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7. Abstract

Tank 241-BX-108 was sampled in 1994, and laboratory analyses were conducted to support safety screening requirements. No exotherms were observed, and all total alpha results were below the data quality objective (DQO) limit. Some indications of sample dryout were noted, and most of the sample material did not conform to the DQO limit of greater than 17 wt% water.

Based on the data from this sampling event, no unsafe condition exists in tank 241-BX-108. Tank 241-BX-108 is classified as conditionally safe in accordance with the DQO criterion.

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Tank Characterization Report for Single-Shell Tank 241-BX-108

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Prepared for the U.S. Department of Energy
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Waste Management

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EXECUTIVE SUMMARY

This Tank Characterization Report summarizes the information on the historical uses, current status, and sampling and analysis results of waste stored in the single-shell underground storage tank 241-BX-108. This report supports the requirements of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1994),[1] Milestone M-44-08.

Tank 241-BX-108 is located in the BX Tank Farm in the 200 East Area of the Hanford Site. The tank went into service in 1949 and was used as the second tank in a three-tank cascade for first-cycle decontamination waste. In January 1953, tank 241-BX-108 was pumped down to a 37,900-L (10,000-gal) heel. Other wastes routed to tank 241-BX-108 included uranium recovery waste, cladding waste, and ion exchange waste.

In 1973, tank 241-BX-108 was suspected of leaking. By 1976, it was saltwell pumped to a 56,800-L (15,000-gal) heel. It was declared inactive and interim stabilized in 1977. Further interim stabilization was completed in 1979.

A description and status of the tank are summarized in Table ES-1 and Figure ES-1. Because the tank is inactive, interim stabilized, interim isolated, and not receiving or transferring waste, the volume of waste will not be changing. The tank, which has an

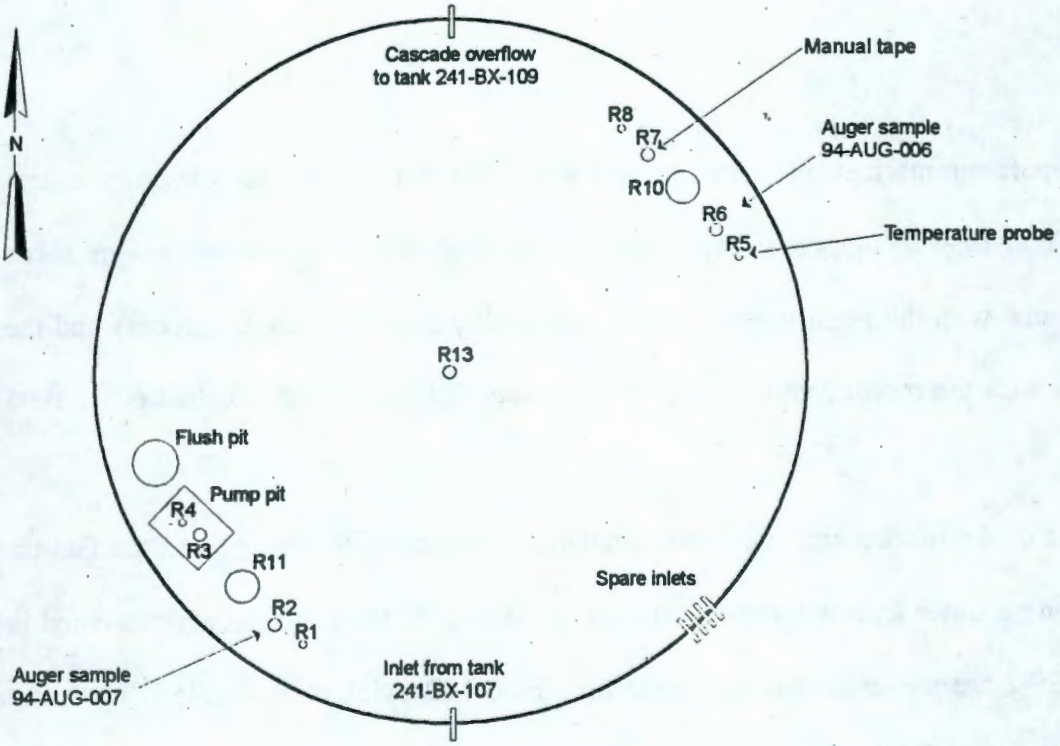
[1]Ecology, EPA, and DOE, 1994, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Table ES-1. Description and Status of Tank 241-BX-108.

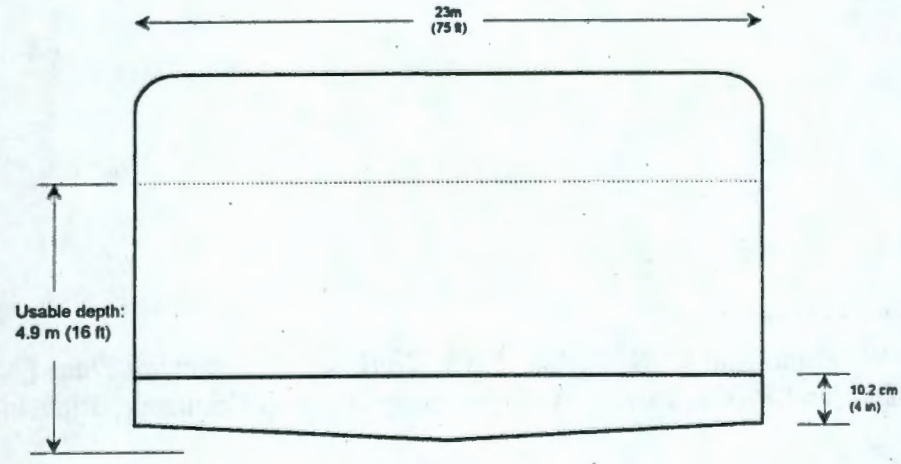
TANK DESCRIPTION	
Type:	Single shell
Constructed:	1947
In service:	1949
Diameter:	23 m (75 ft)
Usable depth:	4.9 m (16 ft)
Capacity:	2,010 kL (530 kgal)
Bottom shape:	Dish
Ventilation:	Passive
TANK STATUS (as of February 1995)	
Watch List:	Non-Watch List
Contents:	Non-complexed waste
Total waste volume:	98.4 kL (26 kgal)
Sludge volume:	98.4 kL (26 kgal)
Interstitial liquid volume:	3.79 kL (1 kgal)
Manual tape surface level:	10.2 cm (4 in.)
Temperature:	<25 °C (<77 °F) (from 05/94 to 01/95)
Integrity category:	Assumed leaker
ISOLATION STATUS	
Interim stabilized:	1979
Intrusion prevention:	1981

Figure ES-1. Tank 241-BX-108 Views.

Above Ground Plan



Waste Profile



Total tank volume: 2,010 kL (530 kgal)
Current waste volume (Oct. 1994): 98.4 kL (26 kgal)
Sludge volume (Oct. 1994): 98.4 kL (26 kgal)
Interstitial liquid volume (Oct. 1994): 3.89 kL (1 kgal)

operational capacity of 2,010,000 L (530,000 gal), contains 98,400 L (26,000 gal) of waste--existing as sludge--which contains approximately 3,800 L (1,000 gal) of drainable interstitial liquid.

This report summarizes one sampling and analysis event. Auger samples were taken from the tank in 1994 to support safety screening requirements. These samples were taken in accordance with the requirements of the data quality objective (DQO) process and therefore comply with the recent requirements of the Safety Screening DQO (Babad et al. 1995).[1]

Because of the limited analytical data available from safety screening, and the fact that there has been no other known sampling of tank 241-BX-108, the historic data contained in Table ES-2 are presented and are based on a model (Brevick et al. 1994).[2] These data should be used with caution as they are from a model that has had only limited sample data verification.

[1]Babad, H., J. W. Hunt, and K. S. Redus, 1995, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

[2]Brevick, C. H., L. A. Gaddis, and W. W. Pickett, 1994a, *Historical Tank Content Estimate for the Northeast Quadrant of the Hanford 200 East Areas, ICF Kaiser Hanford Company*, WHC-SD-WM-ER-349, Rev. 0, ICF Kaiser Hanford Company, Richland, Washington.

Table ES-2. Historical Tank Content Estimate of Tank 241-BX-108.[1]

Physical Properties		
Total solid waste	1.31 E+05 kg	
Heat load	6.63 E-03 kW (22.6 Btu/h)	
Bulk density	1.34 g/cc	
Water	68.4 wt%	
Chemical Constituents		
Analyte	μg\g	kg
Na	1.00 E+05	13,000
Al	6,100	790
Fe	9,200	1,200
Cr	570	75
Bi	16,000	2,100
Zr	2,000	260
OH^-	20,000	2,600
NO_3^-	4,900	640
NO_2^-	3,700	480
PO_4^{-3}	1.2 E+05	17,000
SO_4^{-2}	2,700	350
SiO_3^{-2}	5,800	760
F^-	2,000	260
TOC	0	0
Radiological Constituents		
Pu	0.045 μCi/g	0.096 kg
Cs	0.65 μCi/g	85 Ci
Sr	7.03 μCi/g	920 Ci

[1]Brevick, C. H., L. A. Gaddis, and W. W. Pickett, 1994, *Historical Tank Content Estimate for the Northeast Quadrant of the Hanford 200 East Areas, ICF Kaiser Hanford Company*, WHC-SD-WM-ER-349, Rev. 0, ICF Kaiser Hanford Company, Richland, Washington.

TOC = Total organic carbon

Only those analyses required by the Safety Screening DQO (Babad et al. 1995) were performed. The analyses included thermogravimetric analysis, differential scanning calorimetry, and total alpha. The analyses revealed the following.

- No exotherms were observed from the differential scanning calorimetry.
- All of the total alpha results were below the DQO limit (1g/L of total alpha).
- Of the four subsamples obtained, three contained less water than the DQO limit of 17 wt% H_2O.[1] All three of these subsamples were from one riser.
- Only one subsample of four satisfied the DQO limit (17 wt% H_2O) and measured 52.3 wt% H_2O. This subsample was obtained from the second riser.

Low water content is not a safety concern when taken by itself but is utilized in evaluating tank contents relative to their potential chemical energy value. Because the differential scanning calorimetry revealed no fuel source, further analysis of a secondary set of analytes is not necessary at this time. From Table ES-1, the temperature of this waste is being maintained below 25 °C (77 °F) supporting the conclusion that tank 241-BX-108 is in a safe configuration. Furthermore, from the historic model of Brevick et al. (1994a), there is no total organic carbon and very little heat generation (6.63 W) further supporting the assertion

[1]The data that were reported as being below the DQO limit ranged from 3.29% to 9.19% H_2O (by weight).

that tank 241-BX-108 is being maintained in a safe configuration. Water concentration data may be biased low due to the following factors.

- Drying of the samples was noted before the analyses were run.

- Liquid drainage could have occurred during sample removal from the waste tank. (This is expected from auger samples.)

However, drying alone does not explain the large moisture difference between the samples obtained from the two different risers. The waste is heterogeneous and shows large variability for moisture based on these data.

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LIST OF TERMS

ANOVA	analysis of variance
CASS	Computer Automated Surveillance System
CW	cladding waste
DOE	U.S. Department of Energy
DQO	data quality objective
DSC	differential scanning calorimetry
HTCE	historical tank content estimate
IX	ion exchange
NA	not available
N/A	not applicable
PUREX	Plutonium-Uranium Extraction (Facility)
RPD	relative percent difference
TBP	tributyl phosphate
TCR	Tank Characterization Report
TGA	thermogravimetric analysis
TOC	total organic carbon
WHC	Westinghouse Hanford Company
1C	first-cycle decontamination

TANK CHARACTERIZATION REPORT FOR SINGLE-SHELL TANK 241-BX-108

1.0 INTRODUCTION

This Tank Characterization Report (TCR) presents an overview of single-shell tank 241-BX-108 and its waste contents. It provides estimated concentrations and inventories for the waste components based on the latest sampling and analysis activities and background tank information. Compositions and inventories are based on historical models and 'estimates' from WHC-SD-WM-ER-349, *Historical Tank Content Estimate for the Northeast Quadrant of the Hanford 200 East Areas, ICF Kaiser Hanford Company* (Brevick et al. 1994a). Limited chemical and radiochemical analyses have been performed on actual tank 241-BX-108 waste. This TCR for tank 241-BX-108 describes the results of one sampling event. Two auger samples were taken during July 1994 to support safety screening decisions.

Tank 241-BX-108 is not in active service, has been interim stabilized (July 1979) and interim isolated (June 1981), and can be expected to have no additional transfers (in or out) that will alter the composition of the waste. The concentration and inventory estimates reported in this document reflect the best estimate of the composition of the waste based on historical knowledge and the most recent and available data. This report supports the requirements of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1994), Milestone M-44-08.

1.1 PURPOSE

The purpose of this report is to summarize the information about the use and contents of tank 241-BX-108. When possible, this information will be used to assess issues associated with safety, operations, environmental, and process development activities. This report also provides a reference point for more detailed information about tank 241-BX-108.

1.2 SCOPE

The auger samples acquired in 1994 were taken to support a safety screening assessment of tank 241-BX-108 waste. The technical basis for this safety screening assessment is described in the Safety Screening Data Quality Objective (DQO) (Babad et al. 1995), and only includes the analysis of differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and total alpha.

Because tank 241-BX-108 is inactive, the 1994 sampling event did not include any analyses described in the Waste Compatibility DQO (Carothers 1994). Furthermore, tank 241-BX-108 is not one of the bounding tanks for pretreatment and therefore the Pretreatment DQO (Kupfer 1994) did not apply to this 1994 sampling event. Assessment of the compatibility and pretreatment development issues is not applicable to this TCR.

This report does not include any information on vapor space sampling and analysis to determine the composition of the tank headspace gases.

Because of the limited analysis planned for the 1994 samples, the chemical and radiochemical concentration for most components must be estimated from the historical data provided in WHC-SD-WM-ER-349, *Historical Tank Content Estimate for the Northeast Quadrant of the Hanford 200 East Areas, ICF Kaiser Hanford Company* (Brevick et al. 1994a).

2.0 HISTORICAL TANK INFORMATION

Tank 241-BX-108 is not in active service and it can be expected that there will be no transfers into the tank that will alter the volume and composition status of the tank. The volume status of the tank is provided in documentation that is routinely issued. Tank history includes tank design information, waste transfer history, and waste temperature and level surveillance information.

2.1 TANK STATUS

According to Hanlon (1995), tank 241-BX-108 contains 98,400 L (26,000 gal) of waste: 98,400 L (26,000 gal) are sludge (3,800 L [1,000 gal] of drainable liquid is estimated as well). The sludge volume estimate reported in WHC-EP-0182-84, *Waste Tank Summary for Month Ending March 31, 1995* (Hanlon 1995) is based on a measurement that was obtained on July 31, 1979, and is considered to be accurate. The sludge portion of waste represents the tank contents, and periodic manual tape measurements are obtained to ensure the surface level is not moving dramatically in either an upward (indicative of an intrusion) or downward (indicative of a leak) direction.

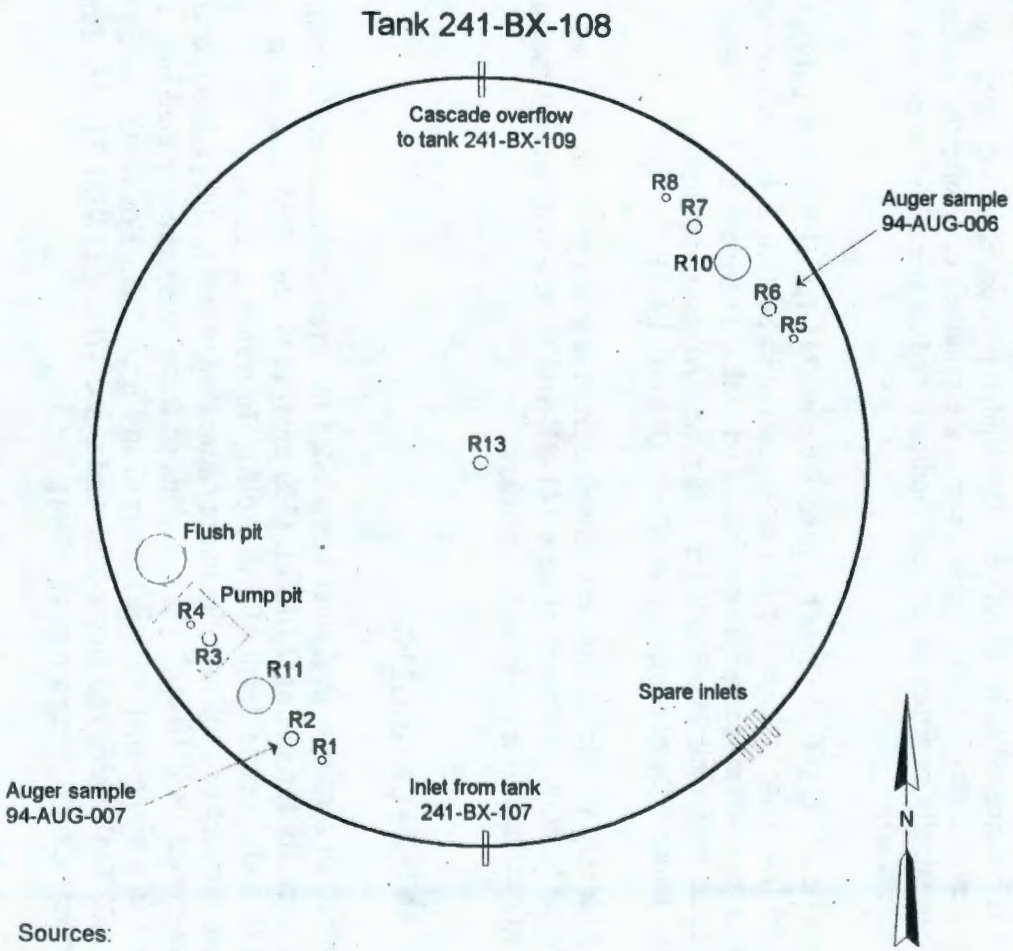
An in-tank temperature of 19 °C (66 °F) was reported for tank 241-BX-108 in February 1995. Waste levels and tank temperatures are further discussed in Section 2.4 of this report. The tank is classified as an assumed leaker, non-Watch List tank. There are no unreviewed safety questions associated with tank 241-BX-108 at this time. All tank monitoring instruments are in compliance with documented standards (Hanlon 1995).

Tank 241-BX-108 is passively ventilated and was removed from active service in 1974 when it was first believed to be leaking. Removal of tank 241-BX-108 from active service means that it is not allowed to continue to receive waste transfers.

2.2 TANK DESIGN AND BACKGROUND

Tank 241-BX-108 consists of a carbon steel liner surrounded by a reinforced concrete shell. The tank has a design capacity for storing 2,010 kL (530 kgal) of waste. The tank has a diameter of 23 m (75 ft) and a usable depth of 5 m (16 ft). Instruments access tank 241-BX-108 through risers and monitor the temperature, liquid level, sludge level, and other bulk tank characteristics (Bell 1994). The locations of these risers are depicted in Figure 2-1. A diagram of a single-shell tank is presented in Figure 2-2. For more information about the BX Tank Farm and single-shell tanks, see WHC-SD-WM-TI-648, *Tank Characterization Reference Guide* (Simpson et al. 1994).

Tank 241-BX-108 was constructed between 1946-47 and went into service in 1949. It is one of twelve tanks that comprise the 241-BX Tank Farm located on the northern end of the



No.	Dia.	Description and comments
R1	4"	Breather filter
R2	12"	Flange, benchmark
R3	12"	Pump, weather covered
R4	4"	Pit riser, weather covered
R5	4"	Temperature probe
R6	12"	B-222 observation port
R7	12"	Manual tape
R8	4"	Benchmark, spare flange
R10	42"	Manhole, below grade
R11	42"	Manhole, below grade
R13	12"	Flange, benchmark

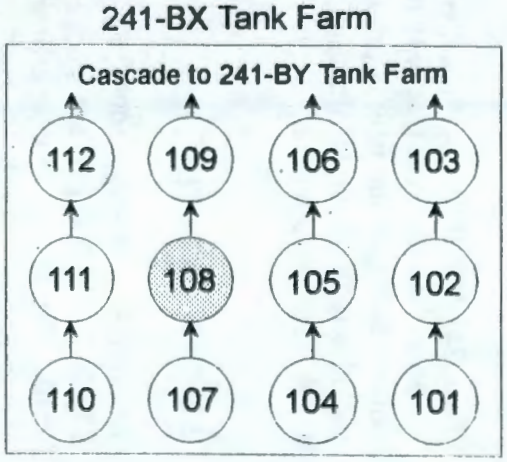


Figure 2-1. Riser Configuration for Tank 241-BX-108.

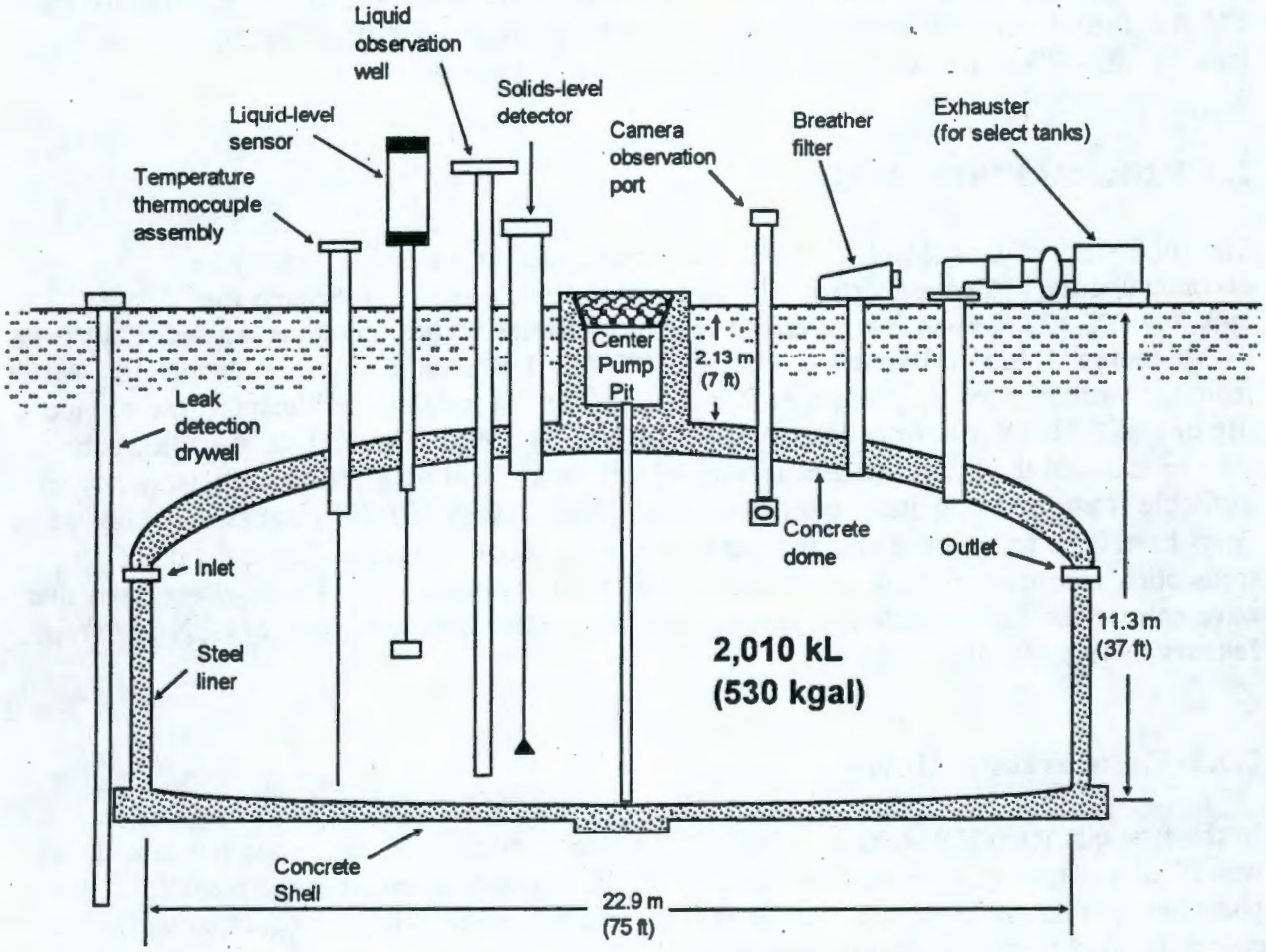
Sources:

Alstad, A.T., 1991, *Riser Configuration Survey for SSTs*, WHC-SD-RE-TI-053, Rev. 8, Westinghouse Hanford Company, Richland, Washington.

Brevick, C.H., L.A. Gaddis, and E.D. Johnson, 1994, *Supporting Document for the Northeast Quadrant Hanford Tank Content Estimate for BX Tank Farm*, WHC-SD-WM-ER-311, Rev. 0, ICF Kaiser Hanford Company, Richland, Washington.

RHO, 1986, *Piping Waste Tank Isolation 241-BX-108*, drawing H-2-73311, Rev. 3, Rockwell Hanford Operations, Richland, Washington.

Figure 2-2. Basic Design of a Single-Shell Tank.



** Not to Scale

200 East Area. Figure 2-3 details the 200 East Area of the Hanford Site and the location of the 241-BX Tank Farm. Tank 241-BX-108 is one of two tanks located in the center of the 241-BX Tank Farm. Of the two centermost tanks in the 241-BX Tank Farm, tank 241-BX-108 is the one located to the west (see Figure 2-1).

2.3 PROCESS KNOWLEDGE

The fill history of tank 241-BX-108 can be summarized as collecting first-cycle decontamination (1C) wastes (from the bismuth phosphate process) through the tank 241-BX-107 cascade line, uranium recovery process wastes, cladding wastes (CW) from the Plutonium-Uranium Extraction (Facility) (PUREX) process, and ion exchange (IX) wastes from the cesium recovery process at B Plant. Figure 2-4 graphically illustrates the service life of tank 241-BX-108 from January 1949 to January 1995. The surface-level fluctuations are the result of the active transfer history of this tank. (Fill data before 1981 were not available from the Computer Automated Surveillance System [CASS] database.) Many waste types have been transferred into and out of the tank. Table 2-1 uses a compilation of transaction records to present an estimate of the total volume of the various waste types that have entered the tank. Table 2-2 summarizes the transfer history of tank 241-BX-108 from January 1949 to January 1995.

2.3.1 Waste Transfer History

In the first quarter of 1949, tank 241-BX-108 began to receive 1C waste via the cascade and was filled to capacity by September 1949. The 1C waste resulted from the bismuth phosphate process in use at the time at B Plant and consisted of by-products that were co-precipitated from a plutonium-containing solution. This waste was comparatively high in solids (much of which had settled in the first tank of the cascade, tank 241-BX-107) and had high concentrations of uranium, phosphate, sodium, and aluminum. The aluminum concentration was high because waste from the fuel element cladding removal process was combined with 1C waste (Anderson 1990). The tank received waste (from tank 241-BX-107) and transferred waste (to tank 241-BX-109) via the cascade lines from March 1949 until the second quarter of 1953. In the fourth quarter of 1952, supernate was pumped from the tank and 87,100 L (23,000 gal) were lost to the ground during the pumping operation. A heel of 41,600 L (11,000 gal) of waste remained in the tank.

From the second quarter of 1953 through the fourth quarter of 1954, the tank received uranium recovery waste from U Plant via cascade lines. In the fourth quarter of 1957, the tank was scavenged for uranium recovery. During the 1957 scavenging operation, the waste from tank 241-BX-108 was pumped to the uranium recovery process vault (244-CR) where it was subsequently routed to U Plant as feed to the uranium recovery process.

Figure 2-3. Location of the BX Tank Farm.

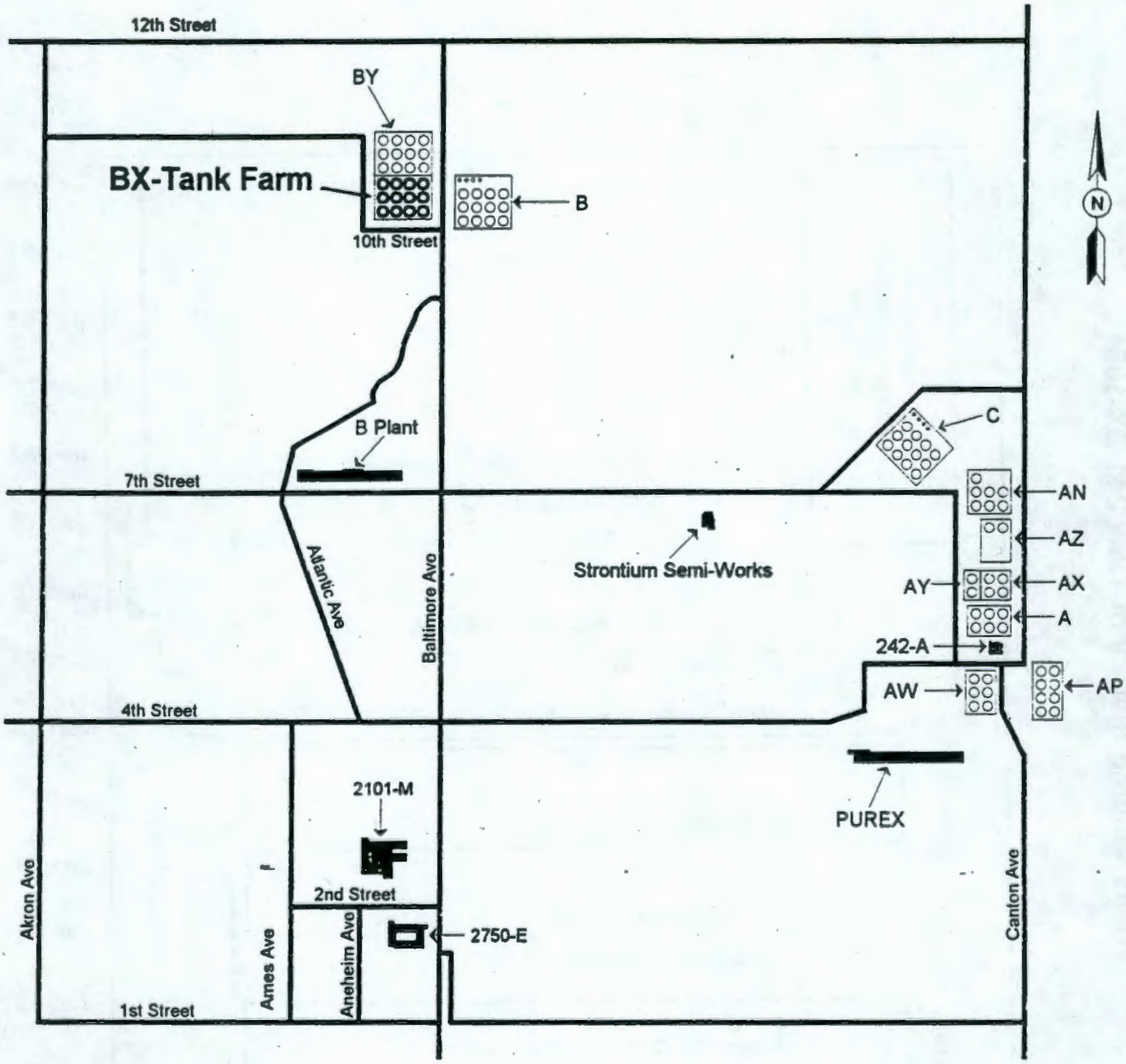
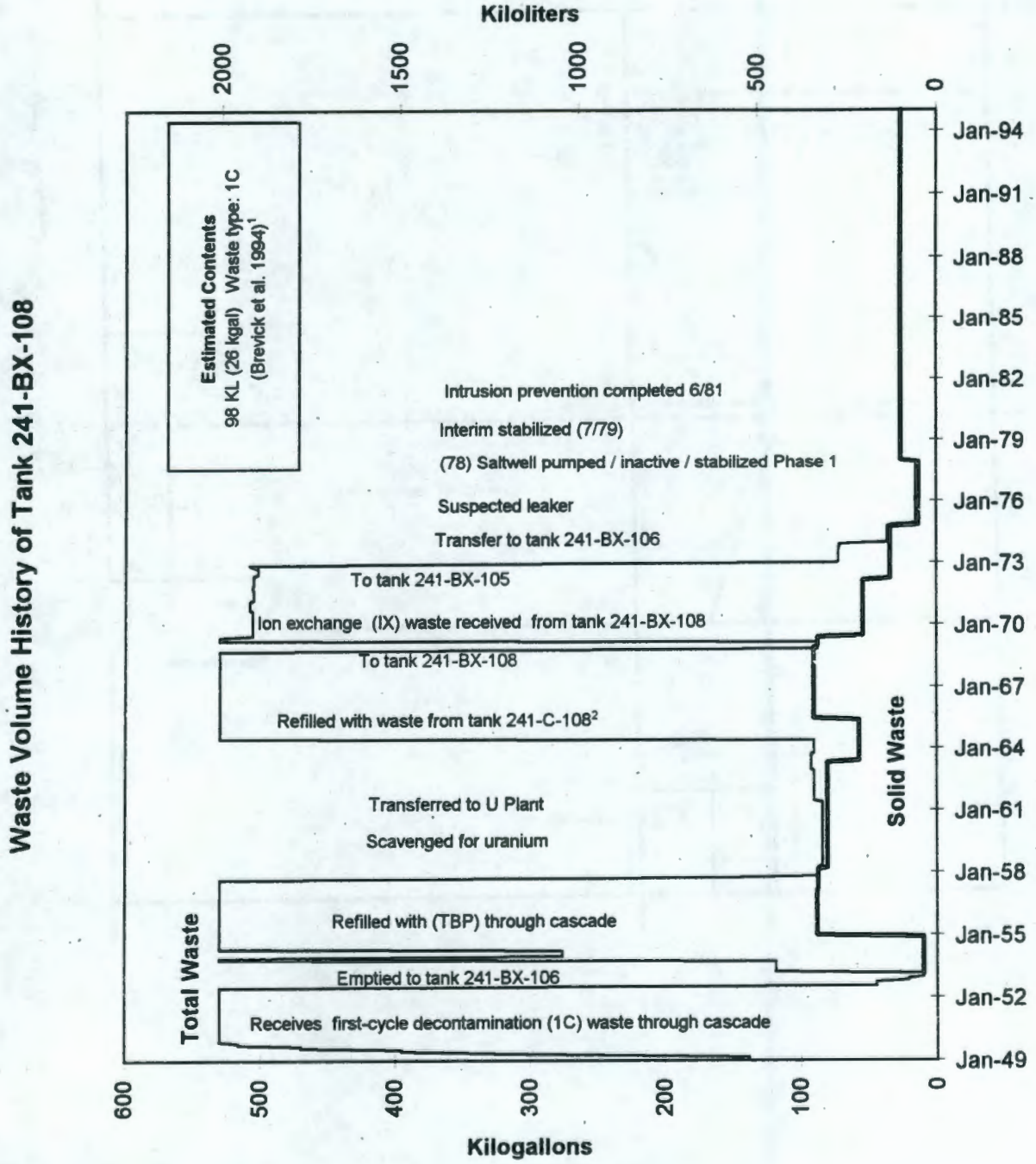


Figure 2-4. Tank 241-BX-108 Fill History.



[1]Brevick. C.H., L.A. Gaddis, and E.D. Johnson, 1994, *Supporting Document for the Northeast Quadrant Hanford Tank Content Estimate for BX Tank Farm*, WHC-SD-WM-ER-311, Rev. 0, ICF Kaiser Hanford Company, Richland, Washington.

[2]Waste from tank 241-C-108 believed to consist of TBP and cladding waste (CW).

Table 2-1. Tank 241-BX-108 Waste Type Inventory.

Waste type	Estimated cumulative volume received kL (kgal)	Years received
1C	1,630 (430)	1949-1952
TBP	2,930 (774)	1953-1964[1]
CW	1,720 (454)	1964-1969
IX	1,710 (452)	1969-1978

[1]TBP waste generation was stopped before 1960, but it is believed that tank-to-tank transfers continued until 1964.

1C = First-cycle decontamination waste (from bismuth phosphate process at B Plant)
CW = Cladding waste (from plutonium-uranium reduction extraction process at PUREX)
IX = Ion exchange (waste from cesium recovery process at B Plant)
PUREX = Plutonium-Uranium Extraction (Facility)
TBP = Tributyl phosphate (waste from uranium recovery process at U Plant)

In the second quarter of 1964, tank 241-BX-108 received CW mixed with tributyl phosphate (TBP) waste. This waste matrix was held in the tank until the fourth quarter of 1968 when the tank contents were transferred to tank 241-BX-106. In the second quarter of 1969, IX waste was received and held in the tank through the first quarter of 1976. Ion-exchange waste resulted from cesium recovery campaigns at B Plant. The tank was declared an assumed leaker in 1974, and supernate was removed from the tank leaving the sludge. The sludge is all that remains in the tank today. Tank 241-BX-108 was saltwell pumped in 1976. A level adjustment[1] was made in March 1978. Level adjustments were made again in 1979, as well as in 1990, to resolve inconsistencies from past calculations.

The waste transfer history of tank 241-BX-108 is detailed in Table 2-2. Figure 2-4 depicts the fill history of the tank based on information from WHC-MR-0132, *A History of the 200 Area Tank Farms* (Anderson 1990) and WHC-SD-WM-TI-615, *Waste Status and Transaction Record Summary for the Northeast Quadrant* (Agnew and Brown 1994).

Table 2-1 presents an estimate of the total volumes of the specific waste types that were added to the tank.

[1]Level adjustments were periodically made in the records to compensate for new level-detection instrumentation being installed, photographs revealing data previously unknown about waste surface levels, etc.

Table 2-2. Waste Transfer History for Tank 241-BX-108. (sheet 1 of 2)

Qtr:Year	Transaction source	Waste type	Transaction amount: kL (kgal)	Destination (tank)	Comment
1-1949	B Plant first-cycle waste and Cell 23 concentrate	1C	515 (136)	241-BX-108	Cascade starts
2-1949		1C	583 (154)	241-BX-108	Cascade
3-1949		1C	503 (133)	241-BX-108	Cascade full
4-1949 to 1-1952		1C	Static	--	Full
2-1952		1C	27 (7)	241-BX-108	Received
4-1952	241-BX-108	1C	1,964 (519)	241-BX-106	Pumped[1]
1-1953 to 2-1953	241-BX-108	1C	2,850 (753)	241-BX-106	Cascade
2-1953	U Plant	TBP	1,968 (520)	241-BX-108	Received
1-1954	241-BX-108	TBP	961 (254)	241-BX-106	Transfer 03-21-54
2-1954	241-BX-109	TBP	961 (254)	241-BX-108	Received
3-1954 to 2-1957	--	TBP[2]	915 (242)	--	Full
3-1957	241-BX-108	TBP	1,821 (481)	U Plant	Scavenged for uranium[3]
4-1957 to 1-1964	--	TBP	Static	--	New electrode for manual tape
2-1964	241-C-108	TBP[2] CW	1,718 (454)	241-BX-108	Received
3-1964 to 3-1968	--	CW	Static	--	--
4-1968	241-BX-108	CW	1,677 (443)	241-BX-106	Transfer
1-1969	--	CW	Static	--	--
2-1969	241-BX-104	IX	1,711 (452)	241-BX-108	Received
3-1969 to 4-1972	--	IX	Static	--	--
1-1973	241-BX-108	IX	1,635 (432)	241-BX-105	Transfer

Table 2-2. Waste Transfer History for Tank 241-BX-108. (sheet 2 of 2)

Qtr:Year	Transaction source	Waste type	Transaction amount: kL (kgal)	Destination (tank)	Comment
2, 4-1973	--	--	--	--	Suspect leaker
1-1974	241-BX-108	IX	163 (43)	241-BX-106	Transfer
2-1974	241-BX-108	IX	8 (2)	241-BX-106	Transfer
3-1974	241-BX-108	IX	4 (1)	241-BX-106	Transfer
4-1974	241-BX-108	IX	4 (1)	241-BX-106	Transfer
1-1975 to 2-1976	--	--	Static	--	--
3-1976	--	IX	--	--	Pumped[4]
4-1976 to 2-1977	--	--	Static	--	--
3, 4-1977	Inactive, leaker, stabilized-Phase 1				
1-1978	Level adjustment	IX	42 (11)	241-BX-108	Received
2-1978 to 1-1995	--	IX	Static	--	--

[1]Pumped to a heel of 42,000 L (11,000 gal); 87,100 L (23,000 gal) of supernate were lost to ground from the pumping operation.

[2]TBP waste generation stopped before 1960, but it is believed that tank-to-tank transfers continued until 1964.

[3]Tank 241-BX-108 was scavenged for uranium recovery and the feed was pumped to the uranium recovery process vault.

[4]Saltwell pumped.

1C = First-cycle decontamination
CW = Cladding waste
IX = Ion exchange
TBP = Tributyl phosphate

2.3.2 Historical Estimation of Tank Contents

Tank inventory estimates based on the tank layer model, the waste status and transaction record summary, and the Hanford Site defined waste types developed by Los Alamos National Laboratory are presented in WHC-SD-WM-ER-349, *Historical Tank Content Estimate for the Northeast Quadrant of the Hanford 200 East Areas, ICF Kaiser Hanford Company* (Brevick et al. 1994a). This model combines waste type inventories and historical waste stream data to obtain an estimate of the current chemical contents of tank 241-BX-108. This estimate is included as Table 2-3.

2.4 SURVEILLANCE DATA

2.4.1 Surface-Level Readings

To determine the surface level of the waste, tank 241-BX-108 is equipped with a manual tape. The manual tape uses a conductivity probe which is lowered by a hand crank until an electric circuit is completed as the probe contacts the waste surface. If an electric circuit is not established, the operator monitors for the tape to go slack indicating contact with the surface. Measurements of the surface level are made on a quarterly basis through riser 7. The data obtained from field readings of the manual tape are input to the CASS on a periodic basis. Liquid waste volume is determined by the manual tape while solid waste volume is determined by a photographic evaluation and a sludge-level measurement device. The most recent sludge level recorded was 10.2 cm (4 in.) on January 24, 1995. Figure 2-5 graphically represents the surface level from 1981 to the present. The large swing in surface-level readings can most likely be explained by viewing the in-tank photographs. For tank 241-BX-108, a sludge weight donut is observed in photo #94040234-21CN (05/05/94) and photo #8606932-33CN (10/23/86). Also, noteworthy in these photos is the hole being made in the waste surface by the donut. The combination of using a sludge weight donut, taking slack tape readings, and making of a hole induces large variation in the field readings of the manual tape.

No liquid observation well is available for establishing interstitial liquid level in the solids of tank 241-BX-108.

There are seven drywells associated with tank 241-BX-108. A review of the historical records for these drywells shows no apparent increase in activity. This is indicative of a sound tank that is not leaking waste into the environment.

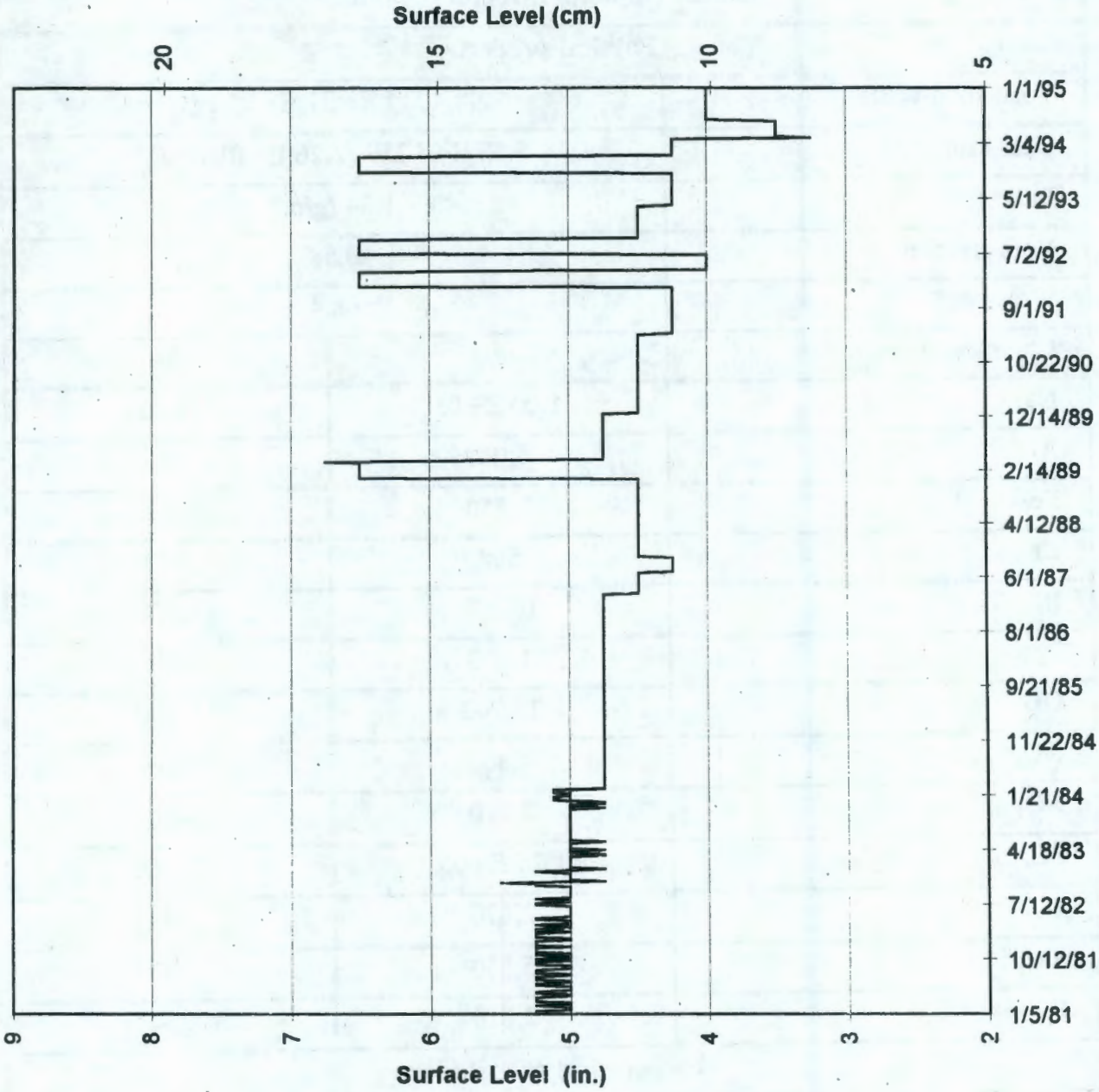
2.4.2 Internal Tank Temperatures

To measure in-tank temperatures, a probe with 14 thermocouples assembled in a pipe (termed a thermocouple tree) is available in tank 241-BX-108 at riser 5 (see Figure 2-1 for the location of this riser). The thermocouple tree monitors the waste temperatures at various levels in the tank, usually every 0.6 m (2 ft). Data are reported for thermocouples 1 through

Table 2-3. Historical Tank Content Estimate of Tank 241-BX-108.

Solids Composite Inventory Estimate		
Physical properties		
Total solid waste	98,400 L (1.31 E+05 kg)	
Heat load	6.63 E-03 kW (2.26 E+01 Btu/h)	
Bulk density	1.34 (g/cc)	
Void fraction	0.58	
Water wt%	68.4	
Chemical constituents	**μg/g**	**kg**
Na	1.00 E+05	13,200
Al	6,060	796
Fe	9,150	1,200
Cr	568	74.7
Bi	16,000	2,100
Zr	1,990	262
OH^-	19,700	2,590
NO_3^-	4,860	639
NO_2^-	3,710	488
PO_4^{-3}	1.26 E+05	16,500
SO_4^{-2}	2,670	351
SiO_3^{-2}	5,830	767
F^-	2,010	264
Radiological constituents		
Pu	4.45 E-02 (μCi/g)	9.76 E-02(kg)
Cs	0.65 (μCi/g)	85.1(Ci)
Sr	7.03 (μCi/g)	9.25 E+02(Ci)

Figure 2-5. Tank 241-BX-108 Surface-Level Readings.



12 from 1975 to 1995.[1] Data for thermocouples 13 and 14 are not available. No data are available from 1981 to 1992. Consequently, two temperature graphs are presented: Figure 2-6 presents temperature data from 1975 to 1981 and Figure 2-7 presents temperature data from 1994 to 1995. The mean temperature for tank 241-BX-108 is 20 °C (68 °F), with a minimum of 12 °C (54 °F) and a maximum of 32 °C (90 °F) (Brevick et al. 1994b). Since May 10, 1994, daily thermocouple readings have been recorded for thermocouples 1, 7, and 11 of tank 241-BX-108. The temperature was measured at 19 °C (66 °F) on February 13, 1995.

2.4.3 Tank Photographs

The interior of tank 241-BX-108 was last photographed on May 5, 1994. Before these photographs were taken, tank 241-BX-108 was photographed on October 23, 1986. From the photographs taken of the interior of tank 241-BX-108 on October 23, 1986, a "montage" was prepared and is presented in Figure 2-8. The sludge is observed to have a cream to medium brown pebble surface with a pool of liquid at the center evidenced by the 1986 and 1994 photographs. With the exception of unidentified debris and an old measuring tape, the only apparatuses seen in the tank are a temperature probe and a manual tape. There have been no changes in the tank which would affect the waste since these photographs were taken, and these pictures should be representative of the current tank contents.

[1]With a waste level of ~10 cm (~4 in.) (see Figure 2-5), and the knowledge that the first thermocouple is ~5 cm (~2 in.) off the tank bottom and the second thermocouple is ~0.6 m (~2 ft) above the first, it is likely that most of the temperature data for this tank is from the vapor space.

Figure 2-6. Tank 241-BX-108 Historical Temperature Data, 1975 to 1981.

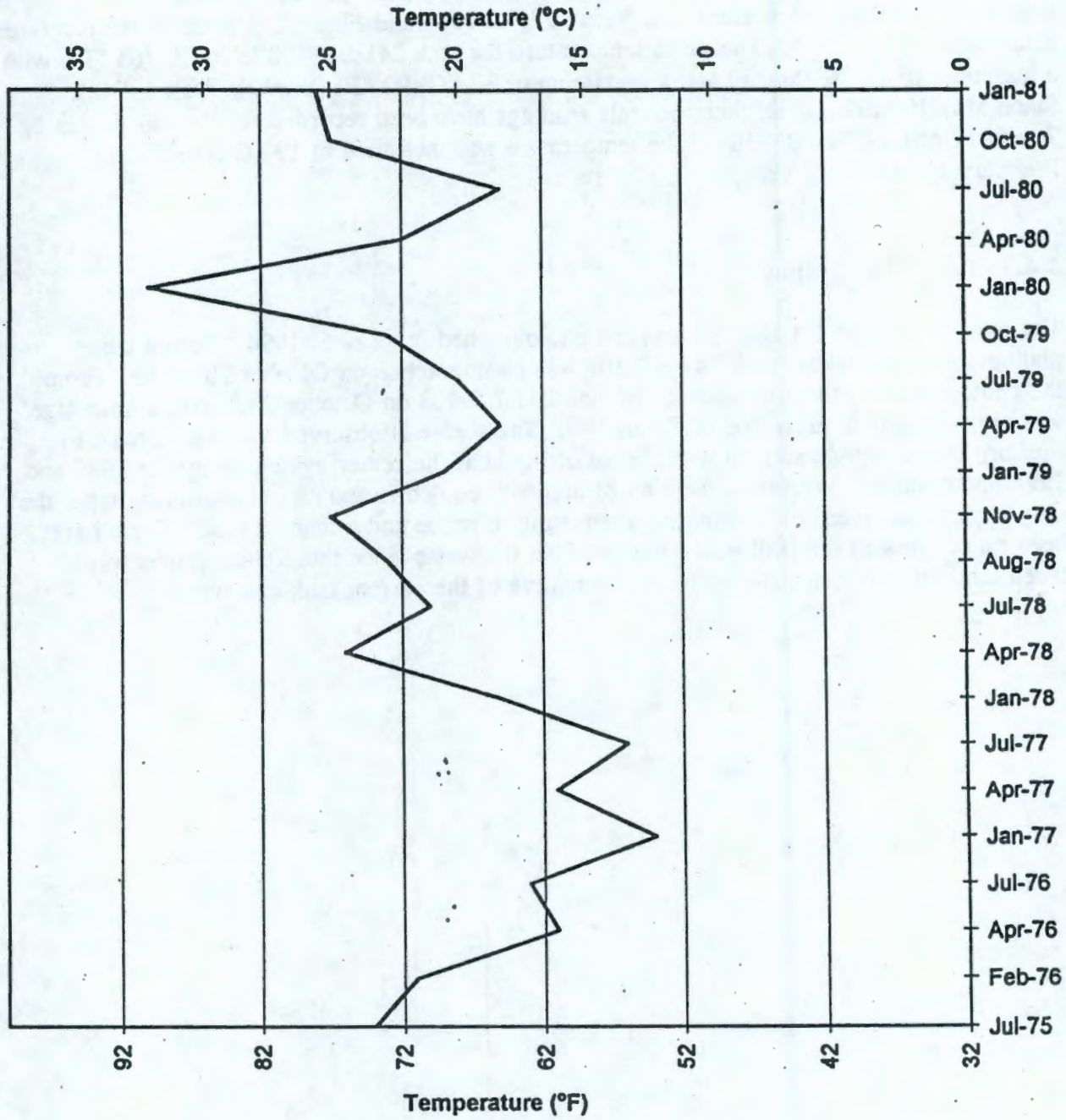
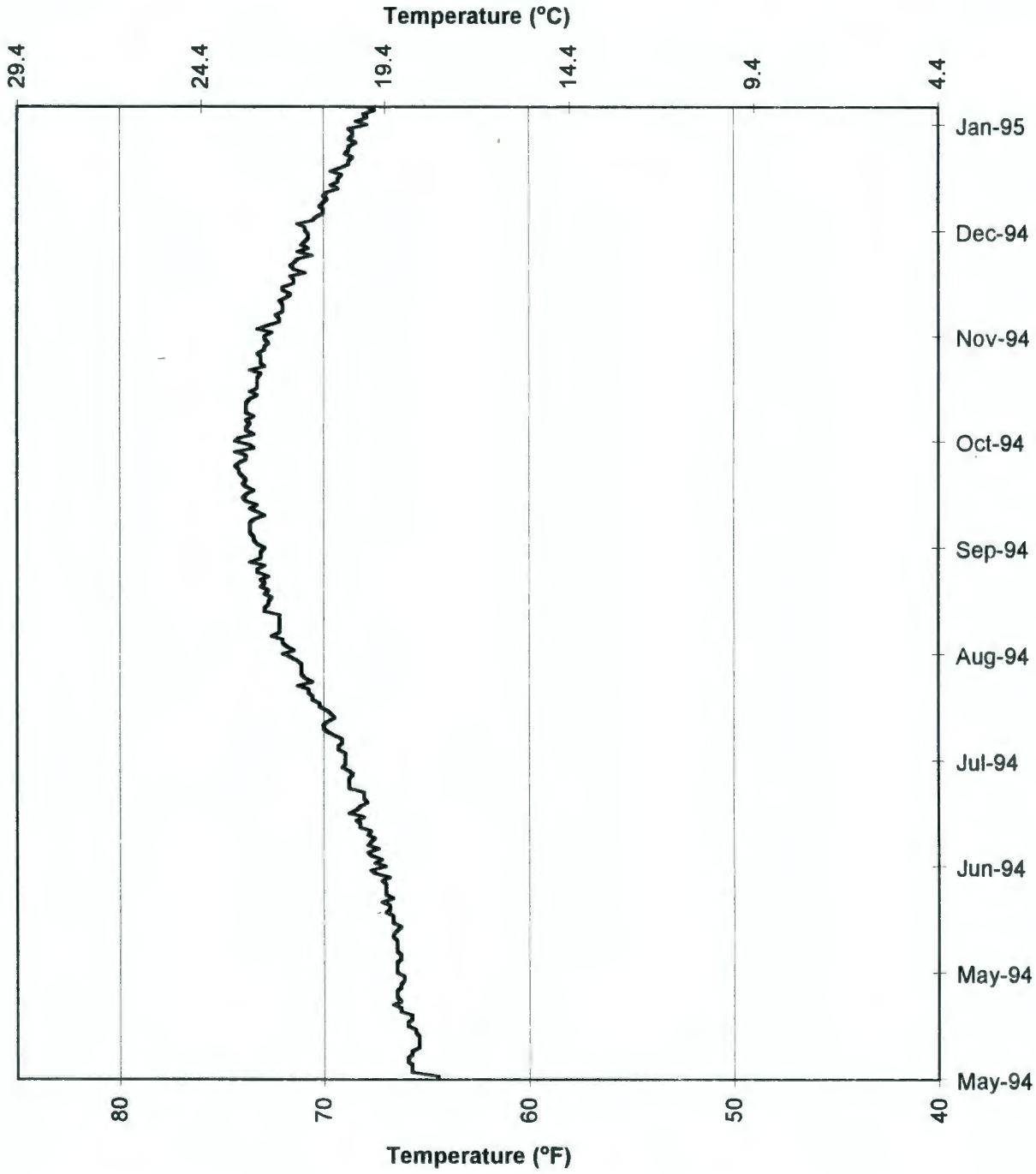


Figure 2-7. Tank 241-BX-108 Historical Temperature Data, 1994 to 1995.



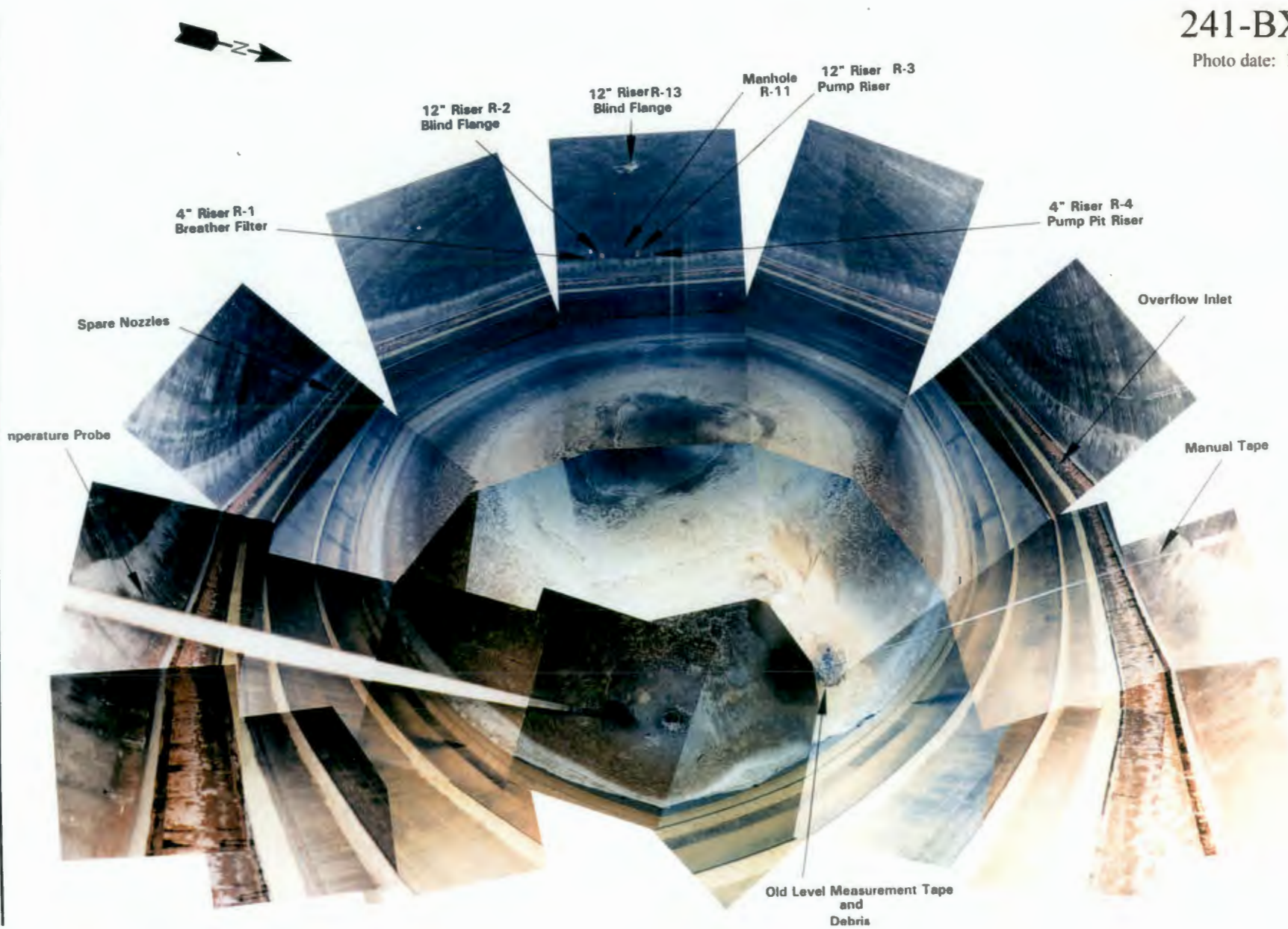


Figure 2-7. Photo Montage of the Tank 241-BX-108.

3.0 TANK SAMPLING OVERVIEW

This section describes one sampling and analysis event for tank 241-BX-108. Auger sampling was performed in 1994. The auger samples obtained from tank 241-BX-108 in 1994 were for a safety screening evaluation. Only general knowledge about sludge components can be estimated from the 1994 data because limited auger sample analyses were performed.[1] A further description of the sampling procedure may be found in WHC-SD-WM-TI-648, *Tank Characterization Reference Guide* (Simpson et al. 1994).

3.1 DESCRIPTION OF 1994 SAMPLING EVENT

In July 1994, auger samples were obtained from risers 6 and 2 of tank 241-BX-108. For a further description of auger sampling procedures, refer to the *Tank Characterization Reference Guide* (Simpson et al. 1994). Each auger sample obtained from tank 241-BX-108 had 8 flutes--flute 1 defined as beginning at the auger shaft and flute 8 as ending at the auger tip.[2,3] A description of the samples recovered is provided in Table 3-1.

3.1.1 Sample Handling (1994)

The samples were extruded and subsampled at the 222-S Laboratory 1E-2 hot cell and kept at the 222-S Laboratory for analysis. The subsampling scheme is described in Table 3-1. There was no significant drainable liquid present in either sample (as is expected from an auger sample). The material from riser 6 was considerably drier than the material from riser 2. It was noted that the samples had dried during the extrusion and observation period in the hot cell. Samples from flutes 6-8 of riser 2 were homogenized before analysis. Because of their dryness, homogenization of riser 6 material may not have been as effective.

3.1.2 Sample Analysis (1994)

The radionuclides are determined on fused samples of sludge. The fusions were performed in nickel crucibles with potassium hydroxide. The fused samples are dissolved in acid and analyzed by the methods identified in Appendix A of this TCR.

---

[1]No other sampling and analysis events are known to exist.

[2]Because of problems in the field, the sleeve was left off the sample obtained from riser 2.

[3]Field notes indicate that the auger for riser 6 hit something hard after about 5 cm (2 in.).

Table 3-1. 1994 Sample Description Summary.

Riser number	Dose rate (mr/h)	Subsample location	Laboratory ID number	Wt. solids (g)	Sample description	Date extruded
2	200	Flutes 1-5	N/A	N/A	Empty	N/A
		Flutes 6-8	R-5872	18.7	Glossy, smooth (similar to wet peanut butter); colored dark/brown solids	7/26/94
6	30	Flutes 1-3	R-5875	8.3	Dry/brittle white crust	7/26/94
		Flutes 4,5	R-5876	10.4	White crust to light brown clay-like material	7/26/94
		Flutes 6-8	R-5877	15.7	Dry/brittle light brown	7/26/94

N/A = Not applicable

The analytical methods used for thermodynamic measurements are also identified in Appendix A. The DSC and TGA analyses were performed on small (5-20 mg) quantities of the solid waste. Because of the small sample size, the reproducibility of the results are affected by sample homogeneity. Additional information on analytical methods can be obtained from the *Tank Characterization Reference Guide* (Simpson et al. 1994).

3.2 DESCRIPTION OF OTHER SAMPLING EVENTS

Currently, this section is not applicable to this document.

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4.0 ANALYTICAL RESULTS AND WASTE INVENTORY ESTIMATES

4.1 OVERVIEW

The purpose of this section is to summarize the sampling and analytical results described in Section 3.0. The 1994 sampling event was performed only to evaluate safety screening criteria (Babad et al. 1995). The only estimate of the chemical and radiochemical composition and inventory for the waste in tank 241-BX-108 is derived from the tank layering model described in subsection 2.3.2 and summarized in Table 2-3. This section describes the safety screening analysis results based on the 45-day report (Kocher 1994). Table 4-1 summarizes where the data can be found in this document.

The safety screening results are based on the analysis of two auger samples taken in 1994 and reported in the following sections. Duplicate measurements were made for each determination for each subsample. The mean for most of the tests on the sludge is based on the average of two auger sample results. The mean value for these sludges is summarized in Table 4-2.

4.2 DATA PRESENTATION-TOTAL ALPHA

Total alpha analyses were performed on the 1994 auger samples from tank 241-BX-108. These total alpha data are presented in Table 4-3.

No inventory or volume-based total alpha results were calculated for tank 241-BX-108 because the density of the waste was not measured.

4.3 PHYSICAL MEASUREMENTS

The only physical measurements of the samples obtained in 1994 were DSC and TGA. The TGA provides an estimate of the chemical property, weight percent water, but also is used to interpret and understand the DSC results. The results of both tests are summarized in the following section.

Table 4-1. Analytical Data Presentation Tables.

Analysis	Tabulated result location
Total alpha	Table 4-3
Thermogravimetric analysis	Table 4-4
Differential scanning calorimetry	Table 4-5

Table 4-2. Safety Screening Data Quality Objective Decision Variables and Criteria. (sheet 1 of 2)

Safety issue	Primary decision variable	Decision criteria threshold	Auger location	Analytical value	Relative percent difference (%)
Riser 2					
Ferrocyanide/ organic	Total fuel content	115 cal/g	Flutes 6-8	No exotherms observed	
Ferrocyanide	Moisture content	If fuel is above 8 wt%, then wt% H2O < [(0.0932*DSC exotherm) - 10.7][1,2]	Flutes 6-8	N/A (no exotherms observed)	
Organic	Percent moisture	17 wt%	Flutes 6-8	52.3 wt%	1.9
Criticality	Total alpha	1 g/L[3]	Flutes 6-8	0.123 μCi/g	9.8
Flammable gas	Flammable gas	No data	--	--	
Riser 6					
Ferrocyanide/ organic	Total fuel content	115 cal/g	Flutes 1-3	No exotherms observed	
			Flutes 4,5		
			Flutes 6-8		
Ferrocyanide	Moisture content	If fuel is above 8 wt%, then wt% H2O < [(0.0932*DSC exotherm) - 10.7][1,2]	Flutes 1-3	N/A (no exotherms observed)	
			Flutes 4,5		
			Flutes 6-8		
Organic	Percent moisture	17 wt%	Flutes 1-3	7.89 wt%	-32.9
			Flutes 4,5	4.02 wt%	36.1
			Flutes 6-8	4.50 wt%	3.3
Criticality	Total alpha	1 g/L[3]	Flutes 1-3	0.0896 μCi/g	0.8
			Flutes 4,5	0.0423 μCi/g	0.2
			Flutes 6-8	0.0719 μCi/g	4.7

Table 4-2. Safety Screening Data Quality Objective Decision Variables and Criteria. (sheet 2 of 2)

Safety issue	Primary decision variable	Decision criteria threshold	Auger location	Analytical value	Relative percent difference (%)
Riser 6					
Flammable gas	Flammable gas	No data	--	--	

[1]See Figure 4-1 in WHC-SD-WM-DQO-007, *Data Requirements for the Ferrocyanide Safety Issue Developed through the Data Quality Objective Process*, J. E. Meacham, R. J. Cash, G. T. Dukelow, H. Babad, J. W. Buck, C. M. Anderson, B. A. Pulsipher, J. J. Toth, and P. J. Turner, Westinghouse Hanford Company, Richland, Washington, 1994, for an explanation of the moisture decision rule.

[2]Fuel content is weight percent disodium nickel ferrocyanide ($Na_2NiFe(CN)_6$). The fuel percentage was calculated according to the following equation. The differential scanning calorimetry value is divided by 1,430, which is the experimentally determined heat of reaction of $Na_2NiFe(CN)_6$ with nitrate in waste simulant (see WHC-EP-0691, *Ferrocyanide Safety Program: Safety Criteria for Ferrocyanide Watch List Tanks*, A. K. Postma, J. E. Meacham, G. S. Barney, G. L. Borsheim, R. J. Cash, M. D. Crippen, D. R. Dickenson, J. M. Grigsby, D. W. Jeppson, M. Kummerer, J. M. McLaren, C. S. Simmons, and B. C. Simpson, Westinghouse Hanford Company, Richland, Washington, 1994).

$$wt\%\ Na_2NiFe(CN)_6 = \frac{[DSC\ exotherm\ (cal/g\ dry\ weight)]}{1{,}430\ cal/g} \times 100.$$

Using this equation, the decision criterion of 4/3(wt% fuel - 8 wt%) listed in the data quality objective becomes:

wt% H20 < [(0.0932 x DSC exotherm) - 10.7]

[3]Although the actual decision criterion listed in the data quality objective is 1 g/L, total alpha is measured in μCi/g rather than g/L. To convert the notification limit for total alpha into a number more readily usable by the laboratory, it was assumed that all alpha decay originates from ^{239}Pu. A tank density is therefore needed, and using the specific activity of ^{239}Pu (0.0615 Ci/g), the decision criterion may be converted to units of μCi/g as shown:

$$\left(\frac{1\ g}{L}\right)\left(\frac{1\ L}{10^3\ mL}\right)\left(\frac{1}{density}\frac{mL}{g}\right)\left(\frac{0.0615\ Ci}{1\ g}\right)\left(\frac{10^6\ \mu Ci}{1\ Ci}\right) = \frac{61.5}{density}\frac{\mu Ci}{g}.$$

DSC = Differential scanning calorimetry
N/A = Not applicable

Table 4-3. Tank 241-BX-108 Analytical Data: Total Alpha (Kocher 1994).[1]

Analyte	Sample location	Sample identification	Result	Duplicate	Riser (mean)	Combined (mean)	Standard deviation of result means
Radionuclide							
Digested solid	Riser		µCi/g	µCi/g	µCi/g	µCi/g	
Total α	2	Flutes 6, 7, and 8	0.117	0.128	0.123	0.0955	0.0337
Total α	6	Flutes 1, 2, and 3	0.0899	0.0892	0.0679		
	6	Flutes 4, 5	0.0422	0.0423			
	6	Flutes 6, 7, and 8	0.0702	0.0736			

[1]Kocher, K. L., 1994, *Single-Shell Tank Waste Characterization for Tank 241-BX-108*, WHC-SD-WM-DP-072, Westinghouse Hanford Company, Richland, Washington.

4.3.1 TGA

Weight percent water by TGA was performed under a nitrogen atmosphere using procedure LA-560-112, *Determination of Weight Loss as Percent Water by Thermogravimetric Analysis (TGA) - Mettler*[1] *TG 50* (Frye 1994a). The weight percent water results and TGA scans for sample from riser 2 are significantly different than those for sample from riser 6. The riser 2 sample contained 52.3% H_2O showing a large weight loss in the first transition between 30 to 120 °C and only a small weight loss between 140 to 300 °C. Consistent with visual observations, the riser 6 subsamples were much drier than the riser 2 sample and showed only a small weight loss between 30 to 120 °C and a larger weight loss between 200 to 300 °C. The second weight loss transition was integrated out to about 490 °C. Examples of typical TGA scans for risers 2 and 6 are provided in Appendix B. Analytical results from the three subsegments from riser 6 ranged from 3.29% to 9.19%. It should be noted that TGA results may be biased low as there was drying of samples from both risers before subsampling (Kocher 1994).

The results of the TGA analyses that were performed are summarized in Table 4-4. The first transition in each sample began at the lower temperature limit of the analysis (30 °C [86 °F]) and was complete at approximately 120 °C (248 °F). In this region, the observed decreases in weight are mainly due to the loss of bulk and interstitial water in the samples. The second transition occurred between 200 and 490 °C (392 and 914 °F). The phenomena demonstrated in this region could be attributed to the loss of covalently bound water molecules or the dehydration of compounds such as aluminum hydroxide.

Table 4-4. Thermogravimetric Analysis Results for Tank 241-BX-108 (Kocher 1994).[1]

Subsample location	Laboratory ID number	Run	Transition 1 and 2 wt% loss				
			1 (30-120 °C)	Mean 1 wt% loss	2 (200-490 °C)	Mean 2 wt% loss	Total weight loss
Riser 2: flutes 6-8	R-5872	1	52.8	52.3	3.03	3.18	55.5
		2	51.8		3.32		
Riser 6: flutes 1-3	R-5875	1	6.59	7.89	25.7	26.6	34.5
		2	9.19		27.4		
Riser 6: flutes 4, 5	R-5876	1	4.74	4.02	29.9	29.5	33.5
		2	3.29		29.0		
Riser 6: flutes 6-8	R-5877	1	4.42	4.50	29.8	29.4	33.9
		2	4.57		29.0		

[1]Kocher, K. L., 1994, *Single-Shell Tank Waste Characterization for Tank 241-BX-108*, WHC-SD-WM-DP-072, Westinghouse Hanford Company, Richland, Washington.

4.3.2 DSC

Analyses for DSC were performed under a nitrogen atmosphere using procedure LA-514-113, *Differential Scanning Calorimetry (DSC)* (Frye 1994b). No exotherms were observed for any of the samples run therefore no exotherms are calculated on a dry weight basis. The DSC data results are presented in Table 4-5. Two endothermic transitions were observed for samples from both risers. The low-temperature endotherm associated with water loss was much larger for the riser 2 sample than for the riser 6 material whereas the high-temperature endotherm associated with dehydration was much larger for the riser 6 material. Examples of the DSC scans for the riser 2 and riser 6 material are provided in Appendix B.

Table 4-5. Differential Scanning Calorimetry Energetic Results for Tank 241-BX-108 (Kocher 1994).[1]

Subsample location	Laboratory core sample number	Run	Range °C	Peak °C	H J/g	Range °C	Peak °C	H J/g
Riser 2: flutes 6-8	R-5872	1	30-170	129.0	1,250	220-310	283	66.9
		2	30-170	125.0	1,190	220-310	283	75.5
Riser 6: flutes 1-3	R-5875	1	40-120	99.0	166	200-340	288	697
		2	50-160	125.0	244	200-360	289	622
Riser 6: flutes 4, 5	R-5876	1	40-140	104.0	237	170-370	291	763
		2	40-120	94.9	189	170-340	286	714
Riser 6: flutes 6-8	R-5877	1	40-120	89.2	103	200-330	280	767
		2	40-130	87.3	109	170-330	280	761

[1]Kocher, K. L., 1994, *Single-Shell Tank Waste Characterization for Tank 241-BX-108*, WHC-SD-WM-DP-072, Westinghouse Hanford Company, Richland, Washington.

5.0 INTERPRETATION OF CHARACTERIZATION RESULTS

The following items are presented in this section:

1. The assessment of the sampling and analytical results
2. The tank waste profile
3. The comparison of historical and analytical information
4. The evaluation of program requirements.

There are no other sampling and analysis events with which to compare data other than the 1994 auger sampling presented in this report.

5.1 ASSESSMENT OF SAMPLING AND ANALYTICAL RESULTS

This section evaluates sampling and analysis factors that may impact interpretation of the data. These factors are used to assess the overall quality and consistency of the data and to identify any limitations in the use of the data. Because of the limited analytes determined and the limited risers and waste depths sampled, it is not possible to perform data consistency checks, compare results from different methods, or perform mass and charge balance calculations.

5.1.1 Field Observations

During the handling of samples from the 1994 auger sampling event, two observations were made that could impact the interpretation of the data.

1. The samples were observed to dry between extrusion and analysis.

2. A larger quantity of sample material was obtained from the riser 6 auger sample than from the riser 2 auger sample even though "something hard" was hit after about 5 cm (2 in.) in riser 6. No sleeve was used in the sampling of riser 2.

During photography and subsampling of the extruded auger samples, sample drying was noted. This was attributed to the time involved in completing the requisite tasks. Drying also increases when the material does not completely fill the flutes but is smeared over a large surface. This occurs more frequently when only small quantities of waste are recovered.

Waste sample material from the riser 2 auger was present on flutes 6, 7, and 8. The waste appeared as smooth and glossy dark brown solids. Waste samples from the riser 6 auger included three types. Flutes 1-3 contained a dry, brittle, white crust. Flutes 4 and 5 contained white crust and a light brown clay-like material. Flutes 6-8 held a dry, brittle, light brown substance. No drainable liquid was present in either sample. The amount of

waste recovered was considerably less than the 80 g expected (Carpenter 1994). Also, the presence of waste on the upper flutes of the auger from riser 6 was not expected because of the depth of the waste.

5.1.2 Quality Control Assessment of Analytical Data

An attempt is always made to quantify the possible sources of error during the chemical analysis of a sample. When these errors are summarized, they provide a strong indication of data reliability. If one or more of the error estimates is outside the acceptable limits, the accuracy of the concentration estimate is questionable. Possible sources of error are sample contamination, matrix interferences, analytical method error, and poor instrument calibration. Error estimates are determined from the analysis of standards, spike recoveries, blank contamination, and sample duplicate variation.

Standards are used to estimate the accuracy of the analytical method and may be evaluated before, and concurrent with, sample analysis. Standards contain the analytes of interest at known concentrations. Solutions used for control standards may or may not be independent of the standard used for calibration. The criterion for standard recovery is 100 $\pm$ 10%. As seen in Table 5-1, the standard for total alpha associated with riser 6 slightly exceeded the criteria while the other alpha and TGA standards were well within the limits. The two standard recoveries for DSC were also within limits (data not shown). The riser 6 high alpha standard result was not considered significant because the total alpha results were well below the safety criteria.

Matrix spikes are used to estimate the bias of the analytical method due to matrix interferences. Spike samples are prepared by splitting a sample into two aliquots and adding a known amount of a particular analyte to one aliquot to calculate a percent recovery. The quality control criterion for matrix spikes is 100 $\pm$ 20% recovery. Spikes were only conducted on total alpha and two of three from riser 6 were below the quality control limits. The low recoveries were probably due to dissolved solids on the planchet resulting in self-absorption. The low results can also be attributed to heterogeneity in the sample when the spiked aliquot (split) contains less of the analyte than the aliquot without a spike. A third rerun was not requested as all analytical values were well below any potential action limit (Kocher 1994).[1]

Contamination resulting from the analytical process is documented by use of method blanks. Method blanks are carried through the complete sample preparation and analytical procedure, and all reagents used in the sample processing are added in the same volumes. Blanks were conducted only on the total alpha data and indications are that contamination was not a problem.

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[1]Refer to Section 5.5 for a discussion of total alpha analytical results obtained as compared to the 1 g/L action limit.

Table 5-1. Quality Control Summary for Tank 241-BX-108.

Riser	Analyte	Relative percent difference %[1]	Standard %[2]	Spike recovery %[3]
2	% water (flutes 6-8)	1.9	98.9	NA
	Alpha (flutes 6-8)	9.8	94.7	97.8
6	% water (flutes 1-3)	32.9	98.9	NA
	% water (flutes 4-5)	36.1		
	% water (flutes 6-8)	3.3		
	Alpha (flutes 1-3)	0.8	111.6	81.3
	Alpha (flutes 4-5)	0.2		71.6
	Alpha (flutes 6-8)	4.7		73.8

[1]10% limit.
[2]Range = 90-110%.
[3]Range = 80-120%.

NA = Not available

Random analytical error can be estimated by the duplicate analysis of a sample. The results from duplicate analyses provide an indication of laboratory precision and the homogeneity of the samples. To estimate this error, a relative percent difference (RPD) is calculated for each duplicate pair. The RPD is a measure of variability, and it is defined as the absolute value of one duplicate minus the other divided by the mean. The tank characterization plan for tank 241-BX-108 set the duplicate precision acceptance criterion at no RPD being >10% (Carpenter 1994). Only the percent water encountered problems with the duplicate analysis, with two of four RPDs exceeding the criteria (see Table 5-1). The homogenization process in sample preparation is extremely critical for the DSC/TGA analyses due to the small amount of sample analyzed (10-50 mg). Even slight variations in sample consistency can result in RPDs >10%. Homogenization of drier samples is more difficult than homogenization of fluid samples because of the dryness of the sample and the probability that repeating the analyses will not improve the data or produce results above 17%. Only one rerun was requested (Kocher 1994).

5.2 COMPARISON OF RESULTS FROM DIFFERENT SAMPLING EVENTS

No records of other sampling events besides the 1994 auger sampling of tank 241-BX-108 are known to exist.

5.3 TANK WASTE PROFILE

The assessment of the tank waste profile is limited because of the following:

1. The small data set required for safety screening
2. The shallow depth of waste in the tank
3. The limited number of risers sampled.

Based on the observed color and consistency variations (noted during the 1994 sample extrusion in the hot cell), the waste appears to be heterogeneous. The difference in percent water between riser 2 and riser 6 is too large to be explained only by drying effects in the hot cell. Because of the shallow depth of the waste, any differences in the vertical profile for riser 6 may be the result of a sampling anomaly.

A statistical test known as the analysis of variance (ANOVA) was conducted on the percent water and total alpha data to determine if there were any differences between the two risers or among the three different subsamples taken from the auger. The ANOVA generates a statistic called a p-value, which is compared with a standard significance level ($\alpha = 0.05$). If a p-value is below 0.05, there is sufficient evidence to conclude that the subsample means differ significantly. However, if a p-value is >0.05, there is not sufficient evidence to conclude that the subsamples are significantly different from each other.

Because only one subsample was obtained from riser 2 (flutes 6-8), it was compared only to the equivalent subsample from riser 6 (flutes 6-8). A second comparison was made with the three riser 6 subsamples to determine if any layering was apparent (flutes 1-3 = top, flutes 4-5 = middle, and flutes 6-8 = bottom). The results of the ANOVA test for percent water indicated that at the 0.05 level, there were no significant differences among the three subsamples from riser 6 (p-value = 0.089). However, there was a significant difference between the two risers for the subsamples taken from flutes 6-8 (p-value = 0.000). It was noted by the hot cell chemist that, during photography and subsampling, some drying of the samples from both risers occurred. This is evidenced by the photos of the two auger samples showing that riser 2 material is wetter than the riser 6 material. The extent of this drying and its impact on the data results is not fully understood; however, it is unlikely that drying in the hot cell could account for the almost 50% difference between risers. For total alpha, the ANOVA results indicated that there were significant differences among the three subsamples from riser 6 (p-value = 0.000), as well as a significant difference between the two risers based on the subsamples taken from flutes 6-8 (p-value = 0.006). Thus, the distribution of percent water and total alpha in the tank appears to be somewhat heterogeneous.

5.4 COMPARISON OF ANALYTICAL AND TRANSFER HISTORY INFORMATION

The analytical results from 1994 are in agreement with what would be expected from the historical uses of this tank. The fact that tank 241-BX-108 has a low inventory of waste

(98,400 L [26,000 gal] total) with very little liquid (approximately 3,800 L [1,000 gal]) (Hanlon 1995) agrees well with the analytical water concentrations of as low as 3.29 wt% H_2O. However, these results are more difficult to compare with the estimated 68% H_2O identified in the historical tank content estimate (HTCE). The is primarily because of the sampling method (auger). Auger sampling of waste, particularly low volume tank inventories, could result in the water draining from the sampler as it is drawn from the waste surface to the riser.

The major sources of waste that entered tank 241-BX-108 did not contain significant quantities of organics. There is no evidence that cyanides were introduced into the tank, therefore, the historical knowledge supports the DSC results of no fuel or exothermic reaction. This result compares well with the HTCE presented in Table 2-3 and the model of 0.4 wt% (wet basis) TOC for liquid as recorded in PNL-10360, *Analysis of Organic Carbon and Moisture in Hanford Single-Shell Tank Waste* (Toth et al. 1995).

The only radiochemical result from the 1994 sampling event was total alpha. The total alpha results, which also included other alpha-emitting nuclides such as americium-241 and neptunium-237, are about twice as high as the historical plutonium estimate.

5.5 EVALUATION OF PROGRAM REQUIREMENTS

The data needs defined in the Safety Screening DQO (Babad et al. 1995) were applicable at the time of the 1994 sampling of tank 241-BX-108. Because only safety screening analyses were performed, no assessment of operational, environmental, or process development programs can be made.

The data criteria identified in the Safety Screening DQO (Babad et al. 1995) are used to assess the safety aspect of the waste in tank 241-BX-108. This DQO identifies several primary and secondary factors for consideration.

The waste fuel energy value is normally determined using DSC analysis of the waste material. All DSC analyses performed on tank 241-BX-108 sludge and interstitial liquid waste samples indicated that there was not sufficient energy value in the tank 241-BX-108 waste to be a safety concern (i.e., all data were less than the 115 cal/g limit). Total organic carbon (TOC) and cyanide concentrations are other parameters that are indications of the fuel content of the waste. However, neither the presence of TOC nor cyanide was analyzed for in the waste samples from tank 241-BX-108 because the primary analyte (exothermic energy from DSC showed no concern). There is little historical basis to expect any appreciable fuel quantities above safety limits (i.e., TOC or cyanide).

Large amounts of moisture reduce the potential for propagating exothermic reactions in the wastes. The waste samples from riser 6 in tank 241-BX-108 were found to be below the safety/notification limit (17 wt% H_2O) during analysis of the 1994 samples obtained from the tank. The samples from riser 2 were well above the safety screening criteria. The average

moisture content was 28.9%. The large difference in moisture content among the samples from risers 2 and 6 indicates that the moisture content could be highly variable in the waste. Therefore, if it were desired to understand this better, more samples would be needed to define this variability. However, with the low volume of waste present in this tank, added sampling is not recommended at this time.

This low moisture content could be a concern, but because the DSC results and historical tank information did not indicate the presence of excessive fuel, the low moisture is not considered to be a concern. The historical estimate of heat output from the waste is very low, and the tank temperature records show only moderate temperatures thereby further reducing concern.

The potential for criticality is assessed from either total alpha analysis or plutonium analysis. Criticality specifications for single-shell storage tanks are defined in Vail (1994). The safety screening criteria for criticality is 1 g plutonium-239 (^{239}Pu)/L of waste. The highest total alpha result reported for the 1994 samples was 0.123 μCi/g. The average total alpha for the two risers was 0.096 μCi/g. This is very close to the 100 μCi/g transuranic waste definition. Should the waste in tank 241-BX-108 ever be evaluated relative to the waste compatibility criterion (100 μCi/g), then it could be necessary to further explore the precise value. However, because the total alpha analysis includes other alpha emitters, the ^{239}Pu concentration is probably lower than these values which in turn are well below any criticality limit that could be derived from the 1 g ^{239}Pu/L, and this is all that is required by the Safety Screening DQO (Babad et al. 1995).

The flammability of the gas in the headspace of a tank is another safety screening consideration. Analysis of tank headspace has not yet been conducted. When, and if, sampling is completed and the analytical data become available, they will be included in this report.

The 1994 analysis of tank 241-BX-108 does not fully meet all the requirements of the Safety Screening DQO (Babad et al. 1995). The weight percent water results for the riser 6 sample were below the 17% limit, and the RPD for this data was greater than the 10% desired. In addition, no data are available or reported for the vapor space composition. Limited historical and analytical information does not show that the waste composition exceeds the safety criteria for criticality or fuel. Even though the moisture concentration for riser 6 is reported to be below the safety screening limit, the results between the two risers sampled are very different indicating a large waste heterogeneity. Some drying of the sample may have occurred during handling and any drainable liquid would be lost during auger sampling. There is no indication of excessive temperatures or heat generation in the waste based on historical information. Because of these factors, the low moisture content for one of the risers is not considered a safety concern.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The sludge and interstitial liquid in tank 241-BX-108 were sampled and analyzed in 1994. Because the 1994 sampling event was focused only on safety screening criteria, the chemical and radiochemical composition of the waste must be estimated from historical information (Brevick et al. 1994a). This estimate indicates that the waste heat generation rate is low and that there are no expected sources for significant quantities of TOC and cyanide. Based on the historical model, the waste is expected to contain significant quantities of sodium, aluminum, iron, bismuth, silicon, nitrate (NO_3^-), phosphate (PO_4^{-3}), and some fluoride (F^-).

The analysis of tank 241-BX-108 does meet the goal of the safety screening. Moisture content was below the safety/notification limit (17 wt%) for all of the samples from riser 6. The mean moisture content for riser 6 samples was 5.5% with a standard deviation of (the mean) 0.9%. The duplicate analyses RPD for these samples was 24.1% ± 18% and exceeded the desired ± 10% precision. Because the weight percent water for these samples was so low, the large RPD is not significant in evaluating the results against the limit. The moisture content of the samples from riser 2 was 52.3%. The large difference in weight percent water between risers indicates that the waste in the tank is heterogeneous with respect to moisture. Even though some drying of the sample was observed during handling, it is unlikely that it could result in this large of a difference. In addition, photographs of the auger samples clearly show that the riser 6 material is drier. A possible explanation is riser locale because riser 2 is located closer to the cascade inlet and the pump pit while riser 6 is located closer to the cascade outlet. A pool of liquid in the center of the tank has been noted in the latest tank waste surface photo montage, but it is indeterminable if this pool lies below riser 2. No drainable liquid was recovered for the riser 2 sample.

Even though the moisture content was very low for the riser 6 material, no exotherms were observed for these samples or from samples from riser 2. Historical information does not indicate that significant sources of fuel (TOC and/or cyanide) existed for tank 241-BX-108. These historical records also indicate that the heat generation rate and the temperature of the waste are not excessive.

The total alpha results show that the fissile content of the waste is far below the criticality limit (1 g ^{239}Pu/L).

The historical and analytical data for tank 241-BX-108 do not indicate any immediate safety problems. Weight percent water measurements from two risers and visual observations indicate that the waste is heterogeneous with respect to moisture. Because of the limited number of samples and analyses, it is not possible to accurately assess the variability of the waste components. The value of additional sampling at this time is questionable because screening analyses and historical information show no indications of safety problems, and there is only a small amount of waste remaining in the tank.

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7.0 REFERENCES

Agnew, S. F., and T. Brown, 1994, *Waste Status and Transaction Record Summary for the Northeast Quadrant*, WHC-SD-WM-TI-615, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Alstad, A. T., 1991, *Riser Configuration Survey for SSTs*, WHC-SD-RE-TI-053, Rev. 8, Westinghouse Hanford Company, Richland, Washington.

Anderson, J. D., 1990, *A History of the 200 Area Tank Farms*, WHC-MR-0132, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Babad, H., J. W. Hunt, and K. S. Redus, 1995, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Bell, K. E., 1994, *Tank Waste Remediation System Tank Waste Analysis Plan*, WHC-SD-WM-PLN-077, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Brevick, C. H., L. A. Gaddis, and W. W. Pickett, 1994a, *Historical Tank Content Estimate for the Northeast Quadrant of the Hanford 200 East Areas, ICF Kaiser Hanford Company*, WHC-SD-WM-ER-349, Rev. 0, ICF Kaiser Hanford Company, Richland, Washington.

Brevick, C. H., L. A. Gaddis, and E. D. Johnson, 1994b, *Supporting Document for the Northeast Quadrant Hanford Tank Content Estimate for BX Tank Farm*, WHC-SD-WM-ER-311, Rev. 0, ICF Kaiser Hanford Company, Richland, Washington.

Carothers, K. G., 1994, *Data Quality Objectives for the Waste Compatibility Program*, WHC-SD-WM-DQO-001, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Carpenter, B. C., 1994, *Tank 241-BX-108 Tank Characterization Plan*, WHC-SD-WM-TP-222, Westinghouse Hanford Company, Richland, Washington.

Ecology, EPA, and DOE, 1994, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Frye, J. M., 1994a, *Determination of Weight Loss as Percent Water by Thermogravimetric Analysis (TGA) - Mettler[1] TG 50*, LA-560-112, Rev. A-2, Westinghouse Hanford Company, Richland, Washington.

Frye, J. M., 1994b, *Differential Scanning Calorimetry (DSC)*, LA-514-113, Rev. B-1, Westinghouse Hanford Company, Richland, Washington.

Hanlon, B. L., 1995, *Waste Tank Summary for Month Ending March 31, 1995*, WHC-EP-0182-84, Westinghouse Hanford Company, Richland, Washington.

Kocher, K. L., 1994, *Single-Shell Tank Waste Characterization for Tank 241-BX-108*, WHC-SD-WM-DP-072, Westinghouse Hanford Company, Richland, Washington.

Kupfer, M. J., 1994, *Pretreatment Interim Data Quality Objectives for Waste Pretreatment and Vitrification*, WHC-SD-WM-DQO-011, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Meacham, J. E., R. J. Cash, G. T. Dukelow, H. Babad, J. W. Buck, C. M. Anderson, B. A. Pulsipher, J. J. Toth, and P. J. Turner, 1994, *Data Requirements for the Ferrocyanide Safety Issue Developed through the Data Quality Objective Process*, WHC-SD-WM-DQO-007, Westinghouse Hanford Company, Richland, Washington.

Postma, A. K., J. E. Meacham, G. S. Barney, G. L. Borsheim, R. J. Cash, M. D. Crippen, D. R. Dickenson, J. M. Grigsby, D. W. Jeppson, M. Kummerer, J. M. McLaren, C. S. Simmons, and B. C. Simpson, 1994, *Ferrocyanide Safety Program: Safety Criteria for Ferrocyanide Watch List Tanks*, WHC-EP-0691, Westinghouse Hanford Company, Richland, Washington.

RHO, 1986, *Piping Waste Tank Isolation 241-BX-108*, drawing H-2-73311, Rev. 3, Rockwell Hanford Operations, Richland, Washington.

Simpson, B. C., D. S. De Lorenzo, A. T. DiCenso, D. B. Hiller, K. W. Johnson, J. H. Rutherford, and D. J. Smith, 1994, *Tank Characterization Reference Guide*, WHC-SD-WM-TI-648, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Toth, J. J., P. G. Heasler, M. E. Lerchen, J. G. Hill, and P. D. Whitney, 1995, *Analysis of Organic Carbon and Moisture in Hanford Single-Shell Tank Waste*, PNL-10360, Pacific Northwest Laboratory, Richland, Washington.

Vail, T. S., 1994, *Single-Shell Waste Storage Tanks and Associated Equipment*, CPS-T-149-00011, Rev. A10, Westinghouse Hanford Company, Richland, Washington.

8.0 BIBLIOGRAPHY

Agnew, S. F., 1994, *Hanford Defined Wastes: Chemical and Radionuclide Compositions*, LAUR-94-2657, Los Alamos National Laboratory, Los Alamos, New Mexico.

Agnew, S. F., P. Baca, R. Corbin, K. Jurgenson, and B. Young, 1994, *Tank Layer Model (TLM), Rev. 1, for Northeast, Southwest, and Northwest Quadrants*, LA-UR-94-4269, Los Alamos National Laboratory, Los Alamos, New Mexico.

Conway, J. T., 1993, *DNFSB Recommendation 93-5 to the Secretary of Energy* (letter 9400070 to H. R. O'Leary, July 19), Defense Nuclear Safety Board, Washington, D.C.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

Welty, R. K., 1988, *Waste Storage Tank Status and Leak Detection Criteria*, WHC-SD-WM-TI-356, vols. 1 and 2, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A

ANALYTICAL PROCEDURES

SINGLE-SHELL TANK 241-BX-108

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APPENDIX A

ANALYTICAL PROCEDURES
SINGLE-SHELL TANK 241-BX-108

Table A-1 contains the procedure number for each of the analytical methods performed on the tank 241-BX-108 waste. All analyses were performed at the Westinghouse Hanford Company 222-S Laboratory.

Table A-1. Analytical Methods.

Analyte	Digestion	Procedure number
Thermogravimetric analysis	N/A	LA-560-112[1]
Differential scanning calorimetry	N/A	LA-514-113[2]
Total alpha	Fusion	LA-508-101[3]

[1]Frye, J. M., 1994a, *Determination of Weight Loss as Percent Water by Thermogravimetric Analysis (TGA) - Mettler[1] TG 50*, LA-560-112, Rev. A-2, Westinghouse Hanford Company, Richland, Washington.

[2]Frye, J. M., 1994b, *Differential Scanning Calorimetry (DSC)*, LA-514-113, Rev. B-1, Westinghouse Hanford Company, Richland, Washington.

[3]Fitzgerald, S. L., 1994, *Alpha and Beta in Liquid Samples*, LA-508-101, Rev. D-2, Westinghouse Hanford Company, Richland, Washington.

N/A = Not applicable

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APPENDIX B

DIFFERENTIAL SCANNING CALORIMETRY AND THERMOGRAVIMETRIC ANALYSIS SCANS FOR 1994 SAMPLE ANALYSES OF TANK 241-BX-108

(The data contained in this Appendix were excerpted from WHC-SD-WM-DP-072[1])

[1]Kocher, K. L., 1994, *Single-Shell Tank Waste Characterization for Tank 241-BX-108*, WHC-SD-WM-DP-072, Westinghouse Hanford Company, Richland, Washington.

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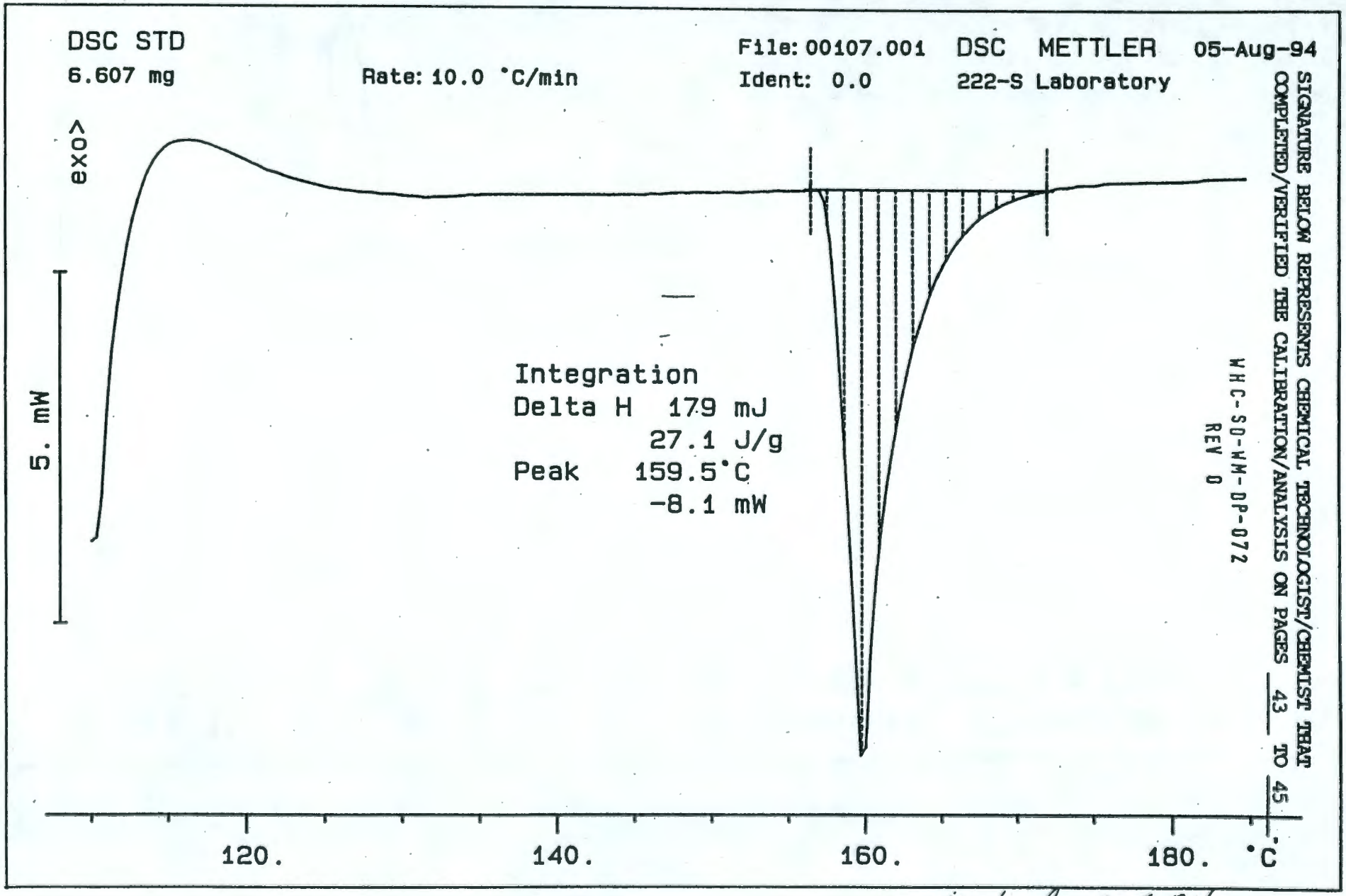

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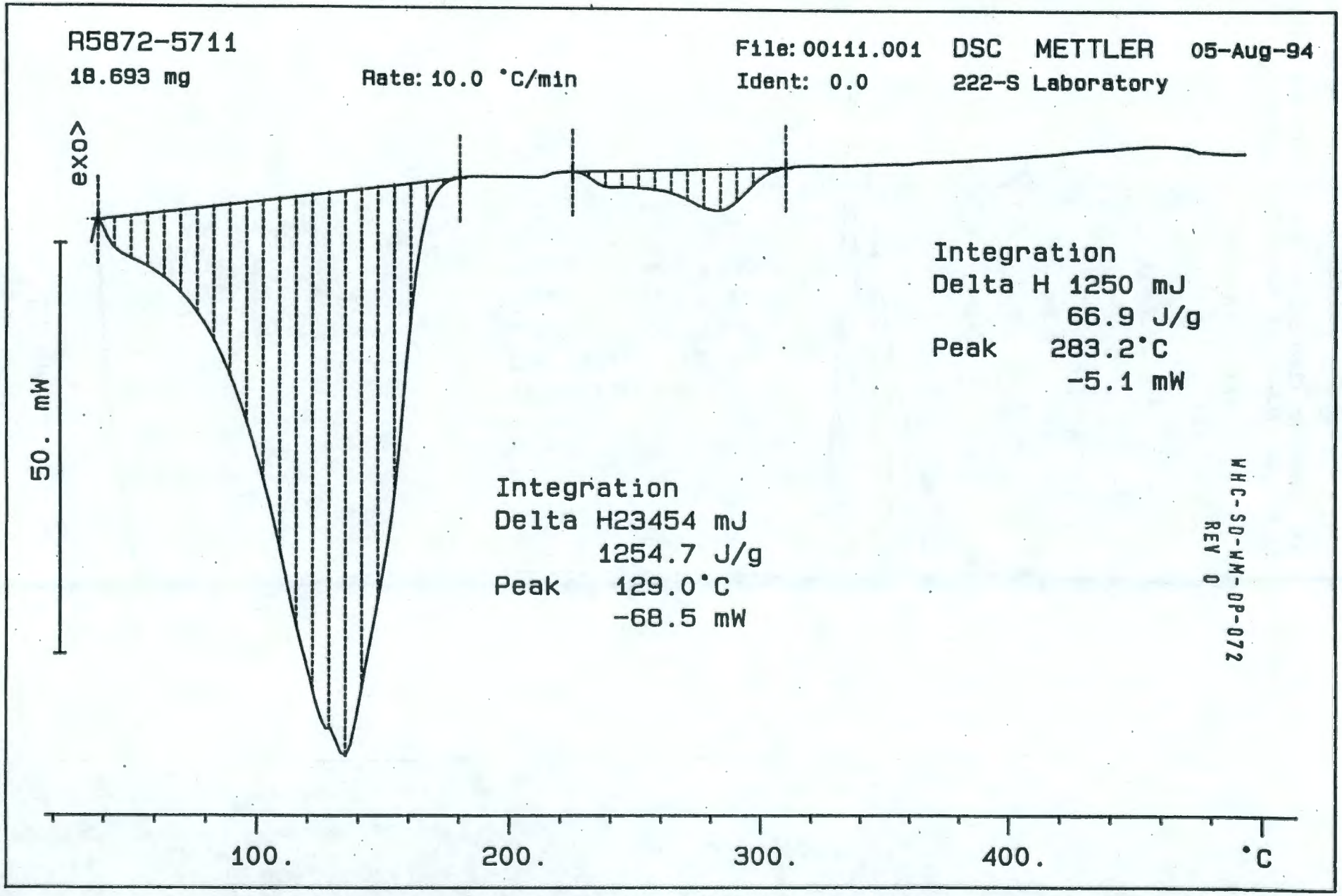
K L Vogel 8-7-94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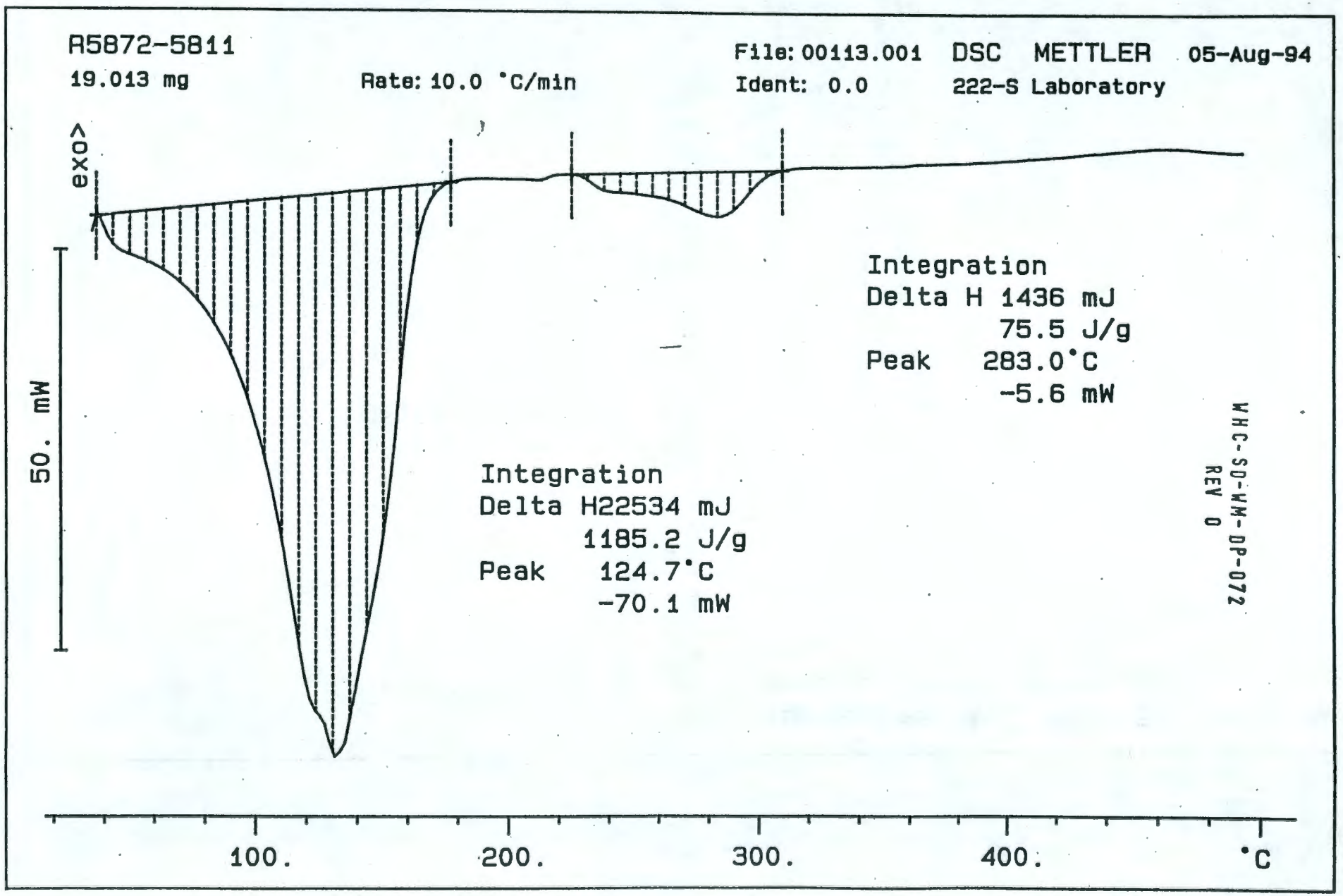

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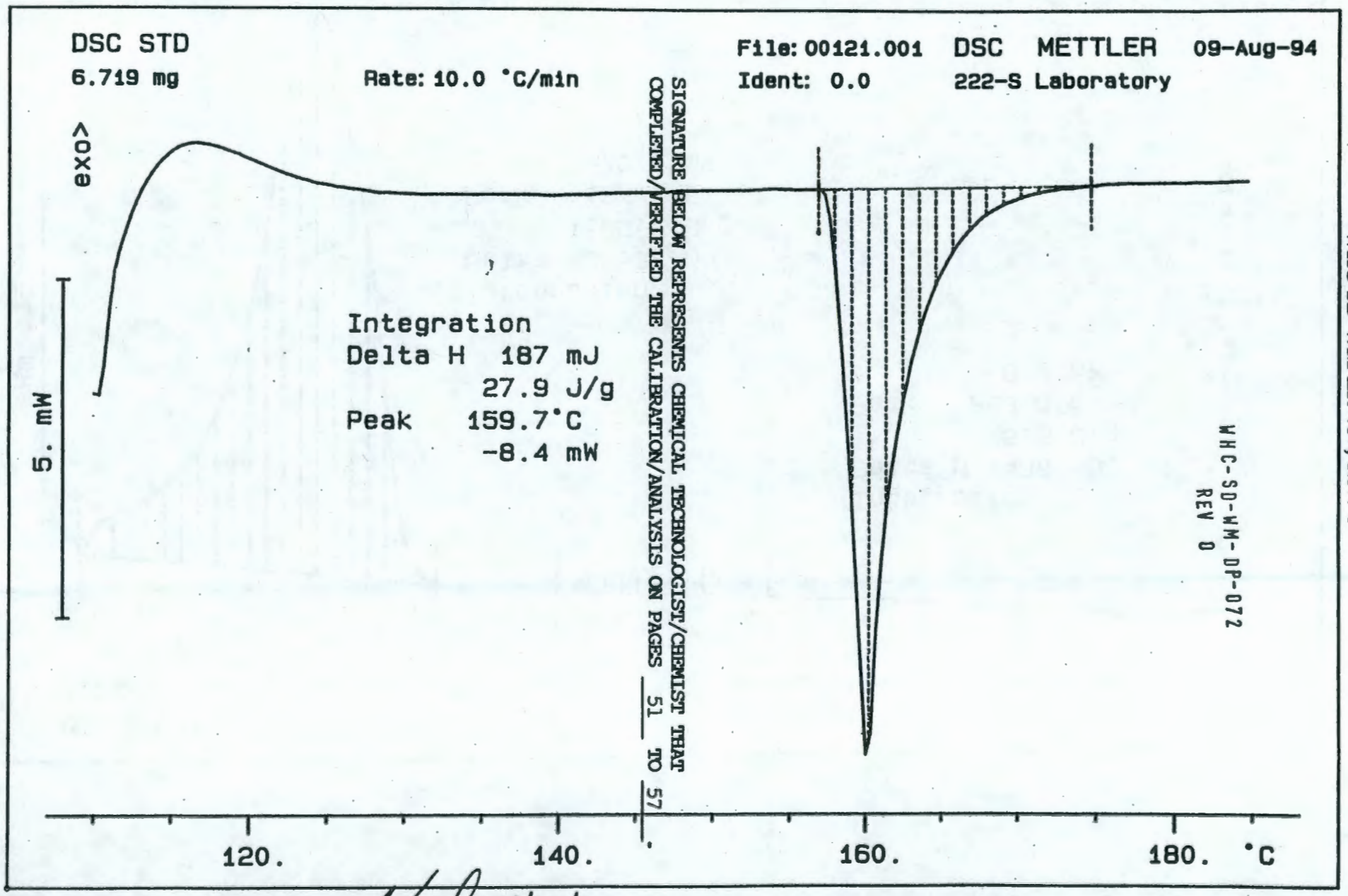

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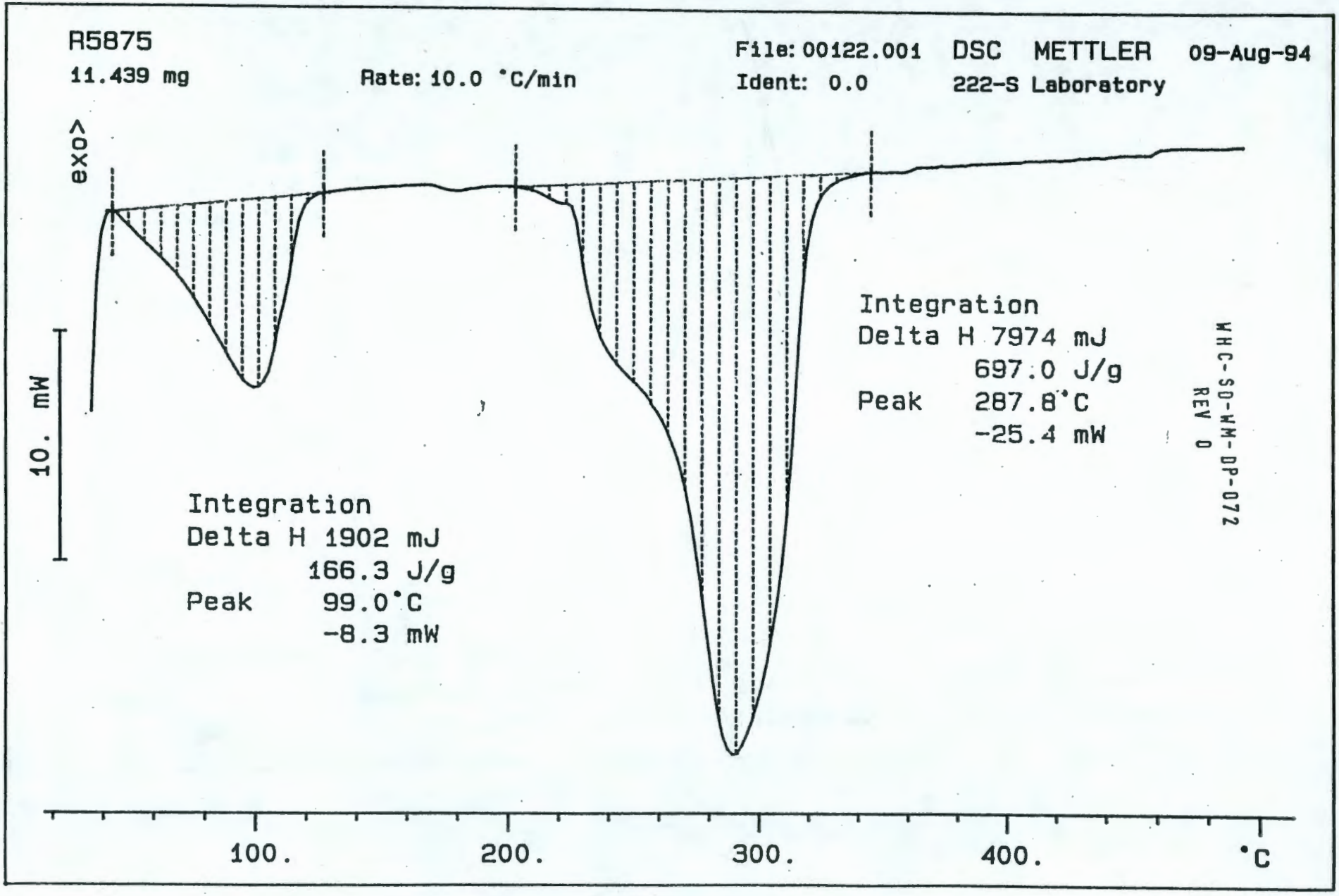
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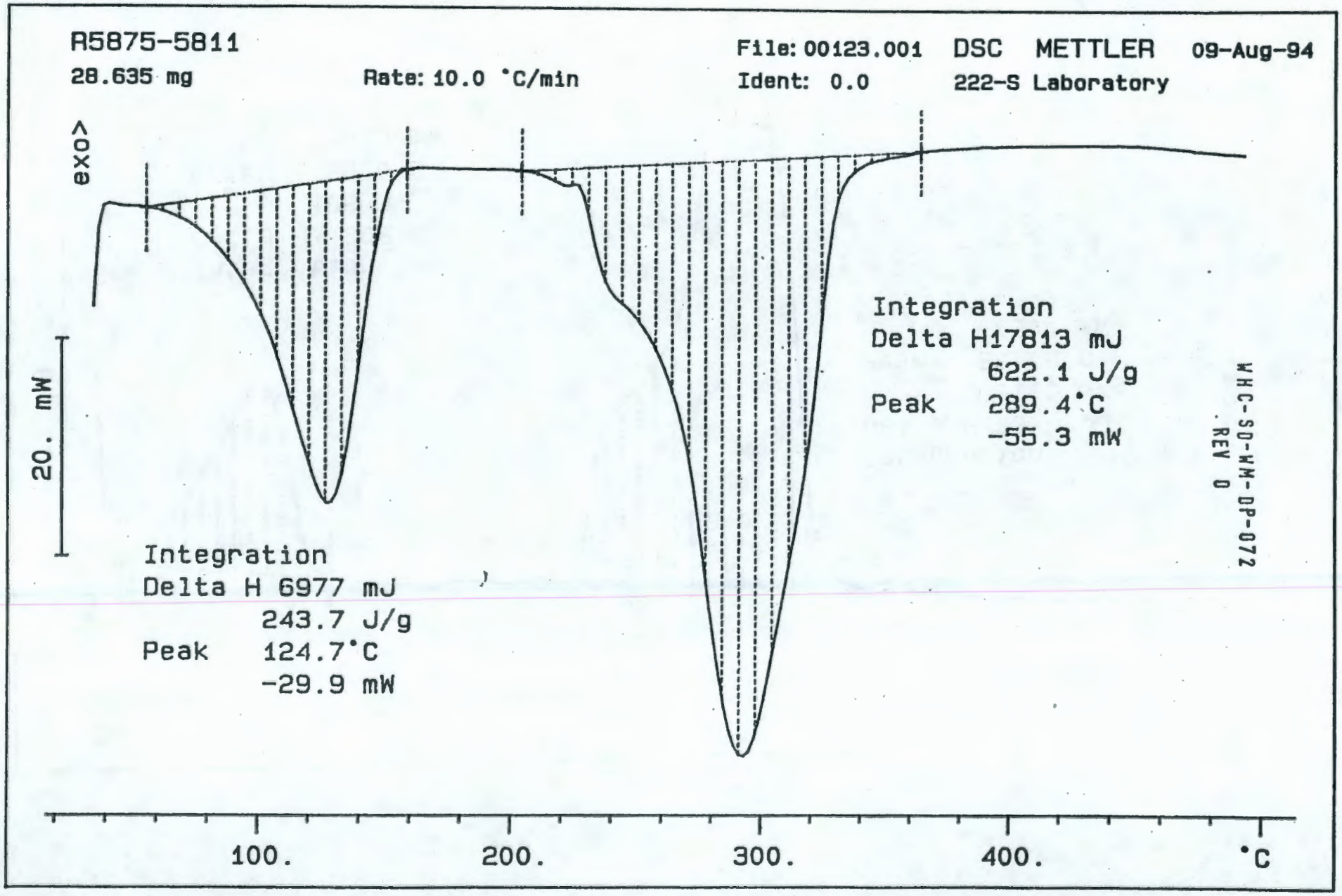

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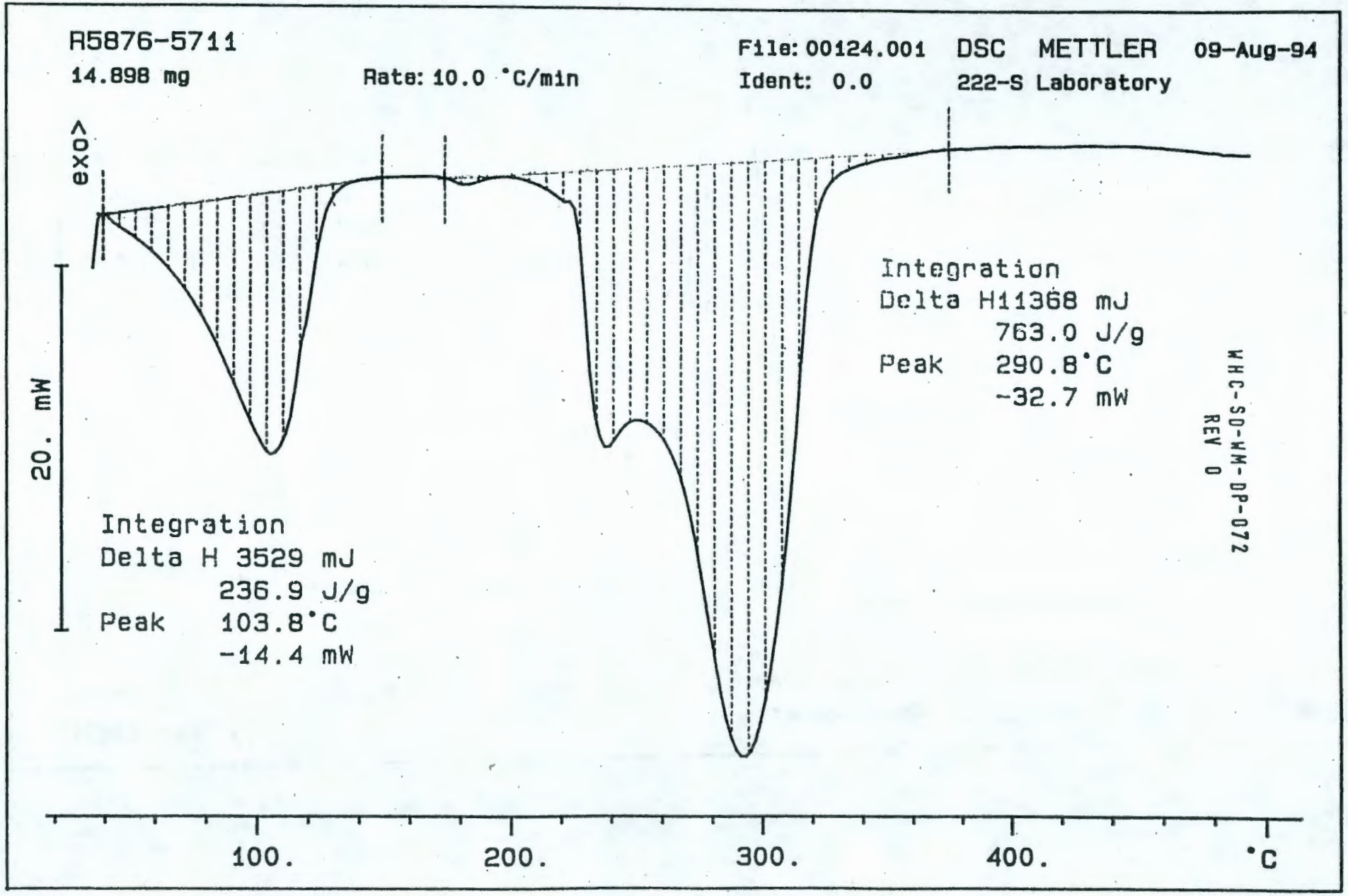
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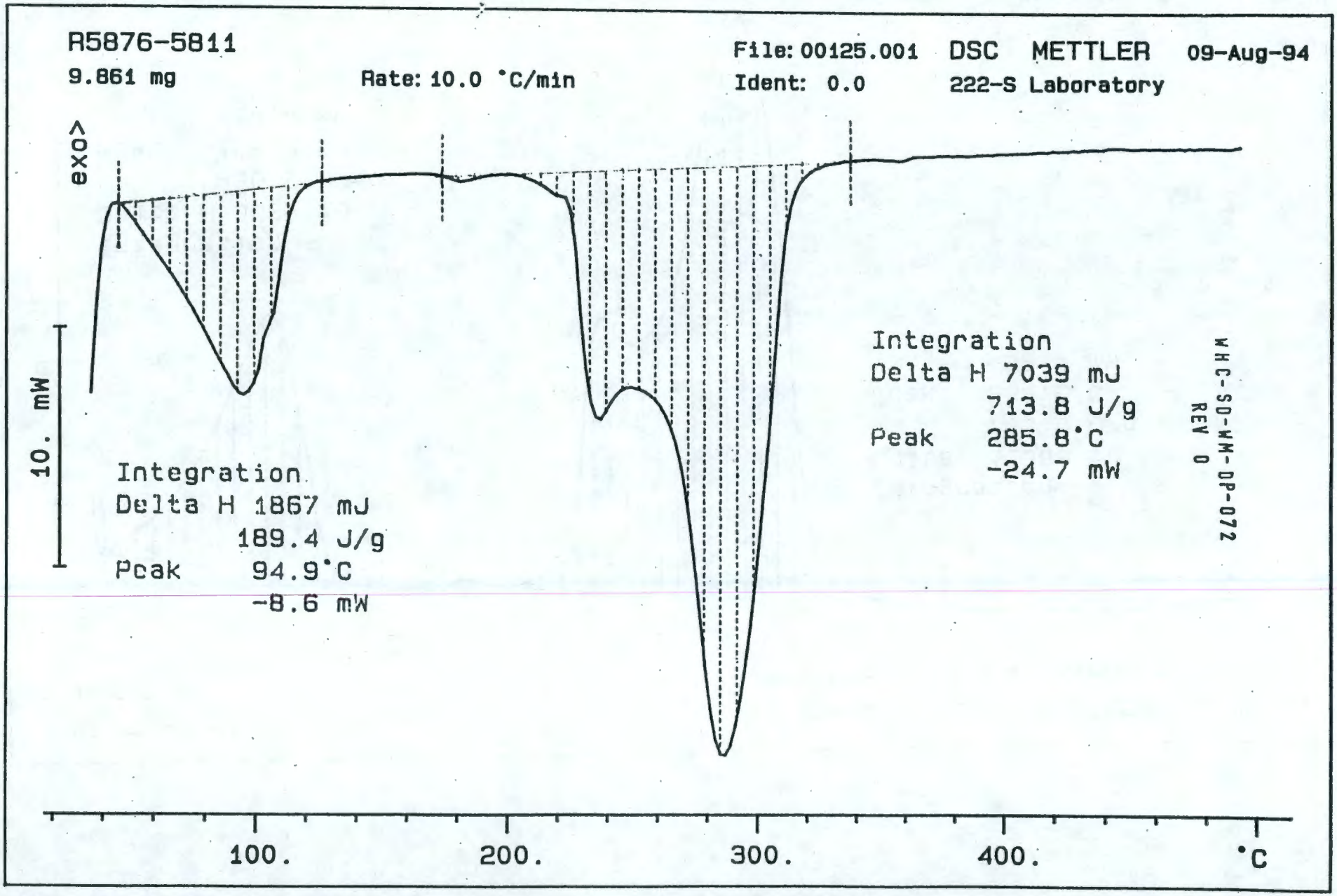
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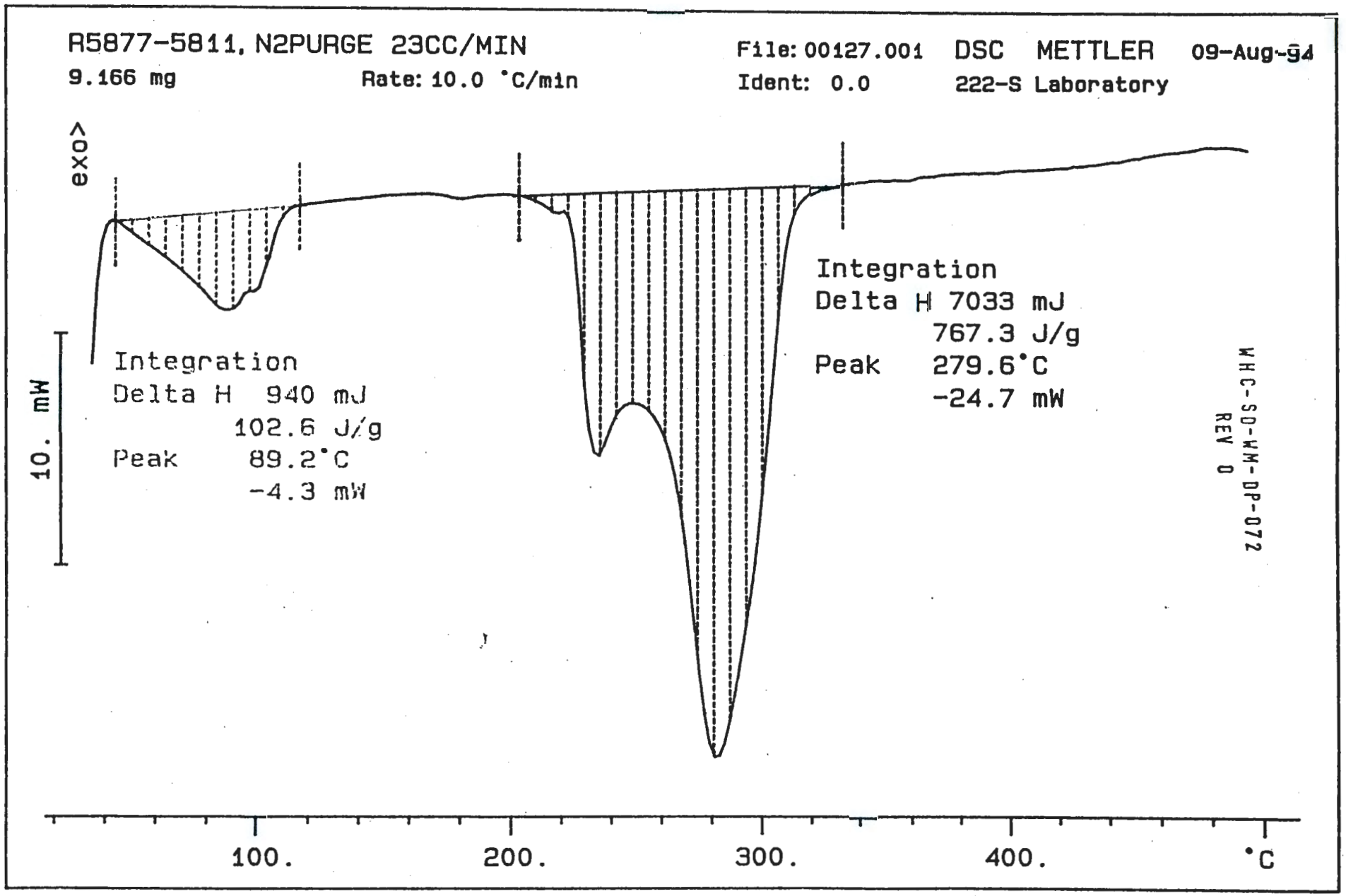
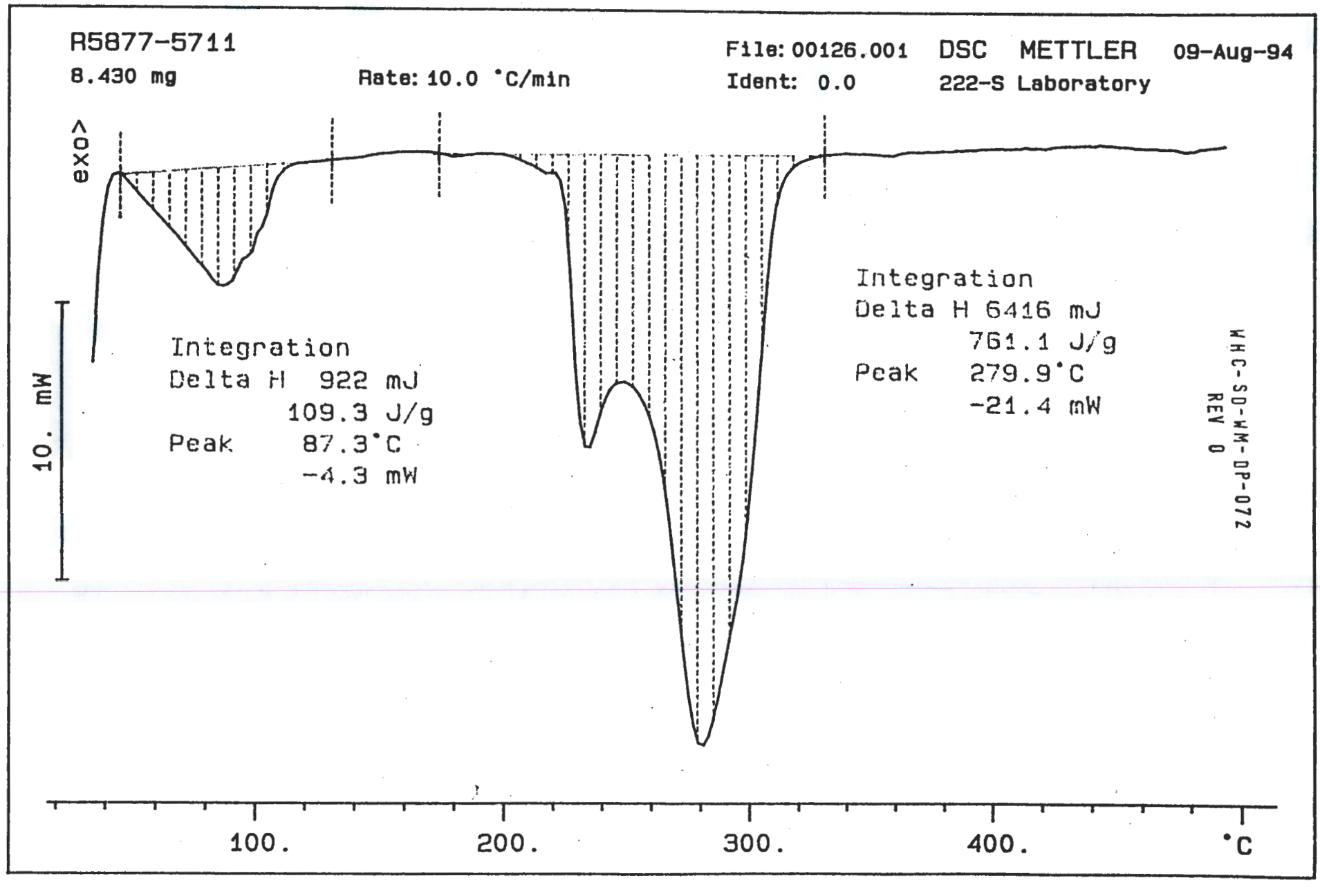
100.
200.
300.
400.
°C


R5877-5811, N2PURGE 23CC/MIN
9.166 mg
Rate: 10.0 °C/min
File: 00127.001
Ident: 0.0
DSC METTLER
222-S Laboratory
09-Aug-94
exo>
10. mW
Integration
Delta H 940 mJ
102.6 J/g
Peak 89.2°C
-4.3 mW
Integration
Delta H 7033 mJ
767.3 J/g
Peak 279.6°C
-24.7 mW
WHC-SD-WM-DP-072
REV 0
100.
200.
300.
400.
°C



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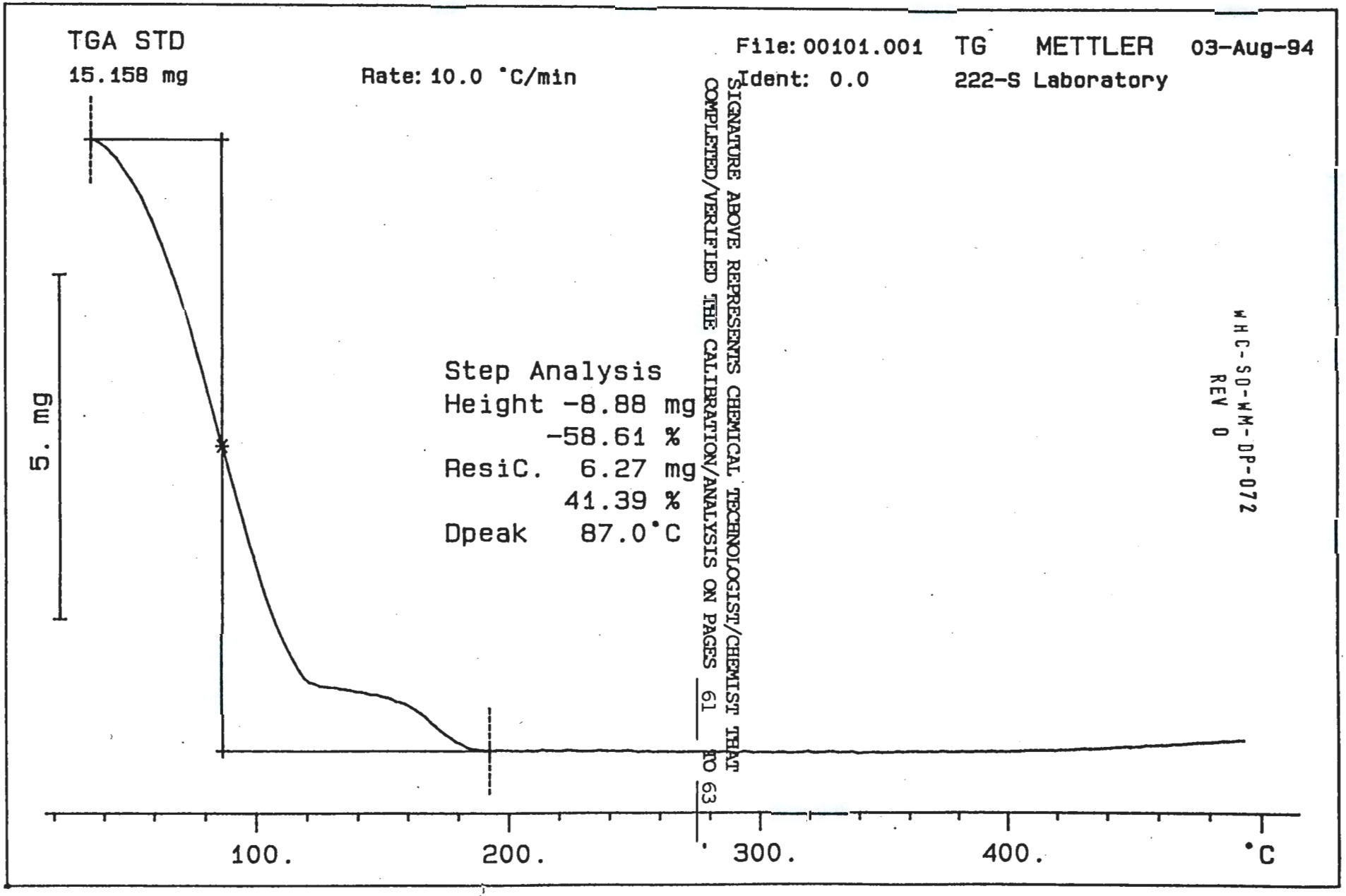
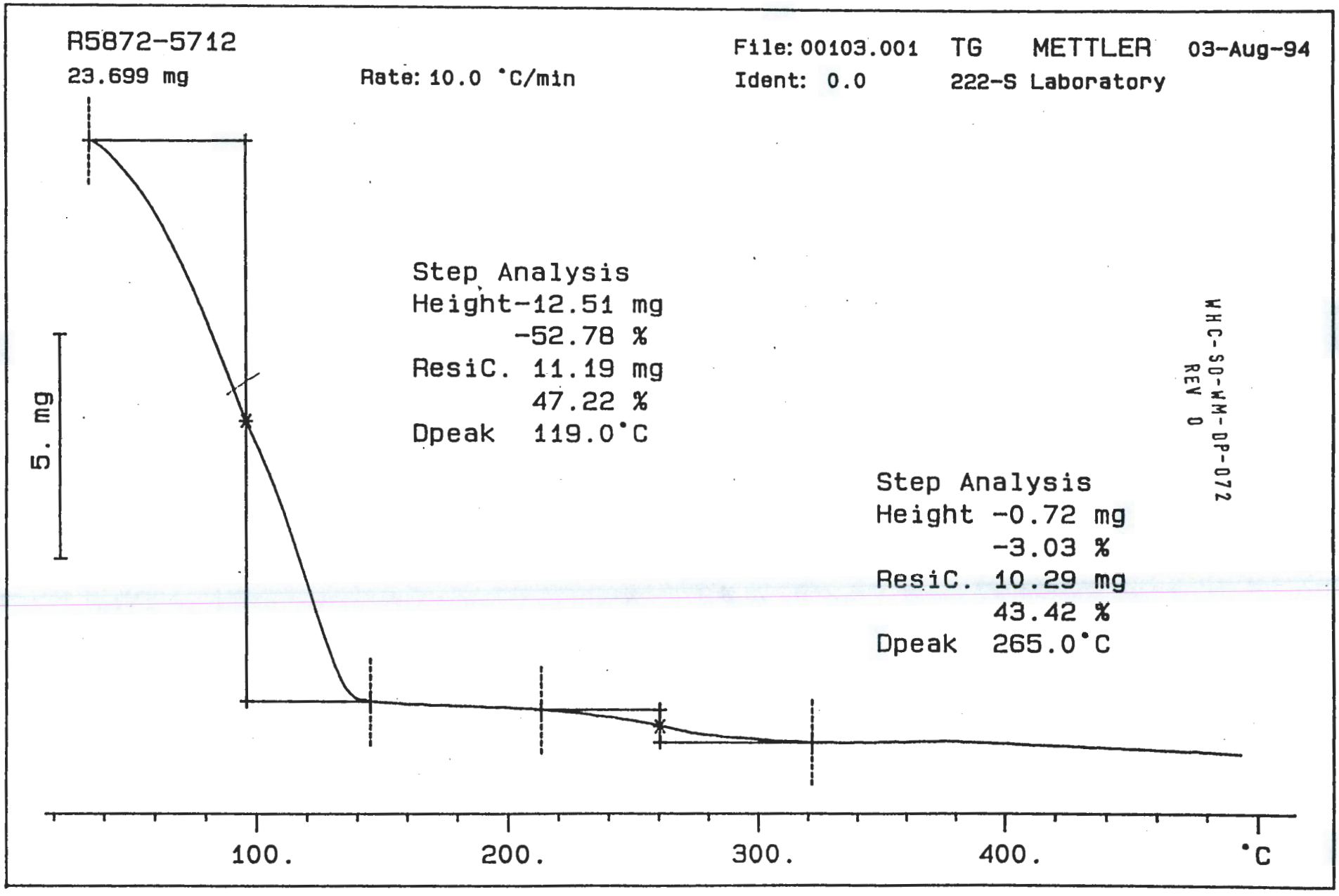


SIGNATURE ABOVE REPRESENTS CHEMICAL TECHNOLOGIST/CHEMIST THAT COMPLETED/VERIFIED THE CALIBRATION/ANALYSIS ON PAGES 61 TO 63

WHC-SD-WM-DP-072
REV 0

KLVarel 8/6/94



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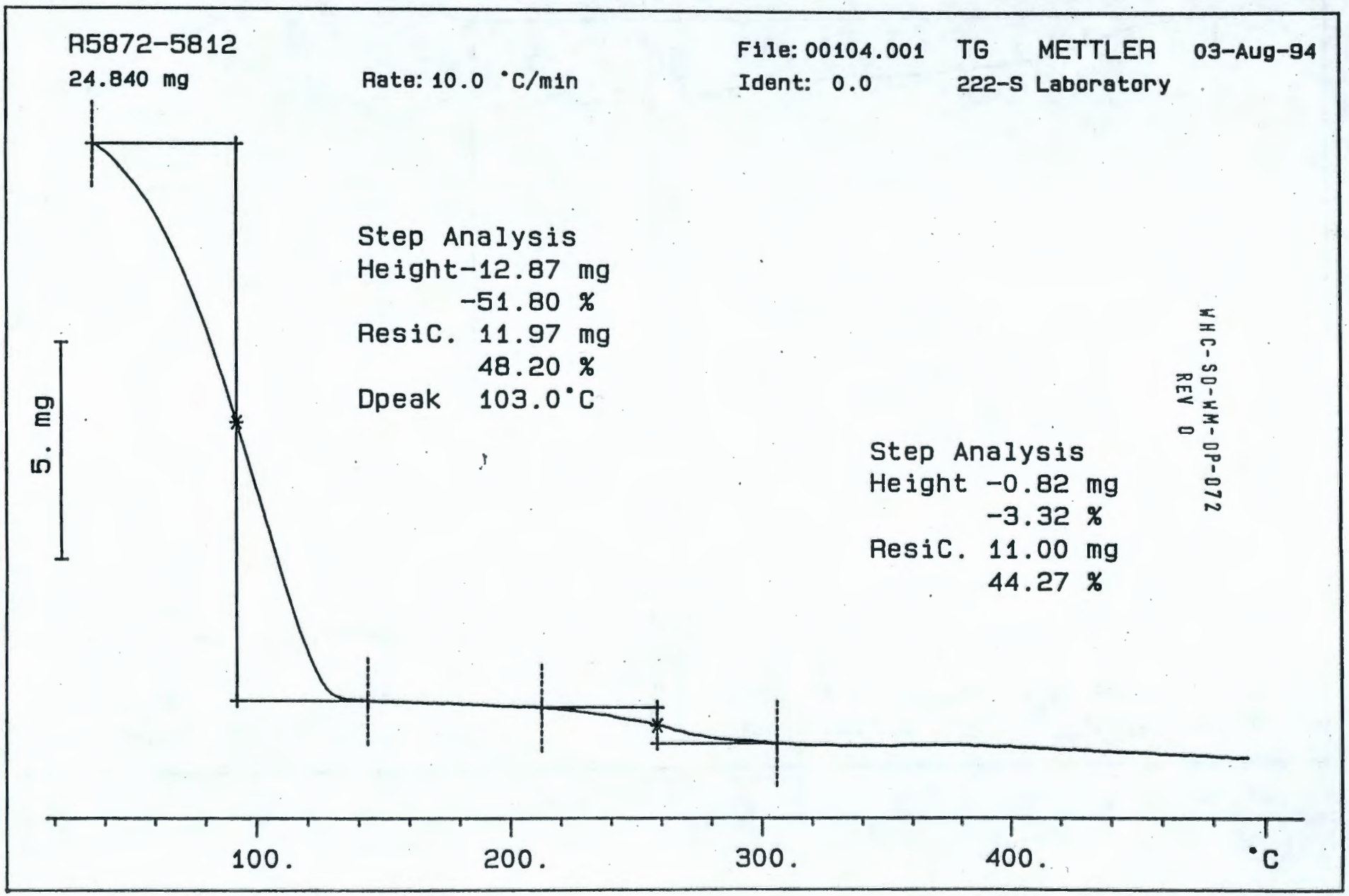
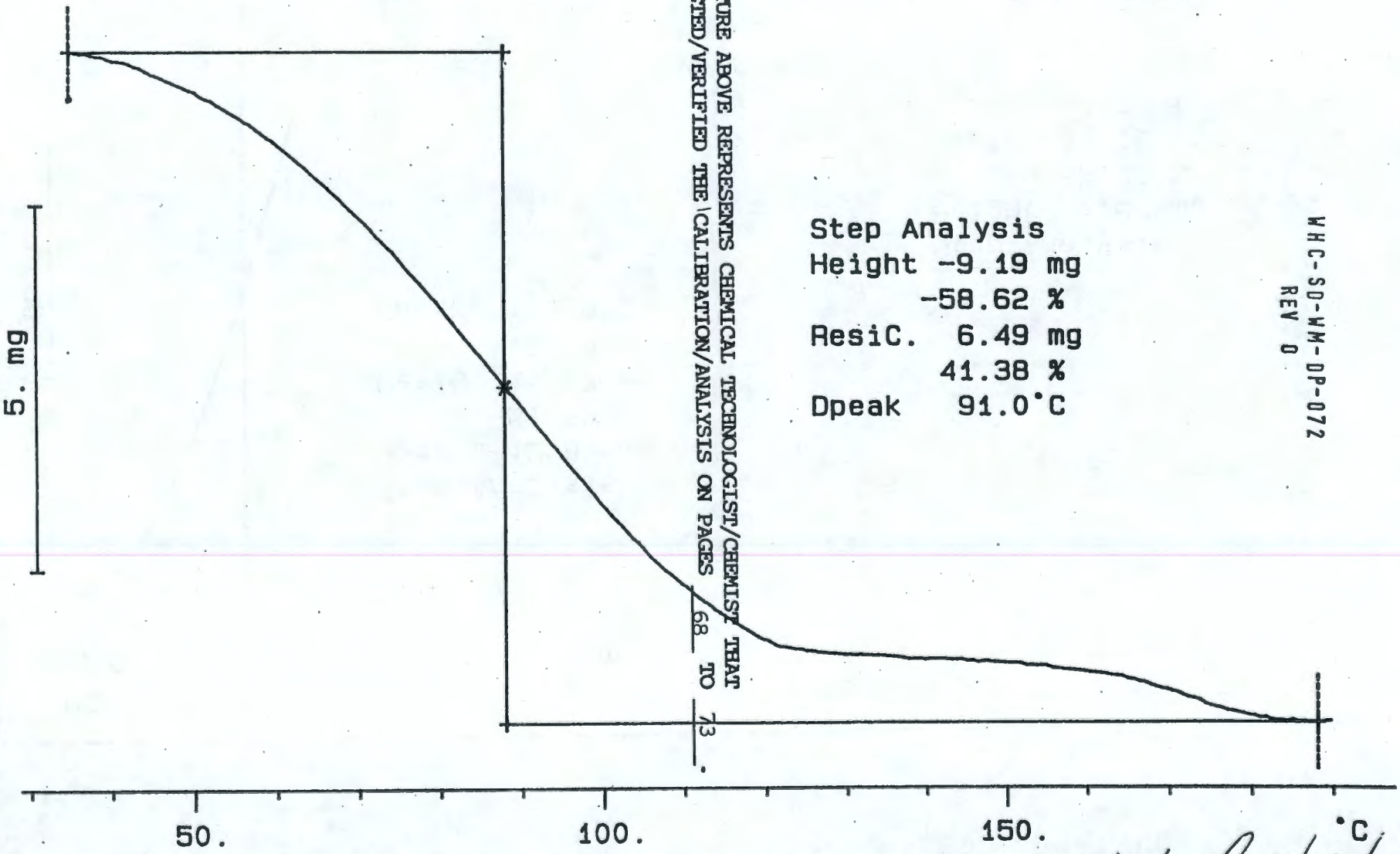


WHC-SD-WM-DP-072
REV 0

TGA STD
15.686 mg

Rate: 10.0 °C/min

File: 00129.001 TG METTLER 16-Aug-94
Ident: 0.0 222-S Laboratory



Step Analysis
Height -9.19 mg
-58.62 %
ResiC. 6.49 mg
41.38 %
Dpeak 91.0°C

WHC-SD-WM-DP-072
REV 0

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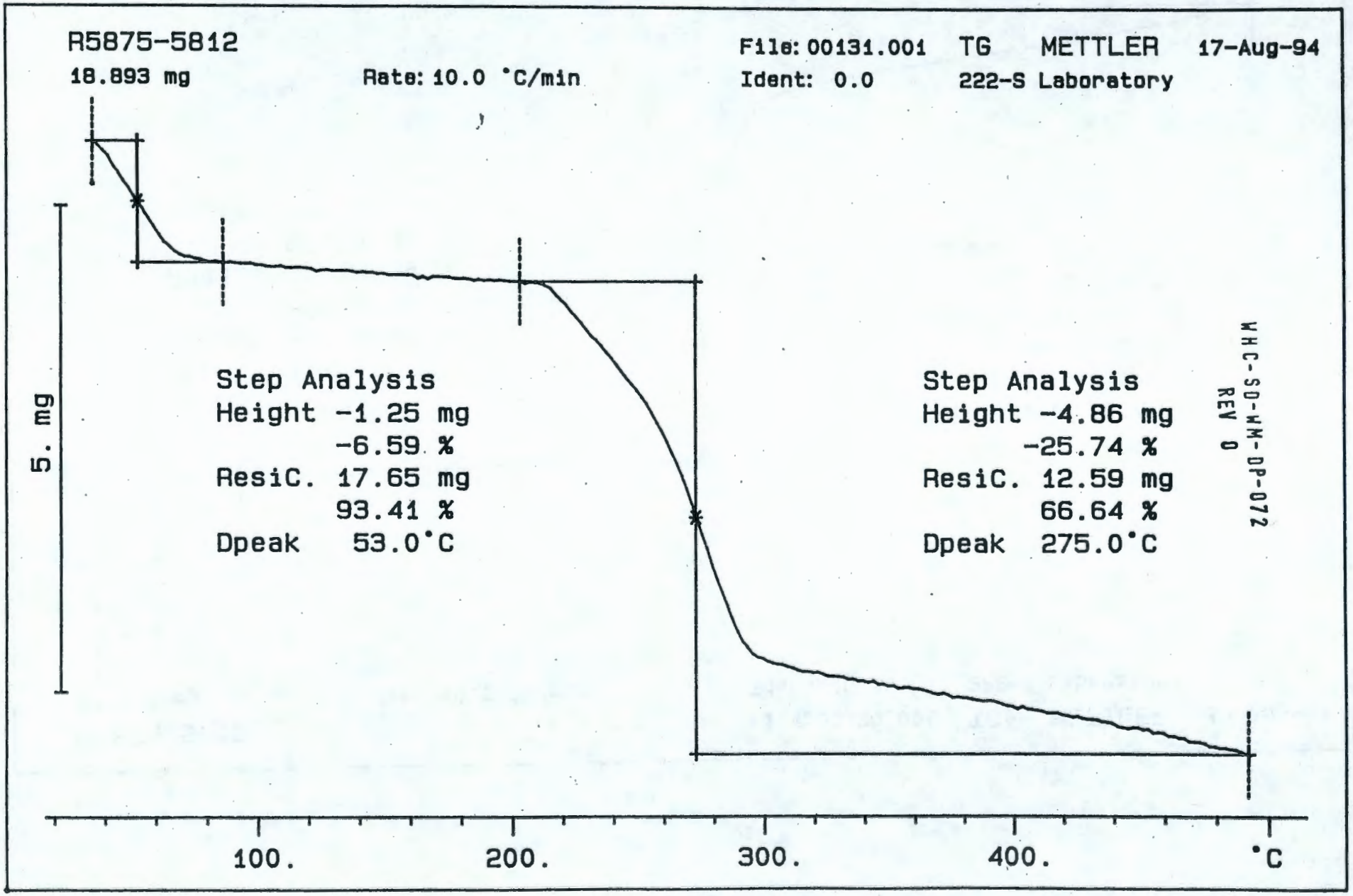
Kelbzel 8/18/94



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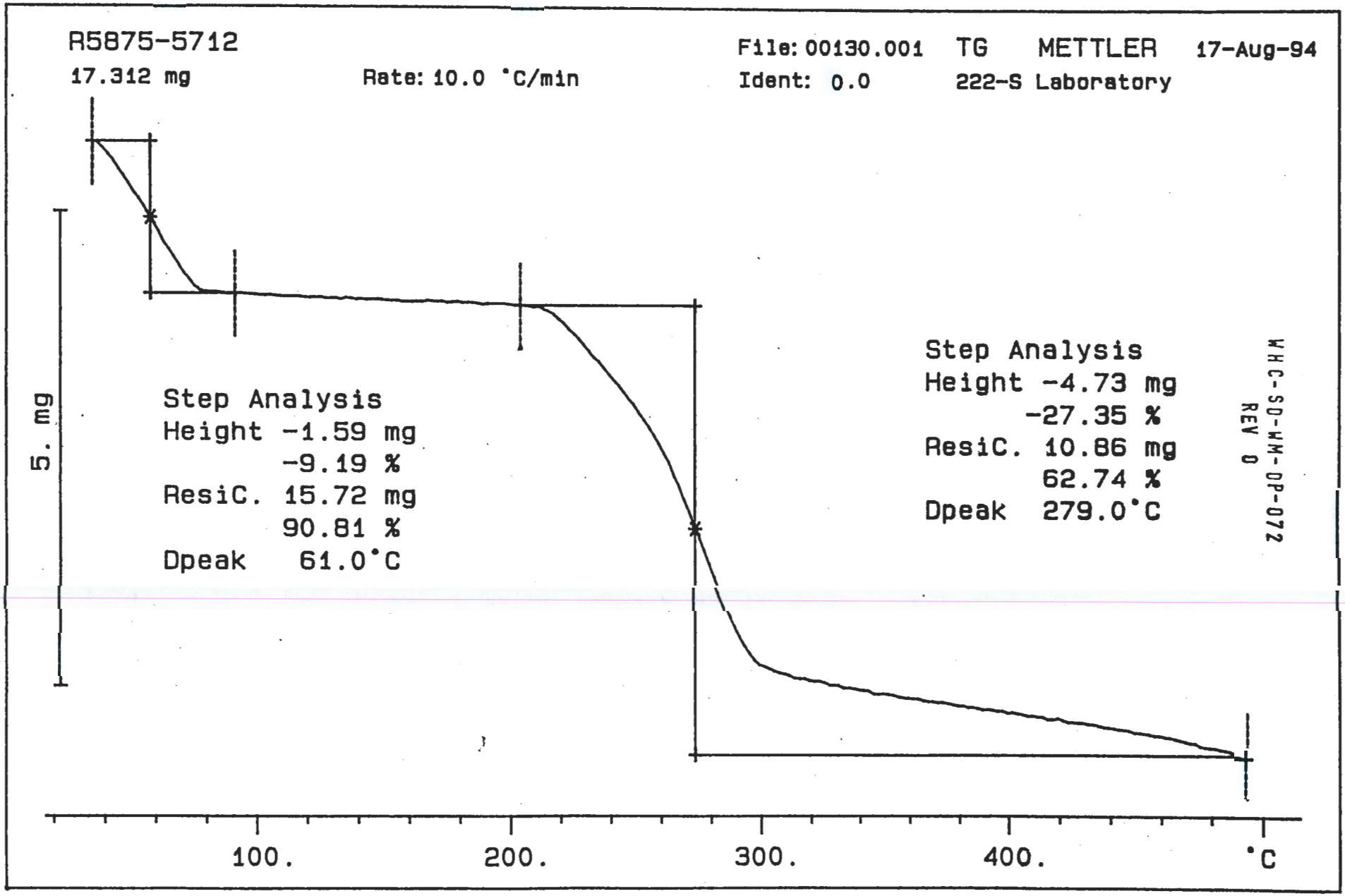
REV 0



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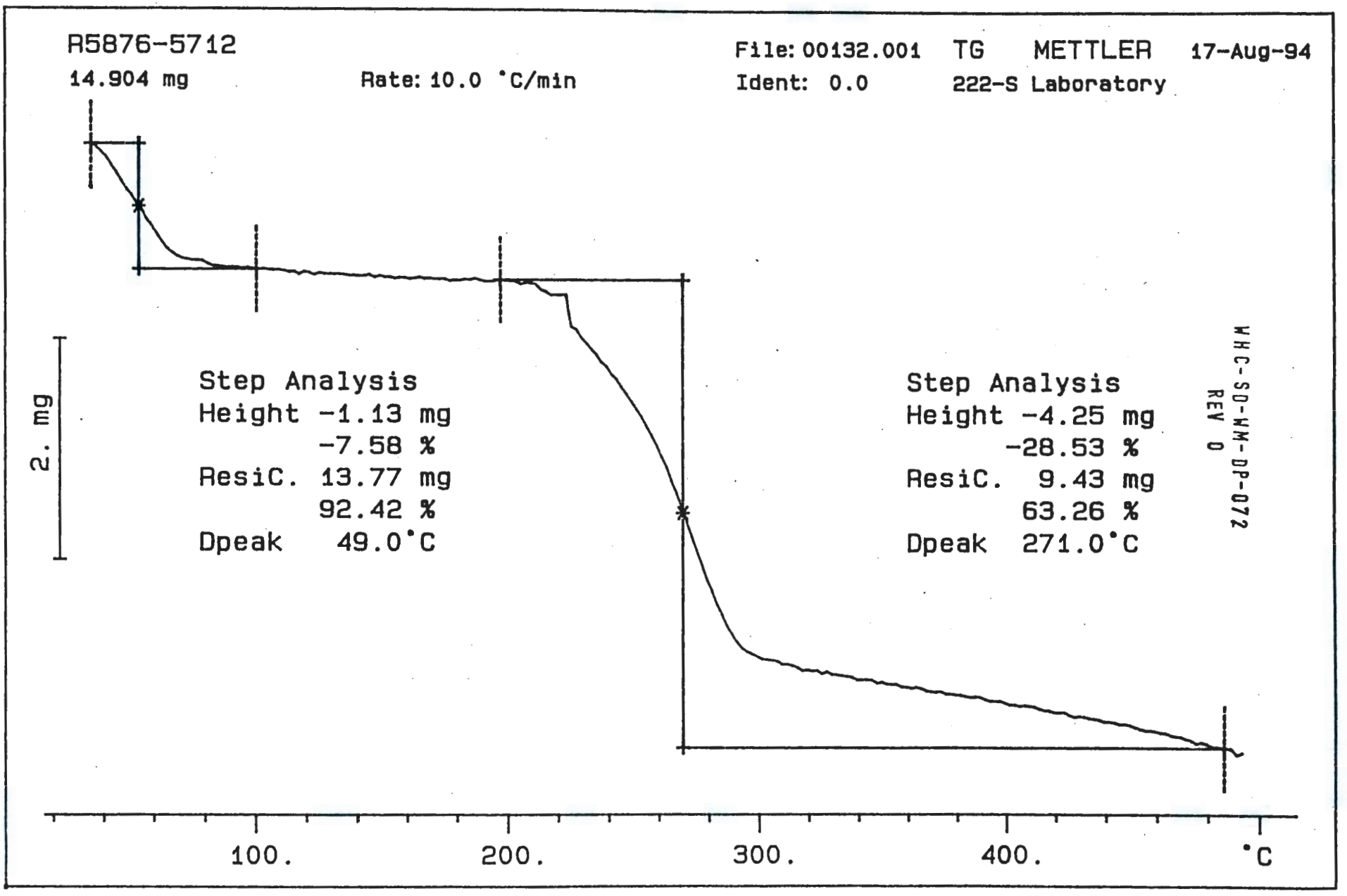
REV 0



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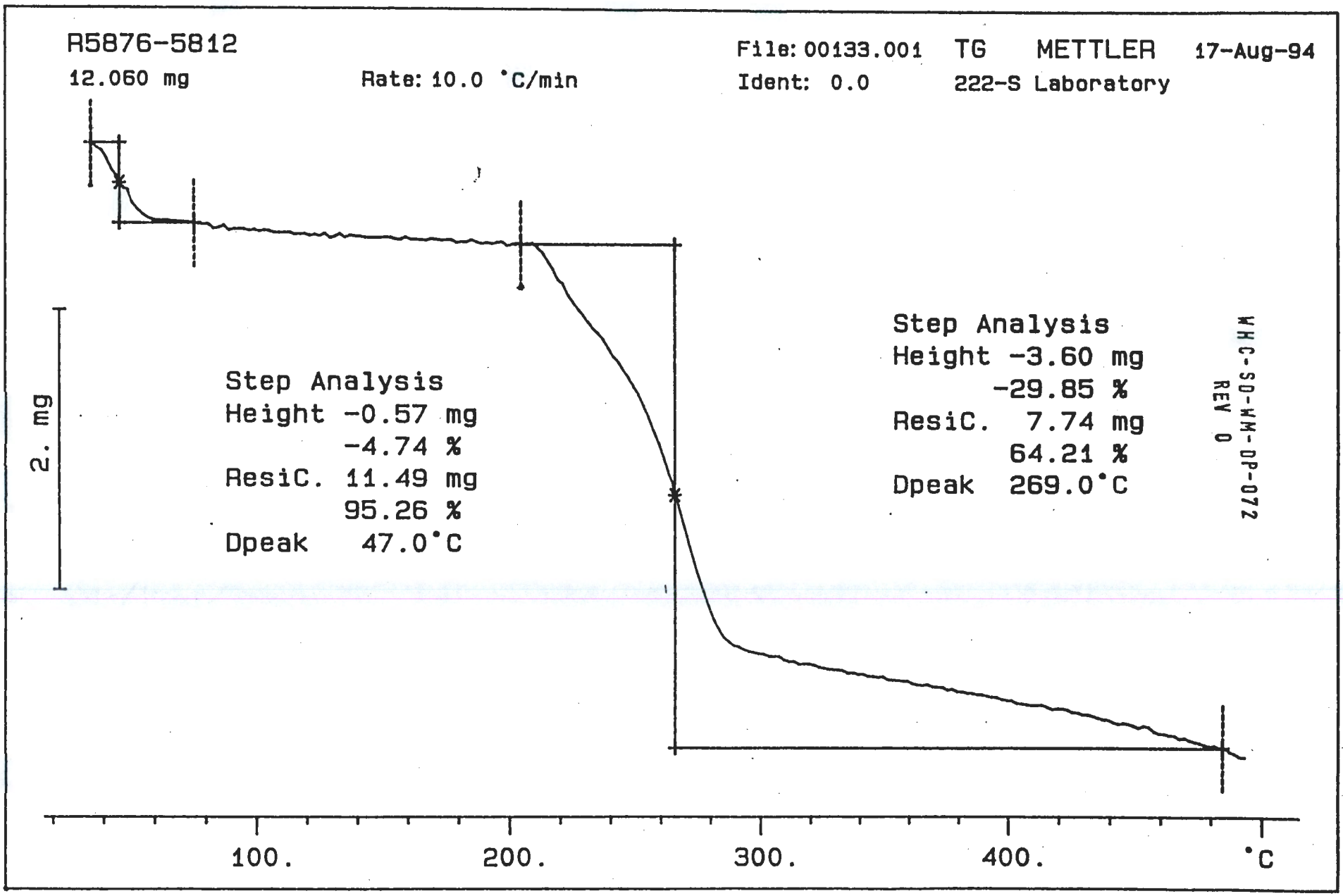

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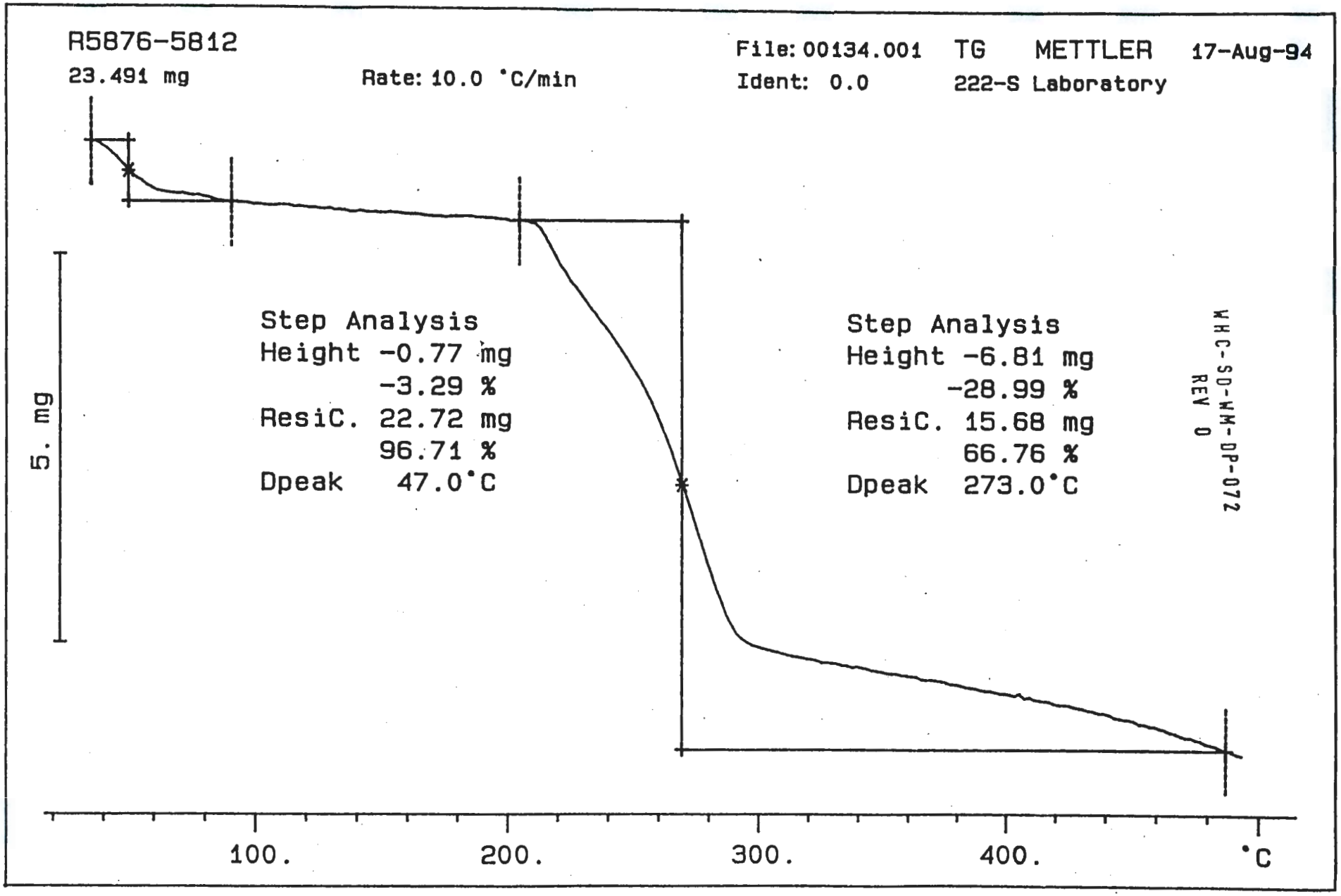

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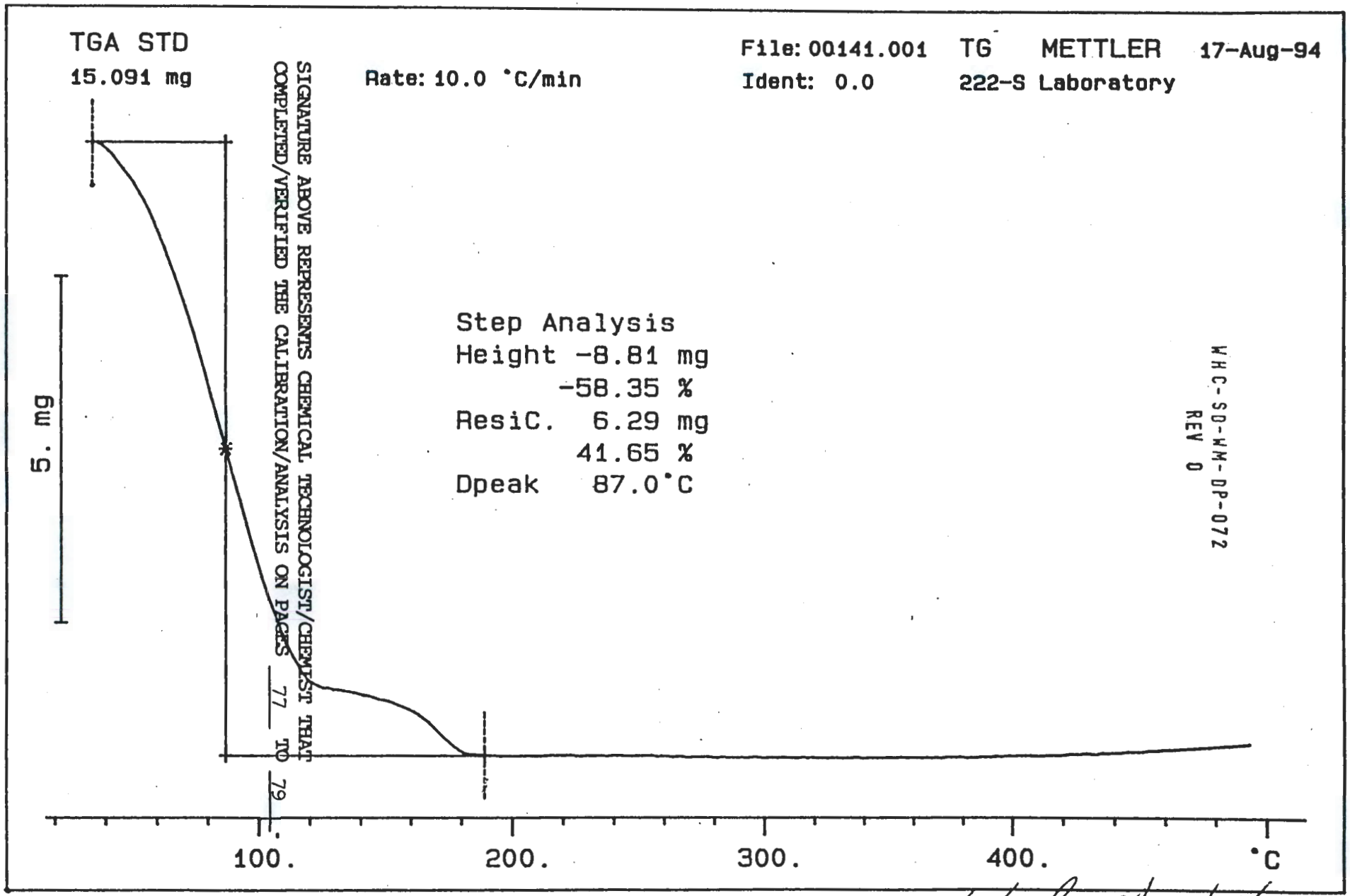

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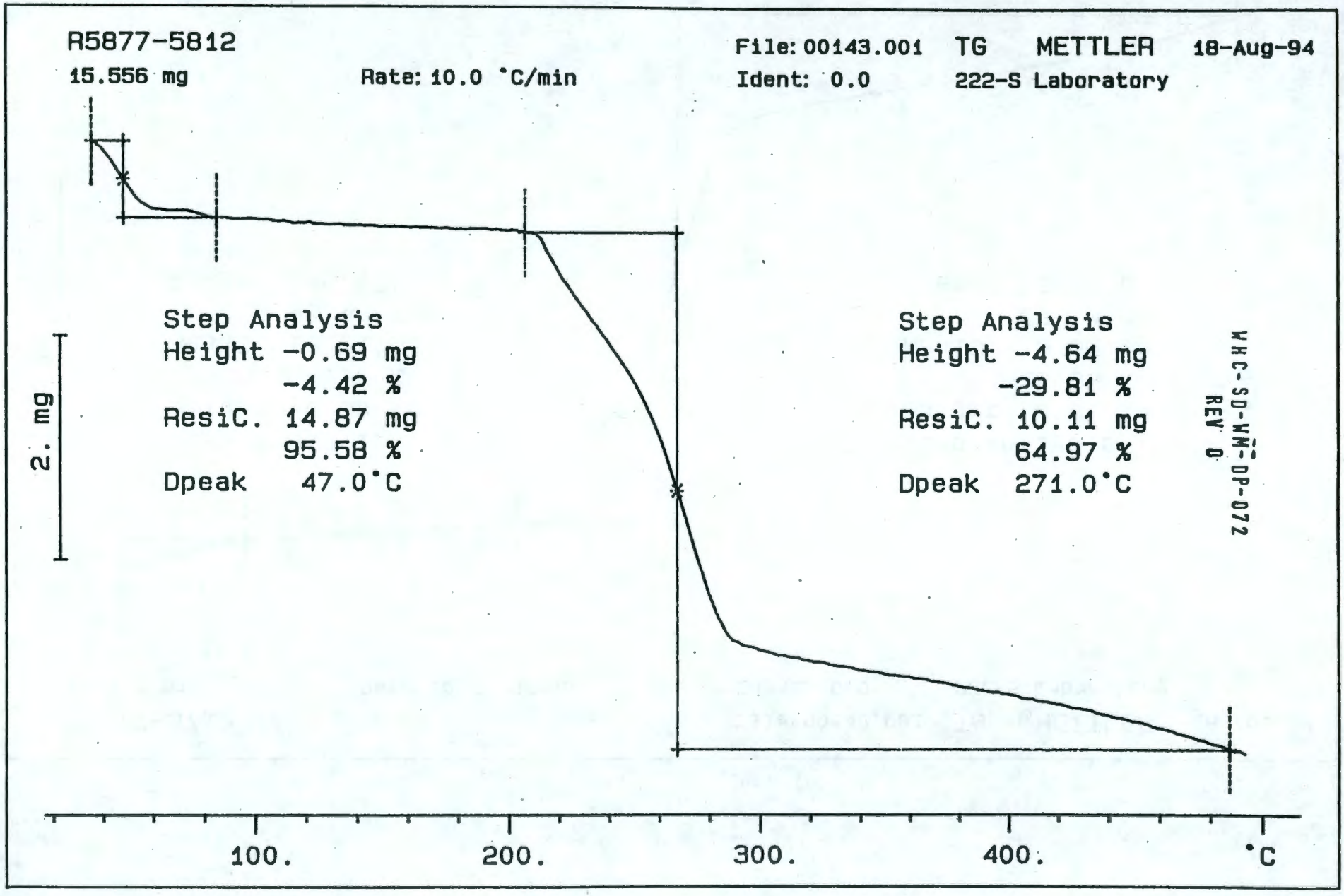
WHC-SD-WM-DP-072
REV 0

K. Vogel 8/19/94



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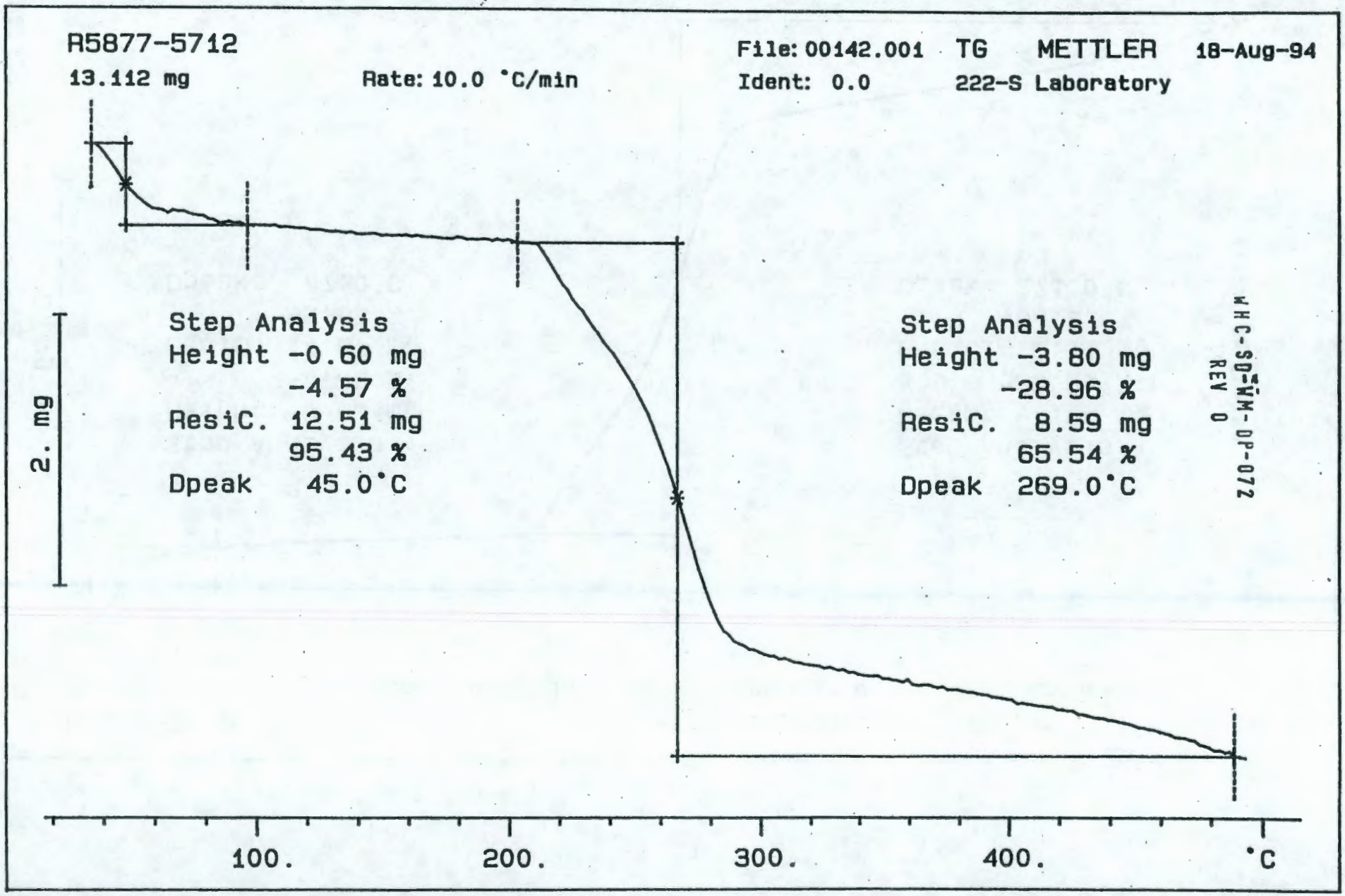

WHC-SD-WM-DP-072
REV 0

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OFFSITE					
Sandia National Laboratory P.O. Box 5800 MS-0744, Dept. 6404 Albuquerque, New Mexico 87815					
D. Powers		X			
Nuclear Consulting Services Inc. P.O. Box 29151 Columbus, Ohio 43229-01051					
J. L. Kovach		X			
Chemical Reaction Sub-TAP 202 Northridge Court Lindsborg, Kansas 67456					
B. C. Hudson		X			
Tank Characterization Panel Senior Technical Consultant Contech 6301 Indian School Road N.W., Suite 614 Albuquerque, New Mexico 87110					
J. Arvisu		X			
U.S. Department of Energy - Headquarters Office of Environmental Restoration and Waste Management (EM-563) 12800 Middlebrook Road Germantown, Maryland 20874					
K. T. Lang		X			
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Science Applications International Corporation 20300 Century Boulevard, Suite 200-B Germantown, Maryland 20874					
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Los Alamos National Laboratory CST-14 MS-J586 P.O. Box 1663 Los Alamos, New Mexico 87545					
S. F. Agnew (6)		X			
Los Alamos Technical Associates 750 Swift Boulevard, Suite 4 Richland, Washington 99352					
T. T. Tran		X			
Ogden Environmental 101 East Wellsian Way Richland, Washington 99352					
R. J. Anema		X			
CH2M Hill Incorporated P.O. Box 91500 Bellevue, Washington 98009-2050					
M. McAfee		X			
Tank Advisory Panel 102 Windham Road Oak Ridge, Tennessee 37830					
D. O. Campbell		X			
ONSITE					
U.S. Department of Ecology					
A. B. Stone	B5-18	X			
U.S. Department of Energy, Richland Operations Office					
L. Erickson	S7-53	X			
W. S. Liou	S7-54	X			
N. W. Willis	S7-54	X			

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K. O. Fein	H4-65				X
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J. S. Garfield	H5-49	X			
J. D. Guberski	R2-06				X
R. D. Gustavson	R1-51	X			
D. L. Herting	T6-09	X			
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M. N. Islam	R3-08	X			
G. Jansen	H6-33	X			

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G. D. Johnson	S7-15	X			
J. M. Jones	S5-13	X			
K. K. Kawabata	S7-55	X			
T. J. Kelley	S7-21	X			
N. W. Kirch	R2-11	X			
J. G. Kristofzski	T6-06	X			
M. J. Kupfer	H5-49	X			
D. L. McGrew	R3-25	X			
W. C. Miller	R1-30	X			
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D. E. Place	H5-27	X			
R. E. Raymond	R2-54	X			
D. A. Reynolds	R2-11	X			
G. W. Ryan	H4-65	X			
L. M. Sasaki (10)	R2-12	X			
F. A. Schmittroth	H0-35	X			
N. J. Scott-Proctor	S5-01	X			
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L. W. Shelton, Jr.	H5-49	X			
B. C. Simpson	R2-12	X			
G. L. Smith	H4-62				X
G. L. Troyer	T6-50	X			
D. A. Turner	S7-15	X			
T. S. Vail	R2-54	X			
D. J. Washenfelder	H5-27	X			
M. S. Waters	S6-30	X			
W. I. Winters ~~(3)~~	T6-50	X			
Central Files (orig. ~~+2~~)	~~L8-04~~ A3-88	X			
TFIC (Tank Farm Information Center)	R1-20	X			
EDMC	H6-08	X			
TCRC (2)	R2-12	X			