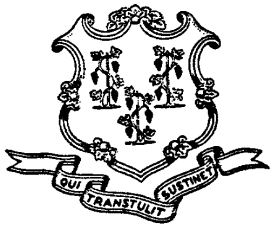
STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

CHILDHOOD LEAD POISONING PREVENTION
& CONTROL REGULATIONS



XRF
FIELD OPERATION
GUIDANCE & TESTING
PROTOCOLS

Version III
December 6, 2000

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

CHILDHOOD LEAD POISONING PREVENTION & CONTROL REGULATIONS

This information was obtained and compiled from:

1. The Performance Characteristic Sheet (PCS) for each XRF manufacturer and model as developed by HUD and E.P.A. (Note: Edition number and Date of PCS displayed in heading).

2. The revised edition of the HUD Chapter 7 Guidelines

3. The State of Connecticut Childhood Lead Poisoning Prevention and Control Regulations

The document is intended for the use of trained local code enforcement officials and certified lead inspectors or lead inspector/risk assessors. The document addresses major XRF field operation and testing criteria but is not all inclusive.

XRF FIELD OPERATION GUIDANCE AND TESTING PROTOCOLS

XRF Model	Field Guidance Criteria	HUD Chapter 7 Guidelines	Performance Characteristic Sheet (PCS) Edition #3 - 9/25/95	Connecticut Lead Poisoning Prevention and Control Regulations	What Does It Mean?
Princeton Gamma Tech (PGT) XK3	Selection criteria for test locations	Identify and test each testing combination	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures	Test components as specified and others found to have a distinct painting history.	Test specific components as stated in LPPC Regulations and any other components found to have a distinct painting history.
	Number of readings per component	One (1) reading per testing combination except for interior or exterior walls [one (1) reading on each wall]	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures.	Defers to the Performance Characteristic Sheet (PCS)	You may take one (1) reading per component except for interior and exterior walls [one (1) reading on each wall]
	Calibration checks and frequency	One (1) set of calibration readings at the beginning and one (1) set at the end of the job. Additionally, one (1) set every four (4) hours during the job. Take three (3) readings per set.	Calibration check limit using 1.0 mg/cm^2 standard: .5-2.3 mg/cm^2 (inclusive). Defers to HUD Chapter 7 Guidelines regarding calibration frequency.	Most stringent protocol takes precedence relative to manufacturer's instructions and PCS.	You must take calibration readings at the beginning and end of a job and every four (4) hours during the job; three (3) readings per set. Valid test readings acceptable only if accompanied by proper calibration check sequence. Calibration check limit using the 1.0 mg/cm^2 standard: .5-1.5 mg/cm^2 (inclusive) per manufacturer's instructions.
	Substrate correction	Defers to PCS	Required for all substrates below 4.0 mg/cm^2	Defers to PCS	Required for all substrates below 4.0 mg/cm^2
	Interpretation of test results	Classifies results as positive, negative, or inconclusive (includes boundaries). Confirmation testing is required for inconclusive unless assumed to be positive. If readings are greater than the upper boundary or greater than or equal to the threshold then the reading is positive.	Refer to the chart on page 1 of the PCS. A threshold value is specified for readings on drywall substrate. Inconclusive range which includes both upper and lower boundaries varies for all other substrates.	Classifies the test results as lead present at or above the toxic level (1.0 mg/cm^2), inconclusive, or lead not present at or above the toxic level (1.0 mg/cm^2). Defers to PCS protocol to determine classification.	For those substrates that contain inconclusive ranges per the PCS, classify test readings as lead present at or above the toxic level (1.0 mg/cm^2), inconclusive, or lead not present at or above the toxic level. Inconclusive includes boundary values for the inconclusive range. For those substrates that list a threshold value per the PCS classify test readings as lead present at or above the toxic level (1.0 mg/cm^2) or lead not present at or above the toxic level. The threshold value is classified as lead present at or above the toxic level (1.0 mg/cm^2). Use PCS protocol to determine classification.

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XRF Model	Field Guidance Criteria	HUD Chapter 7 Guidelines	Performance Characteristic Sheet (PCS) Edition #4 - 10/24/00	Connecticut Lead Poisoning Prevention and Control Regulations	What Does It Mean?
Radiation Monitoring Devices (RMD) LPA 1 (Sold or Serviced After 6/26/95)	Selection criteria for test locations	Identify and test each testing combination	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures	Test components as specified and others found to have a distinct painting history.	Test specific components as stated in LPPC Regulations and any other components found to have a distinct painting history.
	Number of readings per component	One (1) reading per testing combination except for interior or exterior walls [one (1) reading on each wall]	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures.	Defers to the Performance Characteristic Sheet (PCS)	You may take one (1) reading per component except for interior and exterior walls [one (1) reading on each wall]
	Calibration checks and frequency	One (1) set of calibration readings at the beginning and one (1) set at the end of the job. Additionally, one (1) set every four (4) hours during the job. Take three (3) readings per set.	Calibration check limit using the 1.0 mg/cm^2 standard: .7 to 1.3 mg/cm^2 (inclusive). Defers to HUD Chapter 7 Guidelines regarding calibration frequency.	Most stringent protocol takes precedence relative to manufacturer's instructions and PCS.	You must take calibration readings at the beginning and end of a job and every four (4) hours during the job; three (3) readings per set. Valid test readings acceptable only if accompanied by proper calibration check sequence. Calibration check limit using the 1.0 mg/cm^2 standard: .7 to 1.3 mg/cm^2 (inclusive) per manufacturer's instructions.
	Substrate correction	Defers to PCS	Substrate correction required for metal in 30 second standard mode only if below 4.0 mg/cm^2.	Defers to PCS	Substrate correction should be performed if a device shows bias on a metal substrate. The correct protocol requires substrate correction when testing on metal for lead values in the 30 second standard mode below 4.0 mg/cm^2. Quick mode does not require substrate correction on metal.
	Interpretation of test results	Classifies results as positive or negative. If readings are greater than or equal to the threshold value then the reading is positive.	Refer to the chart on page 1 of the PCS. Threshold values are specified for all readings on all substrates.	Classify the test results as lead present at or above the toxic level (1.0 mg/cm^2) or lead not present at or above the toxic level (1.0 mg/cm^2). Defers to PCS protocol to determine classification.	For all substrates, except metal in 30 second standard mode, lead is present at or above the toxic level if the reading is equal to or above the threshold value of 1.0mg/cm^2. For metal substrate, measured in the 30 second standard mode lead is present at or above the toxic level if the reading is equal to or greater than the threshold of 0.9 mg/cm^2 and not present at or above the toxic level if the measured value is less than the threshold value (0.9 mg/cm^2). *

* The threshold limit value of 0.9mg/cm^2 for metal in 30 second standard mode is equivalent to a positive toxic level of lead reading of 1.0 mg/cm^2.

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XRF Model	Field Guidance Criteria	HUD Chapter 7 Guidelines	Performance Characteristic Sheet (PCS) Edition #4 - 4/17/98	Connecticut Lead Poisoning Prevention and Control Regulations	What Does It Mean?
Niton XL 309 Niton 701-A Niton 702-A Niton 703-A	Selection criteria for test locations	Identify and test each testing combination	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures	Test components as specified and others found to have a distinct painting history.	Test specific components as stated in LPPC Regulations and any other components found to have a distinct painting history.
	Number of readings per component	One (1) reading per testing combination except for interior or exterior walls [one (1) reading on each wall]	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures.	Defers to the Performance Characteristic Sheet (PCS)	You must take one (1) reading per component except for interior and exterior walls [one (1) reading on each wall]
	Calibration checks and frequency	One (1) set of calibration readings at the beginning and one (1) set at the end of the job. Additionally, one (1) set every four (4) hours during the job. Take three (3) readings per set.	Calibration check limit using the 1.0 mg/cm^2 standard: a) 0.9 to 1.2 mg/cm^2 (inclusive) for instruments running software version 5.1 (or equivalent). b) 0.9 to 1.1 mg/cm^2 (inclusive) for instruments running software version 1.2c (or equivalent). Defers to HUD Chapter 7 Guidelines regarding calibration frequency.	Most stringent protocol takes precedence relative to manufacturer's instructions and PCS.	You must take calibration readings at the beginning and end of a job and every four (4) hours during the job; three (3) readings per set. Valid test readings acceptable only if accompanied by proper calibration check sequence. Calibration check limit using the 1.0 mg/cm^2 standard: a) 0.9 to 1.2 mg/cm^2 (inclusive) for instruments running software version 5.1 (or equivalent). b) 0.9 to 1.1 mg/cm^2 (inclusive) for instruments running software version 1.2c (or equivalent).
	Substrate correction	Defers to PCS	Not required.	Defers to PCS	Not required.
	Interpretation of test results	Classifies results as positive, negative or inconclusive. If readings are greater than or equal to the threshold, then the reading is positive. Confirmation testing is required for inconclusive unless assumed to be positive.	Refer to the chart on page 2 of the PCS. Threshold values for all substrates equal 1.0 mg/cm^2 (applicable to instruments running software versions 5.1 or 1.2c).	Classify the test results as lead present at or above the toxic level (1.0 mg/cm^2) or lead not present at or above the toxic level (1.0 mg/cm^2). Defer to PCS protocol to determine classification.	For instruments running software version 5.1 (or equivalent), classify test readings as lead present at or above the toxic level (1.0 mg/cm^2) or lead not present at or above the toxic level. The threshold value is classified as positive. Use PCS protocol to determine classification. For model XL309 instruments running software version 1.2c (or equivalent) refer to pages 4-6 of the PCS to classify test readings as lead present at or above the toxic level (1.0 mg/cm2), inconclusive, or lead not present at or above the toxic level.

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XRF Model	Field Guidance Criteria	HUD Chapter 7 Guidelines	Performance Characteristic Sheet (PCS) Edition #3 - 9/25/95	Connecticut Lead Poisoning Prevention and Control Regulations	What Does It Mean?
Warrington Microlead 1 Revision 4	Selection criteria for test locations	Identify and test each testing combination	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures	Test components as specified and others found to have a distinct painting history.	Test specific components as stated in LPPC Regulations and any other components found to have a distinct painting history.
	Number of readings per component	One (1) reading per testing combination except for interior or exterior walls [one (1) reading on each wall]	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures.	Defers to the Performance Characteristic Sheet (PCS)	You may take one (1) reading per component except for interior and exterior walls [one (1) reading on each wall]
	Calibration checks and frequency	One (1) set of calibration readings at the beginning and one (1) set at the end of the job. Additionally, one (1) set every four (4) hours during the job. Take three (3) readings per set.	Calibration check limit using 1.0 mg/cm^2 standard: .4 to 1.6 mg/cm^2 (inclusive). Defers to HUD Chapter 7 Guidelines regarding calibration frequency.	Most stringent protocol takes precedence relative to manufacturer's instructions and PCS.	You must take calibration readings at the beginning and end of a job and every four (4) hours during the job; three (3) readings per set. Valid test readings acceptable only if accompanied by proper calibration check sequence. Calibration check limit using 1.0 mg/cm^2 standard: .4 to 1.6 mg/cm^2 (Inclusive) per manufacturer's instructions.
	Substrate correction	Defers to PCS	Substrate correction required for all substrates except plaster if test readings are below 4.0 mg/cm^2.	Defers to PCS	Substrate correction required for all substrates except plaster if test readings are below 4.0 mg/cm^2
	Interpretation of test results	Classifies results as positive, negative, or inconclusive (includes boundaries). Confirmation testing is required for inconclusive unless assumed to be positive. If readings are greater than the upper boundary or greater than or equal to the threshold then the reading is positive.	Refer to the chart on page 1 of the PCS. Inconclusive range which includes both upper and lower boundaries varies with each substrate.	Classify the test results as lead present at or above the toxic level (1.0 mg/cm^2), inconclusive, or lead not present at or above the toxic level (1.0 mg/cm^2). Defers to PCS protocol to determine classification.	Classify test readings as lead present at or above the toxic level (1.0 mg/cm^2), inconclusive or lead not present at or above the toxic level (1.0 mg/cm^2). Inconclusive includes boundary values for the inconclusive range. Use PCS protocol to determine classification.

XRF Model	Field Guidance Criteria	HUD Chapter 7 Guidelines	Performance Characteristic Sheet (PCS) Edition #3 - 8/24/95	Connecticut Lead Poisoning Prevention and Control Regulations	What Does It Mean?
Scitec Map-3	Selection criteria for test locations	Identify and test each testing combination	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions an`d procedures	Test components as specified and others found to have a distinct painting history.	Test specific components as stated in LPPC Regulations and any other components found to have a distinct painting history.
	Number of readings per component	One (1) reading per testing combination except for interior or exterior walls [one (1) reading on each wall]	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures.	Defers to the Performance Characteristic Sheet (PCS)	You may take one (1) reading per component except for interior and exterior walls [one (1) reading on each wall]
	Calibration checks and frequency	One (1) set of calibration readings at the beginning and one (1) set at the end of the job. Additionally, one (1) set every four (4) hours during the job. Take three (3) readings per set.	Calibration check limit using 1.0 mg/cm^2 standard: .4 to 1.3 mg/cm^2 - 15 second readings .6 to 1.1 mg/cm^2 - 60 second readings (inclusive). Defers to HUD Chapter 7 Guidelines regarding calibration frequency.	Most stringent protocol takes precedence relative to manufacturer's instructions and PCS.	You must take calibration readings at the beginning and end of a job and every four (4) hours during the job; three (3) readings per set. Valid test readings acceptable only if accompanied by proper calibration check sequence. Calibration check limit using 1.0 mg/cm^2 standard: .4 to 1.3 mg/cm^2 - 15 second readings; .6 to 1.1 mg/cm^2 - 60 second readings (inclusive) per manufacturer's instructions.
	Substrate correction	Defers to PCS	Substrate correction required for metal and wood if test readings are below 4.0 mg/cm^2.	Defers to PCS	Substrate correction required for metal and wood if test readings are below 4.0 mg/cm^2.
	Interpretation of test results	Classifies results as positive, negative, or inconclusive (includes boundaries). Confirmation testing is required for inconclusive unless assumed to be positive. If readings are greater than the upper boundary or greater than or equal to the threshold then the reading is positive.	Refer to the chart on page 3 of the PCS. Inconclusive range which includes both upper and lower boundaries varies with each substrate. A threshold value is specified for 60 second readings on wood.	Classify the test results as lead present at or above the toxic level (1.0 mg/cm^2), inconclusive, or lead not present at or above the toxic level (1.0 mg/cm^2). Defers to PCS protocol to determine classification.	For those substrates that contain inconclusive ranges per the PCS, classify test readings as lead present at or above the toxic level (1.0 mg/cm^2), inconclusive, or lead not present at or above the toxic level (1.0 mg/cm^2). Inconclusive includes boundary values for the inconclusive range. For wood substrates that list a threshold value per the PCS, classify test readings as positive or negative. The threshold value is classified as positive. Use PCS protocol to determine classification.

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XRF FIELD OPERATION GUIDANCE AND TESTING PROTOCOLS

XRF Model	Field Guidance Criteria	HUD Chapter 7 Guidelines	Performance Characteristic Sheet (PCS) Edition #3 - 6/26/96	Connecticut Lead Poisoning Prevention and Control Regulations	What Does It Mean?
Scitec Map - 4	Selection criteria for test locations	Identify and test each testing combination	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures	Test components as specified and others found to have a distinct painting history.	Test specific components as stated in LPPC Regulations and any other components found to have a distinct painting history.
	Number of readings per component	One (1) reading per testing combination except for interior or exterior walls [one (1) reading on each wall]	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures.	Defers to the Performance Characteristic Sheet (PCS)	You may take one (1) reading per component except for interior and exterior walls [one (1) reading on each wall]
	Calibration checks and frequency	One (1) set of calibration readings at the beginning and one (1) set at the end of the job. Additionally, one (1) set every four (4) hours during the job. Take three (3) readings per set.	Calibration check limit using 1.0 mg/cm^2 standard: .6 to 1.2 mg/cm^2 (inclusive). Defers to HUD Chapter 7 Guidelines regarding calibration frequency.	Most stringent protocol takes precedence relative to manufacturer's instructions and PCS.	You must take calibration readings at the beginning and end of a job and every four (4) hours during the job; three (3) readings per set. Valid test readings acceptable only if accompanied by proper calibration check sequence. Calibration check limit using 1.0 mg/cm^2 standard: .6 to 1.2 mg/cm^2 (inclusive) per manufacturer's instructions.
	Substrate correction	Defers to PCS	Substrate correction required for drywall, metal, and wood in screen or test mode if test readings are below 4.0 mg/cm^2	Defers to PCS	Substrate correction required for drywall, metal, and wood in screen or test mode if test readings are below 4.0 mg/cm^2
	Interp`retation of test results	Classifies results as positive, negative, or inconclusive (includes boundaries). Confirmation testing is required for inconclusive unless assumed to be positive. If readings are greater than the upper boundary or greater than or equal to the threshold then the reading is positive.	Refer to the chart on pages 3 and 4 of the PCS. Inconclusive range which includes both upper and lower boundaries varies for drywall, metal and wood substrates. A threshold value is specified for brick, concrete and plaster substrates.	Classify the test results as lead present at or above the toxic level (1.0 mg/cm^2), inconclusive, or lead not present at or above the toxic level (1.0 mg/cm^2). Defers to PCS protocol to determine classification.	For those substrates that contain inconclusive ranges per the PCS, classify test readings as lead present at or above the toxic level (1.0 mg/cm^2), lead not present at or above the toxic level (1.0 mg/cm^2) or inconclusive. Inconclusive includes boundary values for the inconclusive range. For those substrates that list a threshold value per the PCS classify test readings as lead present at or above the toxic level (1.0 mg/cm^2) or lead not present at or above the toxic level (1.0 mg/cm^2). The threshold value is classified as lead present at or above the toxic level (1.0 mg/cm^2). Use PCS protocol to determine classification.

XRF Model	Field Guidance Criteria	HUD Chapter 7 Guidelines	Performance Characteristic Sheet (PCS) Edition #3 - 10/31/95	Connecticut Lead Poisoning Prevention and Control Regulations	What Does It Mean?
TN Technologies, Inc. (TN Spectrace Pb Analyzer 9292)	Selection criteria for test locations	Identify and test each testing combination	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures	Test components as specified and others found to have a distinct painting history.	Test specific components as stated in LPPC Regulations and any other components found to have a distinct painting history.
	Number of readings per component	One (1) reading per testing combination except for interior or exterior walls [one (1) reading on each wall]	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures.	Defers to the Performance Characteristic Sheet (PCS)	You may take one (1) reading per component except for interior and exterior walls [one (1) reading on each wall]
	Calibration checks and frequency	One (1) set of calibration readings at the beginning and one (1) set at the end of the job. Additionally, one (1) set every four (4) hours during the job. Take three (3) readings per set.	Calibration check limit using 1.0 mg/cm^2 standard: .7 to 1.4 mg/cm^2 (inclusive). Defers to HUD Chapter 7 Guidelines regarding calibration frequency.	Most stringent protocol takes precedence relative to manufacturer's instructions and PCS.	You must take calibration readings at the beginning and end of a job and every four (4) hours during the job; three (3) readings per set. Valid test readings acceptable only if accompanied by proper calibration check sequence. Calibration check limit using 1.0 mg/cm^2 standard: .7 to 1.4 mg/cm^2 (Inclusive) per manufacturer's instructions.
	Substrate correction	Defers to PCS	Not Required	Defers to PCS	Not Required
	Interpretation of test results	Classifies results as positive, negative, or inconclusive (includes boundaries). Confirmation testing is required for inconclusive unless assumed to be positive. If readings are greater than the upper boundary or greater than or equal to the threshold then the reading is positive.	Refer to the chart on page 1 of the PCS. Inconclusive range which includes both upper and lower boundaries varies with each substrate.	Classify the test results as lead present at or above the toxic level (1.0 mg/cm^2), inconclusive, or lead not present at or above the toxic level (1.0 mg/cm^2). Defers to PCS protocol to determine classification.	Classify test readings as lead present at or above the toxic level (1.0 mg/cm^2), inconclusive or lead not present at or above the toxic level. Inconclusive includes boundary values for the inconclusive range. Use PCS protocol to determine classification.

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XRF Model	Field Guidance Criteria	HUD Chapter 7 Guidelines	Performance Characteristic Sheet (PCS) Edition #3 - 10/7/96	Connecticut Lead Poisoning Prevention and Control Regulations	What Does It Mean?
Advanced Detectors, Inc. Lead Star	Selection criteria for test locations	Identify and test each testing combination	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures	Test components as specified and others found to have a distinct painting history.	Test specific components as stated in LPPC Regulations and any other components found to have a distinct painting history.
	Number of readings per component	One (1) reading per testing combination except for interior or exterior walls [one (1) reading on each wall]	Defers to Chapter 7 of the HUD Guidelines and manufacturers instructions and procedures.	Defers to the Performance Characteristic Sheet (PCS)	You may take one (1) reading per component except for interior and exterior walls [one (1) reading on each wall.
	Calibration checks and frequency	One (1) set of calibration readings at the beginning and one (1) set at the end of the job. Additionally, one (1) set every four (4) hours during the job. Take three (3) readings per set.	Calibration check limit using the 1.0 mg/cm^2 standard: .83 to 1.02 mg/cm^2 (inclusive) software versions 4.1 - 4.30; .83 to 1.12 mg/cm2 (inclusive) software versions earlier than 4.1(inclusive). Defers to HUD Chapter 7 Guidelines regarding calibration frequency.	Most stringent protocol takes precedence relative to manufacturer's instructions and PCS.	You must take calibration readings at the beginning and end of a job and every four (4) hours during the job; three (3) readings per set. Valid test readings acceptable only if accompanied by proper calibration check sequence. Calibration check limit using the 1.0 mg/cm^2 standard: .83 to 1.02 mg/cm^2 (inclusive) - software versions 4.1-4.30; .83 to 1.12 mg/cm^2 (inclusive) -software version earlier than 4.1 (inclusive) per manufacturer's instructions.
	Substrate correction	Defers to PCS	Only required for metal substrate for those instruments with software versions earlier than version 4.1 if test readings are below 4.0 mg/cm^2 .	Defers to PCS	Only required for metal substrate for those instruments with software versions earlier than version 4.1 if test readings are below 4.0 mg/cm^2
	Interpretation of test results	Classifies results as positive, negative, or inconclusive (includes boundaries). Confirmation testing is required for inconclusive unless assumed to be positive. If readings are greater than the upper boundary or greater than or equal to the threshold then the reading is positive.	Refer to the chart on page 2 of the PCS. Inconclusive range which includes both upper and lower boundaries varies for each substrate and depends on which software version is used. Threshold values are specified for all substrates on brief mode readings using software versions 4.1 - 4.30.	Classify the test results as lead present at or above the toxic level (1.0 mg/cm^2), inconclusive, or lead not present at or above the toxic level (1.0 mg/cm^2). Defers to PCS protocol to determine classification.	For those substrates that contain inconclusive ranges per the PCS, classify test readings as lead present at or above the toxic level (1.0 mg/cm^2), lead not present at or above the toxic level (1.0 mg/cm^2) or inconclusive. Inconclusive includes boundary values for the inconclusive range. For those substrates that list a threshold value per the PCS classify test readings as lead present at or above the toxic level (1.0 mg/cm^2) or lead not present at or above the toxic level (1.0 mg/cm^2) . The threshold value is classified as lead present at or above the toxic level (1.0 mg/cm^2) . Use PCS protocol to determine classification.