NC DEQ/DWR WASTEWATER/GROUNDWATER LABORATORY CERTIFICATION

LABORATORY NAME:		CERT #:	
PRIMARY ANALYST:		DATE:	
NAME OF PERSON COMPLETING CHECKLIST (PRINT):			
SIGNATURE OF PERSON COMPLETING CHECKLIST:			

Parameter: **Ignitability of Solids**
Method: **SW-846 1030 (Non-Aqueous)**

NOTE: To promote consistency with the use of SW-846 methods and to assure generation of data of known quality, the minimum recommended quality control benchmarks in the methods will be considered the minimum QA/QC requirements (i.e., **when the method says "should", we consider that to mean "must"**).

Equipment:

	Ceramic tile, impervious, low-heat conducting, non-combustible, ~25 cm x 25 cm x 2.5 cm (or equivalent)		Powder train mold, aluminum, brass, stainless steel or plastic, 250 mm length, triangular cross-section, 20 mm width, 10 mm depth		Bunsen burner, propane gas and air, 5 mm minimum diameter, capable of attaining a temperature of at least 1,000 °C, or equivalent
	High temperature marker		Thermocouple (for temp of material), or equivalent		Anemometer, to measure air flow in fume hood
	Stop watch, or equivalent		Thermocouple (for temp of gas flame), capable of measuring a temperature of at least 1000°C, or equivalent		Ruler, 30 cm or greater in length, or equivalent

PLEASE COMPLETE CHECKLIST IN INDELIBLE INK
Please mark Y, N or NA in the column labeled LAB to indicate the common lab practice and in the column labeled SOP to indicate whether it is addressed in the SOP.

	GENERAL	LAB	SOP	EXPLANATION
1	Is the SOP reviewed at least every 2 years? What is the most recent review/revision date of the SOP? [15A NCAC 2H .0805 (a) (7)] **ANSWER:**			Quality assurance, quality control, and Standard Operating Procedure documentation shall indicate the effective date of the document and be reviewed every two years and updated if changes in procedures are made. Verify proper method reference. During review notate deviations from the approved method and SOP.
2	Are all revision dates and actions tracked and documented? [15A NCAC 2H .0805 (a) (7)]			Each laboratory shall have a formal process to track and document review dates and any revisions made in all quality assurance, quality control and SOP documents.
3	Is there North Carolina data available for review?			If not, review PT data.
	PRESERVATION and STORAGE	**LAB**	**SOP**	**EXPLANATION**
4	Are samples tested on an as-received basis? [SW-846 1030 (8.1)]			Samples should be tested on an as-received basis unless requested otherwise. No sample preservation is required, but sample containers should be completely filled and tightly sealed to preserve sample integrity.
5	Are sample containers completely filled and tightly sealed? [SW-846 1030 (8.1)]			No sample preservation is required, but sample containers should be completely filled and tightly sealed to preserve sample integrity. This will help prevent loss of volatile material.
6	Are samples tested as soon as possible after removal from the sample container? [SW-846 1030 (8.2)]			Samples should be tested as soon as possible after removal from the sample container (i.e., samples should not be allowed to dry or absorb moisture for excessive periods or to lose volatile).
7	What holding time is used? **ANSWER:**			Not regulated. It is recommended that the laboratory establish, implement and document a routine holding time.
	PROCEDURE – Sample Preparation	**L**	**S**	**EXPLANATION**

		A B	O P	
8	Are samples that are chilled or cooled upon receipt to the laboratory allowed to equilibrate to the ambient laboratory temperature in the sample container prior to analysis? [SW-846 1030 (8.2)]			Samples that are chilled or cooled upon receipt to the laboratory should be allowed to equilibrate to the ambient laboratory temperature in the sample container.
	PROCEDURE – Sample Analysis (Preliminary Screening Test)	**L A B**	**S O P**	**EXPLANATION**
9	Are samples pre-tested to determine if they are explosive or extremely flammable? [SW-846 1030 (11.0)]			WARNNG: Prior to starting the preliminary screening test, all sample materials must be tested to determine if that material is explosive or extremely flammable. Use a very small portion of material (1 g or less). If the sample material is explosive or extremely flammable, do not conduct this test.
10	Is the preliminary screening test for ignitability conducted on all waste materials? [SW-846 1030 (11.1.1)]			The preliminary screening test for ignitability is conducted on all waste materials.
11	Is a 250-mm long test path marked on a clean impervious ceramic tile? [SW-846 1030 (11.1.1)]			On a clean, impervious ceramic tile (Sec. 6.1), clearly mark a 250-mm long test path.
12	Is another mark made at exactly 200 mm from the start of the sample path? [SW-846 1030 (11.1.1)]			Make another mark at exactly 200 mm from the start of the sample path.
13	Is the powder train mold used to form an unbroken strip or powder train of sample 250 mm long by 20 mm wide by 10 mm high on the ceramic tile? [SW-846 1030 (11.1.2)]			Prepare the test material in its “as received” form by forming an unbroken strip or powder train of sample 250 mm long by 20 mm wide by 10 mm high on the ceramic tile. Use the mold t form the material as described in Sec. 11.2.3.1, if appropriate.
14	Are powder or granular materials placed into the powder train mold and then the mold dropped from a height of 2 cm onto a solid surface three time to settle the powder? [SW-846 1030 (11.2.3.1)]			**SW-846 1030 (11.2.3.1) - Powder or granular material** – Tighten the side plates on the mold. Place the mold on the base plate. Pour the material to fill the triangular cross section of the mold loosely. Drop the unit from a height of 2 cm onto a solid surface three times t settle the powder.
15	Is a marked ceramic test plate placed face down on top of the mold and then the mold and plate inverted to apply sample to the test plate? [SW-846 1030 (11.2.3.1)]			**SW-846 1030 (11.2.3.1)** - Remove the side supports. Lift the mold off the base plate. Place a clean ceramic test plate with the appropriate timing marks (Sec. 11.2.2) face down on top of the mold. Invert the setup and remove the mold.
16	Is the loaded ceramic tile placed in a fume hood about 20 cm (~8 inches) form the front of the hood and in an area of laminar airflow? [SW-846 1030 (11.1.3)]			Place the ceramic tile with the loaded sample in a fume hood about 20 cm (~8 inches) from the front of the hood and in an area of laminar airflow. Laminar flow is non-turbulent flow, or flow in parallel layers with no disruption between the layers.
17	Is the sample positioned perpendicular to the airflow? [SW-846 1030 (11.1.3)]			Position the sample perpendicular to the airflow (See Figure 2). The airflow across the perpendicular axis of the sample should be sufficient to prevent fumes from escaping into the laboratory and should not be varied during the test.
18	What air velocity is used in the fume hood? [SW-846 1030 (11.1.3)] **ANSWER:**			The air velocity should be approximately 0.7 meters/second. Measure the air velocity with an anemometer.
19	Is the temperature of the tip of the flame measured to be at least 1000°C? [SW-846 1030 (11.1.4)]			Light the Bunsen burner and adjust the height of the flame (6.5 to 7.5 cm) by adjusting the propane gas and air flows. Measure the temperature of the flame (tip of the flame) by a thermocouple. The temperature of the flame must be at least 1000°C.
20	If the waste is <u>non-metallic</u>, is the flame tip held to the sample strip until the sample ignites or for a maximum of 2 minutes? [SW-846 1030 (11.1.5.1)]			If the waste is non-metallic, hold the flame tip on the sample strip until the sample ignites or for a maximum of 2 minutes.

21	If it is a non-metallic waste and combustion occurs, is it noted whether the combustion propagates up to the 200-mm mark within a 2-minute test period? [SW-846 1030 (11.1.5.1)]			If combustion occurs, begin timing with a stopwatch and note whether the combustion propagates up to the 200-mm mark within the 2-minute test period.
22	If the waste is a metal or metal alloy powder, is the flame tip held to the sample strip until the sample ignites or for a maximum of 5 minutes? [SW-846 1030 (11.1.5.2)]			If the waste is a metal or metal alloy powder, hold the flame tip on the sample strip until the sample ignites or for a maximum of 5 minutes.
23	If it is a metal or metal alloy powder and combustion occurs, is it noted whether the combustion propagates up to the 200-mm mark within a 20-minute test period? [SW-846 1030 (11.1.5.2)]			If combustion occurs, begin timing with a stopwatch and note whether the combustion propagates up to the 200-mm mark within the 20-minute test period.
24	If the waste does not ignite and propagate combustion either by burning with open flame or by smoldering for the prescribed length and time, is the sample graded as not flammable. [SW-846 1030 (11.1.6)]			If the waste does not ignite and propagate combustion either by burning with open flame or by smoldering along the 200-mm sample strip within the 2-minute test period (or 20-minute test period for metal powders), the waste is not considered flammable and no further testing is required.
25	If the waste combusts and propagates burning to the 200-mm mark, is the material evaluated by the burning rate test? [SW-846 1030 (11.1.6)]			If the waste propagates burning of 200 mm of the test strip within the 2-minute test period (20-minute test period for metals), the material must be evaluated by the burning rate test (proceed to Sec. 11.2).
	PROCEDURE – Sample Analysis (Burn Rate Test)	**LAB**	**SOP**	**EXPLANATION**
26	Is a 250-mm long test path marked on a clean, impervious ceramic tile? [SW-846 1030 (11.2.2)]			On a clean, impervious ceramic tile (Sec. 6. 2), clearly mark a 250-mm long test path.
27	Are two additional timing marks made at 80 mm and 180 mm from the start of the sample path? [SW-846 1030 (11.2.2)]			Make two additional timing marks at 80 mm and 180 mm from the start of the sample path. The distance between the two marks (100 mm) will be used to calculate the rate of burn in Sec. 12.0.
28	Are powder or granular materials placed into the powder train mold and then the mold dropped from a height of 2 cm onto a solid surface three time to settle the powder? [SW-846 1030 (11.2.3.1)]			**SW-846 1030 (11.2.3.1) - Powder or granular material** – Tighten the side plates on the mold. Place the mold on the base plate. Pour the material to fill the triangular cross section of the mold loosely. Drop the unit from a height of 2 cm onto a solid surface three times t settle the powder.
29	Is a marked ceramic test plate placed face down on top of the mold and then the mold and plate inverted to apply sample to the test plate? [SW-846 1030 (11.2.3.1)]			**SW-846 1030 (11.2.3.1)** - Remove the side supports. Lift the mold off the base plate. Place a clean ceramic test plate with the appropriate timing marks (Sec. 11.2.2) face down on top of the mold. Invert the setup and remove the mold.
30	Are pasty wastes spread on the marked ceramic tile in the form of a rope 250 mm in length with a cross-section of 1 cm^2? [SW-846 1030 (11.2.3.2)]			**SW-846 1030 (11.2.3.2) - Pasty wastes** – Spread the waste on a marked ceramic tile (Sec. 11.2.2) in the form of a rope 250 mm in length with a cross-section of 1 cm^2.
31	Is the loaded ceramic tile placed in a fume hood about 20 cm (~8 inches) form the front of the hood and in an area of laminar airflow? [SW-846 1030 (11.2.4)]			Place the ceramic tile with the loaded sample prepared in Sec. 11.2.3 in a fume hood about 20 cm (~8 in) from the front of the hood and in an area of laminar airflow.
32	Is the sample positioned perpendicular to the airflow? [SW-846 1030 (11.2.4)]			Position the sample perpendicular to the airflow (See Figure 2). The airflow across the perpendicular axis of the sample should be sufficient to prevent fumes from escaping into the laboratory and should not be varied during the test.
33	What air velocity is used in the fume hood? [SW-846 1030 (11.2.4)] **ANSWER:**			The air velocity should be approximately in the range of 0.7-1 meters/second. Measure the air velocity with an anemometer.

34	Is the temperature of the tip of the flame measured to be at least 1000°C? [SW-846 1030 (11.2.5)]			Light the Bunsen burner and adjust the height of the flame (6.5 to 7.5 cm) by adjusting the propane gas and air flows. Measure the temperature of the flame (tip of the flame) by a thermocouple. The temperature of the flame must be at least 1000 °C.
35	If the waste is non-metallic, is the flame tip held to the sample strip until the sample ignites or for a maximum of 2 minutes? [SW-846 1030 (11.2.6) and (11.1.5.1)]			11.2.6 - Apply the tip of the flame to one end of the sample strip to ignite the test strip as described in Sec. 11.1.5.1 or 11.1.5.2 (based on whether the sample is non-metallic or metallic). 11.1.5.1 - If the waste is non-metallic, hold the flame tip on the sample strip until the sample ignites or for a maximum of 2 minutes.
36	If the waste is a metal or metal alloy powder, is the flame tip held to the sample strip until the sample ignites or for a maximum of 5 minutes? [SW-846 1030 (11.2.6) and (11.1.5.2)]			11.2.6 - Apply the tip of the flame to one end of the sample strip to ignite the test strip as described in Sec. 11.1.5.1 or 11.1.5.2 (based on whether the sample is non-metallic or metallic). 11.1.5.2 - If the waste is a metal or metal alloy powder, hold the flame tip on the sample strip until the sample ignites or for a maximum of 5 minutes.
37	Does the laboratory begin timing the rate of combustion when the test strip or powder train has burned up to the 80-mm time marker? [SW-846 1030 (11.2.7)]			When the test strip or powder train has burned up to the 80-mm time marker, begin timing the rate of combustion with a stop watch.
38	Is the timer stopped when the burned strip reaches the 180-mm time marker? [SW-846 1030 (11.2.7)]			Stop the timer when the burned strip reaches the 180-mm time marker.
39	Does the laboratory record the amount of time (in sec) required to burn the 100-mm test strip? [SW-846 1030 (11.2.7)]			Record the amount of time (in sec) required to burn the 100-mm test strip.
40	How is the rate of burning calculated? [SW-846 1030 (12.0)] **ANSWER:**			Calculate the rate of burning by dividing the length of the burn test strip (100 mm) by the total time (sec).
41	Are results of the burn test reported in mm/sec? [SW-846 1030 (12.0)]			Results of the burn rate test should be reported in mm/sec.
42	What constitutes a positive result for ignitability for non-metallic wastes? [SW-846 1030 (12.0)] **ANSWER:**			Wastes that have a rate of burning of more than 2.2 mm/sec (or burn time of less than 45 sec for 100 mm) are considered to have a positive result for ignitability according to DOT regulations.
43	What constitutes a positive result for ignitability for metallic wastes? [SW-846 1030 (12.0)] **ANSWER:**			For metals, this time is 10 minutes or less for 100 mm (or a burn rate of more than 0.17 mm/sec).
44	Are the following items documented (**check those that apply**): □ Source of material (e.g., company, operation or process) □ Description of material (e.g., powder or paste, metallic or non-metallic) □ Particle size (e.g., fine powder, granular, sand, etc.) □ Preliminary burning time (sec) □ Date of test □ Analyst □ Temperature of test material (°C) □ Air velocity through fume hood (m/s) □ Time (sec) elapsed between application of flame and start of ignition □ Burning time over 100 mm (sec) □ Burning rate (mm/sec) □ Positive or Negative test [15A NCAC 2H .0805 (a) (7) and 15A NCAC 2H .0805 (a) (7) (E)]			**15A NCAC 2H .0805 (a) (7):** Supporting records shall be maintained as evidence that these practices are implemented. **15A NCAC 2H .0805 (a) (7) (E):** All analytical records, including original observations and information necessary to facilitate historical reconstruction of the calculated results, shall be maintained for five years. All analytical data and records pertinent to each certified analysis shall be available for inspection upon request.
	QUALITY ASSURANCE	**LAB**	**SOP**	**EXPLANATION**
45	Are all tests performed on a clean ceramic plate at room temperature? [SW-846 1030 (9.2)]			All tests must be performed on a clean ceramic plate at room temperature. Note: All equipment that is in contact with the

				sample must be completely dry before each sample is analyzed.
46	Are all replicate runs analyzed at the same temperature? [SW-846 1030 (9.3)]			All replicate runs must be at the same initial temperature (ambient laboratory temperature).
47	Are all replicate runs analyzed at approximately the same airflow through the fume hood? [SW-846 1030 (9.4)]			All replicate tests must be run at approximately the same airflow through the fume hood.
48	Are subsamples of the same particle size distribution used for all replicate tests? [SW-846 1030 (9.5)]			Only materials of the same particle size distribution should be used for all replicate tests.
49	Is the burn rate test conducted in triplicate, when the preliminary screening test is positive? [SW-846 1030 (9.6)]			The burn rate test must be conducted in triplicate if the preliminary screening test is positive.
50	How are final sample results reported from the triplicate test values? [SW-846 1030 (12.0)] **ANSWER:**			Calculate the rate of burning by dividing the length of the burn test strip (100 mm) by the total time (sec). Results of the burn rate test should be reported in mm/sec. **15A NCAC 2H .0805 (a) (7) (E):** All analytical records, including original observations and information necessary to facilitate historical reconstruction of the calculated results, shall be maintained for five years.
51	Is the data qualified on the report or client report if Quality Control (QC) requirements are not met? [15A NCAC 2H .0805 (a) (7) (B)]			If the sample cannot be reanalyzed, or if the quality control results continue to fall outside established limits or show an analytical problem, the results shall be qualified as such. If data qualifiers are used to qualify samples not meeting QC requirements, the data may not be useable for the intended purposes. It is the responsibility of the laboratory to provide the client or end-user of the data with sufficient information to determine the usability of the qualified data.

Additional Comments:

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Inspector: _____Date:_____

The following format may be used to document the data.

Test Material Information

Source of material (e.g., company, operation or process):

Description of material (e.g., powder or paste, metallic or non-metallic):

Particle size (e.g., fine powder, granular, sand, etc.):

Preliminary burning time (sec):

Test Conditions

Date of Test:

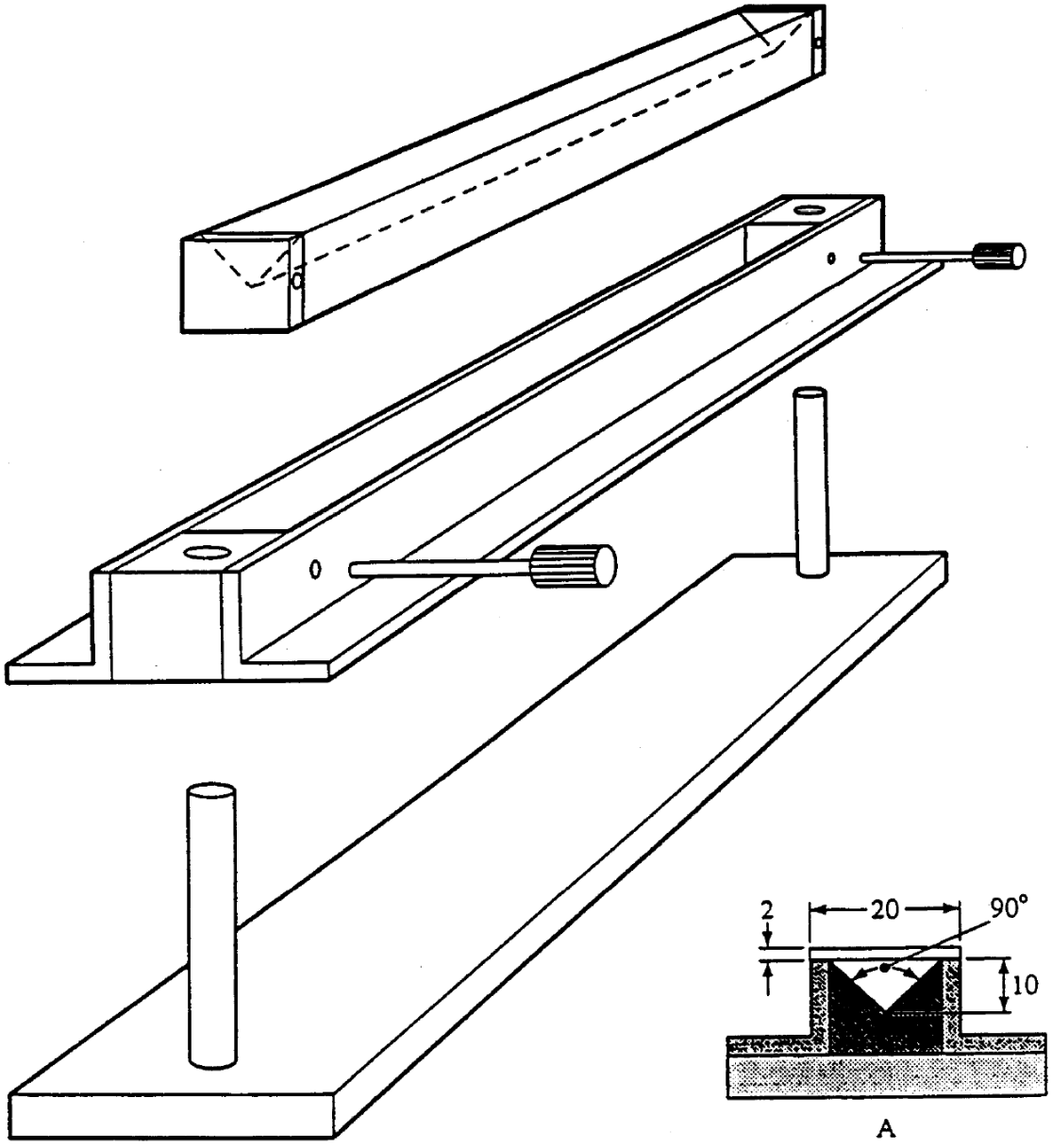
Temperature of test material (°C):

Air velocity through fume hood (m/s):

Ignitability Test Data				
Test Number	Time (sec) Elapsed Between Application of Flame and Start of Ignition	Burning Time over 100 mm (sec)	Burning Rate (mm/sec)	Comments
1				
2				
3				

FIGURE 1

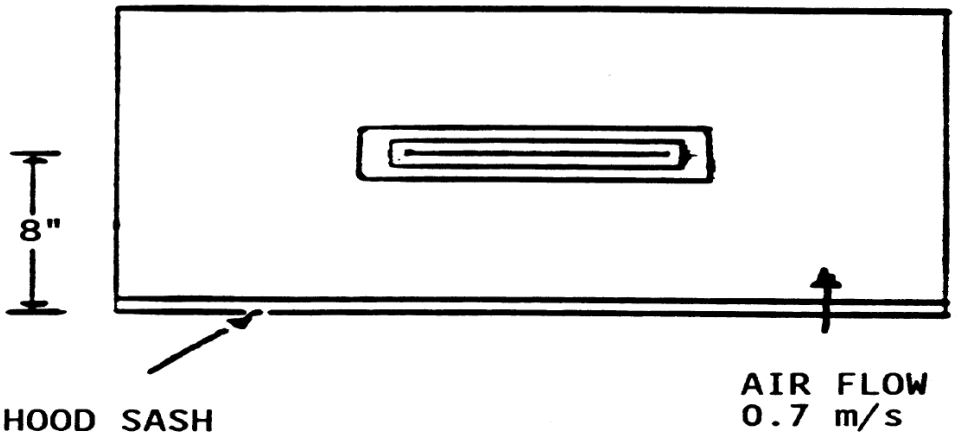
POWDER TRAIN MOLD



(A) Cross-section of 250 mm long mould

FIGURE 2

TEST APPARATUS POSITION IN FUME HOOD



SAMPLE 90° TO AIR FLOW