9442.1988(03)

CALIFORNIA AUTHORIZATION-EVALUATION OF THE WASTE EVALUATION TEST

MAY 2 1988

MEMORANDUM

SUBJECT: California Authorization-Evaluation of the Waste Evaluation Test

FROM: Sylvia K. Lowrance, Director
Office of Solid Waste

TO: Jeff Zelikson, Director
Toxics and Waste Management Division, Region IX

This memorandum is in response to your March 29, 1988 memorandum requesting a determination as to the technical adequacy of California's Waste Extraction Test (WET) for testing wastes to determine whether they meet the toxicity characteristic. Based on the description of the test and the results you have provided, we believe that, for any waste matrix, the WET will extract at least as much of each inorganic constituent as the EPA Extraction Procedure (EP) test. Also, since this action is an authorization issue, the WET does not need to go through the Part 260.21 petition process for equivalency.

As you are aware, our Office of General Counsel (OGC) has some concerns regarding the issue of possible Federal enforcement of regulations based on the WET. Currently, OGC is of the opinion that regulations utilizing the WET are broader in scope (cover more waste) rather than more stringent (tighter control of covered wastes) than regulations utilizing the EP. These concerns affect the overall authorization, and they still need to be resolved.

Please contact David Friedman (FTS 382-4761) of my staff if you have any questions on the technical evaluation of the WET or Josh Sarnoff (FTS 382-7706) of OGC if you have any questions on the legal review.

If the washwater sent to the oil/water separator is ignitable, it would be classified as a D001 hazardous waste, and would remain such for as long as it exhibits the ignitability characteristic. According to 40 CFR Section 261.3(c) and (d), any residues resulting from treatment of D001 are hazardous wastes only if they continue to exhibit a characteristic found under 40 CFR, Part 261, Subpart C.

If you have further questions in this area, please contact Michael Petruska of my staff at (202) 382-7729.

Sincerely,

Marcia E. Williams
Director, Office of
Solid Waste

CC: Kurt Whitford, J.J. DEP
Sam Ezekwo
EPA Region II
Air and Hazardous Waste Division

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region IX
215 Fremont Street
San Francisco, California 94105

29 MAR 1983

MEMORANDUM

SUBJECT: California Authorization - Determining the Technical Equivalency of the Waste Extraction Test to the EPA Extraction Procedure Toxicity Test

FROM: Jeff Zelikson, Director
Toxics & Waste Management Division, Region 9

TO: Sylvia Lowrance, Director
Office of Solid Waste WH-562

As you may be aware, California is in the process of amending its hazardous waste management statutes and regulations for the purpose of obtaining authorization to implement the RCRA program. California would like to retain its Waste Extraction Test (WET) for testing characteristic waste rather than adopting EPA's EP Toxicity Test.

At this time we are requesting an official written determination from your office as to the technical adequacy of the WET. We requested this information previously and understand that David Freidman of the Technical Methods Section did some research on this issue.

Based on previous discussions between Headquarters and Regional staff, we believe there is agreement between the Region and Headquarters that the WET is at least as stringent as the EP Toxicity Test required under the RCRA and therefore, meets the authorization requirement that the State program be equivalent to or more stringent than RCRA.

California's regulation development schedule requires that we give them a final decision on this issue within the next few weeks. For this reason, if we have not received a response by April 30, we will inform California that the WET is as stringent as the EP Toxicity Test and, therefore, will be acceptable for the purposes of authorization.

If you have any questions or need more information, please call Kathy Papalia of my staff at FTS/454-8123. Thank you for your assistance on this issue.

Attachment

cc: Susan Absher, WH-563B

David Freidman, WH-562B
Cindy Byron, WH-527
Lillian Bagus, WH-563B

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Region IX
215 Fremont Street
San Francisco, California 94105

25 NOV 1987

Memorandum

From: Jeff Zelikson, Acting Director
Toxics and Waste Management Division
Region IX

To: Sylvia Lowrance, Director
Characterization and Assessment Division, SE-240
Office of Solid Waste

Subject: California Authorization: Headquarters Assistance in Determining the Technical Equivalency of the Waste Extraction Test to the E.P. Toxicity Test

As you're probably aware, California is in the process of amending its hazardous waste management regulations for purposes of authorization. California would like to retain its Waste Extraction Test (WET) in lieu of adopting EPA's E.P. Toxicity Test.

We need your assistance in determining the technical adequacy of the WET, and have enclosed two copies of the materials sent to us by the state.

Given the regulation development schedule California is attempting to meet, we'd appreciate a written analysis of the WET's technical adequacy within three weeks of receipt of this request. Please contact me if you feel that the review time frame cannot be met.

If you have any questions, please call. If you need further information, your staff may contact Karen Ueno at FTS 454-8128. Thank you for your assistance.

enclosures

cc: with enclosures
David Friedman, Technical Methods Section (SE-240)
Bruce Weddle, Permits and State Programs Division (WH-563B)
Susan Absher, Permits and State Programs Division (WH-563B)

TO: EPA REGION IX
FROM: FLORENTINO CASTELLON

TSCD #1
PAGE 1 OF 1

RCRA AUTHORIZATION ISSUE

DATE:

REFER TO:

CITATION: CFR 261 APPENDIX II
TITLE 22, 66700 ibid
H&SC

CONTACT: MIKE HORNER
(916) 322-1003

SUBJECT: USE OF CALIFORNIA WET TEST VS. E.P. TOXICITY TEST

ISSUE:
The California Department of Health Services (DHS) is currently making those changes in State hazardous waste control law necessary to obtain authorization for California to run a RCRA equivalent hazardous waste program. This effort involves melding our current regulations with those of 40 CFR in such a way as to maintain those provisions wherein State law is more stringent than Federal law. As you are probably aware, Title 22 of the California Administrative Code (CAC) specifies use of the Waste Extraction Test (WET) found in Section 66700 ibid to identify those wastes which are hazardous due to extractable hazardous constituents. Title 22 lists 20 metals and 18 organic compounds which render a waste hazardous when found in the extract from the WET in concentrate greater than the Soluble Threshold Limit Concentration (STLC).

PROPOSAL:
We propose specifying use of the WET in place of the Extraction Procedure (EP) Toxicity Test presented in Appendix II to Part 261, 40 CFR to identify wastes hazardous due to the characteristic of EP Toxicity. We feel that the WET consistently extracts higher levels of inorganic metals than the EP test, thus satisfying the requirement that California law be equally or more stringent than Federal law. In addition, we feel that our laboratory certification program provides a level of quality control that is equivalent or more stringent than that provided by the 40 CFR regulations.

IMPACT:
California will be approved to apply the WET Extraction test in place of the E.P. Toxicity test for waste classification, as part of RCRA Authorization. This will expand the number of wastes classified as a hazardous waste.

REQUEST:
These should be presented to EPA Region IX and EPA Headquarters technical personnel for review and concurrance. A written response regarding EPA's official evaluation of this proposal is requested.

cc: Mike Horner
Don Johnson
Bart Simmons

State of California

Department of Health Services

Memorandum

Date: October 5, 1987

To: Mike Horner
Toxic Substances Control Division
Alternative Technology Section

From: Barton P. Simmons
Hazardous Materials Laboratory

Subject: WET/EP Comparison

Please find attached the WET/EP document which we have discussed. If you have any questions, please give me a call.

cc: Bob Stephens
Raimund Roehl
Tom Li
Stan Lau, TSCD-TSU

Attachment

HAZARDOUS MATERIALS LABORATORY
CALIFORNIA DEPARTMENT OF HEALTH SERVICES

AN EVALUATION OF THE WASTE EXTRACTION TEST (WET) FOR HAZARDOUS WASTE IDENTIFICATION

I. The Problem

As part of the RCRA authorization process, the California Department of Health Services is evaluating its criteria for hazardous waste characterization vis-a-vis the EPA system. One issue which has arisen is whether the California Waste Extraction Test (WET) is at least as stringent as the EPA Extraction Procedure (EP) for the purpose of determining the extractable inorganic constituents.

A related issue is the comparison of the California system and the Federal system for organic compounds. That issue will be addressed in a future document separately from the issue of inorganic substances.

II. Comparison of the two Extraction Tests

The WET procedure is described completely in Section 66700 of the California Administrative Code, Title 22. A copy of that section is included in Attachment A. The EP is described in 40CFR Part 261, Appendix II, and a copy is included as Attachment B. Briefly, both of these procedures are batch extraction tests. The principal difference between the two tests is the choice of extraction solution. The EP uses a acetic acid extraction solution, while the WET uses a 0.2 m citrate buffer solution. Citrate is recognized as a much stronger chelating agent than acetate. The stability constants for acetate and citrate complexes of selected metal ions are listed in Table 1.

Table 1 - Stability of Metal Complexes (Kragten, 1978)

Metal Ion	Citrate Complex	Acetate Complex
Chromium (III)	7.69	1.80
Mercury (II)	10.90	5.30
Lead (II)	6.30	2.20

As shown in Table 1, the citrate is predicted to be a stronger chelating agent than acetate.

III. Comparative Performance of the WET and EP

The prediction of greater stringency of the WET has been demonstrated over several years of testing a diverse collection of

solid wastes. Some examples of documented studies are given below.

A. The Oak Ridge National Laboratory (ORNL) Leaching Study

The California Waste Management Board sponsored a study of leaching tests, which was conducted at ORNL under the management of C. W. Francis. The study included the WET, the EP, and two leaching tests that were being considered to replace the EP. These tests were used in the development of the TCLP. One conclusion of the ORNL Report was "Generally speaking, concentrations of all the trace metals were higher in the WET extracts than in other leach extracts...(Francis, 1984)" This was the result whether extracts were analyzed by atomic absorption (AA) or inductively coupled plasma (ICP) spectroscopy, indicated that the differences were due to the extraction method. A copy of data from the ORNL study is included as Attachment C.

B. Battelle Leaching Study

As part of the evaluation of leaching tests for hazardous waste identification, the Battelle Columbus Laboratory conducted a comparison of leaching tests on several solid wastes, including aqueous sludges, organic chemical wastes, and inorganic solids. A conclusion of the study was: "Citrate buffer was often much more aggressive than acetate buffer for leaching metals (Warner, 1981)." This was in spite of the fact that the highest concentration of citrate buffer used was less than that required by the current WET.

C. Experience in Hazardous Waste Identification

The experience of the DHS over several years has been that the WET is consistently at least as stringent as the EP for hazardous waste identification. As an example, lead smelting slag from the Asarco hazardous waste site in Selby, California was tested by both the EP and the WET. Although the site has a documented source of arsenic contamination in the groundwater, the EP identified it as nonhazardous by the EP criterion, whereas it easily exceeded hazardous waste criteria by the WET. This situation is typical of EP and WET comparisons (DHS HML files).

IV. Quality of Data Generated by the WET

The WET and the EP have both several years of use in the commercial and industrial laboratory community. The formalization of procedures in regulation has eliminated consistency problems which formerly existed. Unlike the EP, the WET is included in a mandated Hazardous Waste Laboratory Certification Program which is conducted by DHS. This program includes requirements for personnel, equipment, analytical methods, quality assurance plans,

and performance testing. Interlaboratory testing which has been conducted to date indicates that the precision of the WET is as good as, or better than the precision of the corresponding analytical procedures and is in general far better than the precision of sampling procedures (DHS HML files).

V. Summary

The experience of DHS, federal laboratories and commercial laboratories is that the WET is at least as stringent as the EP for the purpose of identifying hazarous wastes by extractable metals. The DHS certification program will help to assure that the quality of data generated by the WET is adequate for the California Hazardous Waste Management Program.

References

Francis, C. W., Leaching Characteristics of Resource Recovery Ash in Municipal Waste Landfills. Oak Ridge National Laboratory. DOE Project No. ERD-83-289, 1984.

Kragten, J., Atlas of Metal-Ligand Equilibria in Aqueous Solution. John Wiley & Sons, New York, 1978.

Warner J.S., et.al., "Development of a Method for Determining the Leachability of Organic Compounds from Solid Wastes." Hazardous Solid Waste Testing: First Conference . ASTM STP 760. R.A. Conway and B.C. Malloy, Eds., American Society for Testing and Materials. 1981. pp. 40-60.

ATTACHMENT A

Calculated oral or dermal LD30 = 100

$$\sum_{x=1}^{n} \frac{\%Ax}{TAx}$$

where %Ax is the weight percent of each component in the waste mixture and TAs is the acute oral or dermal LD30 or the acute oral LDLO of each component.
NOTE: Authority cited: Sections 208, 25141 and 25130, Health and Safety Code. Reference: Section 25141, Health and Safety Code.
History:

1. Editorial correction filed 10-5-84; designated effective 10-27-84 (Register 84, No. 41).

66699. Persistent and Bioaccumulative Toxic Substance

(a) Any waste is a hazardous waste which contains a substance listed in subsections (b) or (c) of this section:
(1) at a concentration in milligrams per liter as determined pursuant to Section 66700 which exceeds its listed soluble threshold limit concentration, or
(2) at a concentration in milligrams per kilogram in the waste which exceeds its listed threshold limit concentration.
(b) List of Inorganic Persistent and Bioaccumulative Toxic Substances and Their Soluble Threshold Limit Concentration (STLC) and Total Threshold Limit Concentrations (TTLC) Values.

Substance	STLC mg/l	TTLC Wet-Weight mg/kg
Antimony and/or antimony compounds	15	500
Arsenic and/or arsenic compounds	5.0	500
Asbestos	-	1.0 (as percent)
Barium and/or barium compounds (excluding barite)	100	10,000++
Beryllium and/or beryllium compounds	0.75	75
Cadmium and/or cadmium compounds	1.0	100
Chromium (VI) compounds	5	500
Chromium and/or chromium (III) compounds	560	2,500
Cobalt and/or cobalt compounds	80	8,000
Copper and/or copper compounds	25	2,500
Fluoride Salts	180	18,000
Lead and/or lead compounds	5.0	1,000
Mercury and/or mercury compounds	0.2	20
Molybdenum and/or molybdenum compounds	350	3,500
Nickel and/or nickel compounds	20	2,000
Selenium and/or selenium compounds	1.0	100

Silver and/or silver compounds	5	500
Thallium and/or thallium compounds	7.0	700
Vanadium and or vanadium compounds	24	2,400
Zinc and/or zinc compounds	250	5,000

* STLC and TTLC values are calculated on the concentration of the elements, not the compounds.
* In the case of asbestos and elemental metals, applies only if they are in a friable, powdered or finely divided state. Asbestos includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.
* Excluding barium sulfate

66700 ENVIRONMENTAL HEALTH TITLE 22
(p. 1800.78)

(c) List of Organic Persistent and Bioaccumulative Toxic Substances and Their Soluble Threshold Limit Concentration (STLC) and Total Threshold Limit Concentrations (TTLC) Values.

	STLC	TTLC
	Wet-Weight	
Substance	mg/l	mg/kg
Aldrin	0.14	1.4
Chlordan	0.25	2.5
DDT, DDE, DDD	0.1	1.0
2,4-Dichlorophenoryacetic acid	10	100
Dieldrin	0.8	8.0
Dioxin (2,3,7,8-TCDD)	0.001	0.01
Endrin	0.02	0.2
Heptachlor	0.47	4.7
Kepone	2.1	21
Lead compounds, organic	-	13
Lindane	0.4	4.0
Methoxychlor	10	100
Mirex	2.1	21
Pentachlorophenol	1.7	17
Polychlorinated biphenyls (PCBs)	5.0	50
Toxaphene	0.5	5
Trichloroethylene	204	2,040
2,4,5-Trichlorophenorypropionic acid	1.0	10

NOTE: Authority cited: Sections 208, 25141 and 25150, Health and Safety Code. Reference: Section 25141, Health and Safety Code.

History:
1. Editorial correction file 10-5-84; designated effective 10-27-84 (Register 84, No. 41).

66700. Waste Extraction Test (WET)
(a) The WET described in this section shall be used to determine the amount of extractable substance in a waste or other material as set forth in Section 66699(a).

(b) Except as provided in Section 66700(d), the WET shall be carried out if the total concentration in the waste, or other material, of any substance listed in Section 66699 equals or exceeds the STLC value, but does not exceed the TTLC value given for that substance. The total concentrations of substances listed in Section 66699 shall be determined by analysis of samples of wastes, or other materials, which have been prepared, or meet the conditions, for analysis as set forth in subsections (c) and (d) of this section. Methods used for analysis for total concentrations of substances listed in Section 66699 shall be those given in the following documents or alternate methods that have been approved by the Department pursuant to Section 66310(e): (1) For metal elements and their compounds, the waste shall be digested according to the indicated methods described in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 2nd edition, U.S. Environmental Protection Agency, 1982.

(A) All listed metal elements and their compounds, except hexavalent chromium: Method 3050.
(B) Hexavalent chromium: Method 3060.
(2) For the following substances, the indicated methods as described in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 2nd edition, U.S. Environmental Protection Agency, 1982 shall beutilized:
(A) Antimony: Method 7040 or Method 7041.
(B) Arsenic: Method 7060 or Method 7061.
(C) Barium: Method 7080 or Method 7081.
(D) Cadmium: Method 7131.
(E) Total Chromium: Method 7190.
(F) Hexavalent chromium: Method 7195, Method 7196 or Method 7197.
(G) Lead: Method 7421.
(H) Mercury: Method 7470 or Method 7471.
(I) Nickel: Method 7520 or Method 7521.
(J) Selenium: Method 7740 or Method 7741.
(K) Silver: Method 7760 or Method 7761.
(L) Trichloroethylene: Method 8010 or Method 8240.
(M) Pentachlorophenol: Method 8040, Method 8250 or Method 8270.
(N) Aldrin, Lindane, Chlordane, DDD, DDE, DDT, Dieldrin, Heptachlor, Toxaphene, and PCBS: Method 8080, Method 8250 or Method 8270.
(O) 2,4-Dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxypropionic acid: Method 8150.
(3) For the following substances, the indicated methods as described in "Methods for Chemical Analysis of Water and Wastes", EPA-600 + 79-080, U.S. Environmental Protection Agency, 1979 shall be used:
(A) Beryllium: Method 210.1 or Method 210.2.
(B) Cobalt: Method 219.1 or Method 219.2.
(C) Copper: Method 220.1 or Method 220.2.
(D) Molybdenum: Method 246.1 or Method 264.2.
(E) Thallium: Method 279.1 or Method 279.2.
(F) Vanadium: Method 286.1 or Method 286.2.
(G) Zinc: Method 289.1 or 289.2.
(H) Fluoride: Method 340.1, Method 340.2 or Method 340.3.
(4) For the following substances, the indicated methods as described in "Manual for Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples", EPA-600/8-80-038, U.S. Environmental Protection Agency, 1980 shall be utilized:
(A) Kepone: Section 5,A(5),(a).

(B) 2,3,7,8-Tetrachlorodibenzo-p-dioxin: Section 9,G.
(5) For asbestos, the indicated method as described in the Federal Register,

Volume 47, Number 103, Appendix A, pages 23376-23389, May 7, 1982 shall be utilized.
(c) Samples shall be prepared for analysis for total and extractable content of substances listed in Section 66699(b) and (c) as follows:

(1) Type i: If the waste or other material is a millable solid, the sample shall be passed directly, or shall be milled to pass, through a No. 10 (two millimeter) standard sieve before it is analyzed. If the sample contains non-friable solid particles which do not pass directly through a No. 10 sieve and which are extraneous and irrelevant as hazardous constituents to the waste or other material, they shall be removed to the extent feasible by mechanical means and discarded. Solids which remain in the waste or other material after removal of the aforesaid extraneous particles shall be milled to pass through a No. 10 sieve and shall then be combined and mixed well with the solids which passed through the sieve without milling. The reconstituted sample shall then be analyzed as prescribed in this section.
(2) Type ii: If the waste or other material is a filterable mixture of liquid and solids in which the solids constitute five-tenths (0.5) percent by weight or greater of the sample, the liquid and solids shall be separated by filtration through a 0.45 micron membrane filter. The filtrate so obtained is to be designated as Initial Filtrate. Its volume is determined, and it is retained. The separated solids shall be sieved in a No. 10 sieve and any nonfriable extraneous particles of the kinds described in subsection (c)(1) which do not pass Through the sieve shall be removed to the extent feasible by mechanical means and discarded. The solids which remain after the removal of the extraneous particles shall be milled to pass through a No. 10 sieve and shall be recombined with solids which passed through the sieve without milling. This recombined solid material shall be extracted following the procedure in subsection . A ratio of 10 milliliters of extraction solution per gram of solid shall be utilized with appropriate modifications for extraction vessel size. After completion of solid extraction, the filtered extractant is combined with Initial Filtrate mixed thoroughly and analyzed as described in subsection (f)(3).
(3) Type iii: If the waste or other material is a nonfilterable and nonmillable sludge, slurry, or oily, tarry or resinous material, it shall be analyzed as received unless it contains non-friable extraneous and irrelevant solid particles of the kinds described in paragraph (c)(1) of this section. If it contains such solid particles and they are of such size as not to pass through a No. 10 sieve, they shall be removed to the extent feasible by mechanical means and discarded. The remainder of the sample shall be analyzed as prescribed in this section.
(4) If it is necessary to dry a solid sample or the solids fraction of a sample before sieving, milling or removal of extraneous solids, or if a sample is dried prior to analysis, all weight losses due to drying shall be determined, and these losses and the conditions of drying shall be reported.
(5) If the waste or other material is a liquid containing less than five-tenths (0.5) percent by weight of undissolved solids, it shall not be subject to the WET procedure, but shall be analyzed directly for the substances listed in Section 66699. The waste shall be classified as a hazardous waste if the total concentration in the waste of any substance listed in Section 66699 exceeds the TTLC value given for that substance. If, however, the total concentration is less than the TTLC but exceeds the STLC when express on a milligram per liter basis, the waste or other material shall be filtered through a 0.45 micron membrane filter, the solids discarded and the filtrate shall be analyzed directly for the substances listed in Section 66699. The waste shall be classified as a hazardous waste if the concentration in the filtrate of any of the substances listed in Section 66699 exceeds the STLC value given for that substance.

(e) The WET extraction solution shall consist of 0.2 M sodium citrate at pH 3.0 0.1, which is prepared by titrating an appropriate amount of analytical grade citric acid in deionized water with 4.0 N NaOH, except that the extraction solution for the determination of chromium (VI) shall consist of deionized water.
(f) The extraction procedure shall be as follows:
(1) Fifty grams of sample, or less if it a type ii sample prepared pursuant to subsection (c)(2), obtained pursuant to subsection (c) or (d) of this section shall be placed in a clean polyethylene of glass container designated the Treatment, capable of physically withstanding the extraction procedure and which was rinsed previously with, in succession, an aqueous 1:1 ratio by volume nitric solution and deionized water. If the extract will be analyzed for any of the organic substances listed in Section 66699(c), a glass container shall be used. Furthermore, a container of the same size, shape and material shall be used for an extraction designated as the Blank, which shall be carried through the same procedure as the Treatment, but without addition of the sample.

(2) Five hundred milliliters of extraction solution, or less if the waste sample is a type ii sample prepared pursuant to subsection (c)(2) shall be added to the Treatment and Blank containers, which shall be then fitted with covered air scrubbers extended well into the extraction solutions and flushed vigorously with nitrogen gas for 15 minutes so as to remove and exclude atmospheric oxygen from the extraction medium. If the sample is to be analyzed for any volatile substance, such as trichlorethylene, the sample shall be added after deaeration with nitrogen to avoid volatilization loss. After deaeration the containers shall be quickly sealed with tightly fitting caps and agitated, using a table shaker, an overhead stirrer or a rotary extractor, operated at a speed which shall maintain the sample in a state of vigorously agitated suspension. Required equipment is described in test method 1310 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 2nd edition, U.S. Environmental Protection Agency, 1982. The temperature during extraction shall be maintained between 20 and 40 degrees centigrade. After 48 hours of extracting, the contents of the Treatment and Blank containers shall be either filtered directly or centrifuged and then filtered. Filtering shall be through a medium porosity prefilter and then through a 0.45 micron membrane filter, using a clean, thick-walled suction flask. For coarser solids, prefiltration shall not be necessary. Pressure filtration shall be an optional alternative to vacuum filtration. If the extracts are first centrifuged, glass or polyehtylene bottles shall be used as prescribed for extraction. For very fine solids, centrifuging at as high as 10,000 x G may be necessary. After centrifugation, the liquids shall be decanted, prefiltered if necessary, and then passed through a 0.45 micron membrane filter. All filters shall be of low and identified extractable heavy metals, fluoride and organic chemicals content.
(3) If the filtered extracts are to be analyzed only for the metal elements listed in Section 66699(b), the filtered extracts from the Treatment and Blank shall be transferred to clean polyethylene bottles and acidified with nitric acid to five percent by volume acid content soon after each extract is filtered. For those wastes or waste materials classified under subsection (c)(2), the Treatment shall be the Initial Filtrate combined with the extract generated by the WET extraction of the initially separated solids. Similarly the Blank in this instance shall be the filtrate generated by the WET Blank accompanying the initially separated solids to which is subsequently added a volume of deionized

water equivalent to that of the Initial Filtrate. These procedures shall be followed prior to acidification of Treatment and Blank solutions with nitric acid to five percent (by volume) acid content. The bottle shall then be stored at room temperature or frozen. If the extracts are also to be analyzed for the organic substances listed in Section 66699(c), or for the organic substances only, the filtered extracts shall be transferred to clean glass bottles. If the extracts are to be analyzed for fluoride, they shall be transferred to clean polyethylene bottles. These extracts, containing true organic substances or fluoride, shall not be acidified, but shall be frozen soon after each extract is obtained and held frozen until the day of analysis, unless the extracts are analyzed within 24 hours.
(g) Sample analysis and data treatment shall be as follows:
(1) Each of the filtered extracts from the Treatment and Blank extractions shall have been acidified to five percent by volume nitric acid, and stored at room temperature of frozen in polyethylene bottles or kept frozen without addition of acid in glass bottles until the day of analysis, as prescribed. Each of the extracts shall be thoroughly mixed just prior to being individually analyzed for the substances listed in Section 66699 in order to determine whether the extractable concentration (EC) in the waste or other materials exceeds the STLC for any of the substances listed. The extracts shall be analyzed according to the procedure identified in Sections 66700(b)(2), (b)(3) and (b)(4).
(2) The net EC of a substance in the Treatment sample which is listed in Section 66699 shall be calculated and reported as milligrams per liter of sample (mg/l). This value is derived after subtracting the concentration of the substance in the appropriate Blank extract from that concentration determined in the Treatment extract.

NOTE: Authority cited: Sections 208, 25141 and 25150, Health and Safety Code. Reference: Section 25141, Health and Safety Code.

HISTORY:
1. Editorial correction filed 10-5-84; designated effective 10-27-84 (Register 84, No. 41).

66702 Ignitability Criteria.

(a) A waste, or a material, is ignitable and hazardous if it:
(1) Is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume, and has a flash point less than 60 degree centigrade (140 degrees Fahrenheit), as determined by a Pensky-Martens Closed Cup Tester, using the test method specified in American Society for Testing and Materials (ASTM) Standard D-93-79, or a Setaflash Closed Cup Tester, using the test method specified in ASTM Standard D-3278-73; or
(2) Is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard; or
(3) Is a flammable compressed gas as defined in 49 CFR 173.300(b) (codified October 1, 1982) and as determined by the test methods described in that regulation; or
(4) Is an oxidizer as defined in 49 CFR 173.151 (codified October 1, 1982).
NOTE: Authority cited: Sections 208, 25141 and 25150, Health and Safety Code. Reference: Section 25141, Health and Safety Code.

Attachment B

This manual also contains additional information on application of these protocols.

APPENDIX II-EP TOXICITY TEST PROCEDURES

A. Extraction Procedure (EP)

1. A representative sample of the waste to be tested (minimum size 100 grams) shall be obtained using the methods specified in Appendix I or any other method capable of yielding a representative sample within the meaning of Part 260. (For detailed guidance on conducting the various aspects of the EP see "Test Methods for the Evaluation of Solid Waste, Physical/ Chemical Methods" (incorporated by reference, see §260.11).]
2. The sample shall be separated into its component liquid and solid phases using the method described in "Separation Procedure" below. If the solid residue* obtained using this method totals less than 0.5% of the original weight of the waste, the residue can be discarded and the operator shall treat the liquid phase as the extract and proceed immediately to Step 8.
3. The solid material obtained from the Separation Procedure shall be evaluated for its particle size. If the solid material has a surface area per gram of material equal to, or greater than 3.1 cm2 or passes through a 9.5 mm (0.375 inch) standard sieve, the operator shall proceed to Step 4. If the surface area is smaller or the particle size larger than specified above, the solid material shall be prepared for extraction by crushing, cutting or grinding the material so that it passes through a 9.5 mm (0.375 inch) sieve or, if the material is in a single piece, by subjecting the material to the "Structural Integrity Procedure" described below.
4. The solid material obtained in Step 3 shall be weighed and placed in an extractor with 16 times its weight of deionized water. Do not allow the material to dry prior to weighing. For purposes of this test, an acceptable extractor is one which will impart sufficient agitation to the mixture to not only prevent stratification of the sample and extraction fluid but also insure that all samples surfaces are continuously brought into contact with well mixed extraction fluid.

*The percent solids is determined by drying the filter pad at 80 C until it reaches constant weight and then calculating the percent solids using the following equation:
Percent solids=

$$\frac{\text{(weight of pad + solid) - (tare weight of pad)}}{\text{(total weight of sample)}} \times 100$$

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5. After the solid material and deionized water are placed in the extractor, the operator shall begin agitation and measure the pH of the solution in the extractor. If the pH is greater than 5.0, the pH of the solution shall be decreased to 5.0 0.2 by adding 0.5 N acetic acid. If the pH is equal to or less than 5.0, no acetic acid should be added. The pH of the solution shall be monitored, as described below, during the course of the extraction and if the pH rises above 5.2, 0.5N acetic acid shall be added to bring the pH down to 5.0 0.2. However, in no event shall the aggregate amount of acid added to the solution exceed 4 ml of acid per gram of solid. The mixture shall be agitated for 24 hours and maintained at 20-40 C (68-104 F) during this time. It is recommended that the operator monitor and adjust the pH during the course of the extraction with a device such as the Type 45-A pH Controller manufactured by Chemtrix Inc., Hillsboro, Oregon 97123 or its equivalent, in conjunction with a metering pump and reservoir of 0.5N acetic acid. If such a system is not available, the following manual procedure shall be employed:
(a) A pH meter shall be calibrated in accordance with the manufacturers specifications.

(b) The pH of the solution shall be checked and, if necessary, 0.5N acetic acid shall be manually added to the extractor until the pH reaches 5.0 0.2. The pH of the solution shall be adjusted at 15, 30 and 60 minute intervals, moving to the next longer interval if the pH does not have to be adjusted more than 0.5N pH units.
(c) The adjustment procedure shall be continued for at least 6 hours.
(d) If at the end of the 24-hour extraction period, the pH of the solution is not below 5.2 and the maximum amount of acid (4 ml per gram of solids) has not been added, the pH shall be adjusted to 5.0 0.2 and the extraction continued for an additional four hours, during which the pH shall be adjusted at one hour intervals.
6. At the end of the 24 hour extraction period, deionized water shall be added to the extractor in an amount determined by the following equation:
V=(20 X W)-16(W)-A
V=ml deionized water to be added
W=weight in grams of solid charged to extractor
A=ml of 0.5N acetic acid added during extraction
7. The material in the extractor shall be separated into its component liquid and solid phases as described under "Separation Procedure."
8. The liquids resulting from Steps 2 and 7 shall be combined. The combined liquid for the waste itself if it has less than percent solids, as noted in Step 2) is the extract and

shall be analyzed for the presence of any of the contaminants specified in Table I of §261.24 using the Analytical Procedures designated below.

Separation Procedure Equipment: A filter holder, designed for filtration media having a nominal pore size of 0.45 micrometers and capable of applying a 5.3 kg/cm2 (75 psi) hydrostatic pressure to the solution being filtered, shall be used. For mixtures containing nonabsorptive solids, where separation can be effected without imposing a 5.3 kg/cm2 pressure differential, vacuum filters employing a 0.45 micrometers filter media can be used. (For further guidance on filtration equipment or procedures see "Test Methods of Evaluating Solid Waste. Physical/Chemical Methods" incorporated by reference. see §260.11). Procedure: 2
(i) Following manufacturers directions, the filter unit shall be assembled with a filter bed consisting of a 0.45 micrometer filter membrane. For difficult or slow to filter mixtures a prefilter bed consisting of the following prefilters in increasing pore size (0.65 micrometer membrane, fine glass fiber prefilter, and coarse glass fiber prefilter) can be used.
(ii) The waste shall be poured into the filtration unit.
(iii) The reservoir shall be slowly pressurized until liquid begins to flow from the filtrate outlet at which point the pressure in the filter shall be immediately lowered to 10-15 psig. Filtration shall be continued until liquid flow ceases.
(iv) The pressure shall be increased step-wise in 10 psi increments to 75 psig and filtration continued until flow ceases or the

2. This procedure is intended to result in separation of the "free" liquid portion of the waste from any solid matter having a particle size >0.45 mm. If the sample will not filter, various other separation techniques can be used to aid in the filtration. As described above, pressure filtration is employed to speed up the filtration process. This does not alter the nature of the separation. If liquid does not separate during filtration, the waste can be centrifuged. If separation occurs during centrifugation, the liquid portion (centrifugate) is filtered through the 0.45 mm filter prior to becoming mixed with the liquid portion of the waste obtained from the initial filtration. Any material that will not pass through the filter after centrifugation is considered a solid and is extracted.

pressurizing gas begins to exit from the filtrate outlet.
(v) The filter unit shall be depressurized, the solid material removed and weighed and then transferred to the extraction apparatus, or, in the case of final filtration prior to analysis, discarded. Do not allow the material retained on the filter pad to dry prior to weighing.
(vi) The liquid phase shall be stored at 4 C for subsequent use in Step 8.

B. Structural Integrity Procedure

Equipment: A Structural Integrity Tester having a 3.18 cm (1.25 in.) diameter hammer weighing 0.33 kg (0.73 lbs.) and having a free fall of 15.24 cm (6 in.) shall be used. This device is available from Associated Design and Manufacturing Company, Alexandria, VA 22314, as Part No. 125, or it may be fabricated to meet the specifications shown in Figure 1.

Procedure
1. The sample holder shall be filled with the material to be tested. If the sample of waste is a large monolithic block, a portion shall be cut from the block having the dimensions of a 3.3 cm (1.3 in.) diameter x 7.1 cm (2.8 in.) cylinder. For a fixated waste, samples may be cast in the form of 3.3 mm (1.3 in.) diameter x 7.1 cm (2.8 in.) cylinder for purposes of conducting this test. In such cases, the waste may be allowed to cure for 30 days prior to testing.
2. The sample holder shall be placed into the Structural Integrity Tester, then the hammer shall be raised to its maximum height and dropped. This shall be repeated fifteen times.
3. The material shall be removed from the sample holder, weighed, and transferred to the extraction apparatus for extraction.

Analytical Procedures for Analyzing Extract Contaminants

The test methods for analyzing the extract are as follows:
1. For arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, lindane, methoxychlor, toxaphene, 2,4-D(2,4-dichlorophenoxyacetic acid) or 2,4,5-TP (2,4,5-trichlorophenoxypropionic acid), "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see §260.11).
2. (Reserved) for all analyses, the methods of standard addition shall be used for quanitification of species concentration.

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FIGURE 1 COMPACTION TESTER

Attachment C (Source..Francis. 1984)

Table 40. Percentage of elements extracted by waste extraction test (WET) from each of the resources recovery ashesa

Element	Resource recovery ash			
	Chicago	Sumner	Hampton	Auburn
Al	6.9	17.1	10.5	13.5
Be	1.3	2.0	3.4	5.8
Ca	29.3	42.9	48.1	39.7
Cd	52.8	nc	59.5	ncb
Cr	nc	nc	nc	1.5
Cu	1.3	nc	nc	99.2
Fe	4.8	9.4	3.4	9.3
Mg	35.6	30.0	29.0	26.6
Mn	26.4	41.0	19.4	51.6
Mo	nc	nc	nc	24.8
P	8.8	15.6	19.1	86.8
Pb	18.1	20.4	29.1	41.0
Sb	13.3	27.2	21.1	25.3
Si	0.9	0.77	0.93	3.8
Sr	17.5	29.6	34.9	13.8
Ti	0.66	0.68	1.02	0.38
V	nc	nc	15.0	nc
Zn	48.9	29.8	31.8	31.6

aThose elements in which the percent extracted could not be calculated for all four resource recovery ashes are not included.

bnc = could not be calculated.

Table 41. Concentrations of arsenic measured in four waste leach tests

Waste leach test	Blank	Resource Recovery ash			
		Chicago	Sumner	Hamptom	Auburn
	(10-3 mg/L)				
WET	1	61	185	950	17
EP	<1	3	9	17	2
Carbonic acid	<1	3	2	<1	1
Acetate	<1	5	1	2	3

Table 42. Concentrations of cadmium in four waste leach tests

Waste leach test	Blank	Resource Recovery ash			
		Chicago	Sumner	Hampton	Auburn
	(10-3 mg/L)				
WET	0.5	1600	810	1520	180
EP	<0.5	710	240	500	20
Carbonic acid	<0.5	16	12	70	5
Acetate	<0.5	190	50	330	30