

Performance Characteristic Sheet

EFFECTIVE DATE: September 1, 2022

MANUFACTURER AND MODEL:

Make: **Viken Detection** (previously Heuresis)
 Models: **Model Pb200i, Pb200e**
 Source: **⁵⁷Co, 5 mCi (nominal – new source)**

FIELD OPERATION GUIDANCE

ACTION LEVEL SETTING:

0.7 mg/cm²

OPERATING PARAMETERS:

Action Level mode, fixed 5-second reading (nominal), software version Pb 200i-5.0-DEBUG or higher.
 Action Level mode, variable-time reading (2-5 seconds nominal), software version Pb 200i-7.0.0 or higher.

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm² (inclusive) at Action Level setting = 1.0 mg/cm²

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

ACTION LEVEL MODE READING DESCRIPTION	SUBSTRATE	INCONCLUSIVE RANGE (mg/cm ²)
Results not corrected for substrate bias on any substrate	Brick	0.6 – 0.8
	Concrete	0.6 – 0.8
	Drywall	0.6 – 0.8
	Metal	0.6 – 0.8
	Plaster	0.6 – 0.8
	Wood	0.6 – 0.8

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, 2012 Edition ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in January 2020 and January 2021, with four separate instruments running software version Pb200i 5.0 (DEBUG version) in Action Level test mode. The actual source strength of the 2020 instruments on the day of testing was approximately 2.9 mCi; source ages were approximately 9 months. The 2021 instruments had new sources with strength 5 mCi.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked **with the Action Level set to 1.0 mg/cm²** using the paint film nearest 1.0 mg/cm² in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm² film; for NIST SRM 2579a, use the 1.04 mg/cm² film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below. Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

The nominal reading time recorded in Archive tests averaged 5.38 seconds in fixed-time mode and 2.64 seconds in variable-time mode. Nominal reading time means the time the instrument's shutter is open when the ⁵⁷Co source is new. Actual reading time depends on the age of the source. Since ⁵⁷Co has a half-life of approximately 9 months, reading time doubles for every 9 months of source age.

CLASSIFICATION OF RESULTS:

XRF results are classified as **positive** if they are **greater than or equal** to 0.8 mg/cm², **negative** if they are **less than or equal** to 0.6 mg/cm² and **inconclusive** if they are **equal** to 0.7 mg/cm².

DOCUMENTATION:

This XRF Performance Characteristic Sheet (PCS) was developed by QuanTech, Inc., under a contract with the U.S. Department of Housing and Urban Development, Office of Lead Hazard Control and Healthy Homes.

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to develop Performance Characteristic Sheets at the Federal standard (Action Level) of 1.0 mg/cm², and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at <http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997>. The methodology was subsequently generalized by QuanTech for application to other Action Levels.