SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

GENERAL TEST METHOD FOR DETERMINING SOLVENT LOSSES FROM SPRAY GUN CLEANING SYSTEMS

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I. SCOPE

This method covers the determination of solvent losses from cleaning systems used for the cleaning of spray guns and paint cups.

Rule 1151 (Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations) requires under paragraph (c)(3)(B) that effective January 1, 1990, a person or facility shall not use VOC-containing materials for spray equipment cleanup unless an enclosed system is used for cleaning. The system must totally enclose spray-guns, cups, nozzles, bowls, and other parts during washing, rinsing, and draining procedures. Rule 1151 under paragraph (h), Alternative Emission Control Plan (AECP), provides an alternative for equipment, which does not directly comply with paragraph (c)(3)(B), to comply under an equivalency plan. This plan implies that equipment not directly complying with the provisions of (c)(3)(B) may comply with the rule if VOC emissions from such equipment are equal or less than that from equipment directly complying with the provisions of (c)(3)(B) under similar cleaning conditions. The following equipment have been determined by the District to directly comply with paragraph (c)(3)(B) if all cleaning steps are carried out inside the equipment:

1. Herkules Gun Washer and Recycler (GW/R)
2. Uni-Ram Cascade Model Numbers UG 2000, UG 3000, and UG 4000.

Other enclosed equipment than that listed above may also comply directly with paragraph (c)(3)(B) if all cleaning steps are carried out inside the equipment. The equipment to be evaluated and one of the approved equipment listed above will be tested concurrently such that the cleaning cycles for each equipment are spread out evenly throughout the concurrent test period. An AECP also requires the equipment manufacturer to obtain written approval from the Executive Officer (Office of Operations) before the alternate equipment can be used. This document provides guidelines for obtaining the Executive Officer's approval and test methods to be used for determining solvent losses from various types of spray-gun cleaning equipment.

II. APPLICATION PROCEDURE

1. A test to concurrently determine solvent losses from the candidate equipment and from one of the approved equipment is required.

2. The equipment manufacturer requesting the District approval shall submit a test plan to the Office of Operations of the District for review. The test plan shall be prepared in accordance with the guidelines provided in this document.

3. The test plan shall be reviewed by the District staff and an approval to conduct the test will be given if the test plan is determined to be satisfactory.

4. The test shall be conducted in accordance with the approved plan by an independent testing laboratory approved by the District. The District shall be notified at least 48 hours before the start of the test so that a District observer may be present.

5. A final test report including all test data, calculations and results shall be submitted to the District, Office of Operations, for approval.

6. An approval of the equipment will be issued if the results of the test meet the requirement of Rule 1151(h).

III. INTRODUCTION

This method is intended to determine solvent losses during Active and Passive modes. The Active mode comprises all steps carried out during a cleaning operation. The Active Loss is expressed in grams of solvent loss per cleaning cycle. For the purpose of this test method, a number of cleaning cycles shall be carried out and the total solvent loss determined by the difference between the initial and the final solvent weights in the system. The number of cleaning cycles to be carried out for the purpose of this test shall be such that the total loss of solvent is at least 600 grams. The Active Loss is calculated by dividing total solvent loss by the number of cleaning cycles and shall be the arithmetic average of at least three separate tests. Testing variability may require additional tests on a case by case basis. The Passive mode represents the non-Active mode period when cleaning equipment sits idle between cleaning cycles and for extended periods such as weekends. Passive losses are a result of natural evaporation of the solvent from the equipment. The Passive Loss is expressed in grams of solvent loss in the Passive mode per hour. For the purpose of this test the total Passive losses are determined for a period of at least five (5) consecutive days by measuring the difference between the solvent weights at the beginning and at the end of the Passive mode test period. The Passive mode test shall be terminated at the end of the fifth day if the total solvent loss during this period is 600 grams or more. In case total solvent loss in five days is less than 600 grams, the test shall be extended until a total solvent loss of 600 grams is achieved or up to a total of fifteen (15) days whichever occurs first. The Passive Loss in grams per hour is calculated by dividing the total Passive loss by total number of hours of the Passive mode test period.

Spray gun cleaning systems in industry can be operated under different conditions. In order to determine solvent losses for comparison purposes, test conditions need to be standardized. For the purpose of this test, the following conditions are fixed:

1. Cleanup solvent: Du Pont, Duco Refinish Thinner, 3642S

2. Although type of coating deposit can be reproduced for each test by using the same brand of coating, the quantity and the hardness of the coating

deposit are difficult to reproduce. In order to avoid this complexity, the spray gun and the cup to be used for test purposes will have no coating deposits.

3. Spray gun: Binks Model #7

4. Cup: Binks Model #81-350

IV. CRITERION FOR COMPLIANCE WITH RULE 1151(h)

The candidate equipment shall be deemed in compliance with the provisions of Rule 1151(h) if:

1. The Active solvent loss of the candidate equipment is equal to or less than the Active solvent loss of at least one of the approved equipment, **and**

2. The Passive solvent loss of the candidate equipment is equal to or less than the Passive loss of at least one of the approved equipment, **and**

3. The same approved equipment shall be used to demonstrate compliance with criteria 1 and 2 above.

V. EQUIPMENT:

There are two basic types of spray-gun cleaning equipment currently available on the market: once-through systems and continuous recycle systems.

In once-through systems, cleanup solvent is transferred to the spray-gun cup from a solvent container, flushed through the gun, and captured from the discharge of the gun in a separate container or in a solvent recovery device such as a condensing unit. In these systems, the exterior of the gun and the cup are generally cleaned by hand-wiping with solvent-soaked rags or with brushes, and thus, solvent loss goes directly to the atmosphere. Examples of once-through systems are Lighthall SC 1100 and SC 70 spray-gun cleaning systems.

There are two types of continuous recycle systems: systems with only one solvent container (wash-cycle container) and systems with two solvent containers (wash-cycle and rinse-cycle containers). In systems with only one solvent container, the solvent is pumped from the container to the gun and its parts and drained back to the same container. In systems with two solvent containers, the final rinsing is carried out inside the cleaning equipment with virgin solvent pumped from a separate container after washing with wash solvent. In either case, equipment does not comply with the specific language in paragraph (c)(3)(B) if any cleaning step is carried out outside an enclosed chamber. Examples of continuous recycle systems are Uni-Ram Cascade series models UG 2000, UG 3000 and UG 4000; Herkules Equipment Corporation Gun Washer and Recycler (GW/R); Safety-Kleen Model 1107; Pacific Coast Lacquer PCL Unit III; and Astro Pneumatic Gun Washer/Recycler.

VI. TEST PROCEDURE FOR RECYCLE SYSTEMS:

Notes:

(a) The analytical balances used in this test method shall be accurate and precise enough to assure that the weight loss measured is accurate within ±2% of the measured difference.

(b) Room temperatures during Active and Passive mode testing shall be continuously recorded on a temperature recorder.

A. Active Loss

1. Weigh empty wash-solvent container, "A" grams. Record on Data Sheet 1 or 3.

2. Weigh empty rinse-solvent container, "B" grams. Record on Data Sheet 1 or 3. (Applicable to two solvent container systems)

3. Fill wash-solvent container with sufficient quantity of cleanup solvent.

4. Fill rinse-solvent container with sufficient quantity of cleanup solvent. (Applicable to two solvent container systems)

5. Weigh wash-solvent container with the solvent, "C" grams. Record on Data Sheet 1 or 3.

6. Weigh rinse-solvent container with the solvent, "D" grams. Record on Data Sheet 1 or 3. (Applicable to two solvent container systems)

7. Connect wash-solvent and rinse-solvent containers to the cleaning system as per vendor instructions, if applicable.

8. Clean a gun and a cup as per vendor's operating instructions for a number of cleaning cycles so that the total solvent loss is at least 600 grams. Record number of repeats, "G". The definition and duration of a cleaning cycle for different equipment available in the market are given below.

Totally Enclosed Recycle Systems:

For totally enclosed systems a complete cleaning cycle includes opening the lid of the equipment, placing the spray-gun and cup inside the enclosed chamber, closing the lid, washing and rinsing inside the chamber, opening the lid, removing the cleaned parts from the enclosed chamber, and closing the lid. To start each cleaning cycle the lid should

be opened and parts placed inside. The parts should be completely dry before putting them back into the chamber for the next cycle. This definition of cleaning cycle applies to cleaning equipment such as Herkules and Uni-Ram (Cascade). The following table provides the cycle times to be used during testing.

EQUIPMENT	CYCLE	TIME
Herkules Equipment Corp. (Gun Washer & Recycler)	Wash Cycle	60 seconds
Uni-ram Cascade		
Model UG-4000	Wash Cycle Rinse Cycle	45 seconds 12 seconds
Model UG-3000	Wash Cycle	45 seconds
Model UG-2000	Wash Cycle	45 seconds

Flushing-Recycle System:

Safety-Kleen (Model 1107)

(a) Fill cup with solvent , brush cup for fifteen (15) seconds, swish it around and discard solvent into sink.

(b) Fill cup with 8 ounces of solvent, attach gun-head to the cup, flush solvent through the gun by placing gun tip against gun port on suction canister until cup is empty. Pour remaining solvent (if any) into the sink. Repeat this step three more times.

(c) Clean inside and outside of cup, and the outside of the gun with solvent for 30 seconds.

(d) Clean the inside of the gun suction tube for 30 seconds by placing the suction tube under clean solvent spout and flushing solvent through it.

(e) Let the gun and cup completely dry.

9. Disconnect wash-solvent container from the system, if applicable.

10. Immediately weigh wash-solvent container with solvent, "E" grams. Record on Data Sheet 1 or 3.

11. Immediately connect wash-solvent container to the cleaning system, if applicable.

12. Disconnect rinse-solvent container from the system. (Applicable to two solvent container systems)

13. Immediately weigh rinse-solvent-container with solvent, "F" grams. Record on Data Sheet 1 or 3. (Applicable to two solvent container systems)

14. Immediately connect rinse-solvent container to the cleaning system. (Applicable to two solvent container systems)

15. Perform the test three times. One complete test is comprised of steps 1 to 14. Record on Data Sheet 1 or 3.

B. Passive Loss:

Notes:

(a) The duration of Passive mode test shall be at least five (5) consecutive days. In case the total solvent loss during this period is less than 600 grams, the test shall be extended until a total solvent loss of 600 grams is achieved or up to a total period of fifteen (15) days whichever occurs first. All units shall be placed in the same room to ensure similar environmental conditions for all units. The key of the room will be in the custody of the independent testing laboratory personnel. No person shall be allowed to enter the room without the presence of these personnel.

(b) During each 24 hours, valves on each solvent container (if any) on all units shall be kept open for 10 hours and closed for 14 hours.

(c) Perform following steps on each unit of each type of equipment being tested.

1. Weigh empty wash-solvent container, "J" gms. Record on Data Sheet 4 or 6.

2. Weigh empty rinse-solvent container, "K" gms. Record on Data Sheet 4 or 6. (Applicable to two solvent container systems)

3. Fill wash-solvent container with sufficient quantity of cleanup solvent.

4. Fill rinse-solvent container with sufficient quantity of cleanup solvent. (Applicable to two solvent container systems)

5. Weigh wash-solvent container with solvent, "J1" gms. Record on Data Sheet 4 or 6.

6. Immediately connect wash-solvent container to the respective cleaning equipment as per vendor's instructions, if applicable. Record date and time.

7. Weigh rinse-solvent container with solvent, "K1" gms. Record on Data Sheet 4 or 6. (Applicable to two solvent container systems)

8. Immediately connect rinse-solvent container to the respective cleaning equipment as per vendor's instructions. Record date and time. (Applicable to two solvent container systems)

9. Open and close solvent container valves as per Note (b) above.

10. Weigh wash-solvent container every 24 hours, "J2, J3, - J14" gms. Record date, time and weights on Data Sheet 4 or 6.

11. Weigh rinse-solvent container every 24 hours, "K2, K3, - K14" gms. Record date, time and weights on Data Sheet 4 or 6. (Applicable to two solvent container systems)

12. Weigh wash-solvent container with solvent at the end of the Passive mode period, "J15" gms. Record on Data Sheet 4 or 6.

13. Weigh rinse-solvent container with solvent at the end of the Passive mode period, "K15" gms. Record on Data Sheet 4 or 6. (Applicable to two solvent container systems)

VII. CALCULATIONS FOR RECYCLE SYSTEMS:

A. Active Loss:

Note:

(a) Use Calculation Sheet 1 or 3.

1. Weight of solvent initially put in the wash-solvent container
= (C - A) grams

2. Weight of solvent initially put in the rinse-solvent container. (Applicable to two solvent container systems)
= (D - B) grams

3. Total solvent initially put in the system
= {(C - A) + (D - B)} grams

4. Weight of solvent in the wash-solvent container at the end of the cleaning cycles
= (E - A) grams.

5. Weight of solvent in the rinse-container at the end of the cleaning cycles. (Applicable to two solvent container systems)

= (F - B) grams.

6. Total solvent in the system at the end of the cleaning cycles
= {(E - A) + (F - B)} grams.

7. Total solvent loss
= {(C - A) + (D - B)} - {(E - A) + (F - B)} grams
= {(C + D) - (E + F)} grams

8. Number of cleaning cycles, "G"

9. Solvent loss per cleaning cycle
P = {(C + D) - (E + F)}/G, grams

B. Passive Loss:

Note:

(a) Use Calculation Sheets 4 or 6.

1. Solvent loss from wash-solvent container,
J16 = J1 - J15, gms

2. Solvent loss from rinse-solvent container. (Applicable to two solvent container systems)
K16 = K1 - K15 ,gms

3. Total solvent loss, M = J16 + K16, gms

4. Number of hours of Passive mode test = L

5. Passive loss per hour, N = M/L gms.

VIII. TEST PROCEDURE FOR ONCE-THROUGH SYSTEMS:

Note:

(a) The analytical balances used in this test shall be accurate and precise enough to assure that the weight loss measured is accurate within $\pm$2% of the measured difference.

(b) Room temperatures during Active and Passive mode testing shall be continuously recorded on a temperature recorder.

A. Active Loss

1. Weigh empty solvent container with its cap, "A" grams. Record on Data Sheet 2.

2. Pour sufficient amount of solvent into the solvent container.

3. Weigh solvent container with solvent and cap, "B" grams. Record on Data Sheet 2.

4. Weigh empty solvent recovery container, "C" grams. Record on Data Sheet 2.

5. Weigh clean rags with a non-absorbing container with a lid, or weigh together empty soft scrub brush bottles, whichever is applicable, "D" grams. Record on Data Sheet 2.

6. Install cleaning equipment as per vendor's instructions. Solvent drains from the condensing section and the enclosed chamber to the solvent recovery container shall be kept open.

7. Fill cup with solvent from the solvent container, brush cup for fifteen (15) seconds, swish it around and discard solvent into the enclosed chamber.

8. Fill cup with 8 ounces of solvent from solvent container, attach gun head to the cup, swish the cup thoroughly, connect air hose to the spray-gun, flush solvent through the gun until the cup is empty, capture solvent in the solvent recovery device such as a condensing unit, and collect solvent in solvent recovery container.

9. Disconnect air hose from the gun, remove spray-gun head from the cup.

10. Pour remaining solvent (if any) from the cup into the enclosed chamber.

11. Repeat steps 8 to 10 three (3) more times.

12. Fill cup with solvent, attach gun head to the cup, flush solvent through the gun for 30 seconds, capture solvent in the solvent recovery device such as a condensing unit, and collect in solvent recovery container. Repeat steps 9 and 10 above.

13. Soak a rag with solvent from solvent container, or fill soft scrub brush bottles with solvent from container, whichever is applicable.

14. Wipe clean the exterior of the spray gun and the cup with the solvent-soaked rag for 30 seconds; or if applicable, brush cup and gun with soft scrub brush number 1 for 60 seconds and brush cup and gun with soft scrub brush number 2 for 60 seconds. If either bottle becomes empty, refill it from solvent container. Leave valve open from enclosed chamber to solvent recovery container.

15. Place the rag in the non-absorbing rag storage container, close the lid; or if applicable, leave brushes with bottles in enclosed

chamber with spray gun and cup, close lid to enclosed chamber and let spray gun and cup remain in chamber to drain for 60 seconds.

16. Remove spray gun and cup from enclosed chamber and let the gun and cup completely dry.

17. Repeat steps 7 to 16 enough times to have a total solvent loss of at least 600 grams. Record number of repeats, "H".

18. Weigh solvent container with cap and remaining solvent, "E" grams. Record on Data Sheet 2.

19. Weigh solvent recovery container with collected solvent, "F" grams. Record on Data Sheet 2.

20. Weigh non-absorbing rag storage container with solvent-laden rags stored in it, or if applicable, remove soft scrub bottles from enclosed chamber and weigh them together. "G" grams. Record on Data Sheet 2.

21. Perform Active loss test three times. One test constitutes steps 1 to 20.

B. Passive Loss

Notes:

(a) The duration of passive mode shall be at least five (5) consecutive days. In case the total solvent loss during this period is less than 600 grams, the test shall be extended until a total solvent loss of 600 grams is achieved or up to a total period of fifteen (15) days whichever occurs first. All units shall be placed in the same room to ensure similar environmental conditions for all units. The key of the room shall be in the custody of the independent testing laboratory personnel. No person shall be allowed to enter the room without the presence of these personnel.

(b) During each 24 hours, the drain valve to the solvent recovery container shall be kept open for 10 hours and closed for 14 hours.

(1) Weigh the entire unit including the solvent recovery container empty, "J" gms. Record on Data Sheet 5.

(2) Fill solvent recovery container with solvent. Close the lid of the enclosed chamber.

(3) Weigh the entire unit including the solvent recovery container with solvent, "J1" gms. Record on Data Sheet 5.

(4) Immediately connect solvent recovery container to the equipment as per vendor's instructions.

(5) Open and close drain valve as per note (b) above.

(6) Weigh the entire unit with solvent recovery container every 24 hours, "J2, J3, - J14" gms. Record date, time and weights on Data Sheet 5.

(7) Weigh the entire unit with solvent recovery container at the end of the Passive mode period, "J15" gms. Record on Data Sheet 5.

IX. CALCULATIONS FOR ONCE-THROUGH SYSTEMS:

A. Active Loss

Note:

(a) Use Calculation Sheet 2

1. Initial amount of solvent placed in solvent container
   = (B - A) gms

2. Final amount of solvent remaining in solvent container
   = (E - A) gms

3. Amount of solvent used
   = {(B - A) - (E - A)} gms
   = (B - E) gms

4. Amount of solvent collected in the solvent recovery container
   = (F - C) gms

5. Amount of solvent retained by solvent-laden rags or soft scrub brush bottles
   = (G - D) gms

6. Amount of solvent lost to the atmosphere
   = (B - E) - {(F - C) + (G - D)} gms

7. Solvent loss per cleaning cycle
   P = [(B - E) - {(F - C) + (G - D)}] /H, gms

B. Passive Loss

Note:

(a) Use Calculation Sheet 5.-

1. Total solvent loss, M= (J1 - J15) gms

=_____

=_____

2. Number of hours of Passive mode test, L=_____

3. Passive loss per hour, N= M/L gms

=_____

AL:yav
(sprytst7)

DATA SHEET 1

ACTIVE LOSS OF CANDIDATE EQUIPMENT

(Recycle Systems)

MANUFACTURER'S NAME:_____ DATE OF TEST:_____

MODEL:_____

	TEST (1)	TEST (2)	TEST (3)
WT. OF EMPTY WASH-SOLVENT CONTAINER, " A " gms.			
WT. OF EMPTY RINSE-SOLVENT CONTAINER " B " gms.			
WT. OF WASH-SOLVENT CONTAINER WITH SOLVENT BEFORE CLEANING, " C " gms.			
WT. OF RINSE-SOLVENT CONTAINER WITH SOLVENT BEFORE CLEANING, " D " gms.			
WT. OF WASH-SOLVENT CONTAINER WITH SOLVENT AFTER CLEANING, " E " gms.			
WT. OF RINSE-SOLVENT CONTAINER WITH SOLVENT AFTER CLEANING, " F " gms.			
NUMBER OF CLEANING CYCLES, " G ".			

DATA SHEET 2

ACTIVE LOSS OF CANDIDATE EQUIPMENT

(Once-Through Systems)

MANUFACTURER'S NAME:_____ DATE OF TEST:_____

MODEL:_____

	TEST (1)	TEST (2)	TEST (3)
WT. OF EMPTY SOLVENT CONTAINER WITH CAP," A " gms.			
WT. OF SOLVENT CONTAINER WITH SOLVENT AND CAP," B " gms.			
WT. OF EMPTY SOLVENT RECOVERY CONTAINER, " C " gms.			
WT. OF CLEAN RAGS AND NON-ABSORBING CONTAINER OR EMPTY SOFT SCRUB BRUSH BOTTLES, " D " gms.			
WT. OF SOLVENT CONTAINER WITH REMAINING SOLVENT AND CAP, " E " gms.			
WT. OF SOLVENT RECOVERY CONTAINER WITH COLLECTED SOLVENT, " F " gms.			
WT. OF NON-ABSORBING CONTAINER WITH SOLVENT-SOAKED RAGS, " G ".			
NUMBER OF CLEANING CYCLES, " H ".			

DATA SHEET 3

ACTIVE LOSS OF APPROVED EQUIPMENT

MANUFACTURER'S NAME:_____

MODEL:_____

DATE OF TEST:_____

	TEST (1)	TEST (2)	TEST (3)
WT. OF EMPTY WASH-SOLVENT CONTAINER, " A " gms.			
WT. OF EMPTY RINSE-SOLVENT CONTAINER, " B " gms.			
WT. OF WASH-SOLVENT CONTAINER WITH SOLVENT BEFORE CLEANING, " C " gms.			
WT. OF RINSE-SOLVENT CONTAINER WITH SOLVENT BEFORE CLEANING, " D " gms.			
WT. OF WASH-SOLVENT CONTAINER WITH SOLVENT AFTER CLEANING, " E " gms.			
WT. OF RINSE-SOLVENT CONTAINER WITH SOLVENT AFTER CLEANING, " F " gms.			
NUMBER OF CLEANING CYCLES, " G ".			

DATA SHEET 4

PASSIVE LOSS OF CANDIDATE EQUIPMENT

(Recycle Systems)

MANUFACTURER'S NAME:_____

MODEL:_____

1. Wt. of empty wash-solvent container, "J" gms =_____ gms.
2. Wt. of empty rinse-solvent container, "K" gms =_____ gms.
3. Initial wt. of wash-solvent container with solvent,"J1" gms =_____ gms.
4. Initial wt. of rinse-solvent container with solvent,"K1" gms =_____ gms.
5. Total number of hours of test, "L" =

TIME DATE	(Every 24 Hours)	WT. OF WASH-SOLVENT CONTAINER WITH SOLVENT, gms.	WT. OF RINSE-SOLVENT CONTAINER WITH SOLVENT, gms.
		J2=	K2=
		J3=	K3=
		J4=	K4=
		J5=	K5=
		J6=	K6=
		J7=	K7=
		J8=	K8=
		J9=	K9=
		J10=	K10=
		J11=	K11=
		J12=	K12=
		J13=	K13=
		J14=	K14=
		J15=	K15=

DATA SHEET 5

PASSIVE LOSS OF CANDIDATE EQUIPMENT

(Once-Through Systems)

MANUFACTURER'S NAME:_____

MODEL:_____

1. Wt. of entire unit including solvent recovery container without solvent, "J" gms

   =_____ gms.

2. Wt. of entire unit including solvent recovery container with solvent, "J1" gms

   =_____ gms.

3. Total number of hours of test, "L" = _____

DATE	TIME (Every 24 Hours)	WT. OF ENTIRE UNIT INCLUDING SOLVENT RECOVERY CONTAINER WITH SOLVENT, gms.
		J2=
		J3=
		J4=
		J5=
		J6=
		J7=
		J8=
		J9=
		J10=
		J11=
		J12=
		J13=
		J14=
		J15=

DATA SHEET 6

PASSIVE LOSS OF APPROVED EQUIPMENT

MANUFACTURER'S NAME:_____

MODEL:_____

1. Wt. of empty wash-solvent container, "J" gms =_____ gms.
2. Wt. of empty rinse-solvent container, "K" gms =_____ gms.
3. Initial wt. of wash-solvent container with solvent,"J1" gms =_____ gms.
4. Initial wt. of rinse-solvent container with solvent,"K1" gms =_____ gms.
5. Total number of hours of test, "L" =_____

DATE	TIME (Every 24 Hours)	WT. OF WASH-SOLVENT CONTAINER WITH SOLVENT, gms.	WT. OF RINSE-SOLVENT CONTAINER WITH SOLVENT, gms.
	J2=	K2=	
	J3=	K3=	
	J4=	K4=	
	J5=	K5=	
	J6=	K6=	
	J7=	K7=	
	J8=	K8=	
	J9=	K9=	
	J10=	K10=	
	J11=	K11=	
	J12=	K12=	
	J13=	K13=	
	J14=	K14=	
	J15=	K15=	

CALCULATION SHEET 1

ACTIVE LOSS OF CANDIDATE EQUIPMENT

(Recycle Systems)

Note: Refer To Data Sheet 1

MANUFACTURER'S NAME:_____ DATE OF TEST:_____

MODEL:_____

	TEST (1)	TEST (2)	TEST (3)
INITIAL WT. OF TOTAL SOLVENT IN SYSTEM = {(C - A) + (D - B)} gms.			
FINAL WT. OF TOTAL SOLVENT IN SYSTEM = {(E - A) + (F - B)} gms.			
TOTAL ACTIVE SOLVENT LOSS = {(C + D) - (E + F)} gms.			
NUMBER OF CLEANING CYCLES, " G ".			
SOLVENT LOSS PER CLEANING CYCLE, P = {(C + D) - (E + F)} / G, gms.	P1 =	P2 =	P3 =

Arithmetic average of active loss per cleaning cycle, gms

P4 = (P1 + P2 + P3) /3 gms.

=_____

=_____

CALCULATION SHEET 2

ACTIVE LOSS OF CANDIDATE EQUIPMENT

(Once-Through Systems)

Note: Refer To Data Sheet 2

MANUFACTURER'S NAME:_____ DATE OF TEST:_____

MODEL:_____

	TEST (1)	TEST (2)	TEST (3)
TOTAL WEIGHT OF SOLVENT USED FOR CLEANING, (B - A) gms.			
WT. OF SOLVENT COLLECTED IN SOLVENT RECOVERY CONTAINER, (F - C) gms.			
WT. OF SOLVENT RETAINED BY RAGS, (G. - D) gms.			
TOTAL SOLVENT RECOVERED, {(F - C) + (G - D)} gms.			
WT. OF SOLVENT LOST TO ATMOSPHERE (B - E) - {(F - C) + (G - D)} gms.			
NUMBER OF CLEANING CYCLES, " H ".			
SOLVENT LOSS PER CLEANING CYCLE, P = [(B - E) - {(F - C) + (G - D)}] / H gms.	P5 =	P6 =	P7 =

Arithmetic average of active loss per cleaning cycle, gms

$$P8 = (P5 + P6 + P7) / 3 \text{ gms.}$$

=_____

=_____

CALCULATION SHEET 3

ACTIVE LOSS OF APPROVED EQUIPMENT

Note: Refer To Data Sheet 3

MANUFACTURER'S NAME:_____

MODEL:_____

DATE OF TEST :_____

	TEST (1)	TEST (2)	TEST (3)
INITIAL WT. OF TOTAL SOLVENT IN SYSTEM = {(C - A) + (D - B)} gms.			
FINAL WT. OF TOTAL SOLVENT IN SYSTEM = {(E - A) + (F - B)} gms.			
TOTAL ACTIVE SOLVENT LOSS = {(C + D) - (E + F)} gms.			
NUMBER OF CLEANING CYCLES, " G ".			
SOLVENT LOSS PER CLEANING CYCLE, P = {(C + D) - (E + F)} / G, gms.	P9=	P10=	P11=

Arithmetic average of active loss per cleaning cycle, gms

P12 = (P9 + P10 + P11) /3 gms.

=_____

=_____

CALCULATION SHEET 4

PASSIVE LOSS OF CANDIDATE EQUIPMENT

(Recycle Systems)

Note: Refer To Data Sheet 4

DATES: FROM:_____ TO:_____

MANUFACTURER'S NAME:_____

MODEL:_____

1. Wt. of solvent loss from wash-solvent container, gms J16 = (J1 - J15) gms

   =_____

2. Wt. of solvent loss from rinse-solvent container, gms K16 = (K1 - K15) gms

   =_____

3. Total passive solvent loss, gms M = (J16 + K16) gms

   =_____

   =_____

4. Passive loss per hour, gms $N1 = \frac{M}{L}$ gms

   =_____

   =_____

CALCULATION SHEET 5

PASSIVE LOSS OF CANDIDATE EQUIPMENT

(Once-Through Systems)

Note: Refer To Data Sheet 5

DATES: FROM:_____ TO:_____

MANUFACTURER'S NAME:_____

MODEL:_____

1. Total wt. of solvent loss, gms — M = (J1 - J15) gms

   =_____

   =_____

2. Number of hours of passive mode test, — L =_____

3. Passive loss per hour, gms — $N2 = \frac{M}{L}$ gms

   =_____

   =_____

CALCULATION SHEET 6

PASSIVE LOSS OF APPROVED EQUIPMENT

Note: Refer To Data Sheet 6

DATES: FROM:_____ TO:_____

MANUFACTURER'S NAME:_____

MODEL:_____

1. Wt. of solvent loss from wash-solvent container, gms J16 = (J1 - J15) gms

   =_____

2. Wt. of solvent loss from rinse-solvent container, gms K16 = (K1 - K15) gms

   =_____

3. Total passive solvent loss, gms M = (J16 + K16) gms

   =_____

   =_____

4. Passive loss per hour, gms $N3 = \frac{M}{L}$ gms

   =_____

   =_____

DATA SHEET 7

RESULTS

A. **CANDIDATE EQUIPMENT**

MANUFACTURER'S NAME:_____

MODEL:_____

EQUIPMENT NAME:_____

1. Active loss per cycle =_____ gms.

2. Passive loss per hour =_____ gms.

B. **APPROVED EQUIPMENT**

1. Active loss per cycle =_____ gms.

2. Passive loss per hour =_____ gms.