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SILO PROJECT INDEPENDENT REVIEW TEAM DOCUMENTATION - VITRIFICATION PILOT PLANT STARTUP PROGRAM PHASE I TEST PROCEDURE 2504-SU-0035 PILOT PLANT SYSTEMS OPERABILITY TEST PROCEDURE GLASS CAMPAIGN 2

08/20/96

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PROCEDURE

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VITRIFICATION PILOT PLANT STARTUP PROGRAM

PHASE I

TEST PROCEDURE 2504-SU-0035

PILOT PLANT SYSTEMS OPERABILITY TEST PROCEDURE

GLASS CAMPAIGN 2

EDC CONTROLLED CERTIFIED

Rev. 0
8-20-96

APPROVED BY:

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Fernald Environmental Restoration Management Corporation
Fernald, Ohio

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1.0 PURPOSE

This document defines and comprises the System Operability (SO) test procedure for Campaign 2 of Melter operations. Campaign 2 is the testing of Acceptance Glass and Series D glass which is the surrogate for a vitrified product of waste (70% K-65 material and 30% Silo 3 material) and requisite additives. This SO testing covers:

- The displacement of benign glass from the Melter.
- The 36 hour Acceptance Testing of the Melter for final acceptance by FERMCO.
- The 8 Hour Gem Machine Performance Test
- The preparation of Series D glass slurry.
- The operation of the Melter and the Gem Machine at 1 MT/D to satisfy the procurement specification.
- The adjustment of Melter temperature to correspond to Series D glass formulation.

This testing will demonstrate continuous operations with Acceptance Glass and Series D surrogate under the conditions specified in the Melter and Gem Machine specification.

Specifically, Campaign 2 consists of 2 runs with the following objectives:

Run 1 — This run will feed the Acceptance Glass formula with the Melter main chamber glass temperature maintained at 1350°C. The goal of Run 1 is to perform the 36 hour acceptance test of the Melter and the 8 hour acceptance test of the Gem Machine at a minimum rate of one metric ton per day.

Run 2 — This run will feed the Series D surrogate glass formula with the Melter main chamber glass temperature maintained at 1250°C. The goal of Run 2 is to verify the ability of the Melter and support systems to produce acceptable glass for this feed formulation.

2.0 SCOPE

This procedure applies to all personnel involved in the execution or supervision of Campaign 2 of the VITPP Melter.

Campaign 2 involves slurry feeding the Melter with Acceptance Glass and Series D surrogate waste, i.e., lead and barium will be used. The feed slurries will be mixed directly in the Slurry Tanks. The Thickener will not be used for this operation.

3.0 REFERENCES

3.1 Process Flow Diagrams

No.	Title
94X-5900-F-278	HYDRAULIC WASTE RETRIEVAL AND DEWATERING
94X-5900-F-279	FEED PREPARATION AND VITRIFICATION
94X-5900-F-280	OFF-GAS TREATMENT
94X-5900-F-551	PROCESS COOLING WATER
94X-5900-F-795	RADON REMOVAL AND EMERGENCY OFF-GAS
94X-5900-F-851	FURNACE AND GEM MACHINE

3.2 Piping and Instrumentation Diagrams

No.	Title
94X-5900-N-270	FEED PREPARATION SHEET 1 OF 2
94X-5900-N-271	FEED PREPARATION SHEET 2 OF 2
94X-5900-N-272	FURNACE AND GEM MACHINE
94X-5900-N-273	OFF-GAS TREATMENT
94X-5900-N-274	WASTEWATER TREATMENT
94X-5900-N-314	PROCESS COOLING WATER
94X-5900-N-315	OFF-GAS AIR
94X-5900-N-529	ADDITIVE TRANSFER
94X-5900-N-530	SILO 3 MATERIAL TRANSFER
94X-5900-N-820	EMERGENCY OFF-GAS SYSTEM
94X-5900-N-891	ELECTRODE HOLDERS COOLING SYSTEM
CRU4-X-I-002	MELTER
CRU4-X-I-004	UTILITY AIR
CRU4-X-I-005	COOLING WATER

3.3 FERMCO Procedures

In addition to all of the applicable FERMCO Operations Procedures, and Health and Safety procedures, the following VITPP Procedures also apply specifically to this SOT:

No.	Description
11-A-002	VITPP Melter Control Panel Alarms and Gem Machine Control Panel Alarms
11-C-263	VITPP Recycle Water System
11-C-266	VITPP Off-Gas Treatment System
11-C-267	VITPP Feed Preparation Phase I
11-C-269	VITPP Melter Operation
11-C-270	VITPP Process Cooling Water System
11-C-271	VITPP Electrode Holders Cooling System Operation
11-C-272	VITPP Gem Machine Operation
11-C-274	VITPP Treated Water (TW) System
11-C-276	VITPP Phase I Process Sampling Procedure
11-C-278	VITPP Roller Conveyor Operations
11-C-279	VITPP Utility Air System
11-E-001	VITPP Emergency Operating Procedure, Loss of Electrical Power
VIT-1000	VITPP Carcinogen Control Plan. Phase I Bag Dump Activities

3.4 GTS Duratek Procedures

No.	Description
OP-CRU4-05	Temperature and Power Control Procedure
OP-CRU4-07	Maintenance Procedures for the Melter
PI-CRU4-04	GTS Duratek DuraMelter™ 1000-HT 36 Hour Test Plan
PI-CRU4-06	GTS Duratek Gem Making Machine Test Plan

3.5 General References

Phase I Work Plan, WP-25-0007
Instrument Index, VITPP PO 85 & 92
VITPP Technical Specifications
Equipment Standard Operating Procedures
Vendor Operating Manuals, all.
FERMCO Lockout/Tagout Procedure, OP-0004.
Material Safety Data Sheets for VITPP Substances.
Startup Plan, 18-SU-0001
SO Test Plan, 18-SU-0002
Phase I Test Plan, 18-SU-0003
Safety Performance Requirement Manual, RM-0021
Phase I Operational Safety Guide, VIT-OSG-1007.2
Project Specific Plan, Phase I Process Sampling, 2504-SU-0011

4.0 PREREQUISITES

This section lists required conditions that must be verified by the Test Coordinator prior to SO testing.

NOTE: Not all situations are known or foreseeable. Unusual conditions or circumstances could change the steps in this procedure or add steps.

4.1 Lock(s) and Tag(s) have been removed from equipment to be tested.

_____
Test Coordinator Date

4.2 The Facility Owner has been notified of intention to start test.

_____
Test Coordinator Date

4.3 Required equipment maintenance and pre-start service has been completed.

_____
Test Coordinator Date

4.4 Process Water (treated water from FEMP site), local Cooling Tower water, and fire protection water from the FEMP site are available to support testing.

_____
Test Coordinator Date

4.5 Instrument Air from the VITPP air compressor and Uninterruptable (bottled) Air is available.

_____
Test Coordinator Date

4.6 Electrical power is available to the VITPP to the extent necessary to support the specific electrical line-up attachment for the applicable section being performed.

_____

Test Coordinator Date

4.7 The Off-Gas System and Emergency Off-Gas System are operating in accordance with Procedure 11-C-266, "VITPP Off-Gas Treatment System."

_____

Test Coordinator Date

4.8 Drums are in the Startup, Emergency, and Gem positions.

_____

Test Coordinator Date

4.9 Operators and persons involved with Campaign 2 have read or been briefed on the appropriate section(s) of this procedure and have signed the Signature Record Log (Attachment 1) prior to commencing their assigned task.

_____

Test Coordinator Date

4.10 A sufficient supply of slurry/surrogate chemicals (as specified in Attachments 2, 3, 8 and 9) is available to support this SOT.

_____

Test Coordinator Date

4.11 A sufficient supply of 55 gal drums (minimum of 20) are available to support this SOT.

_____

Test Coordinator Date

4.12 A sufficient supply of side-chamber frit (minimum of 2000 lb) is readily available to support this SOT.

_____
Test Coordinator Date

4.13 The Scrubber has been charged with caustic per SOP 11-C-266, VITPP Off-Gas Treatment System.

_____
Test Coordinator Date

4.14 The Startup diverter is positioned over the (east) Startup drum and Startup gate is OPEN.

_____
Test Coordinator Date

4.15 A sufficient supply of sampling equipment and supplies are available to support this SOT.

_____
Test Coordinator Date

4.16 The Analytical Lab has been notified that slurry feed operations are commencing.

_____
Test Coordinator Date

4.17 Notify VITPP QA prior to initiating Section 7.0.

_____
Test Coordinator Date

4.18 The following Operator Aids have been reviewed and updated:

Utility Rack settings, Melter Control Panel Setpoints, SCR Control Panel Setpoints, Gem Machine Control Panel Setpoints, and Control Room Statue Board.

_____

Test Coordinator Date

4.19 Flushing, treatment and disposal of slurry batches containing lead or barium compounds has been planed with subsequent approval by the appropriate site groups, (e.g. Environmental Compliance, AWWT, etc.).

_____

Test Coordinator Date

4.20 A sulfur dioxide (SO_2) monitor shall be installed and operable in the Melter room with an alarm set point of 2.5 ppm.

_____

Test Coordinator Date

4.22 Exceptions to above prerequisites shall be noted in the Test Log.

_____

Test Coordinator Date

5.0 TEST EQUIPMENT

NONE

6.0 PRECAUTIONS and LIMITATIONS

Special system or equipment operating conditions which could be dangerous (e.g. close proximity of personnel to rotating or moving equipment or equipment that is thermally hot) will be labelled and/or barricaded and the proper safe method of operation will be identified.

Specific operating parameters (e.g. design limits for temperature, pressure, or flow), which if exceeded could cause personal injury or equipment damage, will be identified and limitations specified.

Equipment or systems that must be started or stopped in a certain sequence are identified in Standard Operating Procedures. Notifications should be made to the Shift Supervisor in the VITPP of the starting and stopping of systems or equipment (motors, blowers, fans, pumps, etc.).

Required notifications or approvals necessary to prevent problem conditions should be brought to the attention of the Test Coordinator through test briefings.

6.1 All personnel performing steps within this procedure shall familiarize themselves with this procedure to the degree their test function dictates and indicate such by placing their printed name, signature, initials, and badge number on the Signature Record Log (Attachment 1).

6.2 The FERMCO Lockout/Tagout (Hazardous Energy and Material Control) Procedure, OP-0004, will be administered, and only trained and authorized personnel will conduct the lockout/tagout sequence.

6.3 Sections/steps in this procedure may be performed out of sequence or concurrently as determined necessary by the Test Coordinator with authorization from the Shift Manager. Special care and review by the Test Coordinator should be given in the event sections/steps are performed out of sequence. The exceptions shall be documented according to project procedures and logged in the Test Log.

6.4 If this test is being performed to demonstrate the operability of select components, any steps not applicable to the component(s) being tested may be noted N/A, as determined by the Test Coordinator.

6.5 In the event that conditions require components to be disabled, jumpered, or re-aligned to support unanticipated test conditions, the Test Coordinator, Shift Manager, and System Engineer must approve. Explanations and justification and sign-off by the Test Coordinator and Shift Manager for all changes in configuration must be entered into the Test Log.

6.6 **This campaign uses lead oxide, nickel oxide, crystalline silica and vanadium pentoxide which are either highly toxic or carcinogenic chemicals.** Strict adherence to Radiological Work Permit (RWP),and the VITPP Carcinogen Control Plan-Phase 1 Bag Dump Aditivities (VIT-1000) shall be maintained, especially with respect to engineering, administrative and PPE controls. Any situation which could result in the inhalation, ingestion, or absorption of a hazardous material shall immediately be reported to a Supervisor or to the Assistant Emergency Duty Officer (AEDO), who will immediately report the circumstances to Medical and Industrial Hygiene. The involved personnel shall be directed by the Supervisor or AEDO as to when and where to report for medical evaluation, completion of an Incident Investigation Report (IIR) (Form No. FS-F-1458), and submitting bioassay samples (e.g. blood, urine). Employees are responsible for complying with any additional requirements as specified by OS&H.

6.7 The Shift Manager shall have responsibility for all testing activities.

6.8 The Test Coordinator shall have responsibility for coordinating all testing and data gathering activities, including gathering data specifically requested by the GTS Duratek technical support person.

6.9 The Shift Supervisor shall have responsibility for execution of all equipment operation adjustments and energy isolation to support testing activities.

6.10 The System Engineer shall be responsible for on-shift engineering support and ensuring that systems are available and operational to support the testing activities.

6.11 All conductive items in contact with the molten glass pool have the potential to be electrically energized. Never attempt to defeat or remove any protective covers, cages, or barriers unless the electrodes are de-energized and appropriate supervisory permission has been explicitly received.

6.12 All exterior surfaces of the Melter, in contact with the molten glass discharge stream, off-gas piping ducts, and glass receptacles can become extremely hot. Never attempt to handle components or newly formed glass without appropriate heat-resistant clothing. The minimum required PPE includes heat-resistant leather gloves, heat resistant apron, and heat-resistant leather sleeves or comparable.

6.13 Failure to follow the requirements of this procedure may result in severe personnel injury and/or damage to equipment and components.

6.14 The air bubblers (FI-001 through FI-004) and air trickle flow (FI-006) must be energized AT ALL TIMES.

6.15 Contact Industrial Hygiene for a heat stress survey when the ambient air temperature in the melter room exceeds 80°F.

6.16 If the Melter is idled for greater than 3 days, then consideration should be given to turning over the glass composition to the startup composition.

6.17 The bottom drains, electrodes, center chamber feed tube, center chamber hopper, side drain and side feed hoppers must have Melter cooling water flowing through them <u>AT ALL TIMES.</u>

7.0 DETAILED TEST PROCEDURE

Steps that record data will require the Test Coordinator to note instrument readings, initials, and date in the attachments provided, or record in the Test Log. Other operating data that are routinely recorded by the operators will be recorded on operator Round Sheets and the DCS log. Additionally, DCS operating data is stored in the VPPS database.

This Test Procedure consists of the step-by-step performance of testing activities. Appropriate areas will include a place for action step sign-off and/or verification (and a place for recording data). Testing is accomplished by implementation of this document along with the performance of other equipment Standard Operating Procedures (SOPs), and Long Term Orders as required. Other items included may be warnings, cautions, notes, hold, or witness points, and system restoration. Pending review of the results from the performance of this procedure, certain steps may be changed (through proper change control methods) to obtain a specific result.

7.1 TEST: Transition Glass in Center Chamber and Heat-Up Melter to 1350°C

NOTE: Operators shall complete Attachments 7A and 7B every 30 minutes when the Melter system is stable during batch feeding.

NOTE: Test Coordinator shall complete Attachment 6 for each batch.

___/___ 7.1.1 Ramp up Melter temperature to 1250°C (+/- 20°C) per SOP 11-C-269, "VITPP Melter Operation".

___/___ 7.1.2 Prepare a batch of glass slurry according to the formula on the Campaign Transition Glass Batch Sheet (see Attachment 8).

___/___ 7.1.3 Collect sample per PSP (Project Specific Plan, 2504-SU-0011) from the Slurry Tank approximately 30 minutes after chemical addition is completed.

___/___ 7.1.4 Submit the sample for analysis per the PSP and Test Coordinator.

___/___ 7.1.5 Review analytical results.

___/___ 7.1.6 Verify batch is acceptable.

___/___	7.1.7	Confirm the drums are empty or tare weights are known.
___/___	7.1.8	Discharge glass to Startup or Emergency drum until approximately 10 percent of the center chamber is drained. (Approximately 400 pounds).
___/___	7.1.9	Begin feeding slurry to the Melter. Increase feed rate at 25 rpm/min towards target feed rate to establish a feed rate that creates a stable and desirable cold cap, (approximately 100 - 300 rpm).
___/___	7.1.10	Continue to feed Melter until the slurry tank weight that the Melter is being feed from decreases by one sixth, then stop feeding the Melter.
___/___	7.1.11	Discharge glass to Startup or Emergency drum until approximately 10 percent of the center chamber is drained. (Approximately 400 pounds). If the glass does not flow freely through the discharge chamber (due to high viscosity), then increase the Melter temperature to 1350°C (+/- 20°C).
___/___	7.1.12	Resume feeding slurry to the Melter. Increase feed rate at 25 rpm/min towards target feed rate to establish a feed rate that creates a stable and desirable cold cap, (approximately 100 - 300 rpm).
___/___	7.1.13	Continue to feed Melter until the slurry tank weight that the Melter is being feed from decreases by one sixth then stop feeding the Melter.
___/___	7.1.14	Discharge glass to Startup or Emergency drum until approximately 10 percent of the center chamber is drained. (Approximately 400 pounds). If the glass does not flow freely through the discharge chamber (due to high viscosity), then increase the Melter temperature to 1350°C (+/- 20°C), if not already done.
___/___	7.1.15	Resume feeding slurry to the Melter. Increase feed rate at 25 rpm/min towards target feed rate to establish a feed rate that creates a stable and desirable cold cap, (approximately 100 - 300 rpm).

___/___	7.1.16	Continue to feed Melter until the slurry tank weight that the Melter is being feed from decreases by one sixth then stop feeding the Melter.
___/___	7.1.17	Discharge glass to Startup or Emergency drum until approximately 10 percent of the center chamber is drained. (Approximately 400 pounds). If the glass does not flow freely through the discharge chamber (due to high viscosity), then increase the Melter temperature to 1350°C (+/- 20°C), if not already done.
___/___	7.1.18	Resume feeding slurry to the Melter. Increase feed rate at 25 rpm/min towards target feed rate to establish a feed rate that creates a stable and desirable cold cap, (approximately 100 - 300 rpm).
___/___	7.1.19	Continue to feed Melter until the slurry tank weight that the Melter is being feed from decreases by one sixth then stop feeding the Melter.
___/___	7.1.20	Discharge glass to Startup or Emergency drum until approximately 10 percent of the center chamber is drained. (Approximately 400 pounds). If the glass does not flow freely through the discharge chamber (due to high viscosity), then increase the Melter temperature to 1350°C (+/- 20°C), if not already done.
___/___	7.1.21	Resume feeding slurry to the Melter. Increase feed rate at 25 rpm/min towards target feed rate to establish a feed rate that creates a stable and desirable cold cap, (approximately 100 - 300 rpm).
___/___	7.1.22	Continue to feed Melter until the slurry tank weight that the Melter is being fed from decreases by one sixth then stop feeding the Melter.

___/___ 7.1.23 Discharge glass to Startup or Emergency drum until approximately 10 percent of the center chamber is drained. (Approximately 400 pounds). If the glass does not flow freely through the discharge chamber (due to high viscosity), then increase the Melter temperature to 1350°C (+/- 20°C), if not already done.

___/___ 7.1.24 Resume feeding slurry to the Melter. Increase feed rate at 25 rpm/min towards target feed rate to establish a feed rate that creates a stable and desirable cold cap, (approximately 100 - 300 rpm).

___/___ 7.1.25 Continue to feed Melter until the slurry tank that the Melter is being feed from is empty, then stop feeding the Melter.

___/___ 7.1.26 If not already done, increase Melter temperature to 1350°C (+/- 20°C) per SOP 11-C-269, "VITPP Melter Operation", and hold for a minimum of two hours.

Start Time:_____ Stop Time:_____

___/___ 7.1.27 Collect sample of center chamber glass by discharging and submit it to be analyzed for total metals.

___/___ 7.1.28 Verify center chamber glass is acceptable.

_____

Data Testing Manager Date

___/___ 7.1.29 Obtain Operations Manager's consent to continue.

_____

Operations Manager Date

7.2 TEST: Prepare Acceptance Glass Slurry Batch

Initials/Date

___/___	7.2.1	Make a slurry batch of Acceptance Glass in a Slurry Tank using the batch formula listed in Attachment 2 and recirculate the slurry through the Melter feed loop or the Melter bypass loop (as specified by the Shift Manager) as described in SOP 11-C-267, VITPP Feed Preparation Phase I.
___/___	7.2.2	Sample the surrogate batch in accordance with the PSP (Project Specific Plan, 2504-SU-0011), and per SOT 11-C-276, VITPP Phase 1 Process Sampling Procedure.
___/___	7.2.3	Submit the sample for analysis per the PSP and Test Coordinator.
___/___	7.2.4	Review analytical results.
___/___	7.2.5	If analytical results are not acceptable, adjust slurry batch formula as necessary.
___/___	7.2.6	Make another slurry batch of Acceptance Glass surrogate in the other Slurry Tank using the surrogate batch formula listed in Attachment 2, and recirculate the slurry through the Melter feed loop or the Melter bypass loop (as specified by the Shift Manager) as described in SOP 11-C-267, VITPP Feed Preparation Phase I.
___/___	7.2.7	Sample the surrogate batch in the second tank in accordance with the PSP, Project Specific Plan, 2504-SU-0011, and per SOT 11-C-276, VITPP Phase 1 Process Sampling Procedure.
___/___	7.2.8	Submit the sample for analysis per the PSP and Test Coordinator.
___/___	7.2.9	Review analytical results.

NOTE: Prepare additional batches of Acceptance Glass surrogate as needed. Sample each slurry batch in accordance with the PSP, Project Specific Plan, 2504-SU-0011, SOT 11-C-276, VITPP Phase 1 Process Sampling Procedure, and as directed by the Test Coordinator.

7.3 TEST: Run 36 Hour Melter Performance Test

NOTE: Operators shall complete Attachments 7A and 7B regularly every 30 minutes when the Melter system is stable during batch feed.

NOTE: Test Coordinator shall complete Attachment 6 for each batch.

NOTE: Attachments 4 and 5 are to be used to determine the Melter Feed Pump rpm to achieve one metric ton per day.

NOTE: Attachment 10.1 shall be completed at the begining every 2 hrs during the 36 hr Melter Performance Test.

Initials/Date

___/___ 7.3.1 Begin the 36 hr performance test of the Melter. The test shall be continuous at a minimum rate of one metric ton per day of glass produced for 36 hours.

_____

Shift Manager Date/Time

_____

Duratek Field Rep. Date/Time

NOTE: The Gem Machine performance test (Section 7.4) shall be run concurrently with the Melter performance test after Melter feed is increased to a minimum of 1 MT/D glass rate.

NOTE: The 36 hours refers to total run time <u>while feeding the Melter</u>. Reasonable downtime for maintenance unrelated to the Melter and Gem Machine is allowable. Additionally, the feed rate can be adjusted to control the cold cap as approved by GTS Durateck Technical Representative.

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___/___	7.3.2 *	Continue Melter feed to maintain steady state operation and hold with concurrence from the GTS Duratek technical support person.
___/___	7.3.3	Operators shall complete Attachment 10.1, Duramelter Acceptance Testing Table.
___/___	7.3.4	Commence discharging the Melter into a drum as advised by the GTS Duratek technical support person.
___/___	7.3.5 *	Continue to operate Melter at a steady state with concurrence from GTS Duratek Technical Support person.
___/___	7.3.6	Completed 36 hr Acceptance Test: _____ Shift Manager Date/Time _____ Durateck Field Representative Date/Time
___/___	7.3.7	VITPP Manager approval of completion of the 36 hour Acceptance Test: _____ VITPP Manager Date/Time
___/___	7.3.8	Lower Melter temperature to 1250° C (+/- 20° C) after completion of 36 hour test.

* P/QA: USE ATTACHMENT #6 (4 PAGES) TO VERIFY THESE STEPS. DW 8-22-96

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7.4 TEST: Run 8 Hour Gem Machine Performance Test

NOTE: The 8 hours refers to total run time of the Gem Machine while producing gems when feeding the Melter. Reasonable downtime for maintenance unrelated to the Melter and Gem Machine is allowable. The goal is to run the Gem Machine continuously for at least two hours.

NOTE: Operators shall complete Attachments 7A and 7B initially every 30 min when the Melter system is stable during slurry feed.

NOTE: Test Coordinator shall complete Attachment 6 for each batch.

NOTE: Weigh Gem drums prior to the start of this section.

NOTE: Attachment 10.2 shall be completed every 2 hrs during the 8 hr Gem Machine Performance Test.

Initials/Date

QA/IS REQ'D INSPECTION DATE STAMP

___/___ 7.4.1 With Melter being fed slurry at a steady state operating rate, (target rate of approximately 95 pounds per hour glass production rate), begin Gem Machine 8 hour performance test with concurrence from the GTS Duratek technical support person.

_____
Shift Manager Date/Time

_____
Duratek Field Rep. Date/Time

QA/IS REQ'D INSPECTION DATE STAMP

___/___ 7.4.2 Ensure that the Gem Machine has operated during the 8 hrs and has produced a minimum of 730 lb gems (1/3 MT or a 55 gal drum about 80% full).

___/___ 7.4.3 Operators shall complete Attachment 10.2, Gem Machine Acceptance Testing Table.

___/___ 7.4.4 Complete 8 hour Gem Machine Performance Test.

_____
Shift Manager Date/Time

_____
Duratek Field Rep. Date/Time

7.5 TEST: Run Melter at 1250°C

NOTE: Do not proceed to the next step until a GTS Duratek technical support person and VITPP Manager concurs that the 36 hour performance test is complete.

NOTE: Operators shall complete Attachments 7A and 7B regularly every 30 min when the Melter system is stable during slurry feed.

NOTE: Test Coordinator shall complete Attachment 6 for each batch.

Initials/Date

___/___ 7.5.1 Increase Melter temperature to 1300°C or that temperature required for glass to flow freely through the discharge chamber.

___/___ 7.5.2 Make batch using formulation listed in Attachment 9.

___/___ 7.5.3 Start feeding Melter with Series D surrogate and additives slurry to achieve a stable cold cap.

___/___ 7.5.4 While feeding Series D glass, slowly lower temperature to 1250°C.

___/___ 7.5.5 Run as continuously as possible at an optimum operating rate for a minimum of 2 batches or as directed by the Operations Manager. Vary feed rate, bubbler rate, urea amounts, % solids, cold cap size, etc. to help establish operating envelope as directed in the Daily Orders.

___/___ 7.5.6 Feed the last slurry batch (leaving both Slurry Tanks with a minimal heel) and stop feed to Melter.

___/___ 7.5.7 Hold Melter at standby at a temperature to 1250°C or other temperature as directed by the Operations Manager.

ATTACHMENT 1

SIGNATURE RECORD LOG

Each performer shall record name, signature, initials, and badge number to indicate familiarity with this procedure.

Printed Name	Signature	Initials	Badge No.

Note: This page may be reproduced as necessary for additional signoffs.

Sheet ___ of ___

Attachment 2

CAMPAIGN 2 ACCEPTANCE SURROGATE BATCH SHEET

Add the following ingredients to the available slurry tank in the order specified.

Batch ID_____ Date Batch Initiated:___/___/___

Initials/Start Time			
___/___	1.	Water (including any remaining heel)	2785 lb.
___/___	2.	Sodium Carbonate (Soda Ash, Na_2CO_3)	49 lb.
___/___	3.	Sodium Sulfate (Na_2SO_4)	20 lb.
___/___	4.	Sodium Nitrate (Soda Niter, $NaNO_3$)	34 lb.
___/___	5.	Potassium Carbonate (Potash, K_2CO_3)	18 lb.
___/___	6.	Potassium Nitrate (Saltpeter, KNO_3)	26 lb.
___/___	7.	Calcium Carbonate ($CaCO_3$)	231 lb.
___/___	8.	Calcium Sulfate (Gypsum, $CaSO_4$)	96 lb.
___/___	9.	Aluminum Oxide (Alumina, Al_2O_3)	333 lb.
___/___	10.	Iron(III) Oxide (Rust, Fe_2O_3)	113 lb.
___/___	11.	Iron(III) Sulfate ($Fe_2(SO_4)_3$)	13 lb.
___/___	12.	Magnesium Carbonate ($MgCO_3$)	21 lb.
___/___	13.	Magnesium Sulfate (Epsom salt, $MgSO_4$)	58 lb.
___/___	14.	Magnesium Oxide (MgO)	17 lb.
___/___	15.	Weigh and mix the following in a bucket and add together:	

Calcium Oxide (Lime, CaO)	3 lb.
Manganese Oxide (MnO_2)	3 lb.
Nickel Oxide (NiO)	9 lb.
Vanadium Pentoxide (V_2O_5)	3 lb.
Lithium Carbonate (Li_2CO_3)	5 lb.

___/___	16.	Magnesium Phosphate ($Mg_3(PO_4)_2$)	144 lb.
___/___	17.	Bentonite Clay	89 lb.
___/___	18.	Barium Carbonate ($BaCO_3$)	23 lb.
___/___	19.	Barium Sulfate ($BaSO_4$)	58 lb.
___/___	20.	Lead Oxide (PbO)	107 lb.
___/___	21.	Silicon Dioxide (Silica, SiO_2)	760 lb.
___/___	22.	Sodium Tetraborate Pentahydrate ($Na_2B_4O_7 \cdot 5H_2O$)	476 lb.
___/___	23.	Urea ($CO(NH_2)_2$)	76 lb.

Attachment 3

CAMPAIGN 2 SURROGATE BATCH SHEET (BLANK QUANTITIES)

Batch ID_____ Date Batch Initiated:___/___/___

Initials/Start Time

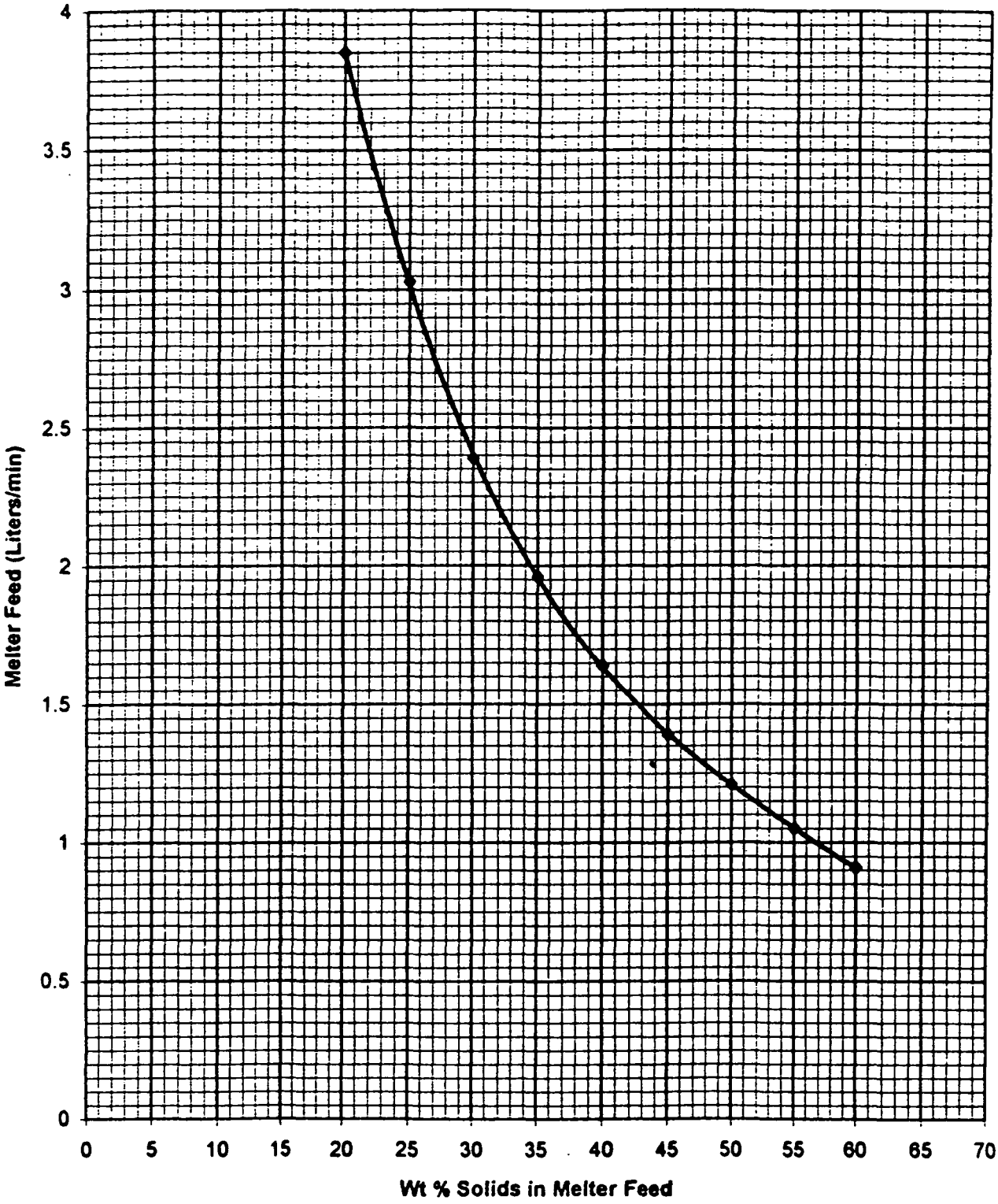
___/___	1.	Water	_____	lb.
___/___	2.	Sodium Carbonate (Soda Ash, Na_2CO_3)	_____	lb.
___/___	3.	Sodium Sulfate (Na_2SO_4)	_____	lb.
___/___	4.	Sodium Nitrate (Soda Niter, $NaNO_3$)	_____	lb.
___/___	5.	Potassium Carbonate (Potash, K_2CO_3)	_____	lb.
___/___	6.	Potassium Nitrate (Saltpeter, KNO_3)	_____	lb.
___/___	7.	Calcium Carbonate ($CaCO_3$)	_____	lb.
___/___	8.	Calcium Sulfate (Gypsum, $CaSO_4$)	_____	lb.
___/___	9.	Aluminum Oxide (Alumina, Al_2O_3)	_____	lb.
___/___	10.	Iron(III) Oxide (Rust, Fe_2O_3)	_____	lb.
___/___	11.	Iron(III) Sulfate ($Fe_2(SO_4)_3$)	_____	lb.
___/___	12.	Magnesium Carbonate ($MgCO_3$)	_____	lb.
___/___	13.	Magnesium Sulfate (Epsom salt, $MgSO_4$)	_____	lb.
___/___	14.	Magnesium Oxide (MgO)	_____	lb.
___/___	15.	Weigh and mix the following in a bucket and add together:		

Calcium Oxide (Lime, CaO)	_____	lb.
Manganese Oxide (MnO_2)	_____	lb.
Nickel Oxide (NiO)	_____	lb.
Vanadium Pentoxide (V_2O_5)	_____	lb.
Lithium Carbonate (Li_2CO_3)	_____	lb.

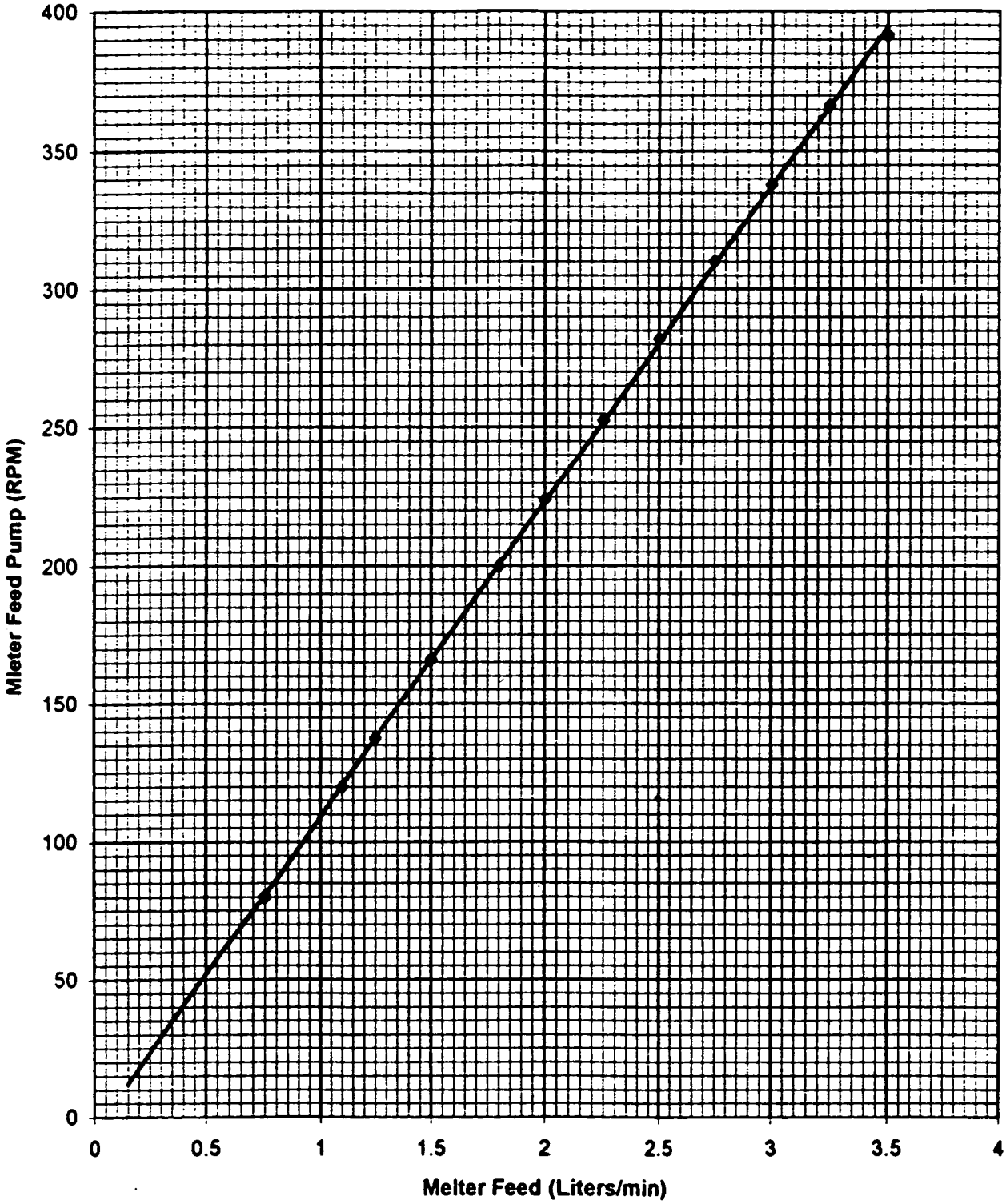
___/___	16.	Magnesium Phosphate ($Mg_3(PO_4)_2$)	_____	lb.
___/___	17.	Bentonite Clay	_____	lb.
___/___	18.	Barium Carbonate ($BaCO_3$)	_____	lb.
___/___	19.	Barium Sulfate ($BaSO_4$)	_____	lb.
___/___	20.	Lead Oxide (PbO)	_____	lb.
___/___	21.	Silicon Dioxide (Silica, SiO_2)	_____	lb.
___/___	22.	Sodium Tetraborate Pentahydrate ($Na_2B_4O_7 \cdot 5H_2O$)	478 lb.	
___/___	23.	Urea ($CO(NH_2)_2$)	_____	lb.

Attachment 4

LPM Melter Feed vs. Wt% Solids in Melter Feed for 1 MT/D



Attachment 5
Melter Feed Pump Calibration



629

TEST PERFORMANCE PARAMETERS FOR SOT CAMPAIGN 2 AT THE VITRIFICATION PILOT PLANT

SHADED PORTION OF TABLE SHALL BE COMPLETED BY VITPP ENGINEERING

Campaign Number _____ Date Charged: __/__/__	Batch Number _____ Formula _____ Slurry Tank: A or B

Batch Objectives: _____

_____

_____

Dry Weight Charged _____	Slurry Feed Rate
Slurry Tank _____	Maximum Average
Initial Weight _____lbs (full batch)	_____ RPM _____ RPM
	_____ L/min _____ L/min
Final Weight _____lbs (heel before flush)	
Solids in Slurry _____ % wt	

Slurry Fed _____lbs

Glass Produced _____lbs

Slurry Feed Start _____ hr Date:_____ (time)

Slurry Feed Stop _____ hr Date:_____ (time)

Slurry Feed Start _____ hr Date:_____ (time)

Slurry Feed Stop _____ hr Date:_____ (time)

Slurry Feed Duration _____ min

Drum ID	Gross Wt. (lbs)	Tare Wt. (lbs)	Net Wt. (lbs)	Form

Total Glass produced: _____

QA/IS REQ'D INSPECTION DATE STAMP

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TEST PERFORMANCE PARAMETERS FOR SOT CAMPAIGN 2 AT THE VITRIFICATION PILOT PLANT

SHADED PORTION OF TABLE SHALL BE COMPLETED BY VITPP ENGINEERING

Slurry Samples		Glass Samples		
Customer Number	Results	Customer Number	Results	Drum ID
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Range Melter Temperature _____ °C Range Melter Power _____ KW Range Melter Current _____ Amp Range Melter Voltage _____ Volts	Gem Production Gem Production Start _____ hr Stop _____ hr Gem Production Start _____ hr Stop _____ hr Gem Production Start _____ hr Stop _____ hr Gem Production Duration _____ min
Average Cold Cap Coverage _____ %	Average Cold Cap Thickness _____ in
Frit Addition West Side Chamber _____ lbs East Side Chamber _____ lbs Center Chamber _____ lbs	Film Cooler Outlet Temperature Max. _____ °F Avg. w/cold cap _____ °F

QA/IS REQ'D INSPECTION DATE STAMP

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TEST PERFORMANCE PARAMETERS FOR SOT CAMPAIGN 2 AT THE VITRIFICATION PILOT PLANT

SHADED PORTION OF TABLE SHALL BE COMPLETED BY VITPP ENGINEERING

Utility Air Flow Settings		Gem Machine Settings	
Film Cooler Flow Rate	_____ scfm	Gem Machine Gob Cutter Speed	_____
Air Lance Flow Rate	_____ scfm	Gem Machine Roller Speed	_____
Bubbler 1 Flow Rate	_____ scfh	Gem Machine Conveyor Speed	_____
Bubbler 2 Flow Rate	_____ scfh		
Bubbler 3 Flow Rate	_____ scfh		
Bubbler 4 Flow Rate	_____ scfh		
Air Lift Flow Rate	_____ scfh		
Trickle Air Flow Rate	_____ scfh		

Glass Characteristics (as reported by the lab)		Normal Off-Gas Characteristics	
Viscosity	_____	Initial DP across HEPA filter	_____
Conductivity	_____	Maximum DP across HEPA filter	_____
TCLP Ba	_____	Final DP across HEPA filter	_____
TCLP Cr	_____	Number of changings of HEPA filter	_____
TCLP Pb	_____	Initial DP across transition line	_____
No. of Phases	_____	Maximum DP across transition line	_____
Gem Size(s)	_____	Final DP across transition line	_____
Gem Uniformity	_____	Initial DP across Film Cooler Outlet	_____
		Maximum DP across Film Cooler Outlet	_____
		Final DP across Film Cooler Outlet	_____
		No. of cleanings of Film Cooler Outlet	_____
		Amount of Caustic added to the Scrubber	_____

QA/IS REQ'D INSPECTION DATE STAMP

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TEST PERFORMANCE PARAMETERS FOR
SOT CAMPAIGN 2 AT
THE VITRIFICATION PILOT PLANT

SHADED PORTION OF TABLE SHALL BE COMPLETED BY VITPP ENGINEERING

Gem Housing Characteristics	Normal Off-Gas Characteristics (Average During Stable Conditions)
Average Pressure _____ " w.c.	PDIC - 250 FI-250
Avg. Discharge Temperature _____ ° C	% Open Pressure Flow
Gem Housing Expansion Joint _____ ° F	_____ _____ " w.c. _____ scfm
	Number of Emergency Off-Gas Trips _____

Comments: _____

_____

_____

QA/IS REQ'D INSPECTION DATE STAMP

ATTA. .IENT 7A

MELTER FEED\OFF-GAS DATA SHEET (for Melter Operator)

SOT 2504-SU-0035

TARGET TIME	DATE/ ACTUAL TIME	COLD CAP THICKNESS (in)	COLD CAP THICKNESS (%)	FILM COOLER, FI-029 (scfh)	PDI-172 (in wc)	PDI-173 (in wc)	East Side Chamber Level (Electrodes Covered)	West Side Chamber Level (Electrodes Covered)	Comments Gem Machine Speed Roller/Cutter/Convey or Pressure

page_____of_____

ATTACHMENT 7B

OFF-GAS PRESSURE AND TEMPERATURE DATA SHEET (for North Pad)

SOT 2504-SU-0035

TARGET TIME	DATE/ ACTUAL TIME	SCRUBBER OUTLET PRES @ V-OG135 (in w.c.)	DESIC TWR OUTLET PRES @ PDI-190 (in w.c.)	HEPA UNIT (A or B)?	PREFILTER DIFF PRESS (in w.c.)	HEPA FILTER DIFF PRESS (in w.c.)	PI UP-STREAM OF 5-FA-25 (in w.c.)	PI DOWN-STREAM OF 5-FA-25 (in w.c.)

page_____of_____

Attachment 8

CAMPAIGN 2 TRANSITION GLASS BATCH SHEET

Batch ID_____ Date Batch Initiated:___/___/___

Initials/Start Time			
___/___	1.	Water	2717 lb.
___/___	2.	Boric Acid, (H_3BO_3)	396 lb.
___/___	3.	Potassium Nitrate (Saltpeter, KNO_3)	122 lb.
___/___	4.	Aluminum Oxide (Alumina, Al_2O_3)	483 lb.
___/___	5.	Iron(III) Oxide (Rust, Fe_2O_3)	279 lb.
___/___	6.	Magnesium Oxide (MgO)	89 lb.
___/___	7.	Nickel Oxide (NiO)	17 lb.
___/___	8.	Magnesium Phosphate ($Mg_3(PO_4)_2$)	354 lb.
___/___	9.	Barium Sulfate ($BaSO_4$)	91 lb.
___/___	10.	Lead Oxide (PbO)	247 lb.
___/___	11.	Silicon Dioxide (Silica, SiO_2)	562 lb.
___/___	12.	Barium Carbonate ($BaCO_3$)	76 lb.

CAMPAIGN 2 1250°C SURROGATE BATCH SHEET

629

Add the following ingredients to the available slurry tank in the order specified.

Batch ID_____ Date Batch Initiated:___/___/___ Tank:_____

Initials/Start Time			
___/___	1.	Water (including any remaining heel)	2740 lb.
___/___	2.	Sodium Carbonate (Soda Ash, Na_2CO_3)	42 lb.
___/___	3.	Sodium Sulfate (Na_2SO_4)	21 lb.
___/___	4.	Sodium Nitrate (Soda Niter, $NaNO_3$)	37 lb.
___/___	5.	Potassium Carbonate (Potash, K_2CO_3)	13 lb.
___/___	6.	Potassium Nitrate (Saltpeter, KNO_3)	19 lb.
___/___	7.	Calcium Carbonate ($CaCO_3$)	480 lb.
___/___	8.	Calcium Sulfate (Gypsum, $CaSO_4$)	62 lb.
___/___	9.	Aluminum Oxide (Alumina, Al_2O_3)	289 lb.
___/___	10.	Iron(III) Oxide (Rust, Fe_2O_3)	87 lb.
___/___	11.	Iron(III) Sulfate ($Fe_2(SO_4)_3$)	14 lb.
___/___	12.	Magnesium Carbonate ($MgCO_3$)	23 lb.
___/___	13.	Magnesium Sulfate (Epsom salt, $MgSO_4$)	31 lb.
___/___	14.	Magnesium Oxide (MgO)	-0- lb.
___/___	15.	In the Lab, weigh and mix the following in a bucket and add together:	

Calcium Oxide (Lime, CaO)	3 lb.
Manganese Oxide (MnO_2)	3 lb.
Nickel Oxide (NiO)	2 lb.
Vanadium Pentoxide (V_2O_5)	3 lb.
Lithium Carbonate (Li_2CO_3)	-0- lb.

___/___	16.	Magnesium Phosphate ($Mg_3(PO_4)_2$)	101 lb.
___/___	17.	Bentonite Clay	97 lb.

NOTE: **Items 18, 19, and 20 bags shall be weighed before and after the required quantities are removed.**

___/___	18.	Barium Carbonate ($BaCO_3$)	25 lb.
___/___	19.	Barium Sulfate ($BaSO_4$)	62 lb.
___/___	20.	Lead Oxide (PbO)	117 lb.
___/___	21.	Silicon Dioxide (Silica, SiO_2)	707 lb.
___/___	22.	Sodium Tetraborate Pentahydrate ($Na_2B_4O_7 \cdot 5H_2O$)	470 lb.
___/___	23.	Urea ($CO(NH_2)_2$)	76 lb.

DATA FOR GTS DURATEK

The following Attachments are data tables to be filled out by the Operators:

Attachment 10.1 Duramelter 1000-HT Acceptance Test Table

Attachment 10.2 Gem Machine Acceptance Testing Table

Attachment 10.1 Duramelter 1000-HT Acceptance Test Table

TIME OF READING:

Item or Device	Possible Low Value	Possible High Value	Actual Value	Average:
ELTER CONTROL PANEL				
TIS 1(°C)	500	1300		
TIS 2(°C)	800	1375		
TIS 3(°C)	1000	1250		
TIS 4(°C)	1000	1250		
TIS 6(°C)	1000	1375		
TIS 8(°C)	500	1200		
TIS 9(°C)	500	1200		
TIK 1(°F)	80	120		
TIK 2(°F)	80	120		
TIK 3(°F)	80	120		
TIK 4(°F)	80	120		
TIK 5(°F)	80	120		
TIK 6(°F)	80	120		
K 7(°F)	80	120		
TIK 8(°F)	80	120		
TIK 9(°F)	80	120		
TIK 10(°F)	80	120		
TIK 11(°F)	100	1000		
TIK 12(°C)	100	1000		
TIK 13(°F)	80	120		
TIK 14(°F)	80	120		
TIK 15(°F)	80	120		
TIK 16(°F)	80	400		
TIK 17(°F)	80	120		
TIK 18(°F)	80	120		
TIK 19(°F)	80	120		
TIK 20(°F)	80	120		
ctrode kW	50	500		
Electrode Voltage	0	200		
Electrode Amps	0	2500		

Attachment 10.1 Duramelter 1000-HT Acceptance Test Table

TIME OF READING:

Item or Device	Possible Low Value	Possible High Value	Actual Value	Average:
;charge Chamber Temp (°C)	1100	1300		
Feed Pump Speed (rpm)	0	500		
UTILITY RACK				
PI-001 (psi)	0	100		
FI-001 (scfh)	2	30		
FI-002 (scfh)	2	30		
FI-003 (scfh)	2	30		
FI-004 (scfh)	2	30		
FI-005 (scfh)	2	30		
FI-006 (scfh)	1.5	4		
FI-007 (scfh)	0	20		
FI-008 (scfm)	10	60		
)29 (scfm)	40	400		
PI-003 (psi)	10	100		
FI-028 (gpm)	0	5		
FI-009 (gpm)	0	5		
FI-010 (gpm)	0	5		
FI-021 (gpm)	1	5		
FI-022 (gpm)	1	5		
FI-023 (gpm)	1	5		
FI-024 (gpm)	1	5		
FI-027 (gpm)	1	5		
PI-004 (psi)	2	100		
FI-011 (gpm)	1	5		
FI-012 (gpm)	1	5		
FI-013 (gpm)	1	5		
)14 (gpm)	1	5		
FI-015 (gpm)	1	5		
FI-016 (gpm)	1	5		
FI-017 (gpm)	1	5		

Attachment 10.1 Duramelter 1000-HT Acceptance Test Table				
TIME OF READING:				
Item or Device	Possible Low Value	Possible High Value	Actual Value	Average:
-018 (gpm)	1	5		
FI-019 (gpm)	1	5		
FI-020 (gpm)	1	5		

Attachment 10.2 Gem Machine Acceptance Testing Table

TIME OF READING:

Item or Device	Possible Low Value	Possible High Value	Actual Value	Average:
Electrode kW	50	500		
Electrode Voltage	0	200		
Electrode Amps	0	2500		
Discharge Heater Temp (°C)	1100	1300		
GEM MACHINE CONTROL PANEL				
Water Flow Rate (GPM)	10	30		
Air Damper Position	1/4	3/4		
TIK 1 (°F)	120	300		
TIK 2 (°F)	120	300		
TIK 3 (°F)	120	300		
TIK 4 (°F)	120	300		
TIK 5 (°F)	120	300		
TIK 6 (°F)	120	300		
TIK 7 (°F)	120	300		
TIK 8 (°F)	120	400		
Gob Roller Speed (RPM's)	10	40		
Gob Cutter Speed (RPM's)	10	40		
Gem Housing Pressure ("W.C.)	0	Max not to exceed Melter Vacuum		
Belt Speed (RPM's)	10	40		
Utility Rack				
FI-006 (scfh, trickle flow airlift)	1	1.5		
FI-007 (scfh, airlift)	0	5		
PI003 (psi, cooling tower inlet pressure	10	100		
PI004 (gpm, DI water inlet pressure)	2	100		

Comments: _____

_____