

EDR Reporting Instructions for Rectangular Stacks or Ducts, with Wall Effects Adjustment

I. Introduction

For rectangular ducts or stacks with installed flow monitors, follow the applicable reporting instructions below for EDR record types 220, 532, 605, 606, 610, 611, 614, 615, 616, and 617, when a wall effects adjustment factor (WAF) is determined using Conditional Test Method CTM-041 and the WAF is applied to the flow rate data.

Conditional Test Method CTM-041 allows the owner or operator to either:

- C Determine a site-specific default WAF; or
- C Make wall effects measurements and calculate an average WAF, based on 3 or more test runs.

If you elect to measure wall effects, the measurements may be made at any load level (low, mid or high) and may either be coupled with the test runs of a flow RATA or may be made separately. Once a default or measured WAF has been determined, you may enter it into the programming of your flow monitor as a correction to the cross-sectional area of the rectangular stack or duct, thereby adjusting the measured stack gas flow rates for wall effects. Then, when a subsequent RATA of the flow monitor is performed, the same WAF that is being used to correct the flow monitor readings should be applied to the reference method test data.

Sections II through IV, below assume that a WAF has been obtained using CTM-041 and that the WAF is being applied to the stack flow monitor readings.

II. Reporting the WAF Information

RT 532: Rectangular Duct WAF Data

All units/stacks currently applying a wall effects correction obtained using CTM-041 to flow rate data are to begin reporting RT 532 in their 1st quarter 2005 quarterly report submittal to EPA. RT 532 is a new record type (available in MDC v 4.2.51) and replaces the wall effects reporting in RTs 910. RT 532 should be included in each quarterly submission. For units not presently applying a wall effects correction, but intending to begin using a WAF, report RT 532 beginning with the EDR for the calendar quarter in which the WAF is determined, with one exception—if the unit is an ozone season-only reporter and the WAF is determined outside the ozone season, report RT 532 beginning with the 2nd quarter EDR for the next ozone season.

Field Descriptions and Instructions

Duct Width at Test Location (10). Report the width of the rectangular duct at the test location (i.e., dimension L_x in Figure 1 of CTM-041), to the nearest 0.1 ft.

Duct Depth at Test Location (15). Report the depth of the rectangular duct at the test location (i.e., dimension L_y in Figure 1 of CTM-041), to the nearest 0.1 ft.

WAF (20). Report the WAF applied to the flow rate data, to four decimal places, with a leading zero (e.g., 0.9750).

Method of Determining WAF (26). Indicate the WAF calculation approach, i.e., report either “FT” if it is a measured value from a full test (CTM-041 §8.1 and 8.2), “AT” if it is a measured value from an abbreviated test (CTM-041 §8.4.1), or “DF” if the WAF is a default value (CTM-041 §8.4.2).

WAF Effective Date and Hour (28, 36). Report the date and hour on which the WAF was first applied to the flow rate data.

WAF No Longer Effective Date and Hour (38, 46). Report the date and hour on which the WAF was last applied to the flow rate data. Leave this field blank if this WAF is still being applied.

WAF Determination Date (48). Report the date the WAF applied in column 20 was determined. Unless you are a first time user of CTM-041, this date must be on or prior to the WAF Effective Date. First time users of CTM-041 may retroactively apply the rectangular duct WAF back to January 1 of the year in which the rectangular duct WAF determination is made.

Number of Test Runs (56). Report the number of runs in the WAF test (must be one for default WAF and at least three for a measured WAF).

Number of Method 1 Traverse Points used in WAF Run(s) (58). Report the number of Method 1 traverse points in the WAF test runs.

Number of Test Ports Used in WAF Test (60). Report the number of test ports at which measurements were made during the WAF test runs.

Number of Method 1 Traverse Points in Reference Flow RATA (62). Report the number of Method 1 traverse points in the “reference” flow RATA test runs. The reference flow RATA is either the RATA that accompanied the CTM-041 determination, or if the WAF was determined separately from a RATA, the RATA that most recently preceded the WAF determination. Consistent with CTM-041, the number of Method 1 traverse points in the reference flow RATA must equal the number of Method 1 traverse points reported in column 58 for the WAF test run(s).

RT 532 should be included in the monitoring plan in every EDR submission. If a new WAF test has been performed (because the stack or ductwork is altered such that the flow profile is significantly changed), report two RTs 532: one that ends the record that is no longer effective, and one that reports the new wall effects adjustment factor data.

The RT 532 record structure table follows:

RT 532 - Rectangular Duct WAF Data						
Start Col	Data Element Description	Units	Range	Length	Format	Edit Checks
1	Record type code		532	3	I3	NBP-IMP15A.
4	Unit/Stack ID			6	A6	Required on import. ARP-79.
10	Duct Width at Test Location	ft		5	F5.1	Required; must be greater than 0.
15	Duct Depth at Test Location	ft		5	F5.1	Required; must be greater than 0.
20	WAF		0.0001-0.9999	6	F6.4	Required. ARP-80.
26	Method of Determining WAF		FT, AT, DF	2	A2	Required; table check.
28	WAF Effective Date	YYYYMMDD	01/01/2004-current date	8	I8	Required on import. NBP-IMP2.
36	WAF Effective Hour	HH	00-23	2	I2	Required.
38	WAF No Longer Effective Date	YYYYMMDD	01/01/2004-current date	8	I8	If present, must be greater than WAF Effective Date (NBP-6A). ARP-IMP-10B.
46	WAF No Longer Effective Hour	HH	00-23	2	I2	Required if WAF No Longer Effective Date is present.
48	WAF Determination Date	YYYYMMDD	01/01/2004-current date	8	I8	Required. Unless you are first time user, this must be on or prior to the WAF Effective Date (NBP-6B).
56	Number of WAF Test Runs		1-99	2	I2	Required. ARP-81.
58	Number of Method 1 Traverse Points in WAF Test		12-99	2	I2	Required. ARP-82.
60	Number of Test Ports in WAF Test		3-99	2	I2	Required. ARP-81.
62	Number of Method 1 Traverse Points in Reference Flow RATA		12-99	2	I2	Required. ARP-82.

III. RATA Reporting Instructions

For RATAs conducted on or after January 1, 2005, use the instructions below to report all RATA data to which a rectangular duct WAF is being applied. This includes all RATAs that either coincided with or were conducted subsequent to the WAF determination using CTM-041.

RT 610

The reference method and flow monitor run values reported in RT 610, columns 34 and 47 will be wall effects-adjusted flow rates. Other than this, there are no special reporting instructions are needed for RT 610. Report the RATA run information in the usual manner, according to the latest edition of the Revised EDR v 2.1 or v 2.2 Reporting Instructions.

RT 611

Follow the Revised EDR v 2.1 or v 2.2 Reporting Instructions, except for column 23:

Reference Method Used (23). Report the primary flow rate reference methods used to determine relative accuracy, using the codes below. Enter only one code per RATA. (no other codes are acceptable):

<u>Code</u>	<u>Commonly Used RATA Method(s)</u>
2J	Method 2, with WAF (either measured or default) from Conditional Test Method CTM-041
2FJ	Method 2F, with WAF (either measured or default) from Conditional Test Method CTM-041
2GJ	Method 2G, with WAF (either measured or default) from Conditional Test Method CTM-041

Flow RATA Support Records—General Instructions

Report flow RATA support information, using RTs 614, 615, 616, and 617 as follows:

- C Report RT 614 and 615 when Method 2F or 2G is used as the flow rate reference method
- C Record types 614, 615 and 616 are not required when regular Method 2 is used as the flow rate reference method
- C Record type 617 is required when regular Method 2 is used as the flow rate reference method
- C Table 37A, below summarizes the flow RATA support information reporting requirements

Table 37A
FLOW RATA SUPPORT RECORDS
(Rectangular Stacks or Ducts, with Wall Effects Adjustment)

Test Method Used	Reference Method Code RT 611: 23	Required EDR Record Types			
		610 / 611	614 / 615*	616	617
Method 2 with calculated or default WAF from CTM-041	2J	Y	N	N	Y
Method 2F with calculated or default WAF from CTM-041	2FJ	Y	Y	N	N
Method 2G with calculated or default WAF from CTM-041	2GJ	Y	Y	N	N

* When RTs 614 and 615 are required, report them only for RATA runs that are used in the relative accuracy calculations (i.e., run status flag in RT 610:62 = "1").

RT 614

When RT 614 is required, follow the Revised EDR v 2.1 or v 2.2 Reporting Instructions, except for the following data fields:

Flow Rate Reference Methods Used (42). Report one of the following uppercase codes to indicate which flow rate reference methods were used for the RATA.

- 2FJ Method 2F, With WAF (either measured or default) from Conditional Test Method CTM-041
- 2GJ Method 2G, With WAF (either measured or default) from Conditional Test Method CTM-041

This code must be the same as the code in column 23 of RT 611. Note that code "2J" does not appear on the list above. Reporting of RT 614 is not required for that method code.

Stack Diameter at Test Port Location (86). Report "d", the equivalent diameter of the rectangular duct or stack (ft), as follows. Determine the actual cross-sectional area of the duct or stack, in square feet; set this area equal to the area of a circle ($1/4 \mathbf{B} d^2$); and solve for "d."

Stack or Duct Cross-sectional Area at Test Port (91). Report the actual cross-sectional area of the rectangular stack or duct at the test port location, in square feet. Do not adjust this cross-sectional area for wall effects.

Average Velocity for Run, Accounting for Wall Effects (103). Leave this field blank.

Calculated Wall Effects Adjustment Factor (WAF) Derived from this Run (109).
Leave this field blank.

Calculated or Rectangular Duct WAF Applied to All Runs of This RATA (115).
Report to four decimal places the WAF (either measured or default) that is being applied to all runs of this RATA. The WAF reported in RT 617 must equal the WAF reported in RT 532, column 20.

Default WAF Applied to All Runs of This RATA (121). Leave this field blank.

Average Stack Flow Rate, Wet Basis, Adjusted if Applicable for Wall Effects (127).
Determine the average stack gas flow rate (in scfh), adjusted for wall effects, using the following equation:

$$Q_{\text{avg}} = 3600 (A_s) (v_{\text{avg}}) (\text{WAF}) (T_{\text{std}}/T_s) (P_s/P_{\text{std}})$$

Where:

Q_{avg} = Average stack gas flow rate for the run, adjusted for wall effects, wet basis (scfh)

A_s = Stack or duct cross-sectional area at the test location, from column 91 (ft²)

v_{avg} = Average stack gas velocity for the run, not accounting for wall effects, from column 97 (ft/sec)

WAF = Wall effects adjustment factor, from column 115

T_s = Average stack temperature (°R)

T_{std} = Standard temperature (528 °R)

P_s = Stack pressure, i.e., sum of barometric and static pressures (in. Hg)

P_{std} = Standard pressure (29.92 in. Hg)

3600 = Conversion factor (sec/hr)

Note: The Equation above is essentially the same as Equation 25b in CTM-041, except that the flow rate is expressed in scfh, rather than scf/sec.

RT 615

When RT 615 is required, follow the Revised EDR v 2.1 or v 2.2 Reporting Instructions,

except for the following data fields:

Exterior Method 1 Traverse Point Identifier (66). Leave this field blank.

Number of Wall Effects Points Used to Derive Replacement Velocity (67). Leave this field blank.

Calculated Replacement Velocity at Traverse Point, Accounting for Wall Effects (87). Leave this field blank.

RT 616

Reporting of RT 616 is not required for rectangular stacks or ducts.

RT 617: Supporting Data for Method 2J

All units/stacks using Method 2J (Method 2 with calculated or default WAF) are to begin reporting RT 617 as part of their RATA data for any RATA conducted after 1/1/2005. RT 617 is a new record type (available in MDC v 4.2.51). Report one RT 617 for each operating level of the applicable flow RATA. Do not report RT 617 when using Method 2FJ or 2GJ. The instructions for reporting RT 617 follow:

Field Descriptions and Instructions

Monitoring System ID (10). Report the system ID of the flow monitor for which the RATA is performed (RT 610/611).

Test Number (13). Report the test number of the flow RATA (RT 611).

Operating Level (15). Report the load level as “H,” “M,” or “L,” consistent with the operating level in the applicable RT 611.

RATA End Date and Time (16, 24). Report the date and time on which the RATA was completed for this operating level.

Number of Method 1 Traverse Points (28). Report the number of Method 1 traverse points in the test runs. The number of Method 1 traverse points reported in RT 617 must equal the number of Method 1 traverse points reported in RT 532, column 58.

Wall Effects Adjustment Factor (30). Report the WAF currently applied. The WAF reported in RT 617 must equal the WAF reported in RT 532, column 20.

The RT 617 record structure table follows:

RT 617 - Supporting Data for Method 2J						
Start Col	Data Element Description	Units	Range	Length	Format	Edit Checks
1	Record type code		617	3	I3	TEST-IMP9A.
4	Unit/Stack ID			6	A6	TEST-IMP4.
10	Monitoring System ID			3	A3	TEST-IMP4 and 5. RATA-IMP9 and 10.
13	Test Number		1-99	2	I2	TEST-IMP4 and 8. RATA-IMP18.
15	Operating Level		L, M, H	1	A1	RATA-IMP18.
16	RATA End Date	YYYYMMDD		8	I8	RATA-IMP18.
24	RATA End Time	HHMM		4	I4	RATA-IMP18.
28	Number of Method 1 Traverse Points		12-99	2	I2	RATA-IMP18. Required. RATA-59.
30	Wall Effects Adjustment Factor		0.0001-0.9999	6	F6.4	RATA-IMP18. Required. RATA-59.

IV. Flow-to-Load Ratio Test Reporting

As discussed in section I above, when you apply a wall effects adjustment factor to the data from a stack flow monitor, the WAF is entered into the programming of the flow monitor as a correction to the stack or duct cross-sectional area. As soon as the wall effects correction is applied, the measured stack gas flow rates at a given load level will decrease, possibly by 5 percent or more. This reduction in the reported flow rates may adversely impact the quarterly flow-to-load (Q/L) ratio test, and may even cause a test failure, if the data from the most recent normal load flow RATA (i.e., the RATA on which the reference Q/L ratio is based) were not corrected for wall effects. Note that this effect is only temporary, and will disappear when the next normal load flow RATA is done and the appropriate WAF is applied to the reference method data. However, in the interim period while the effect is still present, EPA recommends the following:

- C Report the reference flow-to-load ratio information in RT 605 in the usual manner. Do not attempt to make any adjustment to the reference method flow rate data recorded during the previous normal load RATA.
- C Perform the quarterly flow-to-load ratio test in the usual manner and assess the impact of the wall effects adjustment that was applied to the stack flow rates.

>> If the test is passed, report the results in RT 606, in the usual manner.

>> If the test is failed, you may copy your quarterly flow rate data, export it outside the DAHS environment, and remove the wall effects correction from each hourly flow rate, by dividing it by the WAF. Then, re-run the flow-to-load analysis. Report the results of the test in RT 606 and put a note in RT 910¹ indicating that the WAF was removed from the flow rate data before running the flow-to-load ratio test. Keep the results of the data analysis on-site, in a format suitable for inspection.

C In your quarterly EDR, you must report the wall effects-adjusted flow rates in columns 29 and 39 of RT 220, as measured by your flow monitor and as recorded by your DAHS, whether or not you remove the WAF from the flow rate data to perform the flow-to-load ratio test.