

## Small Sample Shipping Instructions

Revised: November 30, 2017

### **This document provides instructions for shipping small samples to ST Equipment & Technology.**

Small (5-10 kilogram) samples should be provided to ST Equipment & Technology (STET) for the purposes of evaluating the material as a candidate for electrostatic beneficiation using STET's proprietary separation technology.

The following should be considered when choosing which samples to send to STET for evaluation:

1. Is the material particle size distribution (PSD) suitable for the STET separator?
  - a. Generally feed materials must be ground finely, with at least 98% of the sample finer than 600 microns (30 mesh).
  - b. In some cases coarser or larger particle size materials may be processed, for example when they are very low density and/or are highly non-spherical (examples include mica or graphite flakes).
  - c. The STET laboratory does not have the capability to grind lump rock samples or core samples.
2. Is the feed material free flowing and friable?
  - a. The feed material to the STET process must be free flowing and mostly non-cohesive.
3. Is the feed material dry or free of surface moisture?
  - a. Generally candidate materials must be very dry, with no free water and minimal surface moisture.
  - b. Moisture (measured by STET as loss in weight in an oven at 110°C) must be less than 0.5% by weight.
  - c. Certain materials such as clay minerals or organic materials contain internal or chemically bound water, but may still be able to be separated electrostatically with minimal drying.
4. Is the material sufficiently liberated and present as individual, discrete particles?
  - a. Often the degree of liberation cannot be directly measured, but evaluated based on the nature of the material, how it was formed, particle size, etc. Any information the customer has on liberation characteristics, including micrographs, QEMSCAN or others would be beneficial.
  - b. The STET separation process is a physical separation and requires sufficient liberation of the material(s) of interest.
5. Does the STET laboratory have the capability to measure the element(s), mineral(s) or properties of interest to support a pilot plant testing campaign?
  - a. In general, rapid and quantitative results are needed, to allow for run decisions to be made during pilot plant trials.
6. Is the STET laboratory and pilot plant equipped to safely handle the candidate material?
  - a. To comply with regulations, STET requires a Safety Data Sheet (SDS) to be included for all materials.
  - b. Some materials may require additional documentation and must be evaluated prior to shipping to STET.

STET will use this information to generate a report detailing the results of the small sample testing, as well as recommendations on how to proceed with pilot scale testing, as applicable. Once STET and the customer are in agreement about the goals of a pilot plant testing program, STET can issue a pilot plant testing proposal. STET is not able to test small bag samples for separation performance, or provide estimates of product grade or recovery.

### Collect & Prepare the Samples

Please collect a 5-10 kilogram (10-20 pound) sample of the feed material that the customer would like to separate/beneficiate.

All samples to be shipped to ST Equipment & Technology should be:

- As representative as possible of the material that the customer would like to separate/beneficiate. Therefore the small sample should have the same grade, particle size, chemistry, composition and moisture. The sample should be as close as possible to the expected feed to the separation process. If the feed to the separator is expected to vary between known ranges, please note that and other details on the **SAMPLE COVER NOTE**.
- Clearly labeled with Company Name, Sample Identification and Date.
- Packaged to ensure there is no spillage or leakage during transport. A small cardboard box with approximately 5-10 kg (10-20 pounds) of each sample in airtight plastic containers works best. Samples should not be placed in a shipping envelope unless very well protected. Experience shows these envelopes tend to rip and leak en route.

Recommended Container Type:



<http://www.uline.com/Product/Detail/S-8508/Jars/Wide-Mouth-Jars-1-2-Gallon>

Please note the following sample specific hazards:

#### *Combustible Dusts:*

- STET requires explosibility and ignitibility measurements for all combustible or potentially combustible dust samples submitted.
- At a minimum, STET requires a measurement of Explosion Severity Index (Kst) [bar\*m/s] and Minimum Ignition Energy (MIE) [mJ].
- All explosibility and ignitibility measurements must be conducted at 100% passing 75  $\mu\text{m}$  (200 mesh).
- STET is not able to process combustible materials with an Explosion Severity Index or Deflagration Index (Kst) greater than 200 bar\*m/s.
- STET is not able to process combustible materials with a Minimum Ignition Energy (MIE) less than 50 mJ.

#### *Toxic, Hazardous or Radioactive Materials:*

- STET is not able to accept samples with a combined Uranium (U) and/or Thorium (Th) content greater than 0.05 weight % (500 ppm).

- STET is not able to accept samples with an arsenic (As) content greater than 0.2 weight % (2,000 ppm).
- STET is not able to accept samples with a lead (Pb) content greater than 1 weight % (10,000 ppm).
- STET is not able to accept samples with a mercury (Hg) content greater than 2 weight % (20,000 ppm).
- STET is not able to accept samples which exceed OSHA guidelines on radioactivity.
- STET is not able to accept samples which contain asbestos containing materials. Samples which contain chrysotile, amosite, crocidolite, tremolite and/or actinolite must be shown to be non-asbestos form (non-fibrous)

This list is not all inclusive. Specific questions should be forwarded to [STETlab@stegtech.com](mailto:STETlab@stegtech.com) prior to submitting the sample.

### **Documentation**

Include the following with the sample:

- A current Safety Data Sheet (SDS) for all material(s) contained in the shipment. **STET requires a Safety Data Sheet (SDS) to be included for ALL SAMPLES.**
- Hazardous Material Declaration (if the shipment contains hazardous materials)
- Chemical and Physical Analysis Data Sheet, Mineralogical Data and/or Particle Size Distribution
- Please complete the **SAMPLE COVER NOTE** (below) and email it to [STETlab@stegtech.com](mailto:STETlab@stegtech.com). Include a printed copy with the sample shipment.

### **For ALL International Shipments**

In addition, all samples shipped from outside the United States will require the following documents to be submitted to your preferred Carrier (DHL, UPS, Federal Express, etc.): If you have specific questions regarding proper documentation, please ask your Carrier.

- Packing slip describing content of shipment
- Commercial/Pro Forma Invoice
- Air Waybill / Bill of Lading (both issued by the carrier)
- Certificate of Origin (issued by the shipper)
- Safety Data Sheet (SDS)
- Hazardous Material Declaration (if the shipment contains hazardous materials)

### **Ship to Address:**

ST Equipment & Technology LLC  
C/O: Frances Kirchberg  
101 Hampton Avenue  
Needham, Massachusetts 02494 USA

### **Attention:**

Primary Contact: Frances Kirchberg, Tel: +1 781-972-2313, [fkirchberg@titanamerica.com](mailto:fkirchberg@titanamerica.com)  
Secondary Contact: Kristin Cappello, Tel: +1 781-972-2319, [kcappello@titanamerica.com](mailto:kcappello@titanamerica.com)



ST Equipment & Technology  
 101 Hampton Avenue  
 Needham, MA 02494  
[STETlab@stegtech.com](mailto:STETlab@stegtech.com)  
 781-972-2300

### Sample Document Checklist

Sample Document Checklist	Email to STET ( <a href="mailto:STETlab@stegtech.com">STETlab@stegtech.com</a> )	Include with Sample Shipment
1. Sample Shipment Cover Note	<input type="checkbox"/>	<input type="checkbox"/>
2. Commercial or Pro Forma Invoice		<input type="checkbox"/>
3. Air Waybill/Bill of Lading (provided by carrier)		<input type="checkbox"/>
4. Certificate of Origin (provided by shipper)		<input type="checkbox"/>
5. Shipping Information / Delivery Order		<input type="checkbox"/>
6. Safety Data Sheet (SDS)	<input type="checkbox"/>	<input type="checkbox"/>
7. Hazardous Material Declaration (if the shipment contains hazardous materials)		<input type="checkbox"/>
8. Tracking Number	<input type="checkbox"/>	

**Email Sample Shipping Cover Note, SDS and Tracking Number to: [STETlab@stegtech.com](mailto:STETlab@stegtech.com)**



ST Equipment & Technology  
 101 Hampton Avenue  
 Needham, MA 02494  
[STETlab@stetech.com](mailto:STETlab@stetech.com)  
 781-972-2300

## Sample Shipment Cover Note

### Customer Contact Information:

Primary Customer Contact	
Name:	
Title:	
Company:	
Address:	
State & Country:	
Phone:	
Email:	
Comments:	

Customer Technical Contact	
(For questions regarding sample analysis, typical feed composition, particle size, separation targets)	
Name:	
Title:	
Company:	
Address:	
State & Country:	
Phone:	
Email:	
Comments:	

STET Business Development Professional	
Name:	

### Sample Information: *(Complete for Each Sample)*

- Please be ***as specific as possible*** when describing the sample, and the expected separation targets.
- Please describe the product separation targets including composition (chemistry, mineralogy) and the desired product(s) composition. Describe any important properties for the products such as desired grades, brightness / color requirements, specifications, etc. in comments section.
- Note that a (Material) Safety Data Sheet (MSDS / SDS) is required for all materials shipped to STET

Example Form:

Sample 1 Information					
<b>(Form below has been filled out as an example)</b>					
Approx. Weight of Sample Included:	2.3 kg				
Sample Name / Label:	Fly Ash Sample 1, Boiler Unit 5 – Date November 1, 2016				
Material Type / Description & Origin:	Fly Ash from Pulverized Coal Combustion				
Sample Origin Location:	Example Power Station – Needham, Massachusetts				
Country of Origin:	United States				
Expected Sample Composition:	10% Carbon (LOI), 50.5% SiO <sub>2</sub> , 26.8% Al <sub>2</sub> O <sub>3</sub> , 10.1% Fe <sub>2</sub> O <sub>3</sub> , 0.5% SO <sub>3</sub> , 3.4% CaO, 0.7% Na <sub>2</sub> O, 0.24% P <sub>2</sub> O <sub>5</sub> (by XRF)				
Feed Particle Size:	PSD measured by Malvern is d10 = 5 micron, d50 = 20 micron, d97 = 103 micron	Approx. Feed Bulk Density [pounds/ft <sup>3</sup> or kg/m <sup>3</sup> ]:	65 lbs/ft <sup>3</sup>		
Moisture [wt. %]:	0.01%	Max Particle Size [micron/mesh]:	100 μm	Median Particle Size [micron/mesh]:	20 μm
Expected Product(s) Composition:	Product 1 = fly ash with carbon (LOI) less than 3.0% at maximum recovery. Product 2 = high carbon product of +30%				
Product(s) to be Recovered:	Low carbon mineral enriched fly ash	Gangue/By-Product(s) to be Rejected:	Carbon (LOI)		
Goals for Separation (Be as specific and quantitative as possible):	Maximize recovery of low carbon fly ash. Product should contain less than 3.0% LOI. Low carbon ash product must be able to meet ASTM C 618A-12 specification. Fineness measured as % retained on #325 mesh sieve must be less than 34% by wt.				
Describe Process or Equipment Used to Prepare Feed Sample:	Fly ash sample was generated from PC boiler unit 5 at power station burning eastern US coal. Sample was collected from outlet of ash silo 2 at power station.				
Describe Process or Equipment After STET Separator:	No additional processing is anticipated. Product will be transported to product storage silo.				
Feed Available for Processing [tons or tons/year]:	150,000 short tons / year	Feed Rate Required for Separator (short or metric tons/hour):	30 short tons / hour		
Method of Analysis:	Primary analysis method is loss on ignition (LOI) at 750 deg C for 30 minutes.				
SDS (MSDS) Included?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Particle Size Distribution (PSD) Included?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Chemistry / Mineralogy Included?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Is Material Combustible?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If Material is Combustible – What is the Explosion Severity Index (K <sub>st</sub> )? [bar*m/s]	N/A	If Material is Combustible – What is the Minimum Ignition Energy? [mJ]	N/A
Is Material a Radiation Hazard, or Contain Radioactive Material?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If Material is a Radiation Hazard, Describe:	N/A		
Is Material Regulated as Hazardous?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If Material is Hazardous, Describe Hazards:	N/A		
List any Additional Safety / Handling Concerns:	Respiratory protection (dust mask) should be worn during handling.				
Comments:	Feed sample is dry and free flowing.				



ST Equipment & Technology  
 101 Hampton Avenue  
 Needham, MA 02494  
[STETlab@stetech.com](mailto:STETlab@stetech.com)  
 781-972-2300

Sample 1 Information (Complete 1 Form Per Sample)					
Approx. Weight of Sample Included:					
Sample Name / Label:					
Material Type / Description & Origin:					
Sample Origin Location:					
Country of Origin:					
Expected Sample Composition:					
Feed Particle Size:			Approx. Feed Bulk Density [pounds/ft <sup>3</sup> or kg/m <sup>3</sup> ]:		
Moisture [wt. %]:		Max Particle Size [micron/mesh]:		Median Particle Size [micron/mesh]:	
Expected Product(s) Composition:					
Product(s) to be Recovered:			Gangue/By-Product(s) to be Rejected:		
Goals for Separation (Be as specific and quantitative as possible):					
Describe Process or Equipment Used to Prepare Feed Sample:					
Describe Process or Equipment After STET Separator:					
Feed Available for Processing [tons or tons/year]:			Feed Rate Required for Separator (short or metric tons/hour):		
Method of Analysis:					
SDS (MSDS) Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Particle Size Distribution (PSD) Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Chemistry / Mineralogy Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Is Material Combustible?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is Combustible – What is the Explosion Severity Index (Kst)? [bar*m/s]		If Material is Combustible – What is the Minimum Ignition Energy? [mJ]	
Is Material a Radiation Hazard, or Contain Radioactive Material?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is a Radiation Hazard, Describe:			
Is Material Regulated as Hazardous?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is Hazardous, Describe Hazards:			
List any Additional Safety / Handling Concerns:					
Comments:					



ST Equipment & Technology  
 101 Hampton Avenue  
 Needham, MA 02494  
[STETlab@stetech.com](mailto:STETlab@stetech.com)  
 781-972-2300

Sample 2 Information (Complete 1 Form Per Sample)					
Approx. Weight of Sample Included:					
Sample Name / Label:					
Material Type / Description & Origin:					
Sample Origin Location:					
Country of Origin:					
Expected Sample Composition:					
Feed Particle Size:			Approx. Feed Bulk Density [pounds/ft <sup>3</sup> or kg/m <sup>3</sup> ]:		
Moisture [wt. %]:		Max Particle Size [micron/mesh]:		Median Particle Size [micron/mesh]:	
Expected Product(s) Composition:					
Product(s) to be Recovered:			Gangue/By-Product(s) to be Rejected:		
Goals for Separation (Be as specific and quantitative as possible):					
Describe Process or Equipment Used to Prepare Feed Sample:					
Describe Process or Equipment After STET Separator:					
Feed Available for Processing [tons or tons/year]:			Feed Rate Required for Separator (short or metric tons/hour):		
Method of Analysis:					
SDS (MSDS) Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Particle Size Distribution (PSD) Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Chemistry / Mineralogy Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Is Material Combustible?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is Combustible – What is the Explosion Severity Index (Kst)? [bar*m/s]		If Material is Combustible – What is the Minimum Ignition Energy? [mJ]	
Is Material a Radiation Hazard, or Contain Radioactive Material?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is a Radiation Hazard, Describe:			
Is Material Regulated as Hazardous?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is Hazardous, Describe Hazards:			
List any Additional Safety / Handling Concerns:					
Comments:					





ST Equipment & Technology  
 101 Hampton Avenue  
 Needham, MA 02494  
[STETlab@stetech.com](mailto:STETlab@stetech.com)  
 781-972-2300

Sample 3 Information (Complete 1 Form Per Sample)					
Approx. Weight of Sample Included:					
Sample Name / Label:					
Material Type / Description & Origin:					
Sample Origin Location:					
Country of Origin:					
Expected Sample Composition:					
Feed Particle Size:			Approx. Feed Bulk Density [pounds/ft <sup>3</sup> or kg/m <sup>3</sup> ]:		
Moisture [wt. %]:		Max Particle Size [micron/mesh]:		Median Particle Size [micron/mesh]:	
Expected Product(s) Composition:					
Product(s) to be Recovered:			Gangue/By-Product(s) to be Rejected:		
Goals for Separation (Be as specific and quantitative as possible):					
Describe Process or Equipment Used to Prepare Feed Sample:					
Describe Process or Equipment After STET Separator:					
Feed Available for Processing [tons or tons/year]:			Feed Rate Required for Separator (short or metric tons/hour):		
Method of Analysis:					
SDS (MSDS) Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Particle Size Distribution (PSD) Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Chemistry / Mineralogy Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Is Material Combustible?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is Combustible – What is the Explosion Severity Index (Kst)? [bar*m/s]		If Material is Combustible – What is the Minimum Ignition Energy? [mJ]	
Is Material a Radiation Hazard, or Contain Radioactive Material?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is a Radiation Hazard, Describe:			
Is Material Regulated as Hazardous?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is Hazardous, Describe Hazards:			
List any Additional Safety / Handling Concerns:					
Comments:					



ST Equipment & Technology  
 101 Hampton Avenue  
 Needham, MA 02494  
[STETlab@stetech.com](mailto:STETlab@stetech.com)  
 781-972-2300

Sample 4 Information (Complete 1 Form Per Sample)					
Approx. Weight of Sample Included:					
Sample Name / Label:					
Material Type / Description & Origin:					
Sample Origin Location:					
Country of Origin:					
Expected Sample Composition:					
Feed Particle Size:			Approx. Feed Bulk Density [pounds/ft <sup>3</sup> or kg/m <sup>3</sup> ]:		
Moisture [wt. %]:		Max Particle Size [micron/mesh]:		Median Particle Size [micron/mesh]:	
Expected Product(s) Composition:					
Product(s) to be Recovered:			Gangue/By-Product(s) to be Rejected:		
Goals for Separation (Be as specific and quantitative as possible):					
Describe Process or Equipment Used to Prepare Feed Sample:					
Describe Process or Equipment After STET Separator:					
Feed Available for Processing [tons or tons/year]:			Feed Rate Required for Separator (short or metric tons/hour):		
Method of Analysis:					
SDS (MSDS) Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Particle Size Distribution (PSD) Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Chemistry / Mineralogy Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Is Material Combustible?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is Combustible – What is the Explosion Severity Index (Kst)? [bar*m/s]		If Material is Combustible – What is the Minimum Ignition Energy? [mJ]	
Is Material a Radiation Hazard, or Contain Radioactive Material?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is a Radiation Hazard, Describe:			
Is Material Regulated as Hazardous?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is Hazardous, Describe Hazards:			
List any Additional Safety / Handling Concerns:					
Comments:					



ST Equipment & Technology  
 101 Hampton Avenue  
 Needham, MA 02494  
[STETlab@stetech.com](mailto:STETlab@stetech.com)  
 781-972-2300

Sample 5 Information (Complete 1 Form Per Sample)					
Approx. Weight of Sample Included:					
Sample Name / Label:					
Material Type / Description & Origin:					
Sample Origin Location:					
Country of Origin:					
Expected Sample Composition:					
Feed Particle Size:				Approx. Feed Bulk Density [pounds/ft <sup>3</sup> or kg/m <sup>3</sup> ]:	
Moisture [wt. %]:		Max Particle Size [micron/mesh]:		Median Particle Size [micron/mesh]:	
Expected Product(s) Composition:					
Product(s) to be Recovered:			Gangue/By-Product(s) to be Rejected:		
Goals for Separation (Be as specific and quantitative as possible):					
Describe Process or Equipment Used to Prepare Feed Sample:					
Describe Process or Equipment After STET Separator:					
Feed Available for Processing [tons or tons/year]:			Feed Rate Required for Separator (short or metric tons/hour):		
Method of Analysis:					
SDS (MSDS) Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Particle Size Distribution (PSD) Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Chemistry / Mineralogy Included?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Is Material Combustible?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is Combustible – What is the Explosion Severity Index (Kst)? [bar*m/s]		If Material is Combustible – What is the Minimum Ignition Energy? [mJ]	
Is Material a Radiation Hazard, or Contain Radioactive Material?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is a Radiation Hazard, Describe:			
Is Material Regulated as Hazardous?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Material is Hazardous, Describe Hazards:			
List any Additional Safety / Handling Concerns:					
Comments:					



Needham Technical Center

**Commercial/Pro Forma Invoice Example**

**DATE:** May 1, 2015

**MATERIAL:** NON-HAZARDOUS, FLY ASH

**ORIGIN OF MATERIAL:** UNITED STATES

**SHIPPER:**

MR. JOHN SMITH  
ABC COMPANY  
135 CAMBRIDGE AVENUE  
ANYTOWN, CA 93235 USA

**CONSIGNEE:**

ST Equipment & Technology LLC  
101 Hampton Avenue  
Needham, MA 02494 USA

**CONTACT PERSON:**

Primary Contact: Frances Kirchberg, Tel: +1 781-972-2313, [fkirchberg@titanamerica.com](mailto:fkirchberg@titanamerica.com)  
Secondary Contact: Kristin Cappello, Tel: +1 781-972-2319, [kcappello@titanamerica.com](mailto:kcappello@titanamerica.com)

**QUANTITY:** 1

**TOTAL WEIGHT OF SHIPMENT:** 1 LBS.

**COMMERCIAL VALUE:** \$25.00

**Tariff Code:**

**Signature:**