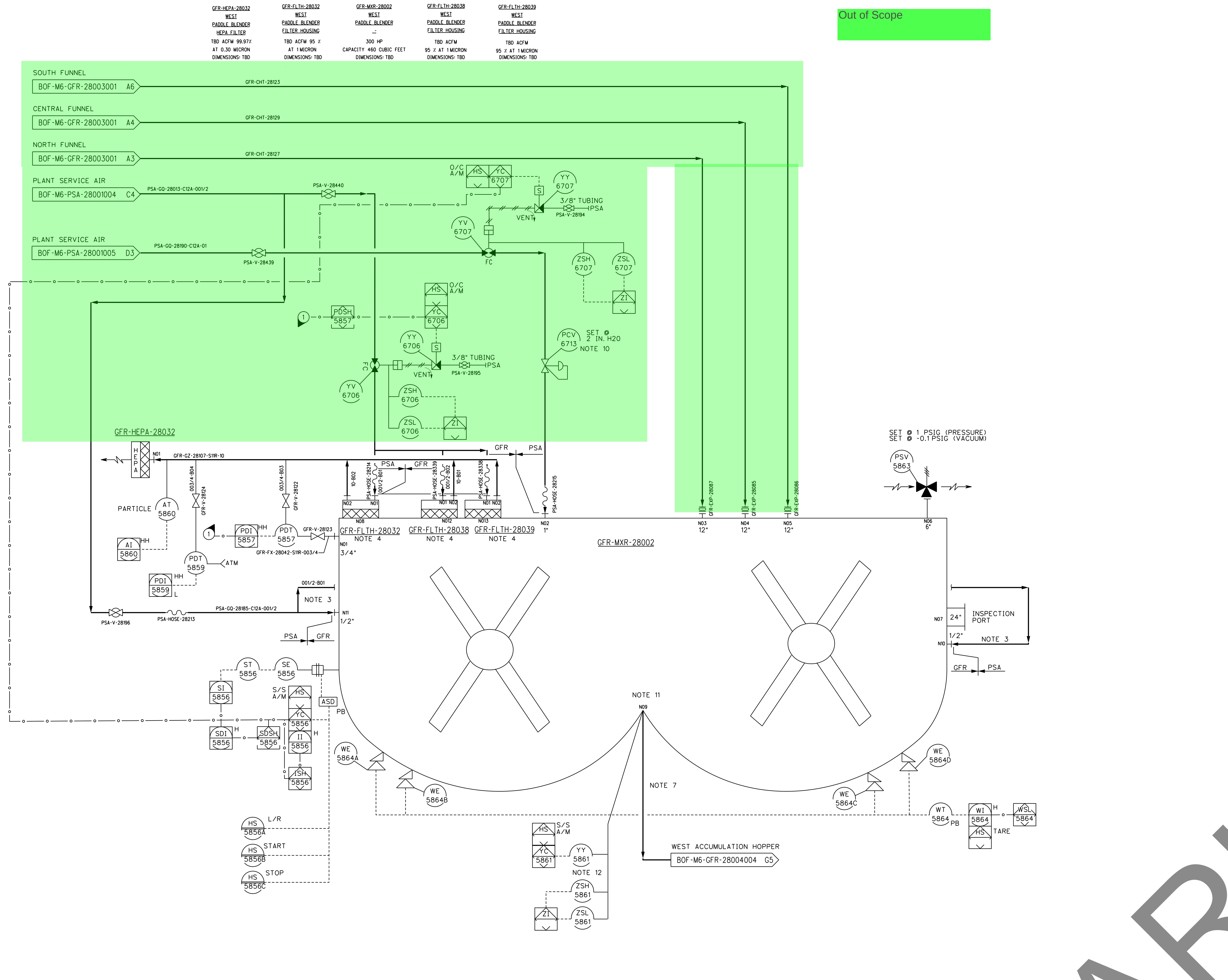
SCALE: NONE
24590-BOF-M6-GFR-28004001
REV 1

E-SIZE 44x34
COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

FORM E_SDN.DGN 02/2009

6/26/2025 8:36:24 AM

PLOTTED BY: cgryson c:\work\jmers...cgryson\dms35754\BOFMEGFR28004001.dgn



NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00010001 THROUGH 24590-WTP-M6-50-00010008 FOR GENERAL NOTES, SYMBOLS AND LEGENDS, AND GENERAL SLOPE REQUIREMENTS.
2. ALL SYSTEMS, STRUCTURES, AND COMPONENTS SHOWN ON THIS DRAWING ARE QUALITY LEVEL CM AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
3. ALL APPURTENANCES REQUIRED FOR SEAL PURGING (SUCH AS PRESSURE AND FLOW DEVICES) ARE PROVIDED WITH BLENDERS, SCREW CONVEYORS, AND ROTARY VALVES.
4. WEST PADDLE BLENDER PULSE JET FILTER.
5. LINES WITHIN THE BOF GFR SYSTEM THAT USE GRAVITY AS THE MOTIVE FORCE ARE OUTSIDE THE SCOPE OF ASME B31.3 PROCESS PIPING AND CONSIDERED AS MATERIAL HANDLING CHUTES. SUCH LINES ARE DISTINGUISHED BY A CHUTE (CHT) COMPONENT TAG NUMBER IN LIEU OF A LINE NUMBER. THE TAGS FOR THESE CHUTES ARE ON DRAWING 24590-BOF-M6-GFR-28003001.
6. DELETED.
7. THE PADDLE BLENDER, EXPANSION JOINT, ACCUMULATION HOPPER, SCREW CONVEYOR, AND SLIDE GATE ARE SEALED TOGETHER WITHOUT ANY INTERMEDIARY CHUTEWORK. THE EQUIPMENT IS SPLIT ACROSS TWO DIFFERENT DRAWINGS FOR CLARITY.
8. DELETED.
9. DELETED.
10. PCV PROVIDED WITH INTEGRAL PRESSURE GAUGE.
11. MIXER TO BE PROVIDED WITH BOMB BAY DOORS.
12. BOMB BAY DOORS CAN BE REMOTELY OPERATED BY THE PCJ.
13. REVISION 1: MAJOR REVISION, NO CHANGE CLOUDS REQUIRED. ADDED BLIND FLANGE TO INSPECTION PORT, NOZZLE SIZES, FLOW ARROWS, DATALINKS, WSL AND NOTES. CORRECTED PIPE CLASS & DRAWING NUMBER ON OFF-SHEET CONNECTOR. ADDED FILTER HOUSINGS. DELETED HOLD 1, NOTE 6, NOTE 8, NOTE 9, YV-5849 AND ASSOCIATED TAGS. UPDATED RELIEF VALVE SETTINGS AND CORRECTED ROOT VALVE SIZES.

HOLD/OPEN ITEMS:

1. DELETED.
2. DELETED.

REFERENCES:

1. 24590-BOF-3ZD-GFR-00001, BOF GLASS FORMERS REAGENT SYSTEM (GFR) SYSTEM DESIGN DESCRIPTION AND GLASSFORMER BAGHOUSE FACILITY (GBF) FACILITY DESIGN DESCRIPTION.

CM QUALITY DESIGNATOR

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	ISSUED FOR CONSTRUCTION (SEE NOTE 13)	SEE STAMPS				
0	ISSUED FOR USE	GC	CK	N/A	PB/NG	12/19/24

REVISION HISTORY

ISSUED BY RPP-WTP PDC
ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	28

	BY	DATE
ORIGINATOR	CHAMOUN, GEORGE	12/18/24
CHECKER	KIRK, CHUCK	12/18/24
APPROVER	BANE, P./GERGELY, N.	12/18/24
REVIEWER	N/A	N/A
APPROVER	SHOEMAKER, J.	12/19/24

CONTENT APPLICABLE TO ALARA? YES X NO
ADR NO. N/A REV: N/A

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
450 HILLS ST.
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - BOF GLASS FORMERS REAGENT SYSTEM WEST PADDLE BLENDER

SCALE: NONE
24590-BOF-M6-GFR-28004002
REV 1

GFR-HEPA-28048	GFR-FLTH-28034	GFR-CNVR-28031	GFR-HPR-28031	GFR-EXP-28053
EAST ACCUMULATION HOPPER HEPA FILTER	EAST ACCUMULATION HOPPER FILTER HOUSING	EAST ACCUMULATION HOPPER SCREW CONVEYOR	EAST ACCUMULATION HOPPER	EAST PADDLE BLENDER EXPANSION JOINT
TBD ACFM 99.97% AT 0.30 MICRON	TBD ACFM 95 % AT 1 MICRON	HORSEPOWER 15 HP RATED FLOW 5.1 TPH	CAPACITY 460 CUBIC FEET DIMENSIONS TBD	DIMENSIONS TBD

Not In Scope

NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00010001 THROUGH 24590-WTP-M6-50-00010008 FOR GENERAL NOTES, SYMBOLS AND LEGENDS, AND GENERAL SLOPE REQUIREMENTS.
2. ALL SYSTEMS, STRUCTURES, AND COMPONENTS SHOWN ON THIS DRAWING ARE QUALITY LEVEL CM AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
3. ALL APPURTENANCES REQUIRED FOR SEAL PURGING (SUCH AS PRESSURE AND FLOW DEVICES) ARE PROVIDED WITH BLENDERS, SCREW CONVEYORS, AND ROTARY VALVES.
4. MANUALLY CONTROLLED DIVERTER VALVE TO REDUCE RISK OF SENDING MIXED GFCS FROM BLENDER TO THE WRONG FACILITY.
5. LINES WITHIN THE BOF GFR SYSTEM THAT USE GRAVITY AS THE MOTIVE FORCE ARE OUTSIDE THE SCOPE OF ASME B31.3 PROCESS PIPING AND CONSIDERED AS MATERIAL HANDLING CHUTES. SUCH LINES ARE DISTINGUISHED BY A CHUTE (CHT) COMPONENT TAG NUMBER IN LIEU OF A LINE NUMBER.
6. DELETED.
7. THE PADDLE BLENDER, EXPANSION JOINT, ACCUMULATION HOPPER, SCREW CONVEYOR, AND SLIDE GATE ARE SEALED TOGETHER WITHOUT ANY INTERMEDIARY CHUTEWORK. THE EQUIPMENT IS SPLIT ACROSS TWO DIFFERENT DRAWINGS FOR CLARITY.
8. DELETED.
9. EAST ACCUMULATION HOPPER PULSE JET BAGHOUSE FILTER.
10. DELETED.
11. ROTARY VALVE VENT LINE SHALL HAVE A MITERED ELBOW AT LINE HIGH-POINT TO ALLOW GFC FLOW TO EITHER DIRECTION. MITER ANGLE TO BE AS SMALL AS FEASIBLE TO PROMOTE FREE FLOW.
12. REMOVABLE SPOOL PROVIDED FOR STARTUP AND MAINTENANCE PURPOSES.
13. REVISION 1: MAJOR REVISION, NO CHANGE CLOUDS REQUIRED. UPDATED AIRSWEEP AIR DELIVERY DESIGN, ADDED AND DELETED INSTRUMENTATION, ADDED VENT LINE TO ROTARY VALVE, AND ADDED SPECIALTY FITTINGS AND PIPING. DELETED HOLDS 1, 2, & 3, NOTE 6, NOTE 8, NOTE 10, YV-5858 AND ASSOCIATED TAGS.

HOLD/OPEN ITEMS:

1. DELETED.
2. DELETED.
3. DELETED.

REFERENCES:

1. 24590-BOF-3ZD-GFR-00001, BOF GLASS FORMERS REAGENT SYSTEM (GFR) SYSTEM DESIGN DESCRIPTION AND GLASSFORMER BAGHOUSE FACILITY (GBF) FACILITY DESIGN DESCRIPTION.

Originator	Checked	Reviewed	Approved	Approved	Approved
By: Sean H. Miller - shmiller, Eng Name: Mech Engineer, Dated: Jul 24, 2025	By: Joseph Guadarrama - jguadarr, Eng Name: BNI - Mechanical, Dated: Jul 25, 2025	N/A	By: Nicholas Gergely - nagergel, Eng Name: Control Systems EOS - Process, Dated: Jul 25, 2025	By: Jeremy Cross - jacross, Eng Name: BNI - Deputy Mechanical EOS, Dated: Jul 25, 2025	By: Jeremie Shoemaker - jrshoema, Eng Name: Knowville Engineering Manager, Dated: Jul 25, 2025

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	ISSUED FOR CONSTRUCTION (SEE NOTE 13)	SEE STAMPS				
0	ISSUED FOR USE	GC	CK	N/A	NG/PB	12/19/24

CM — QUALITY DESIGNATOR

REVISION HISTORY

ISSUED BY RPP-WTP PDC — ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	28

	BY	DATE
ORIGINATOR	CHAMOUN, GEORGE	12/18/2024
CHECKER	KIRK, CHARLES	12/18/2024
APPROVER	BANE, P./GERGELY, N.	12/18/2024
REVIEWER	N/A	N/A
APPROVER	SHOEMAKER, J.	12/19/2024

CONTENT APPLICABLE TO ALARA? [ ] YES [X] NO
ADR NO. N/A REV: N/A

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
450 HILLS ST.
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - BOF GLASS FORMERS REAGENT SYSTEM EAST ACCUMULATION HOPPER

SCALE: NONE

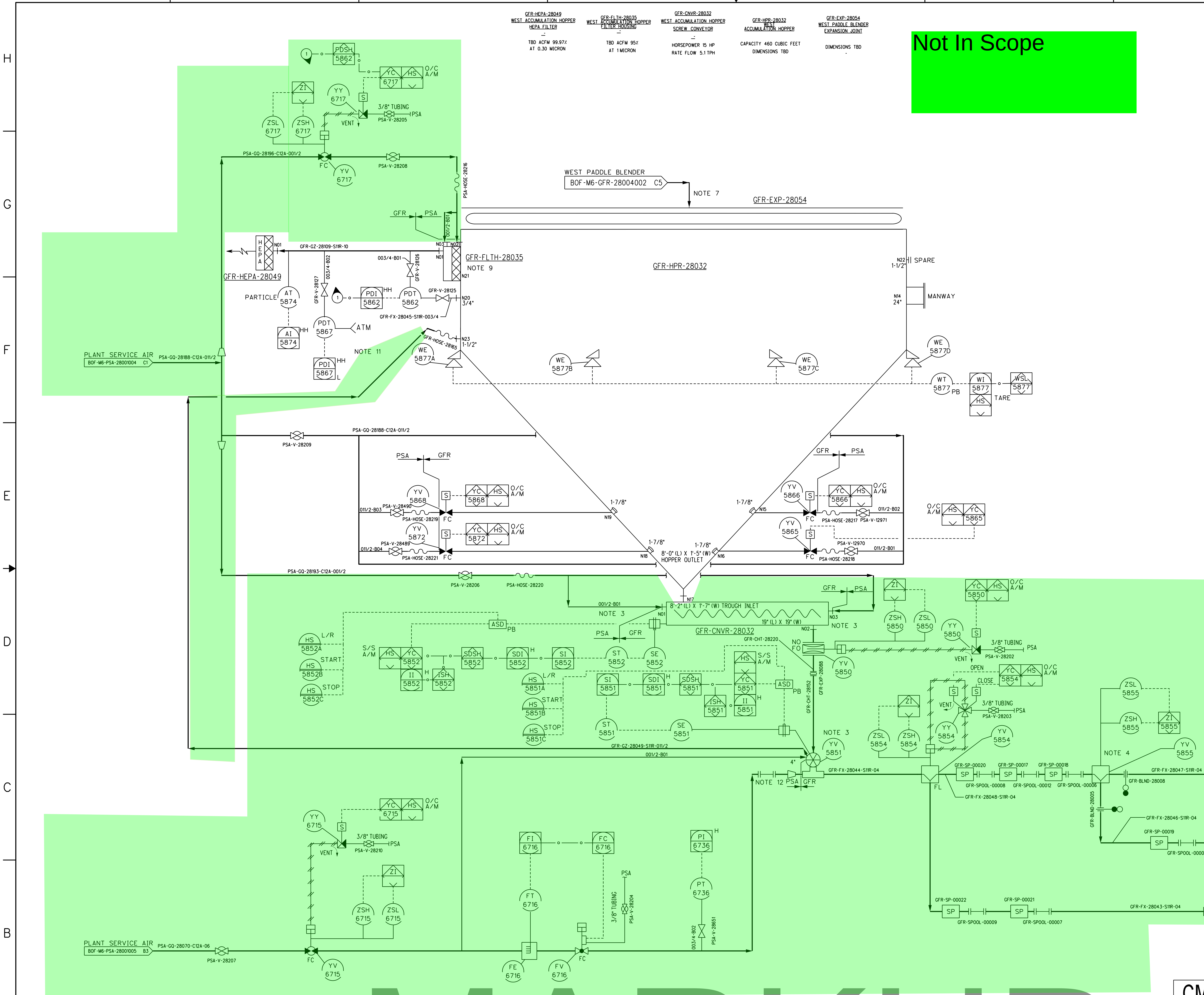
24590-BOF-M6-GFR-28004003 REV 1

E-SIZE 44x34 COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

FORM E_SDN.DGN 02/2009

PLOTTED BY: cgryson c:\work\James...cgryson\dms35754\BOFM6GFR28004003_0.dgn

6/26/2025 9:19:51 AM



NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00010001 THROUGH 24590-WTP-M6-50-00010008 FOR GENERAL NOTES, SYMBOLS AND LEGENDS, AND GENERAL SLOPE REQUIREMENTS.
2. ALL SYSTEMS, STRUCTURES, AND COMPONENTS SHOWN ON THIS DRAWING ARE QUALITY LEVEL CM AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
3. ALL APPURTENANCES REQUIRED FOR SEAL PURGING (SUCH AS PRESSURE AND FLOW DEVICES) ARE PROVIDED WITH BLENDERS, SCREW CONVEYORS, AND ROTARY VALVES.
4. MANUALLY CONTROLLED DIVERTER VALVE TO REDUCE RISK OF SENDING MIXED GFCS FROM BLENDER TO THE WRONG FACILITY.
5. LINES WITHIN THE BOF GFR SYSTEM THAT USE GRAVITY AS THE MOTIVE FORCE ARE OUTSIDE THE SCOPE OF ASME B31.3 PROCESS PIPING AND CONSIDERED AS MATERIAL HANDLING CHUTES. SUCH LINES ARE DISTINGUISHED BY A CHUTE (CHT) COMPONENT TAG NUMBER IN LIEU OF A LINE NUMBER.
6. DELETED.
7. THE PADDLE BLENDER, EXPANSION JOINT, ACCUMULATION HOPPER, SCREW CONVEYOR, AND SLIDE GATE ARE SEALED TOGETHER WITHOUT ANY INTERMEDIARY CHUTEWORK. THE EQUIPMENT IS SPLIT ACROSS TWO DIFFERENT DRAWINGS FOR CLARITY.
8. DELETED.
9. WEST ACCUMULATION HOPPER PULSE JET BAGHOUSE FILTER.
10. DELETED.
11. ROTARY VALVE VENT LINE SHALL HAVE A MITERED ELBOW AT LINE HIGH-POINT TO ALLOW GFC FLOW TO EITHER DIRECTION. MITER ANGLE TO BE AS SMALL AS FEASIBLE TO PROMOTE FREE FLOW.
12. REMOVABLE SPOOL PROVIDED FOR STARTUP AND MAINTENANCE PURPOSES.
13. REVISION 1: MAJOR REVISION, NO CHANGE CLOUDS REQUIRED. UPDATED AIRSWEEP AIR DELIVERY DESIGN, ADDED AND DELETED INSTRUMENTATION, ADDED VENT LINE TO ROTARY VALVE, AND ADDED SPECIALTY FITTINGS AND PIPING. DELETED HOLDS 1, 2, & 3, NOTE 6, NOTE 8, NOTE 10, YV-5858 AND ASSOCIATED TAGS.

HOLD/OPEN ITEMS:

1. DELETED.
2. DELETED.
3. DELETED.

REFERENCES:

1. 24590-BOF-3ZD-GFR-00001, BOF GLASS FORMERS REAGENT SYSTEM (GFR) SYSTEM DESIGN DESCRIPTION AND GLASSFORMER BAGHOUSE FACILITY (GBF) FACILITY DESIGN DESCRIPTION.

Originator — By: Sean H. Miller - shmiller; Org Name: Mech Engineer; Placed: Jun 30, 2025
Checked — By: Joseph Guadarrama - jguadarr; Org Name: BNI - Mechanical; Placed: Jun 30, 2025
Reviewed N/A
Approved — By: Pamela Bane - Pcheral1; Org Name: Mechanical EGS; Placed: Jul 01, 2025
Approved — By: Nicholas Gergely - nagergel; Org Name: Control Systems EGS - Knoxville; Placed: Jul 01, 2025
Approved — By: Jeanette Shoemaker - jmshoema; Org Name: Knoxville Engineering Manager; Placed: Jul 02, 2025

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	ISSUSED FOR CONSTRUCTION (SEE NOTE 13)	SEE STAMPS				
0	ISSUED FOR USE	GC	CK	N/A	PB/NG	12/19/24

REVISION HISTORY

CM
QUALITY DESIGNATOR

ISSUED BY RPP-WTP PDC
ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	28

	BY	DATE
ORIGINATOR	CHAMOUN, GEORGE	12/18/24
CHECKER	KIRK, CHARLES	12/18/24
APPROVER	BANE, P./GERGELY, N.	12/18/24
REVIEWER	N/A	N/A
APPROVER	SHOEMAKER, J.	12/19/24

CONTENT APPLICABLE TO ALARA? [ ] YES [X] NO
ADR NO. N/A REV: N/A

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
450 HILLS ST.
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - BOF GLASS FORMERS REAGENT SYSTEM WEST ACCUMULATION HOPPER

SCALE: NONE
24590-BOF-M6-GFR-28004004
REV 1

'E' SIZE - 44x34
COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

JENIKE & JOHANSON	Data sheet for Mixers	SPECIFICATION NO. 71831.108-20

Client	Bechtel Corporation	Location	Hanford, Washington	Page	1 of 5
Process Unit	Mixers	Item No.	20	By	PMR
Project	BOF GFC storage and transport	Quantity	2	Date	11/1/24
J&J Job No.	71831.108	P&ID no.	~~TBD~~	Datasheet Revision	0

24590-BOF-M6-GFR-28004001/2/3/4
24590-BOF-M6-GFR-28003001

Subcontract no. 24590-CM-FC4-W000-00002

Task Order #10

Design for permanent BOF GFR storage facility for Building 28 at DFLAW and HLW operations

Technical specification for

Mixer (Specification No. 20)

Rev.	Date	Revision description	Prepared by	Checked by	Approved by
0	11/1/24	For Bechtel Review	McKinnon Ray (PMR)	John Cushion (JC)	Eric Maynard (EPM)

TABLE OF CONTENTS

24590-BOF-M6-GFR-28004001/2/3/4
24590-BOF-M6-GFR-28003001

PAGE

1	Cover Sheet
2	Table Of Contents
3	Equipment Data Sheet
4	DFLAW and HLW Blend Concentrations
~~4~~ 5	Summarized particle size and bulk density data

REFERENCES

1	J&J Report no. 71831.103 - 3 - Flow properties test results for 11 GFCs
2	J&J deliverable no. 71831.108 - 1 - Functional design of BLDG. 28 storage & feed equipment for GFRs
3	J&J Report no. 71831.107 - 1 - Flow properties test results for sodium carbonate, borax, one LAW blend, and one HLW blend
4	J&J Report no. 71831.108 - 2 - Functional design recommendations for pneumatic conveying systems for GFCs at Hanford
5	J&J Report no. 71831.108 - 3 - Batch cycle study for Permanent GFR Storage Facility for Building 28

Acronyms

TPH = Tons (short) per hour

NOTES

24590-BOF-M6-GFR-28004001/2/3/4
24590-BOF-M6-GFR-28003001

JENIKE & JOHANSON	Data sheet for Mixers	SPECIFICATION NO. 71831.108-20

Client	Bechtel Corporation	Location	Hanford, Washington	Page	3 of 5
Process Unit	Mixers	Item No.	20	By	PMR
Project	BOF GFC storage and transport	Quantity	2	Date	11/1/24
J&J Job No.	71831.108	P&ID no.	~~TBD~~	Datasheet Revision	0

OPERATING CONDITIONS

Operation		
Mixer will be filled by gravity discharge of GFC through three separate entry ports. Once all GFCs are received, mixer will mix GFCs until evenly dispersed. Once mix is evenly dispersed, GFCs will drop by way of bomb bay doors into accumulation hopper.	Operating temp. :	70 °F (normal, indoors)
	Operating pressure range (gas):	Vacuum: -0.5 psig (TBD, note 1)
		Pressure: 0.5 psig (TBD)

MIXER SPECIFICATIONS AND MATERIAL PROPERTIES

Mixer Specifications		Process Material Characteristics	
Cycle type:	Batch	Materials	All individual GFCs and LAW and HLW blends
Required capacity:	460 CF preferred, note 2	Average particle size:	See Page 5, References 1 and 3
Type of mixer:	Paddle or plow mixer	Material bulk density range:	See Page 5, References 1 and 3
Number of shafts:	TBD, note 3	Moisture:	< 0.4%
Discharge method:	Bomb bay doors	Coefficient of variation (CV):	15%, note 4
Mixing time:	< 10 min. preferred	Shaft seals	Air purge, MECO preferred.
Additional dispersion equip.:	Ports for high speed choppers, note 5	Sampler:	Manual access port for troubleshooting
Support plan	TBD, on load cells	Filter:	Must be reverse pulse clean
Product contact MOC:	Abrasion/corrosion resistance needed, note 6	Dust expolsion protection:	None Required
Additional specifications:	Recommend access doors for maintenance and troubleshooting		

ACCUMULATION HOPPER AND SCREW FEEDER SPECIFICATIONS

Accumulation hopper geometry:	TBD, note 8	Screw feeder:	Single 18 in. screw feeder, note 9 out of scope
Accumulation hopper MOC:	304 stainless steel HRAP plate, #1 mill finish	Additional equip:	Airsweeps required, note 10
Support plan:	TBD, on separate load cells from mixer	Flex joint:	Custom flex joint required between mixer and accumulation hopper to allow weight isolation between units.
Dust expolsion protection:	None Required		
Discharge rate:	5.1 TPH		
Filter:	Must be reversed pulse clean		

INSTRUMENTATION REQUIRED

Mixer Instrumentation

- Motor current, voltage reader
- Variable frequency drive (VFD)
- Speed and zero speed switch
- Safety interlocks
- Torque sensor and limiter
- Load cells

Accumulation Hopper Instrumentation

- Airsweeps (4 total)
- Load cells
- High and High-High level sensors (point level detectors, type TBD)

UTILITIES

Electrical area classification: (note 11)	See Note 12	Compressed air supply required:	Dry compressed instrument air, supply pressure 100 psig
Enclosure ratings:	NEMA 12		

NOTES

1. TBD = To be determined during structural and detailed design phase.
2. Maximum expected batch size is 460 CF, which corresponds to a 87 hour HLW batch. If 87 hour HLW batch is not bounding condition, 390 CF capacity encompasses largest DFLAW batch.
3. To be selected with Vendor input.
4. Maximum 15% CV desired to faciliate transport of GFCs. Uniformity of blend not critical to process chemistry.
5. Only fitting ports for choppers needed at this time. Choppers and motor to be installed separately if required.
6. Abrasion and ~~corrosion~~ corrosion resistant tooling, shaft, and shell required. Arms and paddle must be bolted and mixer trough must have tiled liners to allow for easy maintenance.
7. Not Used.
8. Accumulation hopper geometry will be determined after exact mixer/model selected. Hopper must be designed for mass flow, and converge to an enlongated outlet.
9. Screw feeder geometry will be deterimed after exact mixer/model selected. A single 18 in. screw feeder (similar to Specification 10) is sufficiently sized to hit the required discharge rate and prevent bridging/ratholing. OUT OF SCOPE for Blender supplier - Provided for information only
10. Vendor scope to include 4 Control Concepts model VA-12 (or BUYER approved equal) airsweeps with necessary hardware, valves, accumulators, regulators, controllers, filters, and other misc components. Air consumption for model VA-12 unit is approx. 2 standard cubic ft (scf) per pulse activation at 80 psig.
11. Provide all electrical equipment listed and labeled.
12. Electrical area hazard classification -Unclassified (Non-Hazardous)
13. All instruments and control components are to be provided in compliance with 24590-~~WTP~~-3PS-JQ07-T0002, Bechtel Engineering Specification for Instrumentation and Packaged Systems. HLW

JENIKE & JOHANSON	Data sheet for Mixers	SPECIFICATION NO. 71831.108-20

Client	Bechtel Corporation	Location	Hanford, Washington	Page	4 of 5
Process Unit	Mixers	Item No.	20	By	PMR
Project	BOF GFC storage and transport	Quantity	2	Date	11/1/24
J&J Job No.	71831.108	P&ID no.	~~TBD~~ 24590-BOF-M6-GFR-28004001/2/3/4 24590-BOF-M6-GFR-28003001	Revision	0

DFLAW and HLW Blend Concentrations

	(DF)LAW Component Concentration Ranges			
	% Mass		% Vol.	
GFC	*Min*	*Max*	*Min*	*Max*
Silica	30.7%	43.8%	30.6%	43.2%
Boric acid	15.7%	20.0%	17.5%	22.1%
Cal. silicate	4.9%	14.1%	5.1%	14.7%
Al. silicate	2.5%	11.5%	2.0%	9.4%
Sugar	0.0%	11.2%	0.0%	12.4%
Li. carbonate	0.0%	9.5%	0.0%	10.4%
Iron oxide	4.9%	6.1%	2.8%	3.5%
Zirc. silicate	4.3%	5.2%	2.4%	3.0%
Mag. silicate	3.0%	4.1%	2.5%	3.3%
Zinc oxide	3.3%	4.0%	6.1%	7.2%
Ti. dioxide	1.3%	1.7%	1.6%	2.0%
Borax	0.0%	0.0%	0.0%	0.0%
Soda ash	0.0%	0.0%	0.0%	0.0%

	HLW Component Concentration Ranges			
	% Mass		% Vol.	
GFC	*Min*	*Max*	*Min*	*Max*
Silica	45.8%	47.4%	42.8%	45.0%
Borax	26.7%	32.7%	29.8%	35.9%
Soda ash	10.1%	12.9%	8.5%	11.1%
Li. carbonate	7.9%	8.5%	8.3%	8.7%
Al. silicate	0.0%	2.9%	0.0%	2.3%
Zinc oxide	1.9%	2.1%	3.3%	3.7%
Boric acid	0.0%	0.0%	0.0%	0.0%
Cal. silicate	0.0%	0.0%	0.0%	0.0%
Iron oxide	0.0%	0.0%	0.0%	0.0%
Ti. dioxide	0.0%	0.0%	0.0%	0.0%
Zirc. silicate	0.0%	0.0%	0.0%	0.0%
Mag. silicate	0.0%	0.0%	0.0%	0.0%
Sugar	0.0%	0.0%	0.0%	0.0%

Electrical Characteristics				
Basic Data		UNIT	UNUSUAL SERVICE CONDITIONS: (YES / NO)	
RATED HORSEPOWER		HP	FLAMMABLE OR EXPLOSIVE GASES	
SYNCHRONOUS SPEED		RPM	COMBUSTIBLE, EXPLOSIVE, ABRASIVE, OR CONDUCTIVE DUST	
NEMA DESIGN TYPE (B, C, OTHER)		-	WET OR DRY OPERATING CONDITIONS	
EFFICIENCY (PREMIUM for continuous duty, STANDARD for Intermittent duty)		-	NUCLEAR RADIATION	
ENCLOSURE TYPE (TEFC, TENV, WPII, etc.)		-	SPECIAL PAINTING REQUIREMENTS PER IEEE Std. 841	
SERVICE FACTOR		-	OTHER (Quality Q)	
COUPLED DRIVE (DIRECT, BELT, GEAR)		-	OTHER (SEISMIC CATEGORY III or IV)	
SPACE HEATER (FOR OUTDOOR MOTORS > 20 HP)		W		

24590-BOF-M6-GFR-28004001/2/3/4
24590-BOF-M6-GFR-28003001

JENIKE & JOHANSON	Data sheet for Mixers	SPECIFICATION NO. 71831.108-20

Client	Bechtel Corporation	Location	Hanford, Washington	Page	5 of 5
Process Unit	Mixers	Item No.	20	By	PMR
Project	BOF GFC storage and transport	Quantity	2	Date	11/1/24
J&J Job No.	71831.108	P&ID no.	~~TBD~~	Revision	0

Summarized particle size and bulk/particle density data

Table 3: Particle size distribution test results summary

Material	At 0.5 bar dispersion pressure			At 3.0 bar dispersion pressure		
	D10, µm	D50, µm	D90, µm	D10, µm	D50, µm	D90, µm
Aluminum silicate : 0.15% mc	2	22	80	2	22	81
Boric acid : 0.06% mc	153	357	660	126	328	611
Calcium silicate : 0.15% mc	6	17	43	5	16	41
Ferric oxide : 0.37% mc	1	16	60	1	20	64
Lithium carbonate : 0.23% mc	38	269	510	21	248	492
Magnesium silicate : 0.22% mc	5	33	73	4	33	72
Silica : 0.16% mc	3	23	66	2	23	66
Sucrose : 0.07% mc	243	439	731	87	356	651
Titanium dioxide : 0.13% mc	1	17	99	1	2	96
Zinc oxide : 0.21% mc	1	8	19	0	1	6
Zirconium silicate : 0.1% mc	3	18	45	2	17	44

Table 5: Particle size distribution test results summary

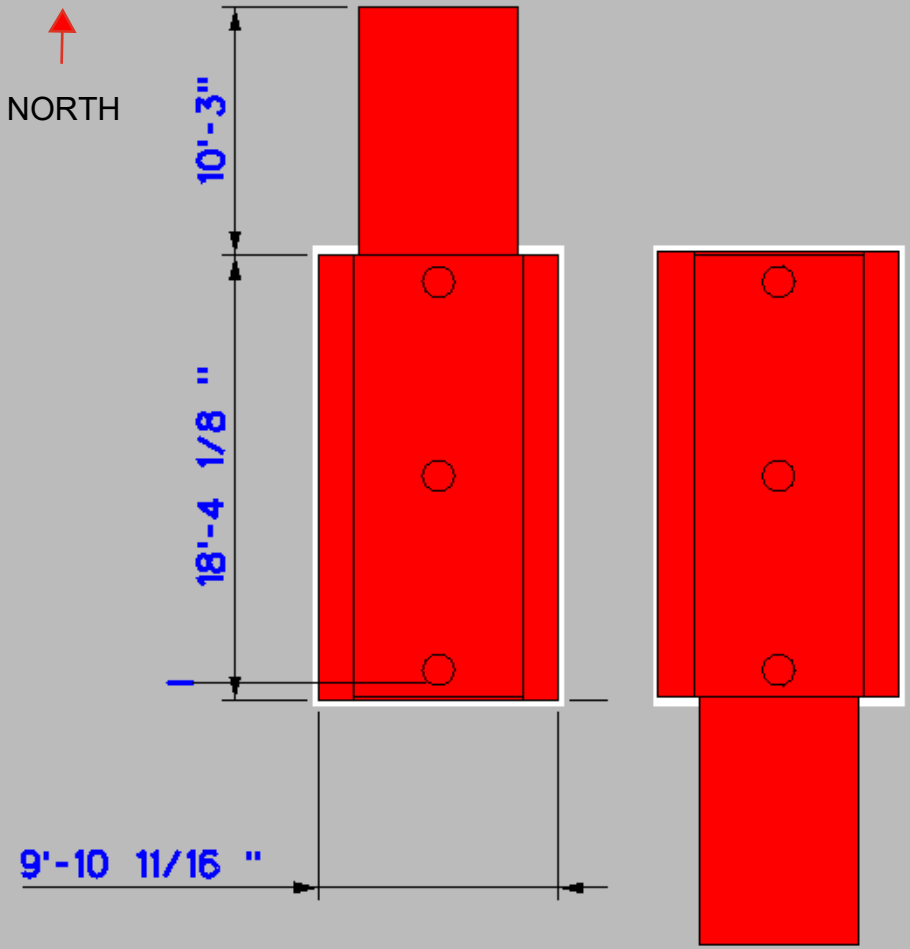
Material	At 0.5 bar dispersion pressure			At 3.0 bar dispersion pressure		
	D10, µm	D50, µm	D90, µm	D10, µm	D50, µm	D90, µm
Borax : 1.2% mc	302	730	1363	175	674	1331
Sodium carbonate : 0.02% mc	182	333	570	36	252	503
LAW Blend 1 – Max Silica : 0.06% mc	6	188	583	6	170	586
HLW Blend 3 – HLW98 96 : 0.38% mc	12	277	686	8	143	584

Table 6: Compressibility and Particle density test results summary

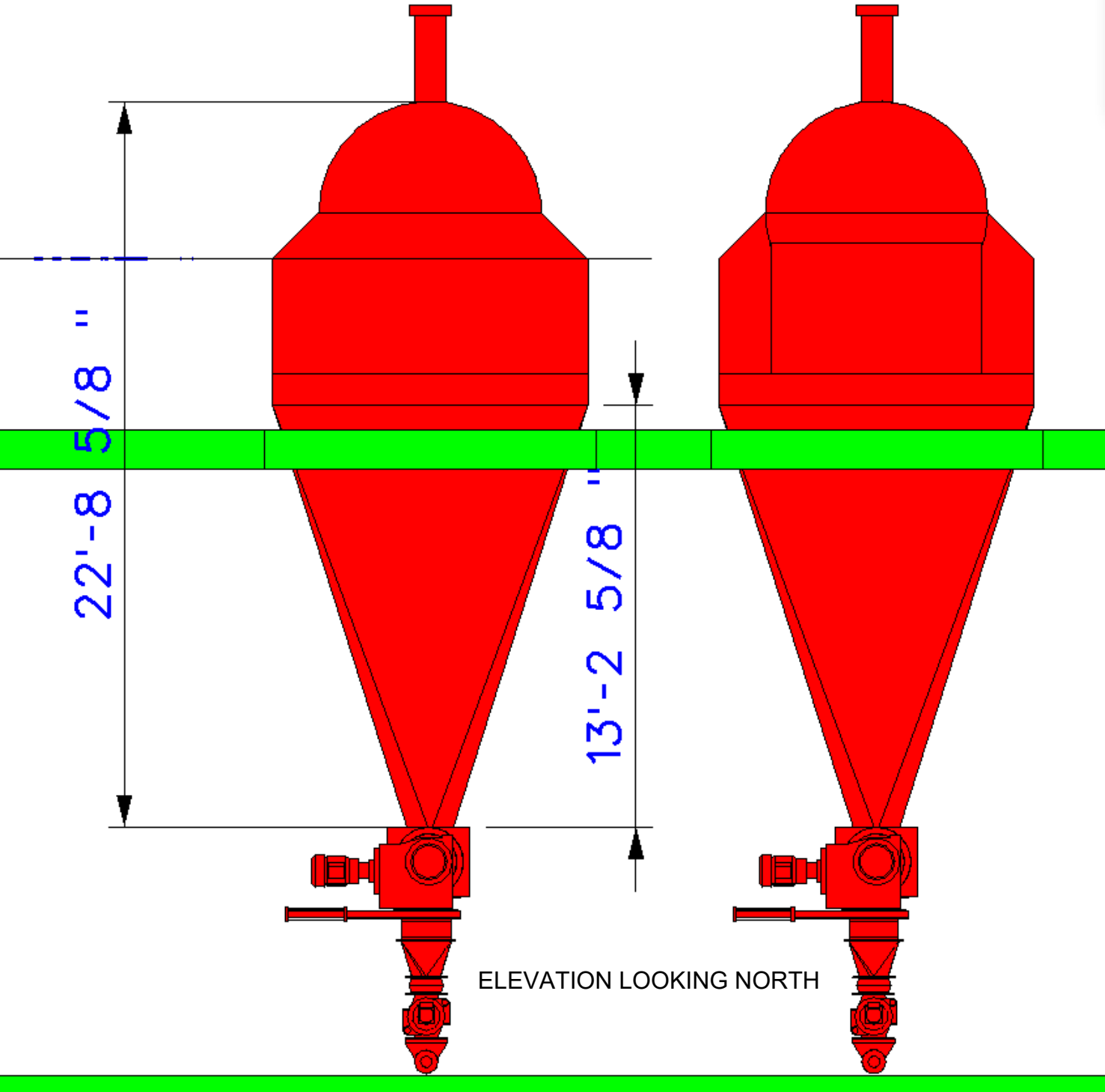
Material	Measured bulk density range [pcf]	Particle density average [pcf]
Aluminum silicate : 0.15% mc	78 – 114	204
Aluminum silicate : 4.8% mc	56 – 97	---
Boric acid : 0.06% mc	56 – 62	87
Boric acid : 4.3% mc	39 – 56	---
Calcium silicate : 0.15% mc	60 – 78	177
Calcium silicate : 4.4% mc	35 – 71	---
Ferric oxide : 0.37% mc	115 – 153	273
Ferric oxide : 4.7% mc	90 – 137	---
Lithium carbonate : 0.23% mc	55 – 64	116
Lithium carbonate : 4.6% mc	45 – 64	---
Magnesium silicate : 0.22% mc	78 – 104	185
Magnesium silicate : 4.5% mc	56 – 95	---
Silica : 0.16% mc	61 – 90	173
Silica : 4.5% mc	44 – 78	---
Sucrose : 0.07% mc	54 – 58	96
Sucrose : 4.4% mc	49 – 69	---
Titanium dioxide : 0.13% mc	51 – 101	245
Titanium dioxide : 4.6% mc	62 – 98	---
Zinc oxide : 0.21% mc	34 – 72	304
Zinc oxide : 4.7% mc	48 – 80	---
Zirconium silicate : 0.1% mc	109 – 150	281
Zirconium silicate : 4.7% mc	76 – 132	---

Table 8: Compressibility and Particle density test results summary

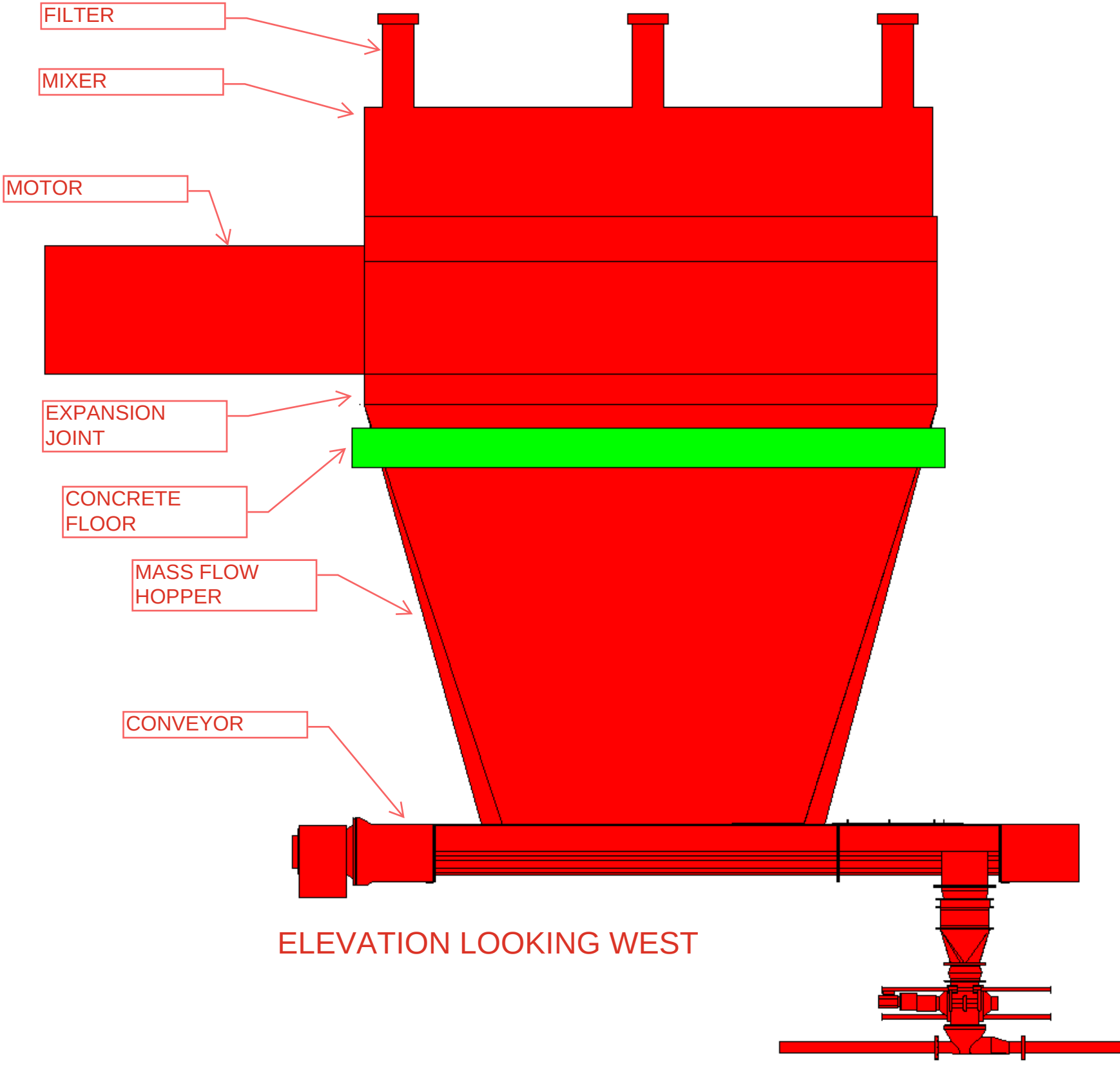
Material	Measured bulk density range [pcf]	Particle density average [pcf]
Borax : 1.2% mc	59 - 61	114
Borax : 5.9% mc	63 - 65	
Sodium carbonate : 0.02% mc	67 - 70	142
Sodium carbonate : 4.5% mc	72 - 74	
LAW Blend 1 – Max Silica : 0.06% mc	64 - 91	Not tested
LAW Blend 1 – Max Silica : 4.3% mc	49 - 91	
HLW Blend 3 – HLW98-96 : 0.38% mc	65 - 91	Not tested
HLW Blend 3 – HLW98-96 : 4.5% mc	53 - 81	



PLAN VIEW



ELEVATION LOOKING NORTH



ELEVATION LOOKING WEST

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

BOF GFR Paddle Blenders

Content applicable to ALARA?	☐ **Yes** ☒ **No**	**Quality Level**
ADR No. N/A	**Rev** N/A	CM
Retroactive applicability:	☒ **N/A** *(alpha revision or revision 0)*	DOE Contract No. DE-AC27-01RV14136

REV	DATE	BY	CHECK	AUTHORIZATION	APPROVER
		Originator By: George Chamoun - gchamoun Org Name: BNI (Knoxville, TN) - Mech. Engineer Placed: Feb 25, 2025	**Checked** By: Zachary Cross - zacross Org Name: BNI Mechanial Systems Placed: Feb 25, 2025		**Approved** By: Pamela Bane - Pcheral1 Org Name: Mechanical EGS Placed: Feb 26, 2025
0	02/10/2025	George Chamoun	Zachary Cross	N/A	**Approved** By: Jeanette Shoemaker - jmshoema Org Name: Bechtel Placed: Mar 05, 2025

SPECIFICATION No.	**Rev**
24590-BOF-3PS-MFBR-T0001	0

Revision History

Revision	Reason for Revision	Q Specification Revision Only Margin Reduced?		CM Only
		YES	NO	N/A
0	Issued for Use	N/A	N/A	N/A
		☐	☐	☐
		☐	☐	☐
		☐	☐	☐

Contents

1 Scope 1
1.1 Project Description and Location 1
1.2 Equipment, Material, and Services Required 1
1.3 Work by Others 2
1.4 Design and Supply Approach 4
1.5 Definitions 4
1.6 Safety/Quality Classifications 4
2 Applicable Documents 5
2.1 General Requirements 5
2.2 Codes 5
2.3 Industry Standards 7
2.4 Engineering Standards 7
2.5 WTP Reference Documents &Drawings 7
3 Design Requirements 10
3.1 Basic Function 10
3.2 Performance 12
3.3 Design Conditions 13
3.4 Environmental Conditions 17
3.5 Mechanical Requirements 17
3.6 Loadings and Structural Requirements 18
3.7 Fire Protection Requirements 18
3.8 Electrical Requirements 18
3.9 Instrumentation and Control Requirements 20
3.10 Fail State Requirements 20
3.11 Accessibility and Maintenance 21
3.12 Failure Effects Requirements 21
3.13 Personnel Protection Requirements 21
3.14 Noise Requirements 21
4 Materials 21
4.1 Construction 21
4.2 Prohibited Materials 23
4.3 Special Requirements 23
4.4 Painting & Coating 24
4.5 Equipment Tagging 24

5 Fabrication 25
5.1 General Fabrication Requirements 25
5.2 Welding –Carbon Steel & Stainless Steel 26
5.3 Specific Fabrication Requirements 26
5.4 Assembly – Interior of Accumulation Hoppers 27
5.5 Heat Treatment 27
5.6 Weld Passivation 27
5.7 Weld Inspection 27
6 Tests and Inspections 28
6.1 General Requirements 28
6.2 Personnel Qualifications 28
6.3 Non-Destructive Examinations 29
6.4 Factory Acceptance Tests - General Requirements 29
6.5 Factory Acceptance Test Functional Requirements 30
7 Preparation for Shipment 31
7.1 General Requirements 31
7.2 Cleanliness 31
7.3 Painting 31
7.4 Shipment Tagging 32
7.5 Packaging 32
7.6 Storage of Special Materials (e.g., stainless steel) prior to work 32
7.7 Shipping Preparation, Documentation, and Transport 33
8 Quality Assurance 33
8.1 QA requirements specific to item(s) or service 33
9 Configuration Management 33
9.1 General Configuration Management 33
10 Documentation and Submittals 33
10.1 General 33
10.2 Meetings 34
10.3 Progress Meetings 34
10.4 Submittals 36
10.5 Controls 40
10.6 Material Test Reports 41
10.7 Electrical Tests 41
10.8 Factory Acceptance Test 41
10.9 Welding and Material Identification Procedures 42

10.10 Spare Parts List 42
10.11 Manuals 42
10.12 Schedules 44

Appendices

Appendix A - Acronyms and Abbreviations A-1

Tables

Table 1-1 Scope of Work: East and West Paddle Blender Equipment List 1
Table 1-2: Related Work, Not Included in Scope for Seller 3
Table 1-3: Definitions 4
Table 3-1: Batch Volumes 12
Table 3-2: GFR Facility, Internal Temperature & Humidity Conditions 17
Table 10-1: Software Function Sequence 38
Table 10-2: Acronyms and Abbreviations A-1

Figures

Figure 1: Simple Schematic of Paddle Blenders & other Equipment. The schematic applies to both the East and West assemblies. 11

1 Scope

1.1 Project Description and Location

1.1.1 The Office of River Protection (ORP) and its contractors manage 177 underground radioactive waste storage tanks at the Hanford Site in Washington. These tanks contain approximately 56 million US gallons of radioactive waste. Bechtel National, Inc. (BNI) has entered a contract with the US Department of Energy to design, construct, and commission the Hanford Tank Waste Treatment and Immobilization Plant (WTP) to process and vitrify this waste into a stable form that is suitable for permanent storage. The WTP will be constructed in the 200 East Area of the Hanford Site, near Richland, Washington.

1.1.2 The purpose of the BOF GFR system is to receive, store, blend, and transport glass forming chemicals (GFCs) to the LAW and HLW vitrification facilities. The BOF GFR supplies glass former chemical batches with a consistent and reliable composition as required by the vitrification facilities. The BOF GFR system includes the Glassformer Baghouse Facility (GBF) (Building 28), which contains the Silo Pad and the Bag Storage Facility, and the transport lines to the LAW and HLW facilities. The Silo Pad stores GFCs in silos along with various equipment to receive, blend, and transfer GFCs. The Bag Storage Facility houses GFCs in bags, measures out GFCs, and transports GFCs to the Silo Pad. The boundary of the BOF GFR system stops 5 feet outside of LAW and HLW facilities.

1.2 Equipment, Material, and Services Required

1.2.1 This specification covers the minimum technical requirements for the design, furnishing of materials, fabrication, assembly, shop test and/or testing, and delivery of the equipment listed in Table 1-1 below. The scope of work shall include all mounting hardware such as interface gaskets, fasteners, etc.

Table 1-1 Scope of Work: East and West Paddle Blender Equipment List

No.	Component Tag No.	Description
2.	24590-BOF-MF-GFR-MXR-28001	East Paddle Blender
3.	24590-BOF-MT-GFR-HPR-28031	East Accumulation Hopper
4.	24590-BOF-PY-GFR-EXP-28053	East Paddle Blender’s Expansion Joint
5.	24590-BOF-MK-GFR-FLTH-28031	East Paddle Blender’s Filter Housing
6.	24590-BOF-MK-GFR-HEPA-28031	East Paddle Blender’s HEPA Filter
7.	24590-BOF-MK-GFR-FLTH-28034	East Accumulation Hopper’s Filter Housing
8.	24590-BOF-MK-GFR-HEPA-28048	East Accumulation Hopper’s HEPA Filter
9.	24590-BOF-MF-GFR-MXR-28002	West Paddle Blender
10.	24590-BOF-MT-GFR-HPR-28032	West Accumulation Hopper
11.	24590-BOF-PY-GFR-EXP-28054	West Paddle Blender’s Expansion Joint
12.	24590-BOF-MK-GFR-FLTH-28032	West Paddle Blender’s Filter Housing
13.	24590-BOF-MK-GFR-HEPA-28032	West Paddle Blender’s HEPA Filter
14.	24590-BOF-MK-GFR-FLTH-28035	West Accumulation Hopper’s Filter Housing
15.	24590-BOF-MK-GFR-HEPA-28049	West Accumulation Hopper’s HEPA Filter

1.2.2 For equipment and services covered by this specification and the accompanying PURCHASE ORDER, SELLER's scope of work shall include, but is not limited to:

1.2.2.1 Preparation of drawings (such as detailed design, shop fabrication, installation, electrical, control & instrumentation) and other technical supporting documents (Section 10).

1.2.2.2 Procurement of components and materials identified in the Scope of Work (Table 1-1), and the drawings and datasheets listed in Sections 2.5.6 and 2.5.7.

1.2.2.3 Complying with Design, Material, and Fabrication Requirements in Sections 3, 4, and 5.

1.2.2.4 Performing equipment testing and inspections in section 6.

1.2.2.5 Preparation for Shipment (Section 7), including fabrication of any required shipping support frames, handling beams, tie-down fixtures and special assembly tools.

1.2.2.6 Loading of equipment on BUYER arranged conveyance.

1.2.2.7 Field support, technical assistance, and SELLER's expert guidance for construction, installation, and start-up of equipment to ensure satisfactory operation in accordance with the requirements of the PURCHASE ORDER.

1.2.2.8 Shipping to the United States, if equipment and components originate outside of the contiguous 48 states.

1.2.2.9 All the attached instruments, valves (e.g., pressure relief valve, air sweeps and fittings (e.g., expansion joints) shown in the P&IDs (Sec. 2.5.6) are in scope.

1.3 Work by Others

1.3.1 Design of major components and system functionality, including GFC analysis and off-the-shelf equipment selection preferences.

1.3.2 The structural design for the accumulation hoppers and expansion joints shall be provided by the SELLER in the form of datasheets, but the detailed design (including integration) shall be developed by the BUYER.

1.3.3 Transportation of equipment and materials within the continental United States to the JOBSITE.

1.3.4 JOBSITE unloading and storage prior to installation.

1.3.5 JOBSITE labor and equipment for initial field tests and for acceptance tests.

1.3.6 Design, supply, and installation of structural building supports for all major components. Note this is for the design of the building's structural supports, and not the structural design of the equipment.

1.3.7 Design, supply, and installation of all maintenance access platforms and their associated supports.

1.3.8 BUYER will supply one 480 Volt, 3 phase, 2 sets of 3 wire with Ground, 60 hertz power source (LVE-LC-28001) to the SELLER furnished equipment.

1.3.9 Field touch-up painting.

1.3.10 BUYER will perform all necessary system integration to develop control system programming in accordance with SELLER supplied Software Documentation.

1.3.11 The BUYER will provide cable, raceways, conduit, conduit supports, trays, and grounding points from the BUYER supplied MCC based on SELLER supplied electrical design.

1.3.12 Supply, transportation, and disposal of GFCs required for SELLER Factory Acceptance Tests and BUYER Site Tests.

1.3.13 Structures, Systems, or Components (SSCs) referred to within the body of this specification and listed in Table 1-2, Related Work Not Included are specifically excluded from the SELLER's scope of work.

Table 1-2: Related Work, Not Included in Scope for Seller

Item	Referenced SSC	Additional SSC Description (including Sub-components)
1.	Foundations	Design, supply, and installation of all concrete foundations and embedded items.
2.	Embeds	Embedded items to which the supplied equipment, when installed, is anchored.
3.	Anchor Bolts	
4.	Structural building supports	
5.	Power Feed System	Secondary Unit Substation, LVE-LC-28001, 480V, 3PH, 3W + Ground, 60HZ. Power feeders, raceway, conduit from Secondary Unit Substation (LVE-LC-28001) to the equipment.
6.	Utility Tubing	Instrument tubing and fittings between BUYER utilities and SELLER instruments
7.	Installation on BUYER site	SELLER shall provide technical support for site installation, erection, and testing.
8.	Startup Testing on BUYER site	SELLER shall provide technical support for site installation, erection, and testing.

9.	Supply and programming of controllers for BUYER's control system	

1.4 Design and Supply Approach

1.4.1 Detailed design and fabrication requirements are found in Section 4.

1.4.2 The features, components, materials, and design concepts depicted in the data sheets and detailed design drawings are considered by the BUYER to be capable of meeting the required functional requirements and facility interface design constraints imposed by this specification. Any proposed design improvements by the SELLER shall result in benefits associated with the following: safety, quality, reliability, fabrication/construction, installation, testing, maintenance, performance, cost, or schedule.

1.4.3 A Supplier Deviation Disposition Request (SDDR) shall be submitted to obtain BUYER approval for changes to mandatory technical requirements and design features.

1.5 Definitions

1.5.1 For definitions of terms used in this specification, refer to Table 1-3.

Table 1-3: Definitions

Owner	DOE U.S. Government.
BUYER	Bechtel National, Incorporated.
JOBSITE	Hanford Tank Waste Treatment and Immobilization Plant (WTP).
SELLER	The party to whom the contract for work described herein has been awarded.
Shall	Indicates a mandatory requirement for all actions of the SELLER.
Should	SELLER is encouraged to comply but not required.

1.5.2 For a list of acronyms and abbreviations used in this specification, refer to Table 10-2: Acronyms and Abbreviations.

1.6 Safety/Quality Classifications

1.6.1 All equipment under this specification shall be designed as Seismic Category (SC)-III. See section 2.5.1.1.

1.6.2 All manufactured products associated with this specification are Commercial Grade (CM).

2 Applicable Documents

2.1 General Requirements

2.1.1 Work shall be performed in accordance with the referenced codes, standards, and documents listed in this section.

2.1.2 When specific chapters, sections, parts, or paragraphs are listed following a code, industry standard, or referenced document, only those chapters, sections, parts, or paragraphs of the document shall be applied. When more than one code, standard, or reference document covers the same topic, the requirements for all shall be met with the most stringent governing.

2.1.3 In case of conflict between this specification and referenced codes and standards, the more stringent requirement shall apply. All conflicts shall be brought to the attention of the BUYER.

2.1.4 For the codes and standards listed below, the specific revision or effective date identified, as well as the specific revision or effective date of codes and standards that they incorporate by reference, such as daughter codes and standards, shall be followed. If a date or revision is not identified, the latest issue, including addenda, at the time of quotation shall apply.

2.1.5 The SELLER shall utilize industry consensus standards and commonly accepted practices appropriate for the equipment in the absence of a listed standard. If a listed practice, national standard, or common approach is not followed, the SELLER shall be required, upon request from the BUYER, to provide appropriate justification for any deviations from these accepted practices.

2.1.6 The years of the codes referenced in this specification supersede the years referenced within any of the supporting specifications or documents.

2.2 Codes

2.2.1 U.S. Code of Federal Regulations

2.2.1.1 29 CFR Part 1910, Occupational Safety and Health Standards

2.2.1.2 29 CFR Part 1910.1200(g), Hazard Communication Standard

2.2.2 American Society of Mechanical Engineers (ASME)

2.2.2.1 ASME Y14 series, Drawing Standards

2.2.2.2 ASME Section V – 2023, Boiler Pressure Bessel Code Section V Nondestructive Examination

2.2.2.3 ASME BPVC Section IX – 2023, Welding, Brazing, and Fusing Qualifications

2.2.2.4 ASME B31.3-1996, Process Piping (*for piping*)

2.2.2.5 ASME B31.3-2022, Process Piping (*for materials, fabrication, examinations, and testing*)

2.2.2.6 ASME B16.5-2020, Pipe Flanges and Flanged Fittings

2.2.3 American Society for Nondestructive Testing (ASNT)

2.2.3.1 SNT-TC-1A - 2024, Personnel Qualification and Certification in Nondestructive Testing

2.2.4 American Welding Society (AWS)

2.2.4.1 AWS D1.1 - 2020, Structural Welding Code – Steel

2.2.4.2 AWS D1.6 - 2017, Structural Welding Code – Stainless Steel

2.2.4.3 AWS D1.3 - 2018 Structural Welding Code - Sheet Steel

2.2.5 National Fire Protection Association (NFPA)

Sucrose has been replaced with a non-combustible blend of silica, boric acid and sucrose. No explosion suppression is required.

2.2.5.1 ~~NFPA 68 – 2023, Venting of Deflagrations~~

2.2.5.2 ~~NFPA 69 - 2019, Explosion prevention systems~~

2.2.5.3 NFPA 70 - 2023, National Electrical Code (NEC), 2023 edition

2.2.5.4 ~~NFPA 652 - 2019, Combustible Dust~~

2.2.5.5 ~~NFPA 654 - 2020, Standard for Prevention of Fire and Dust Explosions~~

2.2.6 National Electrical Manufacturers Association (NEMA)

2.2.6.1 NEMA 250 - 2020 Standard Enclosures for Electrical Equipment (1000 Volts Maximum)

2.2.6.2 NEMA WC 57 - 2021, Standard for Control, Thermocouple Extension, and Instrumentation Cables

2.2.6.3 NEMA MG1 - 2021, Motors and Generators

2.2.7 Underwriters Laboratories, Inc. (UL)

2.2.7.1 UL 467 - 2022, Standard for Safety Grounding and Bonding

2.2.7.2 UL 1581 - 2023, Reference Standard for Electrical Wires, Cables, and Flexible Cords

2.2.7.3 UL 508A – 2018, Standard for Safety Industrial Control Panels

2.2.8 Eurocode

2.2.8.1 BS EN – 1991-4:2006, Eurocode 1 – Actions on structures, Part 4: Silos and tanks, June 2006

2.3 Industry Standards

2.3.1 Association for Materials Protection and Performance

2.3.1.1 SSPC-PA-2-2022, Procedure for Determining Conformance to Dry Coating Thickness Requirements

2.4 Engineering Standards

N/A – already covered in the other subsections of Sec. 2.

2.5 WTP Reference Documents &Drawings

2.5.1 Documents: Fabrication & Construction

2.5.1.1 24590-WTP-3PS-FB01-T0002, Rev 0, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks for HLW Support Facilities

2.5.1.2 24590-WTP-3PS-G000-T0003, Rev 3, Engineering Specification for Packaging, Handling, and Storage Requirements

2.5.1.3 24590-WTP-3PS-G000-T0005, Rev 5, Engineering Specification for Cleanness Requirements for WTP Fluid Systems

2.5.1.4 24590-WTP-3PS-M000-T0002, Rev 4, General Specification for Mechanical Handling Equipment Design and Manufacture

2.5.1.5 24590-WTP-3PS-P000-T0001, Rev. 6, Piping Material Classes General Description and Summary

2.5.1.6 24590-WTP-3PB-P000-TC12A, Rev. 33, Engineering Specification for Piping Material Classification Pipe Class C12A

2.5.1.7 24590-WTP-3PB-P000-TS11R, Rev. 13, Engineering Specification for Piping Material Classification Pipe Class S11R

2.5.1.8 24590-WTP-3PS-SS00-T0002, Rev. 9, Engineering Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel

2.5.1.9 24590-WTP-3PS-SS00-T0001, Rev. 9, Engineering Specification for Welding of Structural Carbon Steel

2.5.2 **Coatings Documents**

2.5.2.1 24590-WTP-3PS-AFPS-T0001, Rev 5, Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment

2.5.3 **Documents: Electrical, Instrumentation & Controls Documents**

2.5.3.1 24590-WTP-3PS-EKP0-T0001, Rev. 5, Engineering Specification for Electrical Requirements for Packaged Equipment

2.5.3.2 24590-WTP-3PS-EV00-T0001, Rev. 2, Engineering Specification for Low Voltage Adjustable Speed Drives

2.5.3.3 24590-HLW-3PS-JQ07-T0002, Rev. 0, Engineering Specification for Instrumentation for Packaged Systems

2.5.3.4 24590-HLW-3PS-MUMI-T0002, Rev. 0, Engineering Specification for Low Voltage Induction Motors

2.5.4 **Documents: Software**

2.5.4.1 24590-HLW-3PS-JQ00-T0004, Rev. 0, Engineering Specification for Management of Supplier Software and Firmware

2.5.4.2 24590-HLW-3PS-JQ00-T0005, Rev. 0, Engineering Specification for Management of Supplier Safety Software and Firmware for HLW and DFHLW Supporting Facilities

2.5.5 **Documents: General Design & Materials**

2.5.5.1 24590-WTP-LIST-ESH-16-0001, Rev. 11, Restricted Materials List

2.5.5.2 24590-CM-FC4-W000-00002-01-00010, Rev. A, Report – Final Report 71831.103-3 providing flow properties test results for 11 Glass Forming Chemicals

2.5.5.3 24590-BOF-POSP-PENG-17- 00002, Rev 0, Glass Former Chemicals Physical Property Requirements, para 4.1, and SDS Sheets)

2.5.6 **Design Drawings**

2.5.6.1 24590-BOF-M6-GFR-28003001, Rev 0, GFR Funnel Assembly (P&ID)

2.5.6.2 24590-BOF-M6-GFR-28004001, Rev 0, GFR East Paddle Blender (P&ID)

2.5.6.3 24590-BOF-M6-GFR-28004002, Rev 0, GFR West Paddle Blender (P&ID)

2.5.6.4 24590-BOF-M6-GFR-28004003, Rev 0, GFR East Accumulation Hopper (P&ID)

2.5.6.5 24590-BOF-M6-GFR-28004004, Rev 0, GFR West Accumulation Hopper (P&ID)

2.5.6.6 ~~24590-BOF-M6-GFR-28005001, Rev 0, GFR Reject Bin (P&ID)~~

2.5.6.7 24590-BOF-P1-28-00005, Rev 0, WTP Glassformer Baghouse Facility, Silo Area General Arrangement Silo Area Plan at El. 0'0" and El. 20'-3"

2.5.6.8 24590-BOF-P1-28-00009, Rev 0, WTP Glassformer Baghouse Facility General Arrangement Silo Area Section C-C

2.5.6.9 24590-BOF-P1-28-00010, Rev 0, WTP Glassformer Baghouse Facility General Arrangement Silo Area Section D-D

2.5.7 **Data Sheets & Specifications**

2.5.7.1 24590-CM-FC4-W000-00002-04-00025, Rev A Data Sheet for Mixers

2.5.7.2 24590-BOF-JVD-GFR-28001, Rev A, Instrument Datasheet: Solenoid with Air Sweeps

2.5.7.3 24590-WTP-3PS-EV00-T0001, Rev 2, Engineering Specification for Low Voltage Adjustable Speed Drives (Non-Safety)

2.5.7.4 24590-HLW-EVD-C3V-00007, Rev 1, Electrical Data Sheet: Adjustable Speed Drive

2.5.7.5 24590-CM-FC4-W000-00002-04-00018, Rev A, Datasheet for Single 18in Mass Flow Screw Feeders

2.5.7.6 24590-BOF-J0X-J12T-28001, Rev A, BOF GBF Instrument Index Work Package B28

2.5.7.7 24590-BOF-JWD-GFR-28001, Rev A, Instrument Datasheet – Weight Elements

2.5.8 Safety Data Sheets (SDSs)

2.5.8.1 24590-WTP-MSDS-SA-19-0276, Rev. 3, Silica

2.5.8.2 24590-WTP-MSDS-SA-20-0087, Rev. 3, Lithium Carbonate

2.5.8.3 24590-WTP-MSDS-SA-20-0088, Rev. 2, Magnesium Silicate

2.5.8.4 24590-WTP-MSDS-SA-20-0089, Rev. 2, Boric Acid

2.5.8.5 24590-WTP-MSDS-SA-20-0090, Rev. 2, Sucrose ~~(Sucrose is part of a potential future recipe)~~

Sucrose has been replaced with a non-combustible blend of silica, boric acid and sucrose. No explosion suppression is required.

2.5.8.6 24590-WTP-MSDS-SA-20-0091, Rev. 1, Aluminum Silicate (Kyanite)

2.5.8.7 24590-WTP-MSDS-SA-20-0092, Rev. 3, Titanium Dioxide

2.5.8.8 24590-WTP-MSDS-SA-20-0093, Rev. 2, Calcium Silicate

2.5.8.9 24590-WTP-MSDS-SA-20-0094, Rev. 2, Sodium Carbonate

2.5.8.10 24590-WTP-MSDS-SA-20-0095, Rev. 1, Zinc Oxide

2.5.8.11 24590-WTP-MSDS-SA-20-0091, Rev. 1, Aluminum Silicate

2.5.8.12 24590-WTP-MSDS-SA-20-0097, Rev. 2, Zirconium Silicate

2.5.8.13 24590-WTP-MSDS-SA-21-0152, Rev. 1, Iron Oxide

2.5.8.14 24590-WTP-MSDS-SA-22-0114, Rev. 0, Borax (Borax is part of a potential future recipe)

2.5.9 Requirements Source References – *for internal use only*

2.5.9.1 24590-BOF-3ZD-GFR-00001, Rev 0, Balance of Facilities (BOF) Glass Formers Reagent (GFR) System Design Description, Section 3.4.1.11

2.5.9.2 24590-BOF-3ZD-GFR-00001, Rev 0, Balance of Facilities (BOF) Glass Formers Reagent (GFR) System Design Description, Section 3.4.2.2

3 Design Requirements

3.1 Basic Function

3.1.1 Figure 1 shows a simple schematic of the equipment and flow directions.

3.1.2 The BOF (Balance of Facilities) GFR (Glass Former Reagent) System stores glass forming compounds in bulk and draws on this storage to create specific mixtures of GFCs to supply the glass production operations of the LAW and HLW by pneumatic transfer lines.

3.1.3 Individual GFCs will be stored either in Mass Flow Bins or the Bag Storage Facility. Refer to the SDSs in Sec. 2.5.8.

3.1.4 Individual GFCs flow into the paddle blenders via gravity feed via overhead chutes. After the GFCs are mixed in one of the paddle blenders, the bomb bay doors beneath the paddle blender open to transfer all the GFCs to the accumulation hopper.

3.1.5 The GFCs are transferred from the bottom of the accumulation hopper via a screw feeder. The air sweeps facilitate the transfer of GFCs from the accumulation hoppers.

3.1.6 The paddle blender is decoupled from the accumulation hopper via the expansion joint to allow the measurement of GFC contents in both locations independently.

3.1.7 Disclaimer: the components and processes shown in the P&IDs in Section 2.5.6 supersede the schematic shown in Figure 1.

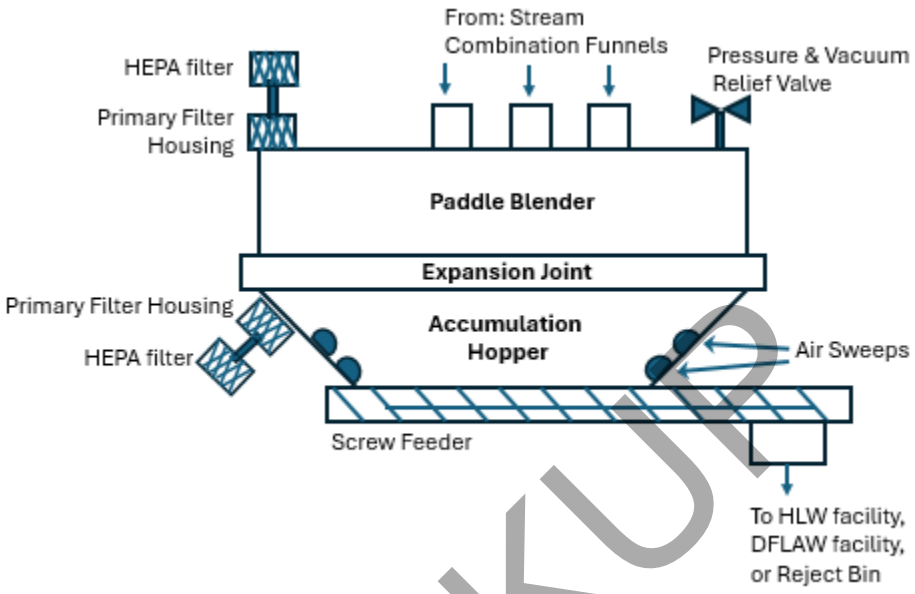


Figure 1: Simple Schematic of Paddle Blenders & other Equipment. The schematic applies to both the East and West assemblies.

3.1.8 Paddle Blenders:

3.1.8.1 Located beneath the stream combination funnels and receive GFCs from them via gravity feed.

3.1.8.2 The blenders shall have a primary and secondary filtration system with a HEPA being the secondary.

3.1.8.3 Each paddle blender shall have only one outlet (bomb bay doors) for the GFCs from where the GFCs are discharged by gravity into the accumulation hopper.

3.1.8.4 Each paddle blender shall be accompanied by a Variable Frequency Drive (VFD). See the specification in Section 2.5.7.4 (24590-HLW-EVD-C3V-00007, Rev 1, Electrical Data Sheet: Adjustable Speed Drive).

3.1.9 Accumulation Hoppers:

3.1.9.1 Located underneath and are gravity fed from the blenders.

3.1.9.2 Shall have a primary and secondary filtration system with a HEPA being the secondary.

3.1.9.3 Shall have four (4) air sweeps to facilitate the transfer of GFCs out of the hoppers. Refer to the data sheet in Sec. 2.5.7.2.

3.1.9.4 Temporarily store GFCs before the GFCs are transported to the DFLAW or HLW facilities.

3.1.9.5 GFCs exit each of the Accumulation Hoppers through a flanged screw feeder.

3.1.10 Expansion Joint:

3.1.10.1 Adjoins each Paddle Blender and its Accumulation Hopper circumferentially and with an airtight seal.

3.1.10.2 Provides the capability to isolate the Paddle Blender from its Accumulation Hopper to take separate weight measurements of the GFCs in each piece of equipment.

3.1.10.3 Allows operations to mix and weigh a new batch of GFCs in the overhead blender without having to wait for the previous batch (in the hopper) to be fully transferred.

3.2 Performance

3.2.1 All Equipment

3.2.1.1 Shall have the ability to run 24 hours per day, 365 days a year, for 40 years with planned routine maintenance, refer to Section 2.5.9.1. Selection of materials of construction for design life of equipment shall consider the effects of chemical, radiological, and thermal exposure.

3.2.1.2 Materials shall be corrosion and abrasion resistant. Unless otherwise specified by the BUYER materials shall be selected by the SELLER.

3.2.1.3 The maximum expected batch volumes to be mixed in the blenders are shown in Table 3-1.

Table 3-1: Batch Volumes

Facility	Max Batch Volumes m^3 (ft^3)	Max Mixing duration (min)
HLW	11 (390)	10
DFLAW	13 (460)	10

3.2.2 **Paddle Blenders**

3.2.2.1 Shall fully mix a volume of GFCs that fall within the range shown in Table 3-1.

3.2.2.2 The mixing duration is shown in Table 3-1.

3.2.2.3 Each of the Paddle Blenders' primary filter shall have a general efficiency of 95%. The flow rate through the filter is to be determined.

3.2.2.4 Each of the Paddle Blenders' secondary HEPA filter shall have an efficiency of 99.97% at a particle size of 0.3 microns. The flow rate through the filter is to be determined.

3.2.3 **Accumulation Hoppers**

3.2.3.1 Each of the Accumulation Hoppers' primary filter shall have a general efficiency of 95%. The flow rate through the filter is to be determined.

3.2.3.2 Each of the Accumulation Hoppers' secondary HEPA filter shall have an efficiency of 99.97% at a particle size of 0.3 microns. The flow rate through the filter is to be determined.

3.2.4 **Expansion Joints**

3.2.4.1 Shall isolate each paddle blender from its corresponding accumulation hopper to provide the capability to take weight measurements in each piece of equipment (via load cells) independently.

3.3 Design Conditions

3.3.1 **All Equipment**

3.3.1.1 All SSCs shall allow full process operations at the conditions listed in Table 3-2.

3.3.1.2 The BUYER'S detailed design for the paddle blenders, accumulation hoppers, air sweeps, expansion joints, and specialty electrical equipment can be found in the drawings (Section 2.5.6, **Design Drawings**) and the datasheets (Section 2.5.7, **Data Sheets**). The general layout of the equipment is shown in the General Arrangement drawing, see Section 2.5.6.7. The SELLER shall provide any additional design and fabrication detail drawings for these items that are not already captured in the BUYER'S drawings and datasheets. The BUYER'S plant model will act as the as-built design to maintain configuration with any proposed dimensional changes from the SELLER. The BUYER provided datasheets are for procurement only. The SELLER shall submit updated datasheets for all equipment with updated as-built information.

3.3.1.3 The SELLER shall provide the detailed design for the equipment using the BUYER'S dimensional and functional requirements. The BUYER'S

dimensional and functional requirements for the equipment can be found in the drawings (Section 2.5.6, **Design Drawings**) and the datasheets (Section 2.5.7, **Data Sheets**). The detailed design for these items shall include design drawings, fabrications drawings, datasheets, cutsheets, and operation manuals.

3.3.1.4 The SELLER shall provide detailed design of the electrical system using the BUYER'S functional requirements.

3.3.1.5 SELLER shall identify operating life of each component on the datasheets and/or drawings.

3.3.1.6 Modularization of systems and components shall be provided to minimize onsite assembly requirements, assist in equipment installation, and minimize maintenance time. Where feasible, the designs shall include equipment designed for modular installation and maintenance.

3.3.1.7 ~~The equipment will contain sucrose, a combustible hazard. Suppression of deflagrations is a required capability for the blenders and accumulation hoppers. The explosion suppression design will be provided by the BUYER and is to be determined. The implementation and design will be provided by the SELLER.~~ Sucrose has been replaced with a non-combustible blend of silica, boric acid and sucrose. No explosion suppression is required.

3.3.1.8 Details for the equipment's flanges such as the facing type (e.g., raised face), pressure rating, facing type restrictions (e.g., slip-on), fluid type service category, and engineering standard(s) will be determined by the BUYER. Standard flanges shall have bolt holes that straddle the centerline and be in accordance with ASME B-16.5 (Section 2.2.2.6) or be a SELLER-selected and BUYER-approved alternative. Non-standard flanges and their bolt-hole alignment shall be determined by the BUYER.

3.3.2 Paddle Blenders

Below are the conditions for each of the paddle blenders

3.3.2.1 The mixing volume shall be 13 cubic meters (460 cubic feet).

3.3.2.2 Shall transfer mixed GFCs to the accumulation hoppers.

3.3.2.3 The interior parts shall have replaceable abrasion and corrosion resistant construction (tooling, shafts, shell). SELLER shall identify operating life of each component on the datasheets and/or drawings.

3.3.2.4 Access panels shall be provided for hands-on maintenance.

3.3.2.5 The filter system allows the venting of displaced air during the filling & discharging processes.

3.3.2.6 Each blender shall have the capability to add high-speed choppers to the sidewalls.

3.3.2.7 Each blender shall have the ability to add explosion suppression agent (powder or liquid) to the top of the shell. The suppression agent will be determined. Each blender shall have a single or twin shaft.

3.3.2.8 Each blender shall have the capability to physically interface with and be mounted onto four weight-measuring load cells as described in Section 2.5.7.7.

3.3.2.9 Each blender shall include the capability to confirm weight of contents entering to +/-0.5%.

3.3.2.10 All appurtenances required for seal purging (such as pressure and flow devices) shall be provided.

3.3.2.11 Each blender shall have the following openings or nozzle connections, with flanged connections:

3.3.2.11.1 Full-length bomb bay discharge doors (outlet). The outlet will be bolted to the flanged expansion joint.

3.3.2.11.2 Three (3) flange-bolted overhead GFC inlets that connect to 11" diameter gravity-fed stream combination funnels.

3.3.2.11.3 One (1) flange-bolted inspection port that is a minimum 24" in diameter.

3.3.2.11.4 One (1) access port that is adequately large for all maintenance and part replacement requirements.

3.3.2.11.5 One (1) flange-bolted nozzle connection for an air blanketing line (1" C12A pipe).

3.3.2.11.6 One (1) ½" 150# raised flange-bolted nozzle connection for a differential pressure sensor.

3.3.2.11.7 One (1) flange-bolted nozzle connection for a pressure safety valve that serves as a dual pressure and vacuum relief valve. The operating pressure of the blender is to be determined by the BUYER.

3.3.2.11.8 One (1) flange-bolted connection for the filter housing.

3.3.2.11.9 Two (2) flange-bolted connections for the air purge seals (connects to ½" C12A pipe).

3.3.3 **Accumulation Hopper**

3.3.3.1 The working capacity will be determined and is pending vendor input.

3.3.3.2 Shall be wedge-shaped with an elongated outlet fitted to the screw feeder.

3.3.3.3 Shall have a large, cross section inlet to fully accommodate the paddle blender's full-length bomb bay doors.

3.3.3.4 The interior parts shall have replaceable abrasion and corrosion resistant construction.

3.3.3.5 Shall include the ability to confirm weight of contents entering to +/- 0.5%.

3.3.3.6 Shall have a primary filter for dust confinement and a secondary HEPA filter.

3.3.3.7 Each accumulation hopper shall have the ability to add explosion suppression bottles to the sides of the shell. The suppression material will be determined.

3.3.3.8 Each Accumulation hopper will have the following openings or nozzle connections:

3.3.3.8.1 One (1) full-length opening from above (inlet) to receive GFCs from the Paddle Blender. The inlet shall be flange-bolted onto the expansion joint from above.

3.3.3.8.2 One (1) flange-bolted opening (outlet) from below connecting to the screw feeder (see specification in Section 2.5.7.5).

3.3.3.8.3 One (1) flange-bolted adequately large access point for inspection and hands-on maintenance.

3.3.3.8.4 One (1) flange-bolted nozzle connection for a differential pressure sensor (connects to 1/2" C12A pipe).

3.3.3.8.5 One (1) flange-bolted connection for the filter housing. See filter housing specification in Section 2.5.7.1.

3.3.3.8.6 Four (4) 1" coupling connections for the air sweeps according to the datasheet in Sec.2.5.7.2 (24590-BOF-JVD-GFR-28001, Rev A, Instrument Datasheet: Solenoid with Air Sweeps.

3.3.4 **Expansion Joint**

3.3.4.1 Shall provide a flange-bolted tight seal between the paddle blenders and accumulation hoppers.

3.3.4.2 Shall be provided with all supportive and mounting hardware such as backing strips, fasteners, gasketing, abrasion resistance liner, etc.

3.4 Environmental Conditions

3.4.1 The equipment is fully located inside of the GFR building, which is designated as an "Other C1 area (Reference **2.5.6.7 -** 24590-BOF-P1-28-00005, Rev 0, WTP Glassformer Baghouse Facility, Silo Area General Arrangement Silo Area Plan at El. 0'0" and El. 20'-3").

Table 3-2: GFR Facility, Internal Temperature & Humidity Conditions

Area	Winter Temp (min)	Summer Temp (max)	Relative Humidity (%)
Other C1 Areas	68 °F	78 °F	30% minimum

3.5 Mechanical Requirements

3.5.1 General Requirements for All Equipment

3.5.1.1 All non-transfer piping shall be designed per ASME Code B31.3 and Project Specification 24590-WTP-3PS-P000-T0001. Refer to 2.5.9.2.

3.5.1.2 If any MDS includes a recommended vendor or equipment model number, SELLER may submit SDDR to get another vendor and/or equipment model number approved. The SELLER must supply all document specification for the equipment supplied by the BUYER for the equipment and a written justification for the request.

3.5.1.3 If any information stated to be on the datasheets in Section 2.5.7 and is not provided on the datasheets, SELLER must reach out to BUYER for information. However, if information is NOT stated to be on MDS and is left blank, that is for the SELLER to populate with information to completion as applicable.

3.5.2 Accumulation Hopper

3.5.2.1 Each shall have four (4) air sweeps with quantity and location per the data sheet in Sec. 2.5.7.2.

3.5.2.2 Each shall be designed in accordance with Section 2.2.8.1.

3.5.3 Expansion Joint

3.5.3.1 Shall be capable of operating at vacuum rated for at least the value per the MDSs.

3.5.3.2 Shall be capable of operating at pressure of at least value listed on the MDSs.

3.5.3.3 SELLER to verify expansion joints inlet and outlet flanges match to the connecting equipment.

3.5.3.4 Shall be constructed in a manner which compensates for axial, lateral, torsional and angular movement, and misalignment between the equipment. Misalignment tolerance (translational and rotational) is to be determined.

3.5.3.5 Shall be constructed from material that is compatible with the GFCs.

3.5.3.6 Shall be provided with a metal liner and abrasion shield.

3.5.3.7 Shall be constructed in a manner which does not restrict movement of GFCs through joint in any position within manufacturer's specified range of allowable motion.

3.5.3.8 Each shall be designed in accordance with the code that will be determined by the BUYER.

3.6 Loadings and Structural Requirements

3.6.1 All equipment and components for the GFR system shall be designed to Category SC-III in accordance with (Section 2.5.1.1) *Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks*, 24590-WTP-3PS-FB01-T0002. SELLER shall provide suggested embed locations within Category 1.1, *Outline Dimensions, Services, Foundations and Mounting Details* on the G-321-E form.

3.6.2 Structural load forces in the accumulation hoppers shall be designed in accordance with Section 2.2.8.1.

3.6.3 Structural load forces in the paddle blenders shall be designed in accordance with the code that will be determined by the BUYER.

3.7 Fire Protection Requirements

Sucrose has been replaced with a non-combustible blend of silica, boric acid and sucrose. No explosion suppression is required.

3.7.1 ~~Explosion Protection: all equipment will contain sucrose, a combustible substance. The SELLER shall provide recommended controls and logic to ensure explosion protection of equipment (explosion isolation valves, explosion panels, deflagration vents, etc.) operate in accordance with NFPA 68, NFPA 69, and NFPA 654.~~

3.7.2 No foreign substances including free liquids, pyrophoric, explosive, ignitable or reactive materials shall be introduced into the main material stream, even if it were from the intrinsic components. Excess lubricating oil, bearing grease, and fragments from seals are examples of such foreign substances. The measure for "excess" will be provided by the BUYER.

3.7.3 All the equipment shall be bonded and grounded as applicable to prevent static build-up.

3.8 Electrical Requirements

3.8.1 General Electrical Requirements

3.8.1.1 BUYER provided electrical power distribution to cabinet/equipment is 480VAC, 3 phase, 3 wire, solidly grounded, 60 Hz, unless otherwise specified. SELLER shall provide any added motor/non-motor loads and/or feeder circuits to work with the existing BUYER LC (LVE-LC-28001). The existing configuration of the BUYER Secondary Unit Substation, LC (LVE-

LC-28001) is provided to the SELLER in the electrical single line diagram drawings listed in Section 2.5.

3.8.1.2 BUYER will provide cable, raceway, conduit, and conduit supports from the Secondary Unit Substation, LC (LVE-LC-28001) and other electrical equipment to SELLER provided equipment and facility grounding system grounding points.

3.8.1.3 Transient voltage variations that cause momentary voltage depression down to 80% of rated equipment shall not affect equipment operation.

3.8.1.4 SELLER shall provide motors, motor starters, and all necessary accessories. Any local motor control panel shall be designed in accordance with 24590-HLW-3PS-JQ07-T0002, Section 3.8.9 Local Panel and Instrumentation Control.

3.8.1.5 SELLER shall provide any required cabinet mounted power transformer(s) for deriving voltage required to operate equipment and control systems.

3.8.1.6 SELLER shall provide grounding connection for the BUYER to connect to the facility.

3.8.1.7 Grounding system in accordance with Section 5.7 of 24590-WTP-3PS-EKP0-T0001.

3.8.1.8 Electrical power distribution cabinets/equipment shall be designed and fabricated in accordance with NFPA 70-2023.

3.8.1.9 Suitability of all electrical equipment and material, including industrial control panels and cabinets, shall be evidenced by listing or labeling by a nationally recognized testing laboratory (NRTL) as recognized by OSHA Certification(s), in accordance with Section 2 of 24590-WTP-3PS-EKP0-T0001, and test results shall be submitted to the BUYER.

3.8.1.10 Cable and raceway design and fabrication shall be in accordance with Sections 5.5 and 5.6 of 24590-WTP-3PS-EKP0-T0001.

3.8.1.11 Enclosures/cabinets shall be tagged with nameplates in accordance with Section 5.10 of 24590-WTP-3PS-EKP0-T0001.

3.8.1.12 SELLER shall test all electrical equipment in accordance with Section 6.1 of 24590-WTP-3PS-EKP0-T0001.

3.8.1.13 Where practical, the motor base shall be drilled for ground connection and a bolt shall be provided complete with nut and washer. If no ground bolt is added to the base plate, the SELLER shall ensure that the motor can be installed with electrical continuity (removing any paints or coatings at mating locations, etc.) and that the system has grounding capabilities elsewhere.

3.8.1.14 Motors shall be completely enclosed in heavy gauge steel and cast-iron construction to contain explosions and not propagate them.

3.9 Instrumentation and Control Requirements

3.9.1 General Control Requirements

3.9.1.1 Controller and software programming will be provided by BUYER. COTS Software, firmware and support software provided by SELLER shall adhere to 24590-HLW-3PS-JQ00-T0004.

3.9.1.2 Enclosures shall be designed and fabricated in accordance with Sections 3.7.2, 3.7.7, 3.8.8, and 4.1.3 of 24590-HLW-3PS-JQ07-T0002.

3.9.1.3 SELLER shall provide variable frequency drives (VFDs) for the paddle blenders. VFDs will be installed in the appropriate BUYER LCs. Refer to the VFD engineering specification document and data sheet (Secs. 2.5.7.3 and 2.5.7.4).

3.9.1.4 Variable frequency drives shall communicate via PROFINET in accordance with Section 3.8.4.5 of 24590-HLW-3PS-JQ07-T0002.

3.9.1.5 Instruments, cables, and enclosures shall be labeled and tagged in accordance with Sections 3.7.11 and 3.8.2 of 24590-HLW-3PS-JQ07-T0002.

3.9.1.6 The equipment control and instrumentation shall be tested in accordance with Section 6 of 24590-HLW-3PS-JQ07-T0002 to the maximum extent practical.

3.9.1.7 For independently controlled equipment that communicates with BUYER control system, SELLER shall provide a listing and detailed description of data points available for integration into BUYER control system. Refer to Integration Requirements in 24590-HLW-3PS-JQ00-T0004.

3.9.1.8 All instrumentation and control valves shall be supplied in accordance with 24590-HLW-3PS-JQ07-T0002 and instrument data sheets identified in 2.5.7 within this specification.

3.10 Fail State Requirements

3.10.1 The required configuration of WTP SSCs shall be included to reflect the operational need for the SSCs (e.g., fail closed), as applicable.

3.10.2 Any valves provided by vendor shall have a fail-state that sends the valve to a safe state relative to where it is in the process.

3.10.3 Level switches used to indicate high or high-high alarms shall fail to indicate as such.

3.10.4 Level switches used to indicate low or low-low alarms shall fail to indicate as such.

3.11 Accessibility and Maintenance

3.11.1 All equipment (including the expansion joints) shall have all wear components made replaceable. Where equipment is not practical to remove from service for routine maintenance, provisions shall be made to allow in-line replacement of components.

3.11.2 All equipment shall be easily accessible for ease of maintenance including, but not limited to, application of grease/lubricants and replacement of seals, gaskets, and rotating/moving parts.

3.11.3 SELLER to submit design change SDDRs in event any component cannot be accessed by personnel in a safe and reasonable manner.

3.11.4 Any items requiring specialty tools shall be supplied by SELLER at least one set of tools. See equipment requirements for number of sets required.

3.12 Failure Effects Requirements

3.12.1 All equipment shall be designed to fail to a safe position in the event of power loss, mechanical, or other failure.

3.12.2 SELLER shall design all equipment and systems so that recovery from a failure is possible with minimal disassembly of equipment and piping.

3.13 Personnel Protection Requirements

3.13.1 SELLER shall design protections for all personnel safety hazards including (but not limited to) rotating equipment, sources of heat, sources of electrical shock, etc.

3.14 Noise Requirements

3.14.1 The additive noise of equipment within rooms shall be designed to be below 109dBA when equipment is in operation. The specific noise criteria for each piece of equipment based on distance and octave bands will be determined.

4 Materials

See codes and standards in Section 2.

4.1 Construction

4.1.1 The SELLER shall comply with general material requirements given in Sections 4.11.1, 4.11.3 through 4.11.15 of *General Specification for Mechanical Handling Equipment Design and Manufacture*, 24590-WTP-3PS-M000-T0002.

4.1.2 Equipment shall be designed in English units.

4.1.3 All SELLER-supplied packed or loose materials shall be identified (see Section 7.4) and shall conform to the following:

4.1.3.1 All 2-inch and larger piping welds shall be butt welded. Exceptions may be approved by BUYER using the SDDR process.

4.1.3.2 All C12A piping welds less than 2-inch in diameter shall be socket weld. Exceptions may be approved by BUYER using the SDDR process. No S11R piping shall be socket welded.

4.1.3.3 No loose Stainless-Steel fittings or pipe shall be supplied without SELLER's spool markings/piece marks as identified on SELLER's drawings.

4.1.3.4 Blue color marking on the site is reserved for "Safety Class" and "Safety Significant" material, which does not apply for the equipment in this document. Blue tinting with the blue marking is not acceptable.

4.1.3.5 Loose washers shall not be painted blue.

4.1.3.6 Loose bolts, studs and nuts: No blue paint, and all loose bolting materials must be controlled by container or a bolt marking control method.

4.1.3.7 No loose structural steel members without SELLER's piece marks as identified on SELLER's drawings.

4.1.3.8 Any loose threaded rod shall be galvanized.

4.1.3.9 No loose galvanized U-bolts are permitted.

4.1.3.10 No loose reinforcing steel is permitted.

4.1.3.11 No loose electrical "Strut" (e.g., Unistrut or B-Line) with blue markings is permitted.

4.1.4 All materials used shall be new and unused, except for those used exclusively for testing.

4.1.5 All internal constructions and finishes for GFC or other process components shall be free from major crevices to avoid build-up of bulk solids.

4.1.6 Commercial Off The Shelf (COTS) components (such as COTS instruments, valves, and filters) shall be manufactured and accepted in accordance with applicable industry consensus standards.

4.1.7 For all GFC and non-GFC related piping the SELLER shall select piping materials as specified in the P&IDs in Sections 2.5.6.2, 2.5.6.3, 2.5.6.4, and 2.5.6.5. The piping materials will be in accordance with either 2.5.1.6 or 2.5.1.7 depending on the pipe class.

4.1.8 Materials shall be selected to endure the physical and chemical properties of those bulk solids that they encounter.

4.1.9 Material selections for equipment components shall not hinder the flow properties of the GFCs, individual or batch.

4.1.10 Wear liners shall be included for silo and hopper design, if required per MDS.

4.1.11 All internal construction and finishes for GFC and other process components shall be free from crevices to avoid build-up of bulk solids.

4.1.12 Accumulation hoppers to be fabricated from 304SS hot rolled annealed pickled (HRAP) plate with #1 mill finish in accordance with ASTM A240.

4.1.13 Gears and gear boxes supplied by SELLER shall meet the requirements given in section 4.8 of General Specification for Mechanical Handling Equipment Design and Manufacture, 24590-WTP-3PS-M000-T0002.

4.1.14 Precautions shall be taken to mitigate steel-on-steel galling on parts such as hinges, pins, etc. This includes, but is not limited to, the application of lubricants to the threads of the fasteners before installation, tightening fasteners with the proper torque, and slow installation to mitigate heat generation from friction. Excess lubricants shall be wiped clean after installation to avoid having them introduced into the main material stream. The measure for "excess" will be provided by the BUYER.

4.2 Prohibited Materials

4.2.1 SELLER shall meet the prohibited material requirements given in Section 4.11.2 of General Specification for Mechanical Handling Equipment Design and Manufacture, 24590-WTP-3PS-M000-T0002.

4.2.2 SELLER and any of the SELLER's sub-suppliers shall have controls in place to prevent any suspect/counterfeit items that pertain to this Purchase Order from being delivered. If suspect/counterfeit items are identified, the SELLER shall promptly replace such parts with those acceptable to the BUYER. The SELLER shall be liable for all costs relating, but not limited to the impoundment, removal and/or replacement of such items. SELLER, as a minimum, shall preclude the introduction of suspect/counterfeit items by:

4.2.2.1 Identifying technical and quality assurance requirements in procurement specifications.

4.2.2.2 Accepting only those items that comply with procurement specifications.

4.2.2.3 Inspecting inventory and storage areas to identify, control, and disposition suspect/counterfeit items.

4.2.3 Markers or cleaning agents used on stainless steel material shall contain no more than 200 Parts per Million total halogens.

4.3 Special Requirements

4.3.1 All chemicals installed or used, such as oils and lubricants shall be accompanied by a Safety Data Sheet (SDS) per requirements in 29 CFR Part 1910.1200(g).

4.3.2 The SELLER shall apply mounting and fastener requirements given in Section 4.12 of General Specification for Mechanical Handling Equipment Design and Manufacture, 24590-WTP-3PS-M000-T0002 (excluding Section 4.12.3 and 4.12.6).

4.3.3 The SELLER shall meet the requirements of ASME B30.20, Below the Hook Lifting Requirements, when testing integrated lifting features, such as eyebolts, lugs, or trunnions.

4.4 Painting & Coating

4.4.1 The SELLER shall comply with painting-coating requirements given in sections 4.13.3 through 4.13.4, and 4.13.7 through 14 of General Specification for Mechanical Handling Equipment Design and Manufacture, 24590-WTP-3PS-M000-T0002.

4.4.2 All visible oil, grease, dust, dirt, mill scale, rust, oxides, corrosion products and other foreign matter shall be removed to produce acceptable surface conditions for the selected coating system per manufacturer's requirements. Surface profile shall be < 3.0 mils.

4.4.3 During surface preparation, care shall be taken to avoid blasting or grinding away markings that identify the material or other significant data that has been placed on the item. Where such data appears in an area requiring additional mechanical surface preparation, it shall be transferred using the SELLER approved procedures, to an area where it will be protected.

4.4.4 Dry Film Thickness shall be determined and measured in accordance with SSPC PA 2. Measurement and test equipment shall be calibrated to standards traceable to National Institute of Standards and Technology or BUYER approved equal.

4.4.5 SELLER shall submit detailed written procedures for material receiving, marking, storage, handling, surface preparation, environmental control, application, curing, inspecting, testing, touch-up/repair, application personnel qualification, inspector qualification, (G-321-E, category 28.0) and proposed documentation forms. The final procedure and documentation forms shall be submitted and reviewed with BUYERs permission to proceed prior to start of coating work.

4.5 Equipment Tagging

4.5.1 Valves, in-line fittings (e.g., flexible hoses), and pipelines shall be tagged, stamped or engraved with size and equipment tag number. All other equipment shall include a stainless-steel nameplate permanently mounted or wired to the equipment.

4.5.2 Equipment nameplates shall include the following information:

4.5.2.1 Project Number

4.5.2.2 Purchase Order Number

4.5.2.3 Manufacturer's Name

4.5.2.4 Equipment Model Number

4.5.2.5 Equipment Tag Number

4.5.2.6 Size

4.5.2.7 Subcontractor's Serial Number (if applicable)

4.5.2.8 Equipment Weight (only if the weight is above 20 lb.)

4.5.3 Instrumentation shall be identified and tagged in accordance with Sections 3.8.2 and 10.2.1.1 of Engineering Specification for Instrumentation for Package Systems. Instrument tag information can be found in the Index Work Package in Section 2.5.7.6.

4.5.4 Electrical motors shall be identified and tagged in accordance with Section 2.5.3.4 (24590-HLW-3PS-MUMI-T0002, Rev. 0, Engineering Specification for Low Voltage Induction Motors—see section 4.3).

4.5.5 Tags or labels shall have characters not less than 1/4 inch high. Characters shall be legible through any applied coatings. The metallic material for the tags will be determined.

5 Fabrication

See codes and standards in Section 2.

5.1 General Fabrication Requirements

5.1.1 The SELLER shall apply general fabrication requirements given in Sections 4.1 through 4.10, 4.14, and 4.15 of General Specification for Mechanical Handling Equipment Design and Manufacture, 24590-WTP-3PS-M000-T0002.

5.1.2 Manufacturing shall be conducted to the requirements of this specification and SELLER's submittal drawings as reviewed by BUYER. The SELLER shall inform the BUYER if any aspect of the MDSs, design drawings, or specification content is incorrect, or if the application could have an adverse effect on the operation or reliability of equipment.

5.1.3 Unless otherwise specified on the drawing, fabrications shall be free of pockets or traps where water or GFCs may lodge, and totally enclosed box sections shall be sealed to prevent the ingress of fluids or powders.

5.1.4 Where two or more pieces of equipment are performing the same function, they shall be products of the same manufacturer.

5.1.5 Equipment shall be constructed with standardized units or dimensions, when possible, to minimize onsite fabrication requirements and to assist equipment installation, maintenance, and replacements.

5.1.6 Fabrication processes shall be performed using U.S. Customary units, not metric, unless otherwise approved by BUYER.

5.1.7 Fixtures used to fabricate equipment shall be retained by the SELLER until written instruction is received from the BUYER.

5.1.8 All welding shall be accomplished by welders qualified according to appropriate American Welding Society (AWS) or ASME/BPVC Section IX.

5.1.9 All welding shall be in accordance with D1.6 as follows:

5.1.9.1 Shielded Metal Arc welding (SMAW): E308(L) Electrodes: 304 Stainless Steel to 304 Stainless Steel.

5.1.9.2 Gas Metal Arc Welding (GMAW): ER308(L) Wire: 304 Stainless Steel to 304 Stainless Steel.

5.1.9.3 Tungsten Inert Gas Welding (TIG): ER308(L) Wire: 304 Stainless Steel to 304 Stainless Steel.

5.1.10 All welds shall be visually inspected and documented. Any instances of irregularities must be reported to buyer.

5.2 Welding –Carbon Steel & Stainless Steel

5.2.1 Pipe welding and qualification shall be per ASME B31.3, refer to Section 2.5.9.2.

5.2.2 All welding procedure processes for structural stainless steel shall comply with AWS D1.6 or ASME Section IX, and Engineering Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel, 24590-WTP-3PS-SS00-T0002.

5.2.3 All welding procedure processes and consumables for sheet metal shall be in accordance with Section 4.16.4 of General Specification for Mechanical Handling Equipment Design and Manufacture, 24590-WTP-3PS-M000-T0002.

5.2.4 The BUYER retains the right to require weld procedure tests to be conducted when deemed necessary. Structural welding procedures shall be qualified in accordance with the requirements of ASME Section IX, AWS D1.1, AWS D1.3, or AWS D1.6 as applicable. Welding Procedure Specification (WPS) shall be submitted for review.

5.2.5 Welding Procedure Qualification Records (PQRs) shall be submitted by the SELLER for BUYER review. These records shall be a standard PQR in accordance with the ASME/AWS code. Pre-qualified PQRs may be used for a given design. PQRs shall accompany WPSs when submitted for review.

5.3 Specific Fabrication Requirements

5.3.1 The SELLER shall apply mounting and fastener requirements given in Section 4.12 of General Specification for Mechanical Handling Equipment Design and Manufacture, 24590-WTP-3PS-M000-T0002.

5.4 Assembly – Interior of Accumulation Hoppers

5.4.1 Finish with a narrow abrasive belt near the outlet and in the direction of flow. Mechanically polish entire hopper in direction of flow after being formed/rolled.

5.4.2 Maintaining the surface finish on the inside surfaces of sloping hoppers is critical. The hoppers are designed to convey GFCs with mass flow, and the successful operation will be jeopardized if the surface finish of rolled material is destroyed by weld spatter, careless grinding, or rolling the hopper sections to shape with unsuitable rolls that could mark or scratch finish.

5.4.3 Every precaution must be taken to protect the interior sloping hopper surfaces during fabrication and erection.

5.4.4 Protect stainless steel wall surfaces with 1/16” thick fiberglass fire-resistant fabric.

5.4.5 Do not use pickling paste, oven cleaner, or any other similar product on the sloped stainless steel wall surfaces or finished weld joints exposed to flow. These products will damage the mechanically polished 240 grit surface finish and alter its flow characteristics. The surfaces shall be cleaned only with hot water and mild detergent. Only soft cotton cloths, not abrasive pads, should be used.

5.5 Heat Treatment

5.5.1 N/A

5.6 Weld Passivation

5.6.1 Welds shall be cleaned, descaled, and passivated per ASTM A380.

5.7 Weld Inspection

5.7.1 SELLER shall provide an inspection testing plan and schedule for review and approval by buyer. The plan shall be according to the codes specified in Section 2.

5.7.2 All complete joint penetration welds shall be 20% (Aggregate weld length) non-destructively inspected using MAG particle or dye-penetrate inspection in accordance with AWS D1.6 or ASME Section IX.

5.7.3 BUYER reserves the right to x-ray complete penetration weld joints to verify 100% weld penetration.

5.7.4 All welds that fail non-destructive inspection or complete penetration welds that are not 100% penetration shall be repaired at seller’s cost.

5.7.5 If multiple welders work on the equipment, the SELLER shall provide a performance report for each of the welders.

6 Tests and Inspections

6.1 General Requirements

6.1.1 The SELLER shall be responsible for performing and documenting all inspections and testing necessary to demonstrate compliance with all relevant specifications, drawings, mandatory dimensions, and related standards. The SELLER shall also compile the test results that demonstrate compliance with the purchase order and submit to BUYER.

6.1.2 The SELLER shall develop and submit for BUYER review and approval an overall integrated testing strategy outlining how and where testing will be performed to demonstrate compliance with the requirements contained in this specification. If testing can take place at the SELLER's facilities, it shall be to reduce both the risk associated with design and to reduce overall Project cost. The outline should contain indication of whether the SELLER proposes to utilize vendor test data, modeling, SELLER performed laboratory tests, SELLER performed shop tests and/or BUYER performed site testing to confirm specification compliance.

6.1.3 The tests and demonstrations identified in this specification are not limiting and shall not relieve SELLER of their responsibilities to fully test and demonstrate the performance of the components and associated equipment, to the satisfaction of the BUYER.

6.1.4 The equipment control and instrumentation shall be tested in accordance with Section 6 of Engineering Specification for Instrumentation for Packaged Systems, 24590-HLW-3PS-JQ07-T0002 to the maximum extent practical.

6.1.5 Measuring and test equipment shall be calibrated, adjusted, and maintained at prescribed intervals or prior to use against certified equipment having known valid relationships to nationally recognized standards. If no nationally recognized standard exists, the basis for calibration shall be documented.

6.1.6 All defects in materials, wiring, and tubing detected because of testing and inspections shall be repaired or replaced by SELLER at no additional cost to the BUYER.

6.1.7 Fixtures used to test equipment shall be retained by the SELLER until written instruction is received from the BUYER.

6.1.8 If conflicts arise between this specification and form G-321-E, Engineering Document Requirements the requirements called out on the G-321-E form shall govern.

6.2 Personnel Qualifications

6.2.1 Welding personnel qualifications: All welders, welding operators, and tackers shall be qualified in accordance with ASME Section IX, AWS D1.1, AWS D1.3, and/or AWS D1.6.

6.2.2 Welding Qualification shall be as applicable for the work. Documentation shall be available to the BUYER, prior to commencement of welding.

6.2.3 At the discretion of the BUYER, current certificates of welder competency, endorsed by an independent body and covering the scope of the procedure, may be reviewed.

6.2.4 Non-destructive Examination (NDE) Personnel Certification: NDE personnel performing all NDE, visual examination operations, and shop tests shall be qualified and certified in accordance with SNT-TC-1A. All test reports shall be signed by personnel holding either Level II or Level III certifications and who either performed or witnessed the test. A copy of the individual's current certification(s) shall be provided (if requested) for review at SELLER's facility.

6.3 Non-Destructive Examinations

6.3.1 All welds shall be visually inspected and documented per ASME Section V, ASME Section VIII, AWS D1.1, D1.3, or AWS D1.6 as appropriate.

6.3.2 Verification reports of all NDE, in accordance with ASME/AWS, shall be submitted to the BUYER.

6.4 Factory Acceptance Tests - General Requirements

6.4.1 SELLER shall perform FATs for the major components in Table 1-1 and provide test procedures to the BUYER for each test.

6.4.2 The SELLER shall provide BUYER with a minimum of sixteen working days advance notice of all FAT activity for the first blender assembly fabricated.

6.4.3 The equipment supplied under this specification shall be qualified and tested in accordance with this specification prior to the release for shipment to WTP. The BUYER will witness testing prior to shipment.

6.4.4 All steps shall be taken to ensure that tests are realistic and representative of the equipment's operational cycle. Operation of switches and contacts shall be tested via movement of the equipment and not by the shorting/open circuit action of terminals.

6.4.5 For testing the equipment, the SELLER shall provide all necessary equipment, rigs, fixtures, controls, electrical supplies, power, control equipment, motor starters, interconnecting wiring, and any other miscellaneous equipment to prove the functionality of the equipment to the requirements of this specification.

6.4.6 BUYER will provide GFCs to run through the equipment and be responsible for delivery and disposal of GFCs after testing is complete.

6.4.7 The SELLER shall supply all FAT results in a Test Report to the BUYER.

6.4.8 Upon BUYER concurrence, FAT test demonstrations or verifications may be substituted by SELLER with equivalent information published by the item manufacturers. The SELLER may also choose to combine some of the FAT tests if each requirement can be verified.

6.5 Factory Acceptance Test Functional Requirements

6.5.1 The factory acceptance test shall be done with BUYER-supplied GFCs, approximately 55,000 lbs. on both the paddle blender and accumulation hopper.

6.5.2 The SELLER shall functionally test the paddle blender with the BUYER supplied GFCs, to demonstrate that it mixes the GFCs effectively. The acceptance criteria for mixing effectiveness shall be as indicated in Section 2.5.7.1. Additional guidelines for testing the blender's mixing effectiveness will be provided in the final engineering specification document.

6.5.3 The SELLER shall functionally test the accumulation hopper with the BUYER supplied GFCs and screw feeder, to demonstrate that it transports the GFCs properly according to the datasheets in Sections 2.5.7 and 2.5.8.

6.5.4 If the GFCs are either stored incorrectly (i.e., exposed to moisture or high temperatures) or for a prolonged period, they may clump together causing good equipment to fail its tests. The GFCs will need to be stored such that their consistency matches the expected consistency during normal operations. To ensure appropriate consistency, the SELLER shall manipulate or agitate the GFCs prior to testing as needed.

6.5.5 The SELLER shall functionally test the flow from the paddle blender to the accumulation hopper to ensure the expansion joint forms a tight seal and properly isolates the equipment for weight measurements. The SELLER shall provide load cells and panels for weight measurement verification if the BUYER does not possess this equipment.

6.5.6 The SELLER shall functionally test the air sweeps on the accumulation hopper to ensure they function as intended and described in datasheet 2.5.7.2.

6.5.7 The SELLER shall provide a FAT for the equipment's noise levels. The acceptable criteria for the distance and octave bands for testing individual pieces of equipment are to be determined.

6.5.8 The SELLER shall provide a FAT for the paddle blenders' electrical loads during operation at maximum anticipated GFC weight measurement.

6.5.9 The SELLER shall provide a FAT for the equipment's mechanical performance attributes such as the operability of the bomb bay doors (e.g., fully opening and shutting).

6.5.10 The electrical components and panels shall be tested in accordance with Section 6 of 24590-WTP-3PS-EKP0-T0001, Rev 5.

6.5.11 The SELLER shall provide a FAT of all the major equipment dimensions.

7 Preparation for Shipment

7.1 General Requirements

7.1.1 Packaging, handling, and storage shall be performed in accordance with Engineering Specification for Packaging, Handling, and Storage Requirements, 24590-WTP-3PS-G000-T0003.

7.1.2 To support the safe shipping of equipment, all equipment shall be adequately drained of any oils, lubricants, etc.

7.1.3 Equipment shall be shipped in a climate-controlled environment if and as required by the equipment vendor or manufacturer.

7.2 Cleanliness

7.2.1 SELLER shall ensure all equipment is adequately cleaned and free from dirt, oils, GFCs, liquids, or other materials. Equipment shall meet standard cleanness levels per the procedure in Section 2.5.1.3 (24590-WTP-3PS-G000-T0005). Adequate cleanliness will ensure that no liquids or oils will drip or leak from the equipment during shipping, and that the equipment will be ready to use upon arrival after its exposed surfaces are minimally wiped with a damp cloth.

7.3 Painting

7.3.1 SELLER shall submit to BUYER written procedures for each step for review and acceptance prior to use. Coatings shall be applied in strict accordance with the Manufacturer's application procedures.

7.3.2 Coating system codes are defined per 24590-WTP-3PS-AFPS-T0001, *Shop Applied Special Protective Coatings for Steel Items and Equipment, Appendix C & D.*

7.3.3 For coating of stainless-steel equipment, the SELLER shall comply with 24590-WTP-3PS-AFPS-T0001.

7.3.4 The SELLER shall comply with painting-coating requirements given in sections 4.13.3 through 4.13.4, and 4.13.7 through 14 of *General Specification for Mechanical Handling Equipment Design and Manufacture*, 24590-WTP-3PS-M000-T0002.

7.3.5 All visible oil, grease, dust, dirt, mill scale, rust, oxides, corrosion products and other foreign matter shall be removed to produce acceptable surface conditions for the selected coating system per manufacturer's requirements. Surface profile shall be 1.5 – 3.0 mils.

7.3.6 During surface preparation, care shall be taken to avoid blasting or grinding away markings that identify the material or other significant data that has been placed on the item. Where such data appears in an area requiring additional mechanical surface preparation, it shall be transferred using the SELLER approved procedures, to an area where it will be protected.

7.4 Shipment Tagging

7.4.1 The equipment shall be tagged in accordance with Section 6 of the Engineering Specification for Packaging, Handling, and Storage Requirements, 24590-WTP-3PS-G000-T0003. Shipping marks shall be on all four sides of the package where practical, such as items shipped in a crate, in accordance with Section 6.5 of 24590-WTP-3PS-G000-T0003. For items not being shipped in crates, equipment tags with all pertinent information including the PO number shall be in plain sight and easily accessible.

7.4.2 The CTN (use SELLER's component number when BUYER CTN is not available) and the BUYER's PURCHASE ORDER number shall be placed on each piece of equipment, including separate and loose items.

7.5 Packaging

7.5.1 All fabricated pipe and mechanical components shall meet standard cleanness levels per Section 4 of 24590-WTP-3PS-G000-T0005 prior to packaging for shipment. Where items will contact the GFCs for testing prior to shipment (such as the mass flow screw and wetting screw), any powders shall be removed from the equipment using best efforts with compressed air. No powders shall be present on the exterior of the equipment when visually inspected.

7.5.2 The equipment shall be packaged in accordance with Section 5 of 24590-WTP-3PS-G000-T0003.

7.5.3 Threaded connections shall be cleaned and protected with metal or plastic caps and plugs.

7.5.4 All equipment shall be packed, braced, supported, and securely anchored such that the equipment is fully protected for shipment.

7.5.5 All separate or loose items shall be boxed, individually protected as required and packed in a plywood container for shipment. Each container shall include a complete copy of the Bill of Materials identifying each item in the container.

7.5.6 Equipment enclosed in boxes shall have the BUYER's PURCHASE ORDER number and equipment number stenciled on outside of the box.

7.5.7 The SELLER shall be responsible for the adequacy of the preparation for shipment and provide detailed instructions for storage and handling.

7.5.8 All openings shall be sealed shut prior to shipment to trap any residual powder on the inside of the screw feeders, in accordance with Section 5.4 of 24590-WTP-3PS-G000-T0003.

7.6 Storage of Special Materials (e.g., stainless steel) prior to work

7.6.1 The SELLER shall apply material storage requirements given in Section 10 of Engineering Specification for Packaging, Handling, and Storage Requirements, 24590-WTP-3PS-G000-T0003.

7.7 Shipping Preparation, Documentation, and Transport

7.7.1 SELLER shall submit shipping and site handling procedures per Section 11.1.2 of 24590-WTP-3PS-G000-T0003.

7.7.2 SELLER shall submit transportation and shipping documentation to BUYER per Section 11.2 of 24590-WTP-3PS-G000-T0003.

7.7.3 All shipments to be SELLER arranged with BUYER-provided transportation.

8 Quality Assurance

8.1 QA requirements specific to item(s) or service

8.1.1 The SELLER shall submit a Quality Assurance manual which outlines the identified Performance Categories within the Manufacturing (Design/Build) Supplier Category, listed in Attachment E of *CM Datasheet of Quality Assurance Program Requirements*.

9 Configuration Management

9.1 General Configuration Management

9.1.1 SELLER shall promptly notify BUYER of any changes, modifications, revisions to the design or functionality of the equipment/components covered by this specification via a SDDR. Each item shall be tagged with the provided CTN.

10 Documentation and Submittals

10.1 General

10.1.1 Documentation shall be submitted to the BUYER in accordance with this specification, governing specifications, Attachment DD of the Material Requisition, and as summarized on the G-321-E and G-321-V forms. The G-321-V form lists all the documents required for quality verification, and the G-321-E form lists those engineering documents required.

10.1.2 General requirements and submittal procedures are also covered in Attachment DD of the Material Requisition. Each document to be submitted must be listed on the "SELLER's Index/Schedule" (Form 15EX). This form tracks the scheduled and actual delivery of each submittal.

10.1.3 The units of measure to be used for this project shall be in US customary units, not metric. Drawings, reports, calculations, and other technical documents shall exclusively use the

required unit system in specifying quantities, without the parenthetical inclusion of their metric equivalent.

10.1.4 Schedule information shall be submitted as a Gantt chart under submittal Category 5.0.

10.1.5 If conflicts arise between this specification and form G-321-E, Engineering Document Requirements the requirements called out on the G-321-E form shall govern.

10.2 Meetings

10.2.1 The SELLER shall document all discussions, resolutions and follow-up action items with required closure dates discussed in meetings between the SELLER and the BUYER or BUYER's representative. The SELLER shall send the preliminary document to the BUYER within five working days following the meeting.

10.3 Progress Meetings

10.3.1 The intent of the progress meetings is for the SELLER and BUYER to have clear communication on requirements and expectations. The SELLER will provide updates on the controls and electrical design, paddle blender design, expansion joint design, accumulation hopper, fabrication, testing, and schedule.

10.3.2 Progress review shall be conducted in accordance with the method outlined in this section. The number or location of the progress reviews may be changed or canceled at the BUYER's discretion. The meetings may also be changed to virtual meetings at the BUYER's discretion.

10.3.3 The SELLER shall provide to the BUYER, a minimum of five working days prior to the scheduled meeting, copies of documentation or information that is expected to be discussed and presented in the meeting. Documentation may be provided as either hard copies or as electronic files via email (if not previously submitted in accordance with the submittal schedule).

10.3.4 The SELLER shall participate in the progress review, present the design including discussion of the provided submittals, and shall be prepared to discuss any comments.

10.3.5 To facilitate the BUYER'S review of the provided (required) design media, the SELLER shall provide electronic files containing 3D models of the design if available at each design review meeting. The 3D model files shall be provided in ".dgn" Version file format, in addition to the "native" modeling program file format; a file format such as SolidWorks eDrawings, or other 3D model format viewable with freely available file viewers is also acceptable.

10.3.6 Following the progress review meeting, the BUYER will formally transmit comments or other requests on the design and fabrication documents.

10.3.7 The resolved/corrected documents shall be provided as a formal submittal in accordance with the submittal schedule and engineering document requirements, form G-321-E.

10.3.8 **Contract Award Kick-Off Meeting**

10.3.8.1 The contract award kick-off meeting will be a formal discussion conducted at the BUYER's facility to review requirements and the SELLER's schedule and ensure that the SELLER has a clear understanding of the scope of the contract and submittal requirements. The SELLER shall be prepared to discuss any recommended changes to the approaches indicated on the proposed design drawings and is encouraged to bring concept drawings to aid review of such proposed approaches.

10.3.8.2 Preliminary Review:

10.3.8.2.1 The first interim review will be an informal review conducted at the SELLER's facility, by the SELLER, after the SELLER'S preliminary design is completed along with any in-progress fabrication details.

10.3.8.2.2 Preliminary design media, including preliminary arrangement, assembly, and fabrication drawings, preliminary control narratives, datasheets, analyses as appropriate, and the updated SELLER'S schedule shall be provided to the BUYER.

10.3.8.2.3 The SELLER shall also provide the following documents if not previously submitted: 1) external envelope drawings which identify equipment outline dimensions, expected equipment weights, and locations of centers-of-gravity for the paddle blender and accumulation hopper, and 2) instrument index and instrument data sheets for approval. Following completion of the preliminary review, the BUYER may authorize early material procurement at BUYER's risk.

10.3.8.3 Final Review

10.3.8.3.1 At the conclusion of definitive design of the electrical controls, paddle blender, accumulation hopper, and expansion joint. Review shall be conducted at the BUYER'S facility, by the SELLER.

10.3.8.3.2 The draft final design report, including all design media, supporting analyses as appropriate, the updated SELLER'S schedule, instrument index and instrument data sheets, and other required submittals, which documents the design shall be provided to the BUYER. The SELLER shall participate in the final review and shall record and resolve each design review comment.

10.3.8.4 Final Closeout Meeting

10.3.8.4.1 The SELLER shall provide a corrected, completed final design report at the conclusion of the review that resolves any issues associated with the Final progress review. An informal meeting

shall be held to accept the revised design media and discuss and resolve any remaining open items. Final submittals shall be provided to the BUYER for formal processing.

10.4 Submittals

10.4.1 Drawings

10.4.1.1 The SELLER shall specify dimensions, tolerances, materials, surface finishes, weld symbols, special filler material used, and special fabrication instructions on drawings supplied to BUYER.

10.4.1.2 Drawings shall be prepared in accordance with ASME Y14 series.

10.4.1.3 Piping and Instrument Diagrams (P&IDs) shall be submitted for review and approval by BUYER. P&IDs shall show all equipment, instrumentation, piping, piping size and material of construction, flow directions, valves, and type of valves, utility piping, and tag numbers.

10.4.1.4 Assembly drawings shall be submitted for review and approval by BUYER. Assembly drawings shall be detailed to facilitate assembly of the component parts of an equipment item. The assembly drawings shall include but are not limited to overall dimensions, component weights, component tag numbers, alignment criteria, safety and recovery features, equipment and facility interfaces, and utilities.

10.4.1.5 Assembly drawings shall include detailed plans and elevations for all piping.

10.4.1.6 Shop Detail Drawings shall be submitted for review and approval by BUYER. Shop detail drawings shall provide sufficient information for fabrication or manufacture.

10.4.1.7 Installation Drawings and/or procedures shall be submitted for review and approval by BUYER. The drawings and/or procedures shall be detailed to provide sufficient information for installation and erection of the equipment and components, including all piping, instrument tubing, etc. The installation drawings shall clearly indicate lifting points and lifting requirements, fit-up tolerances, torque requirements, cutting criteria, assembly sequences, etc.

10.4.1.8 Bill of Materials: shall be in the top right corner of the first or second sheet of an Assembly Drawing (except for P&ID's), Panel Layout Drawings, or Wiring Diagram and contain the minimum following information:

10.4.1.8.1 Item number for each individual part or material.

10.4.1.8.2 Quantity of an item or part.

10.4.1.8.3 Description of an item or part.

10.4.1.8.4 Reference code (such as ASTM) of an item or part.

10.4.1.8.5 Material callout or SELLER part number.

10.4.1.8.6 Operations and Maintenance Manuals/RAMI data.

10.4.1.9 The SELLER drawings shall show critical interface dimensions, and their tolerances as specified by BUYER, such as on MDSs. This information shall be identified by using an asterisk or other method, and a note shall be included that explains how to distinguish these dimensions.

10.4.1.10 Electrical design documents shall include but are not limited to: Equipment Wiring Diagrams, Interconnection Wiring Diagrams, Cable Block Diagrams, Single Line Diagrams, Control Schematic Diagrams, COTS product datasheets, and Equipment and Electrical Plans. These documents shall be submitted for review and approval by BUYER.

10.4.1.11 Cable Block diagrams identify the relationship of all cabling with cable numbers that interconnect between panels, junction boxes, and components. These diagrams shall identify the size and number of conductors in each cable. The formal submittal shall be submitted prior to fabrication. Cables that will be installed by BUYER will use BUYER provided cable numbers. The SELLER shall use BUYER supplied cable numbers on all documentation for all cables that will require the BUYER to reconnect at the WTP site.

10.4.1.12 Equipment and Electrical Plans include Grounding, Panelboard Schedules, Lighting Layouts, Lightning Protection Layouts, Instrumentation Layouts, Instrumentation Loop Diagrams, Nameplate Schedules, Cable Schedules, Cable Tray and Raceway Schedules, Selective Device Coordination Curves (such as fuses and breakers), and installation details.

10.4.1.13 Where applicable, materials shall be identified by ASME or ASTM material specification on the drawings.

10.4.2 **Software & Electronics Documentation**

10.4.2.1 The Software Documentation shall include:

10.4.2.1.1 Operational description for equipment (movements within logic sequences) and software, and description of the division of responsibility (can include sketch).

10.4.2.1.2 Data Table mapping the data points available to BUYERs DCS on SELLERs PLC's, with datatype (i.e. floating point / integer / bit), Engineering Units, and scaling information for analog values. Refer to Integration Requirements in 24590-HLW-3PS-JQ00-T0004.

10.4.2.1.3 I/O list, if applicable, differentiating between different types of interfacing I/O. Refer to 24590-HLW-3PS-JQ00-T0004.

10.4.2.1.4 List of all controllers, equipment used, with manufacturer and model number.

10.4.2.1.5 Relevant communication manuals for controllers.

10.4.2.1.6 Interface files for controllers and system devices.

10.4.2.2 The following documents shall be required for the Software Functional Sequence (SFS):

Table 10-1: Software Function Sequence

No.	Document	Comments
1.	Code 1 or 2 Software Documentation	Refer to 24590-HLW-3PS-JQ00-T0004
2.	Submitted Electrical Test Procedures incorporating a step-by-step guide to the Shop Test and appropriate checklist.	Note: Submitted Electrical test procedures should include both "Local" and "Remote" test requirements. Refer to 24590-HLW-3PS-JQ00-T0004.
3.	Code 1 or 2 Wiring Diagrams	Refer to 24590-HLW-3PS-JQ00-T0004.

10.4.3 **Mechanical Data Sheets (MDSs)**

10.4.3.1 SELLER shall submit BUYER supplied data sheets listed in Table 2-3 for major components, filling in any missing information and correcting any data as necessary.

10.4.3.2 SELLER shall submit material descriptions and technical data for any material the SELLER proposes to use such as gaskets, seals, lubricants, motor oils, paints, and coatings. SDSs shall be provided for all hazardous material.

10.4.4 **Tabulations**

10.4.4.1 The SELLER shall provide a complete Equipment List with BUYER or SELLER Component Tag Number, Component Description, Materials, and Quantities. Equipment List shall include all mechanical, electrical, instrumentation, and piping components (such as valves). Components shall be included also with supplier identified and supplier part number.

10.4.4.2 The SELLER shall provide a complete Drawing List with Drawing Number and Title.

10.4.4.3 The SELLER shall provide a complete Special Tools List. The Special Tools List shall include any specialty tools, lifting beams, or fixtures that are

manufactured specifically for the operation, assembly, installation, or maintenance of equipment and components.

10.4.5 **Inspection and Test Reports**

10.4.5.1 SELLER shall prepare a detailed Inspection and Test Plan for all equipment, including insertion of BUYER-designated source inspection/witness notification points in accordance with Attachment SQ of the PURCHASE ORDER and in accordance with Section 6 of this specification. Prior to starting work, the plan shall be submitted to the BUYER for review. The plan shall include, but not be limited to, the following:

10.4.5.1.1 Equipment or system to be inspected and tested.

10.4.5.1.2 Description of inspections and tests to be performed.

10.4.5.1.3 Sequential hold and notification points for inspection and tests to be performed.

10.4.5.1.4 Each characteristic or attribute to be evaluated.

10.4.5.1.5 The inspection and test report form to be used.

10.4.5.1.6 Other requirements as required by Codes, Standards, or PURCHASE ORDER.

10.4.5.2 The SELLER shall provide an inspection and test procedure documenting the process followed for determining that the specified requirements (such as dimensions, properties, and performance results) are met.

10.4.5.3 The results of the inspections and tests shall be documented in the Inspection and Test Report.

10.4.6 **Calculations**

10.4.6.1 Where applicable, the SELLER shall provide calculation reports documenting all calculations with clearly articulated inputs.

10.4.7 **Manuals**

10.4.7.1 The SELLER shall provide, per specification 24590-WTP-3PS-G000-T0003 paragraph 11, clearly written operation and maintenance manuals. The manuals shall be submitted to the BUYER as summarized in the Attachment DD of the PURCHASE ORDER and the G-321-E and G-321-V “Engineering Document Requirements” forms.

10.4.7.2 The manuals shall include final as-built information.

10.4.8 **Certificates of Conformance**

10.4.8.1 The SELLER shall provide clearly written Certificate of Conformance report. The report shall be submitted to the BUYER.

10.4.9 **Schedules**

10.4.9.1 The SELLER shall submit a schedule identifying all milestones necessary to demonstrate that the equipment will be delivered in accordance with the project schedule.

10.4.9.2 The SELLER's proposed design and fabrication schedule shall include BUYER hold points.

10.4.10 **Materials Certificates/Statistics**

Material Verification requirements will be determined.

10.5 Controls

10.5.1 Control Logic Narrative

10.5.1.1 SELLER shall provide a control logic narrative for any software provided by the SELLER. Refer to 24590-HLW-3PS-JQ00-T0004.

10.5.2 **Operating Philosophy**

10.5.2.1 All indicators and controls, permissives, interlocks, and alarms will be processed in the BUYER provided controller.

10.5.3 Instrument Range and Setpoint List: A comprehensive list/tabulation shall be created and submitted which identifies every instrument with its range and setpoint. For each instrument, the table shall include:

10.5.3.1 Equipment Number

10.5.3.2 Vendor Dwg Number

10.5.3.3 Instrument Code

10.5.3.4 Project Loop Number

10.5.3.5 Project Instrument Tag Number

10.5.3.6 Service Description

10.5.3.7 Supplier Tag Number (if applicable)

10.5.3.8 Range

10.5.3.9 Setpoint

10.5.4 Product Bulletins: for each instrument supplied on this project, the current manufacturer's product bulletin shall be submitted. Each product bulletin submitted shall be marked with the applicable tag numbers for that product.

10.5.5 Instrument Data Sheets: SELLER shall submit Completed Bechtel Datasheets with data indicated by an asterisk (*) populated by SELLER. Any deviations to the data should be included in the Exceptions List.

10.6 Material Test Reports

10.6.1 The SELLER shall submit to the BUYER, a complete package of Material Test Reports (MTRs) and for all raw materials used to fabricate any components that will contact GFCs or are part of the structural integrity of the component. These items are listed below. MTRs for weld filler material shall be made readily available if requested but are not required to be submitted to the BUYER.

10.6.1.1 Paddle Blenders

10.6.1.2 Accumulation Hoppers

10.6.1.3 Expansion Joints

10.6.1.4 Air Sweeps

10.7 Electrical Tests

10.7.1 SELLER shall submit electrical test procedures per Section 10.2.2.2 of 24590-HLW-3PS-JQ07-T0002.

10.7.2 SELLER shall submit electrical test reports per Section 9.1.9 of 24590-WTP-3PS-EKP0-T0001.

10.8 Factory Acceptance Test

10.8.1 SELLER shall submit FAT procedures, at least 30 days prior to testing, for the major components listed in Section 5.5 to include a detailed test plan, equipment/setups being used, and acceptance criteria.

10.8.2 SELLER shall submit FAT reports for all the major components listed in Section 5.5 to include the equipment's performance results against the acceptance criteria.

10.8.3 SELLER to test and confirm proper fitment of all joining flanged components.

10.9 Welding and Material Identification Procedures

10.9.1 For fabrication processes requiring welding, procedures for welding and associated welding procedure qualification reports shall be submitted to BUYER.

10.9.2 For fabrication processes requiring welding, procedures for visual inspection of welds shall be submitted to BUYER.

10.9.3 For welding NDE processes, procedures for conducting NDE inspections of welds shall be submitted to BUYER.

10.9.4 For potential positive material identification (PMI), testing procedures shall be submitted to BUYER.

10.10 Spare Parts List

10.10.1 The SELLER shall provide to the BUYER a recommended spare parts list for all equipment within SELLER's scope of supply for the preventive maintenance of three distinct classifications of spare parts. SELLER's recommendations are to address a startup and warranty period, operational spare parts, and capital spare parts. The recommendations shall also include intervals of replacement based on the operating life of the equipment subject to the duty cycles identified in this specification.

10.10.2 Startup and warranty spare parts are those parts that may be required at any time during equipment installation, startup, testing, and unit operation through the warranty period.

10.10.3 Operational spare parts are those parts that require replacement at regular intervals to maintain continuous operation of the supplied equipment and system.

10.10.4 Capital spare parts are major parts or equipment that provide reliable equipment operation throughout the plant life and have a significant lead-time for manufacture and delivery.

10.10.5 The spare parts list shall include names of manufacturers with appropriate model numbers and special ordering instructions for replaceable parts.

10.11 Manuals

10.11.1 The SELLER shall provide, per specification 24590-WTP-3PS-G000-T0003 paragraph 11, clearly written operation and maintenance manuals. The manuals shall be submitted to the BUYER as summarized in the Attachment DD of the PURCHASE ORDER and the G-321-E and G-321-V "Engineering Document Requirements" forms.

10.11.2 The manuals shall include final as-built information.

10.11.3 **Operating Manual**

10.11.3.1 The operating manual(s) shall describe in detail all procedures necessary to address safe and proper operation of equipment.

10.11.3.2 The operating manual(s) shall include but is not limited to:

10.11.3.2.1 A general description of the equipment identifying technical characteristics.
10.11.3.2.2 Instructions for equipment operation (start-up, shut-down, normal, and emergency), referencing drawings and diagrams as appropriate.
10.11.3.2.3 Rigging Instructions containing sufficient details, such as center of gravity, weights, sling locations, balance points, methods of attachment, maximum hoist speeds, ground loading, and other features necessary for safe handling operations.
10.11.3.2.4 Equipment and panel bolting patterns.
10.11.3.2.5 The use of any special tooling shall be explained in detail.
10.11.3.2.6 Test and adjustment information.
10.11.3.2.7 Troubleshooting charts or matrices that quickly identify operational problems and determine their solutions.
10.11.3.2.8 Diagnostics, schematics, and performance curves for the system.
10.11.3.2.9 A list of all critical alarm features as well as step by step instructions for clearing alarms, lockout-tagout features, and safety/warning notices.
10.11.3.2.10 Complete documentation of all programming software including local programmable logic controllers.
10.11.3.2.11 Sequence of operations with cycle times.
10.11.3.2.12 SELLER shall provide rigging sketches for all field lifts of greater than 10 ton.
10.11.3.2.13 Procedures for the safe removal and replacement of parts, including filters, to mitigate airborne dust contamination. For elevated parts that weigh more than 50 pounds, the SELLER shall specify handling instructions and whether temporary structures (e.g., scaffolding) will be required to safely make the replacement. For parts that are in confined spaces, the SELLER shall specify handling instructions to successfully and safely make the bag-in, bag-out replacement.

10.11.4 **Maintenance Manual**

10.11.4.1 The Maintenance Manual(s) shall detail all necessary information for the proper care and maintenance of the equipment and system components.

10.11.4.2 The maintenance manual(s) shall include but is not limited to:

10.11.4.2.1 General maintenance instructions with frequencies, locations, methods, and materials for maintaining the equipment.
10.11.4.2.2 Functional descriptions of all pneumatic, hydraulic, electronic, mechanical, and lubrication systems on the equipment.
10.11.4.2.3 Equipment storage maintenance instructions.

10.11.4.2.4 Recommended inspection points, with procedures and periods for inspection.
10.11.4.2.5 Maintenance instructions for any required lubrication.
10.11.4.2.6 Complete set of wiring diagrams and schematics, with all instrumentation identified by location and I/O hard addresses.
10.11.4.2.7 Equipment manuals, data sheets, and catalog cut sheets.
10.11.4.2.8 A separate Preventive Maintenance (PM) manual shall be supplied that suggests a preventive maintenance program and procedure, and a suggested implementation of the program.

10.12 Schedules

10.12.1 The SELLER shall submit a schedule identifying all milestones necessary to demonstrate that the equipment will be delivered in accordance with the project schedule.

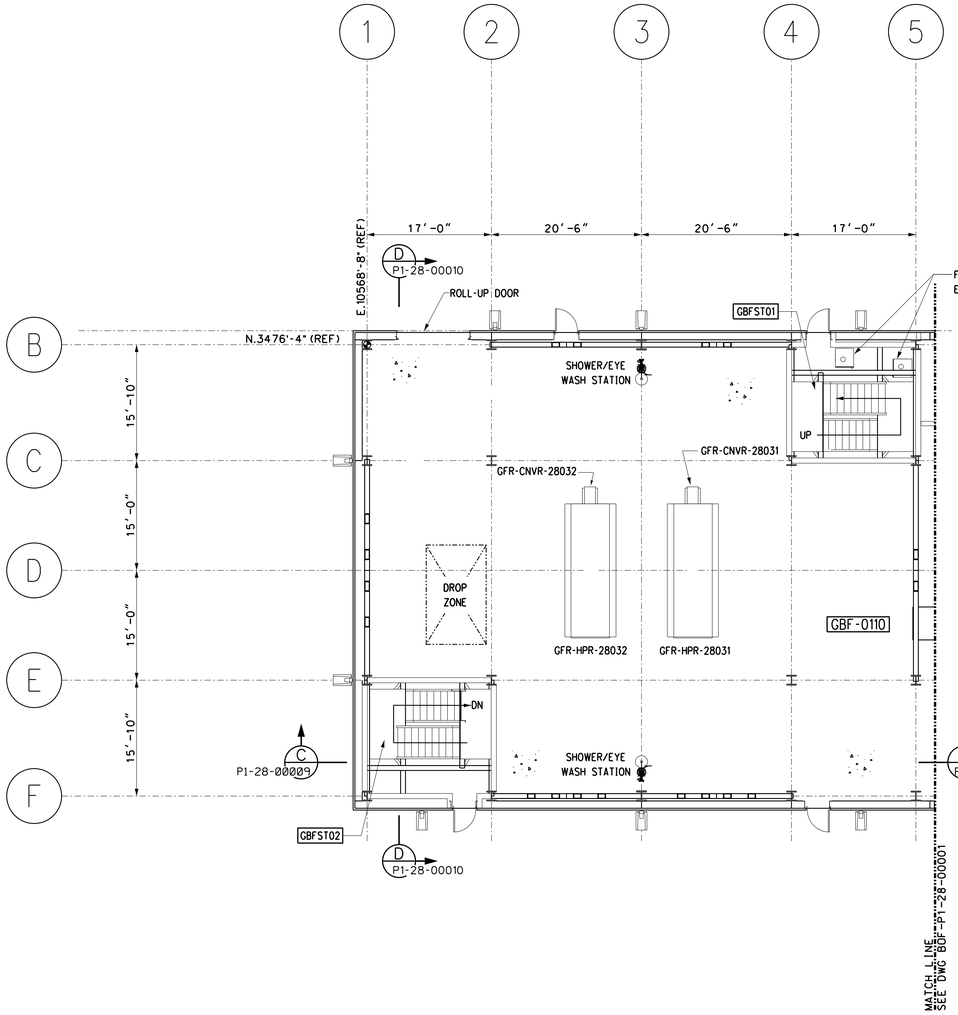
10.12.2 The SELLER's proposed design and fabrication schedule shall include BUYER hold points.

Appendix A - Acronyms and Abbreviations

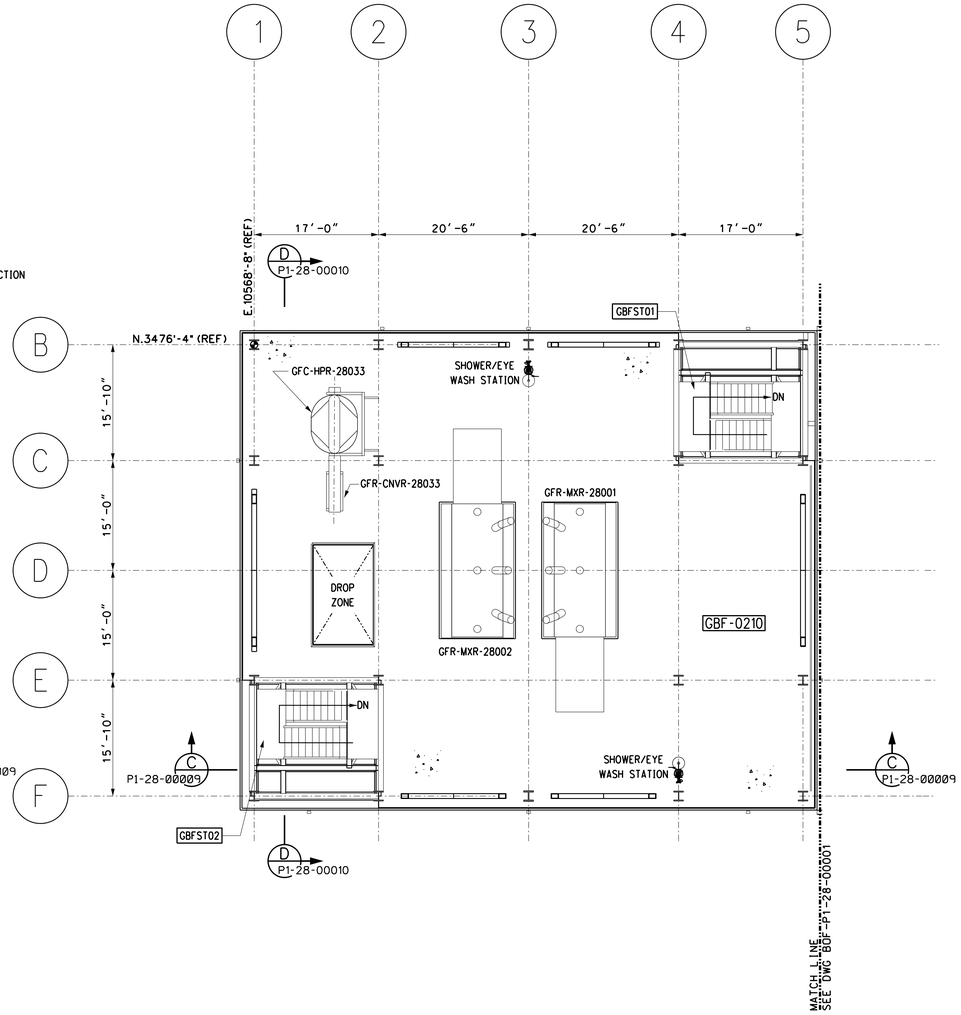
Table 10-2: Acronyms and Abbreviations

Acronym	Unabbreviated Form
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
ASTM	American Society for Testing and Materials
AWS	American Welding Society
BNI	Bechtel National, Inc.
BOF	Balance of Facilities
COTS	Commercial Off The Shelf
CTN	Component Tag Number
DOE	U.S. Department of Energy
FAT	Factory Acceptance Test
GBF	Glass former Building Facility
GFC	Glass Former Chemical
GFR	Glass Former Reagent
HEPA	High Efficiency Particulate Air (filter)
HLW	High Level Waste
I/O	Input/Output
LAW	Low-Activity Waste
MCC	Motor Control Center
MDS	Mechanical Data Sheet
MFPV	Melter Feed Preparation Vessel
RAMI	Reliability, Availability, Maintainability, and Inspectability
SDD	System Design Description
SDS	Safety Data Sheet
SSC	Systems, Structures, and Components
SDDR	Supplier Deviation Disposition Request
VFD	Variable Frequency Drive

KEY PLAN



PLAN AT EL 0'-0"



PLAN AT EL 20'-3"

NOTES:

1. FOR REFERENCE SEE MECHANICAL DRAWING 24590-80F-P1-28-00009 FOR SECTION "C-C" & 24590-80F-P1-28-00010 FOR SECTION "D-D".

2. ROOMS ARE OFFICALLY IDENTIFIED BY ROOM NUMBERS. ROOM NUMBERS ARE ESTABLISHED ON GENERAL ARRANGEMENT AND ASSOCIATED EQUIPMENT LOCATION DRAWINGS.

3. REFER TO DRAWING 24590-80F-C2-C12T-00002 FOR CONVERSION FROM GBF FACILITY ELEVATIONS TO SITE ELEVATIONS. GBF FACILITY ELEVATION 0'-0" EQUALS SITE ELEVATION 682'-0" MLS.

4. ALL OPERATING AREAS ARE DESIGNATED C1/R1 UNLESS NOTED OTHERWISE.

HOLD NOTES:

1. STAIRS, DOORS AND EGRESS ARE ON HOLD UNTIL CONFIRM FINAL EQUIPMENT AREA REQUIREMENTS.

2. ROOM NUMBERS ARE ON HOLD UNTIL DOCUMENT NUMBER 24590-WTP-3DI-A10W-00001, REV. 0 IS ISSUED.

LEGEND:

CA	CONTROLLED ACCESS
EE	EMERGENCY EXIT
GBF-0110	SILO AREA FIRST LEVEL ROOM
GBF-0210	SILO AREA SECOND LEVEL ROOM
GBFST01	STAIRWELL
GBFST02	STAIRWELL
	EQUIPMENT REMOVAL/PULL SPACE OR LAYDOWN AREA
	CONCRETE
	CHECKERED PLATE
	GRATING SPAN
	CONSTRUCTION ACCESS

CM
QUALITY DESIGNATOR

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUE FOR USE	J.A.B.	B.G.	A.B.	J.S.	10/31/24

REVISION HISTORY

ISSUED BY RPP-WTP PDC

ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	28

	BY	DATE
ORIGINATOR	J. BADILLO	10/31/24
CHECKER	B. GREER	10/31/24
APPROVER	J. SHOEMAKER	10/31/24
REVIEWER	A. BASS	10/31/24

CONTENT APPLICABLE TO ALARA? [ ] YES [X] NO
ADR NO. N/A REV: N/A

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

WTP GLASSFORMER BAGHOUSE FACILITY, SILO AREA GENERAL ARRANGEMENT SILO AREA PLAN AT EL. 0'0" AND EL. 20'-3"

SCALE: 1/8"=1'-0"

24590-80F-P1-28-00005

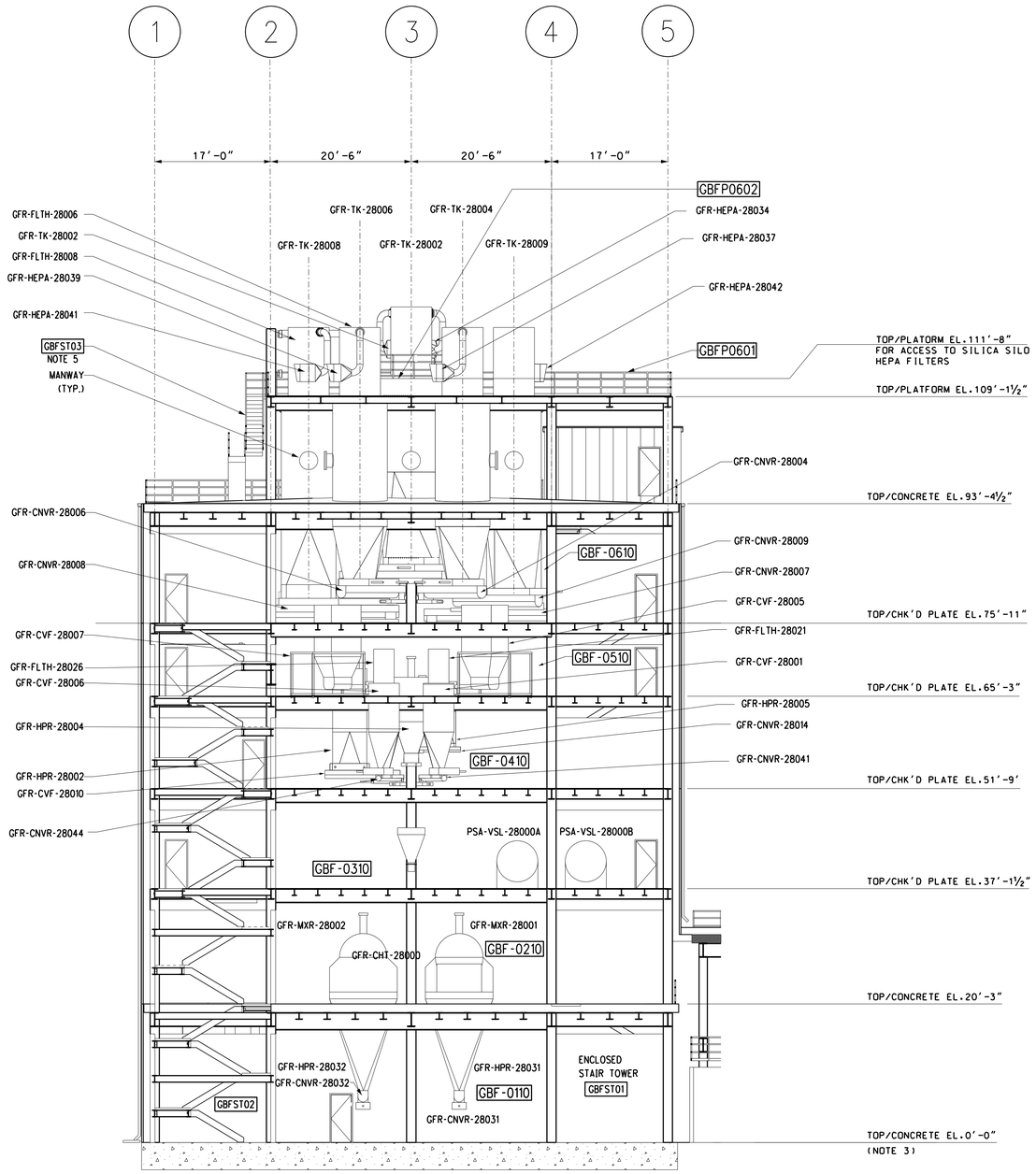
REV 0

E-SIZE - 44x34
COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

FORM E_SDN.DGN 02/2009

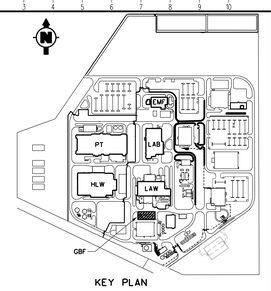
PLOTTED BY: $USERNAME$ $FILE$

$DATE$ $TIME$



SECTION C-C

BOF-P1-28-00005
BOF-P1-28-00006
BOF-P1-28-00007
BOF-P1-28-00008



KEY PLAN

NOTES:

1. FOR REFERENCE SEE MECHANICAL DRAWING 24590-BOF-P1-28-00005 TO 24590-BOF-P1-28-00008 FOR GENERAL ARRANGEMENT.

2. ROOMS ARE OFFICALLY IDENTIFIED BY ROOM NUMBERS. ROOM NUMBERS ARE ESTABLISHED ON GENERAL ARRANGEMENT AND ASSOCIATED EQUIPMENT LOCATION DRAWINGS.

3. REFER TO DRAWING 24590-BOF-C2-C12T-00002 FOR CONVERSION FROM GBF FACILITY ELEVATIONS TO SITE ELEVATIONS. GBF FACILITY ELEVATION 0'-0" EQUALS SITE ELEVATION 682'-0" MLS.

4. ALL OPERATING AREAS ARE DESIGNATED C1/R1 UNLESS NOTED OTHERWISE.

HOLD NOTES:

1. STAIRS, DOORS AND EGRESS ARE ON HOLD UNTIL CONFIRM FINAL EQUIPMENT AREA REQUIREMENTS.

2. ROOM NUMBERS ARE ON HOLD UNTIL DOCUMENT NUMBER 24590-WTP-3DI-A10W-00001, REV. 0 IS ISSUED.

CM
QUALITY DESIGNATOR

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUE FOR USE	J.A.B.	B.G.	A.B.	J.S.	10/31/24

REVISION HISTORY

ISSUED BY RPP-WTP PDC

ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	28

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

	BY	DATE
ORIGINATOR	J. BADILLO	10/31/24
CHECKER	B. GREER	10/31/24
APPROVER	J. SHOEMAKER	10/31/24
REVIEWER	A. BASS	10/31/24

CONTENT APPLICABLE TO ALARA? [ ] YES [X] NO
ADR NO. N/A REV: N/A

WTP GLASSFORMER BAGHOUSE FACILITY GENERAL ARRANGEMENT SILO AREA SECTION C-C

SCALE: 1/8"=1'-0"

24590-BOF-P1-28-00009

REV 0

"E" SIZE - 44x34
COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

FORM E_SDN.DGN 02/2009

PLOTTED BY: $USERNAME$ $FILE$ $DATE$ $TIME$