Korean Agency for Technology and Standards
Public Announcement No. 2009-121

We hereby announce, in accordance with Article 41 Paragraph 1 of the Administrative Procedures Act, the intent and the key elements of the following revision of 'Notification of Safety Standards of the Industrial Products subject to Safety Certification', in compliance with Article 14 (Safety Certification etc) Paragraph 2 of the 'Quality Management and Safety Control of Industrial Products Act' and the provisions stipulated in [Appendix 1] that is related to Article 2 of Enforcement Regulation of the same Act in order to notify the industry and citizens in advance and to collect public opinions.

April 29, 2009

Administrator,
Korean Agency for Technology and Standards

An Advance Notice of (Proposed) Revision of 'Notification of Safety Standards of the Industrial Products subject to Safety Certification'

1. The intent of the Revision

This revision has been proposed to improve safety certification standards in order to strengthen safety control of harmful chemical substances such as phthalate plasticizer, lead, etc. used for carriages and walking frames for babies while minimizing mandatory safety requirements.

2. Main contents

○ Newly added safety requirements of phthalate plasticizer for the parts which may be touched by the infant and complementary test method for 8 harmful chemical substances including lead.
○ Changed self-observable safety requirements to recommendations and improved test methods to secure reproducibility of safety test.

3. The Contents of (Proposed) Revision of 'Notification of Safety Standards of the Industrial Products subject to Safety Certification'

Of the safety standards of the industrial products subject to safety certification, revise Annex 9 'Baby Walking Frames' and Annex 14 'Baby Carriages' as follows.

※The (Proposed) Revision of 'Notification of Safety Standards of the Industrial Products subject to Safety Certification' can be found in Notices/Announcements section of the Korean Agency for Technology and Standards website (www.kats.go.kr), and would not be published in the official gazette.

Industrial Products Safety Certification

Old vs. New Comparison Table

□ **Safety Certification Annex 9: Baby Walking Frames** (Omit the contents when to be published in the official gazette)

Current	Proposed Revision	Remarks
2. Related standards (Omitted) **KS A 3151** Random sampling method **KS K 0611** A method to measure formaldehyde in textile products: Water extraction method	2. Related standards (The same as at present) ---------- ---------- formaldehyde ----- ---------- **KS M 1991** Determination of phthalates content in plastic materials **KS M 8221** N-hexane (reagent) **KS G ISO 8124-3** Safety of toys – Part 3: Effluent of certain element **KS M ISO 3696** Water for analytical laboratory use – Specification and test methods	Added a lead (Pb) and plasticizer Effluent test method to related standards
3.2 Materials **3.2.1** The harmful elements test results for tables, plastic products and parts that were coated with synthetic resin paints must fit the following standards. However, casters and rings are excluded. Harmful Element Standard (mg/kg) Harmful Element Standard (mg/kg) Lead(Pb) Antimony(Sb) Arsenic(As) Barium(Ba) Below 90 Below 60 Below 25 Below 1,000 Cadmium(Cd) Chromium(Cr) Mercury (Hg) Selenium (Se) Below 75 Below 60 Below 60 Below 500	**3.2 Materials** **3.2.1 Harmful elements** The harmful elements test results for tables, plastic products and parts that were coated with synthetic resin paints must fit the following standards. However, casters and rings are excluded. **3.2.1.1 Effluent of harmful elements** The materials used for walking frames must be suited to the table below. **Table:** Permitted effluent limits of certain elements in walking frame materials (Unit: mg/kg) Element Standard Element Standard Antimony(Sb) Arsenic(As) Barium(Ba) Cadmium(Cd) Below 60 Below 25 Below 1 ,000 Below 75 Chromium(Cr) Lead(Pb) Mercury (Hg) Selenium (Se) Below 60 Below 90 Below 60 Below 500	Added the safety requirements for plasticizer.

Current	Proposed Revision	Remarks
	3.2.1.2 Phthalate plasticizer The contents of diethylhexylphthalate (DEHP), dibutylphthalate (DBP), and Butylbenzylphthalate (BBP) in plastic materials used for walking frames must not exceed 0.1%.	
3.2.3 Corrosion resistance of metallic coatings: There must not be any spot that is greater than 2mm in diameter per area of 50cm^2.	**3.2.3**----------. (Recommendation)	Changed from obligation to recommendation.
4.2 Materials **4.2.1 Testing harmful elements for tables, plastic products and parts that were coated with synthetic resin paints.** **4.2.1.1 Sample preparation** **4.2.1.1.1** Films of paints, solid-state decalcomanias: grind dried materials and pass them through a sieve of 0.5mm mesh. **4.2.1.1.2** Plastics, papers, textiles, dyed goods etc.: cut the materials into 6 by 6 mm (should be thinner than 6mm). **4.2.1.1.3** Metals, liquid materials: sample as they are. **4.2.1.2 Testing** **4.2.1.2.1** Films of paints, plastics, textiles, dyed goods, metals, decalcomanias, modelling clays, paint imitations and general paints etc. **4.2.1.2.1.1** Take more than 100mg of sample and add 50 times the sample's weight of 0.07 mol/ℓ hydrochloric acid (37±2 °C), and then agitate for a minute. **4.2.1.2.1.2** Measure the pH. If it is higher than 1.5, then adjust it to 1.5 by adding 2 mol/ℓ of hydrochloric acid. **4.2.1.2.1.3** Agitate for 1 hour while keeping the temperature to 37±2 °C, and then leave it stationary for 1 hour. **4.2.1.2.1.4** When necessary, separate solid powder with centrifuge and filtration, and then quantitate the elements by means of Atomic Absorption Spectrometry etc. **4.2.1.2.2** Papers and cardboards**.** **4.2.1.2.2.1** Take more than 100mg of sample and add 25 times the sample's weight of distilled water (37±2 °C) to resolve solidity.	**4.2 Materials** **4.2.1 Harmful elements** **4.2.1.1 Sampling** Walking frames exist in various forms and there could be important differences according to the lead content level in each component. Therefore, each item in a walking frame needs to be treated individually. In other words, if a product is composed of several substances, the substances must be broken down into its components, and a sample of each one tested. The sampling requires the separation of each component by their characters either by hand or cut out with tools while ensuring no damage is done to each component. Therefore, buckles, hooks or other components can be separated one by one by hand or by cutting them off to use as samples for individual testing. If there are components in a walking frame that are painted or coated, separate the coated layers from the base material. When doing so, apply a few drops of a solvent such as ethylene chloride to separate the paint or coating easily, therefore to contain as little base material as possible. When a solvent is used, it must be evaporated before testing. If the amount of sample is not enough for testing, take samples from multiple products of the same kind and cut the separated samples into proper size or grind them into minute size. In the case of effluent test for walking frames, be careful to not make any damage on the surface of the product. Depending on the sample separation method, multiple samples may be needed to keep the surface as it is during the effluent test. The coatings of each individual part can be tainted while cutting	Clarified the sampling method.

Current	Proposed Revision	Remarks
4.2.1.2.2.2 Add to the solution 25 times the sample's weight of 0.14 mol/ℓ hydrochloric acid (37±2 °C),and then agitate for a minute. **4.2.1.2.2.3** Follow "**4.2.1.2.1.2 ~4.2.1.2.1.4"** for the rest of the test. **4.2.1.2.3** After quantitating the elements in **"4.2.1.2"**, calculate the result of the harmful elements test based on the correction ratios in the table below. Element Pb Sb As Ba Cd Cr Hg Se Adjusted rate (%) 30 60 60 30 30 30 50 60 (Example) • If Pb weighs 120 mg/kg, • Apply 30% of correction ratio for Pb. • The equation for Pb test result calculation could be: 120 – (120*30)/100 = 84	the samples out, therefore yielding incorrect results. If damage is unavoidable, test the part without separation. **4.2.1.2 Lead content** **4.2.1.2.1 Leads in metal base material** Follow the Safety Certification Standards Annex 9.A1. **4.2.1.2.2 Leads in high molecular base material** Follow the Safety Certification Standards Annex 9.A2. **4.2.1.2.3 Leads in paint or paint like coating** Follow the Safety Certification Standards Annex 9.A3. **4.2.1.2.4 Leads in other base material** Follow the Safety Certification Standards Annex 9.A4. **4.2.1.3 Effluent of harmful elements** Operate according to the rules in KS G ISO 8124-3. **4.2.1.4 Phthalate plasticizer** Follow Safety Certification Standards Annex 9.C for Diethylhexylphthalate (DEHP), dibutylphthalate (DBP), and Butylbenzylphthalate (BBP) contents.	Added a test method for lead, plasticizer.
4.2.2 Formaldehyde content: follow KS K 0611	**4.2.2 Detecting formaldehyde:** Measure the amount of free formaldehyde according to **KS K 0611-A.**	
4.2.3 Corrosion resistance of metallic coatings Take the major metallic coating part apart, soak it in 5% sodium chloride water solution (20±5 °C) for 2 hours, and check whether it rusts 1 hour after removing it from water.	**4.2.3 Corrosion resistance of metallic coatings** ----------. (Recommendation)	Changed from obligation to recommendation

Current	Proposed Revision	Remarks
<New>	**Safety Certificate Standards** **Baby Walking Frames** **-Lead in metal base materials –** **Annex 9.A1**	
	A.1.1 The principle Provided in this Annex are methods to quantitate lead content in baby walking frames that have metal as their base material. Atomic Absorption Spectrometry (AAS), Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), Inductively Coupled Plasma Mass Spectrometry (ICP-MS), and some of chemical sample preparation methods are provided. Dissolve the sample using acids such as hydrochloric acid or nitric acid, and then quantitate lead content with AAS, ICP-OES, ICP-MS etc. **Note:** Poisonous and dangerous substances are used in this method; therefore the detailed precautions below must be followed. **A.1.2 Reagents** The concentration of the analyte and disturbing elements in reagent and water etc. must be negligibly low compared to the detection limit. **a) Water:** Use the first class water that is stipulated in KS M ISO 3696 for all sample solution preparations and dilution. **b) Nitric acid:** p (HNO_3) = 1.4 g/mL, 65% (*m/m*) , "Trace Metal" grade. **c) Weak nitric acid (1:2):** dilute strong nitric acid [A.1.2.b)] with water [A.1.2.a] to ratio of 1:2 (by volume). **d) Boron fluoride:** HBF_4, 50% (*m/m*), "Trace Metal" grade. Or solution of boric acid [A.1.2.m)] 75g dissolved in 200 mL of 40% (*m/m*) hydrofluoric acid [A.1.2.j)] can be used. **e) Hydrogen peroxide:** p (H_2O_2) = 1.10 g/mL, 30% (*m/m*) "Trace Metal" grade, **f) Perchloric acid:** p ($HClO_4$) = 1.67 g/mL,70% (*m/m*) "Trace Metal" grade, **g) Phosphoric acid:** p (H_3PO_4) = 1.69 g/mL, more than 85% (*m/m*) "Trace Metal" grade, **h) Sulphuric acid:** p (H_2SO_4) = 1.84 g/mL,95% (*m/m*) "Trace Metal" grade, **i) Weak Sulphuric acid (1:2):** dilute strong sulphuric acid [A.1.2.h)] with water [A.1.2.a)] and ratio of 1:2 (by volume). **j) Hydrofluoric acid:** p (HF) = 1.18 g/mL,40% (*m/m*) "Trace Metal" grade, **k) Hydrochloric acid:** p (HCI) = 1.16 g/mL,37% (*m/m*) "Trace Metal" grade, **l) Hydrobromic acid:** p (HBr) = 1.48 g/mL,47%~49% (*m/m*) "Trace Metal" grade, **m) Boric acid (H_3BO_3)** ; 1.48 mg/mL, 5% (*m/m*) "Trace Metal" grade, **n) Mixed acid 1** (Hydrochloric acid [A.1.2 k)] : Nitric acid [A.1.2 b)]: Water [A.1.2 a)] = 2:1:2) **o) Mixed acid 2** (Nitric acid [A.1.2 b)]: Hydrofluoric acid [A.1.2 j)] = 1:3) **p) Mixed acid 3** (Hydrochloric acid [A.1.2 k)] : Nitric acid [A.1.2 b)] = 3:1)	

Current	Proposed Revision	Remarks
	q) Lead standard solution (1,000 mg/L) **r) Internal standard solution** The internal standard elements must not interfere with the analyte. Also, the internal standard elements in the sample solution must be in negligible quantity. Sc, In, Tb, Lu, Re, Rh, Bi and Y can be used as the internal standard elements. **Note:** The toxicity of each reagent used in this method cannot be determined exactly. However, each chemical compound must be considered as a potential health threatening element. Therefore, it is recommended to reduce exposure to those chemicals as much as possible. **Note:** Pre-processing with strong acids can cause corrosion and burns. Lab coats, gloves and goggles must be worn when dealing with acids. **Note:** Nitric acid may generate toxic gas. Always add acid into the sample inside an air exhauster (hood). **Note:** Gases from plasma must come out through the air exhauster hood. **Note:** A special measure must be taken when using hydrofluoric acid. For example, if hydrofluoric acid has contacted the skin, wash thoroughly with water for more than 5 minutes and apply an antidote ointment (water-soluble gel with 2.5% calcium gluconate) to the skin as a first aid then see a doctor. If it requires a long term care, foods containing lots of calcium will be good for healing. **A.1.3 Instruments and tools** a) **Atomic Absorption Spectrophotometer (AAS):** Consists of sample container, nebulizer/burner system with air/acetylene burner head, hollow cathode tube, detector, data processing and control system. b) **Inductively coupled plasma Optical Emission Spectrometer(ICP-OES):** Consists of sample container, plasma torch, spray chamber, nebulizer, optical system, detector, control and data output system. c) **Inductively coupled plasma Optical Mass Spectrometer(ICP-MS):** Consists of sample container, plasma torch, spray chamber, nebulizer, interface, mass filter, detector, discharger, control and data output system. d) **Scale**: Must be able to measure precisely up to 0.1mg. e) **Glassware**: Wash all glassware with 10% (% by volume) nitric acid before using. 1) **Kjeldhal flasks**-100 mL 2) **Beakers**-100 mL, 200 mL etc. 3) **Measuring flasks** -100 mL, 200 mL, 500 mL etc. Other measuring tools can be used provided they are precise and accurate. 4) **Single channel pipettes**- 1mL, 5 mL,10 mL, 20 mL etc. 5) **Funnels** 6) **Watch glasses** f) **Platinum crucibles** – 50 mL, 150 mL etc. g) **Porcelain crucibles** – 50 mL, 150 mL etc.	

Current	Proposed Revision	Remarks
	h) **Micro pipettes** - 10µL, 100 µL, 200 µL etc. i) **Heating plates or Sand bath** j) **Electric furnace** (550 ± 25) °C k) **Bunsen burner or Gas burner** l**) Microwave digestion system:** Use a sample container and containers that are made of high-pressure TFM (tetrafluoro-methaxil) or PFA (perfluoro-alkoxyfluorocarbon) or other fluorinated carbon substances. **Note:** The safety guidelines on handling the device vary depending on the microwave device used at each laboratory. The analyst must refer to the instructions on proper and safe use of the microwave device and containers. m) **Containers for Microwave digestion –** 100 mL etc**.** Note: TFM (tetrafluoro-methaxil), PFA (perfluoro-alkoxyfluorocarbon), PTFE (polytetrafluoroethylene) etc. **A.1.4 Sample preparation** **A.1.4.1 Test sample** Weigh 1g of sample to every 0.1mg and put it in a beaker (Use PTFE or PFA beaker if using hydrofluoric acid [A.1.2.j)]). **A.1.4.2 Preparation of test sample solution** The pre-processing of a sample described in this section does not apply to all metals and their compounds. Generally, the solution is prepared using hydrochloric acid, nitric acid or mixed acid. For samples that are difficult to dissolve with those acids, add perchloric acid and sulphuric acid wherever necessary. However, keep in mind that the use of sulphuric acid carries a risk of lead element loss, and therefore seriously affects the quantitative test of lead. The sample must be completely dissolved without residue by heating at high temperature. Phosphoric acid also can be used to dissolve the sample. Dissolving metals and their compound with strong acids have a risk of deposit (Pb, Ba from sulphuric acid, and Ag, Au, Ag Oxide, or hydroxide from hydrochloric acid will be formed).The substances in the analyte might decrease due to co-precipitation. The analyte must be checked to see whether there is any loss of the substances. Many elements and related compounds (aluminum oxide, silicon oxide, chromium carbide and niobium carbide etc.) cannot be completely dissolved with this method. If there are any of these substances, completely dissolve the residue by alkali melting or by using an airtight pressurized container after the decomposition of acids, and then mix with the undiluted sample solution. **a) General method to dissolve the sample** Cover the glass beaker [A.1.3.e) 2)] containing the sample with a watch glass. Put 20 mL of mixed acid 1 [A.1.2.n)] into it and heat until it dissolves. Cool down to room temperature, and then wash inside of the watch glass and the side of the beaker with water. Remove the watch glass. Move the solution into a 100 mL measuring flask [A.1.3 e) 3)] and fill water up to the scale mark to dilute. Dilute each sample solution with water to the appropriate concentration level of each measuring tool. Put all sample solutions together to make the final solution. Add	

Current	Proposed Revision	Remarks
	an internal standard element containing rhodium [A.1.2. r)] and add water to the scale mark of the flask to dilute when necessary. The type and amount of element are determined based on the selected method of analysis, and each dilution process must be taken into account when calculating the result. The dilutions made and additions of internal standard elements must be recorded in the test report. **b) For samples containing tin** Cover the glass beaker [A.1.3.e) 2)] containing the sample with a watch glass. Put 10 mL of mixed acid 3 [A.12 p)] little by little into it. Once the intense reaction has stopped, slowly heat the beaker and dissolve completely. Cool down to room temperature, and then wash inside of the watch glass and the side of the beaker with water. Remove the watch glass. Add 10 mL of sulphuric acid [A.1.2.h)] and heat until white lead is being generated from the sulphuric acid. Cool for a few minutes, add 20 mL of hydrobromic acid [A.1.2.l)], and reheat until white lead is being generated. Repeat this process 3 times and cool to room temperature. Then add 10 mL of nitric acid [A.1.2 b)] to liquefy soluble salts in it. Cool to room temperature, then move the solution into a 100 mL measuring flask [A.1.3 e) 3)] and fill water up to the scale mark to dilute. Dilute each sample solution with water to appropriate concentration level of each measuring tool. Put all sample solutions together to make the final solution. Add an internal standard element [A.1.2. r)] containing rhodium and add water to the scale mark of the flask to dilute when necessary. The type and amount of element are determined based on the selected method of analysis. Each dilution process must be taken into account when calculating the result. The dilutions made and additions of internal standard elements [A.1.2. r)] must be recorded in the test report. Another method is to dissolve 1g of the sample using water 40mL, nitric acid [A.1.2.b)] 12 mL and boron fluoride [A.1.2.d)] 6mL {or a solution that has 75g of boracic acid [5.5.3.2 m] melted into 200 mL of hydrofluoric acid [A.1.2.j)] 40% (*m/m*)} . In this case, use PTFE or PFA beakers or PFA measuring flask. **c)** If there are any residues, separate them through centrifugation or filtration. Use appropriate method to make sure there are no remaining lead elements in the residue. **Note:** If there exists silver and a large amount of tin (i.e. lead-free solder), melt with hydrofluoric acid and 10 mL of hydrogen peroxide little by little until it is completely dissolved. **A.1.5 Preparation of the base solution** Prepare the base solution the same way as the sample solution was prepared using all reagents except for the sample. **A.1.6 Test operation** If the composition of the sample is clearly known, use the calibration curve method (medium correction method). Otherwise use the internal standard method (sensitivity comparison method). The standard addition method can be used if necessary.	

Current	Proposed Revision	Remarks
	Note: The internal standard method is not applicable for AAS. **Note:** A medium correction method is better for samples with high medium concentration. **Note:** If the effect of the medium is incorrect, the medium must be removed by methods such as solvent extraction and ion exchange. **A.1.6.1 Preparation of the standard solution for calibration curve** The following two methods can be used to prepare the standard solution for the calibration curve. **a) Calibration curve method (medium correction method)** Put a standard lead solution into 100 mL measuring flask and dilute with water to have a concentration of 0μg ~ 100 μg. In the case of using the medium correction method, it is necessary to correct the medium of sample solution and the medium of standard solution to be as close as possible. Add each reagent and medium element to prepare a mixed standard solution for the calibration curve that corresponds to the sample solution. When using hydrofluoric acid, use PTFE or PFA beaker and low-density polyethylene (LDPE) or PFA measuring flask. **b) Standard addition method** Prepare the standard solution for the calibration curve by adding reagents and internal standard elements to get the same concentration as the sample solution. When using hydrofluoric acid, use PTFE or PFA beakers and LDPE or PFA measuring flasks. **5.5.3.6.2 Standard solution for calibration curve** **a) Atomic Absorption Spectrometry (AAS)** Inject some of the prepared standard solution for the calibration curve into the air-acetylene flame of the AAS under optimal conditions and measure the atomic wavelength absorption of the lead element. For the calibration curve method (medium correction method), create a curve that shows the relationship between strength and concentration in the lead element spectral line as a calibration curve. If there is interference due to co-existing substances, select an interference-free wavelength within the range of selected calibration or the strength of the interference must be corrected by appropriate means. < A Linear Regression Line with less than 0.998 of linear coefficient (R^2) can be used for the initial calibration. If the difference between the expected value and the result of the checked standard (i.e. standard substance, standard solution etc.) is greater than 20%, all relevant calibration materials and samples must be measured again. b**) Inductively Coupled Plasma Optical Emission Spectrometry(ICP-OES)** Inject some of the prepared standard solution for the calibration curve into the argon plasma of the ICP-OES under optimal conditions and measure the atomic wavelength absorption of the lead element. For the calibration curve method (medium correction method), create a curve that shows the relationship between strength and concentration in the lead element	

Current	Proposed Revision	Remarks
	spectral line as a calibration curve. For the internal standard method, create a curve showing the relationship between the sensitivity ratio and concentration of lead for the internal standard element as a calibration curve. When measuring samples containing hydrofluoric acid, use sample containers and torches that can stand hydrofluoric acid. The wavelength is selected from the spectral line of lead element. If there is interference due to co-existing substances, select an interference-free wavelength within the range of selected calibration or the interference level must be corrected by appropriate means. **c) Inductively Coupled Plasma Mass Spectrometry (ICP-MS)** Spray the sample solution into the argon plasma through the spray chamber. When measuring samples containing hydrofluoric acid, use sample containers and torches that can stand hydrofluoric acid. Read the value of the mass versus electric charge of lead and measure the internal standard elements. Calculate the ratio of the measured values to that of the measuring element for the internal standard elements. **A.1.7 Measuring the sample** Once the calibration curve has been created, measure the base solution for calibration and the sample solutions. If the concentration of the sample solution is higher than the calibration curve, dilute the sample solution to be within the range of the calibration curve and measure again. Check the precision at regular intervals with standard substances, calibration curve, etc.(per every 10 samples). Re-create the calibration curve when necessary. **Note:** When the sample solution has been diluted within the range of the calibration curve, adjust the internal standard concentration in the diluted solution to the concentration of the standard solution. **A.1.8 Calculation** Obtain the strength of the spectral line of the lead element from the sample solution in A.1.7 and the amount of lead element from the calibration curve. Then calculate the lead element content (mg/kg) with the equation below. $C = (A_1-A_2)/m * V$ C: The lead concentration in the sample (mg/kg) A_1 = The measured lead concentration in the sample solution (mg/L) A_2 = The measured lead concentration in the base test solution (mg/L) V = Total volume of the sample solution (mL) m = Amount of the sample (g)	

<New>	**Safety Certificate Standards** **Baby Walking Frames** **-Lead in high molecular base materials –** **Annex 9.A2**	
	A.2.1 The principle Defined in this annex are methods to quantitate lead contents in high molecular base materials used for baby walking frames. Choose the most appropriate method for quantitative analysis among Atomic Absorption Spectrometry (AAS), Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), and Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Dry ashing, acid decomposition using sulphuric acid or nitric acid, and acid decomposition using a microwave digestion system can be used as method to decompose the sample. A microwave digestion system is recommended when using sulphuric acid for decomposition to reduce the measurement error of analyte. It is because the use of sulphuric acid has a risk of losing lead. If the sample solution contains insoluble substances in it, analyze the deposit separately with X-ray fluorescence spectrometry or any other means, and then mix it with undiluted solution to quantitate lead. **Note:** Poisonous and dangerous substances are used in this method; therefore the detailed precautions below must be followed. **A.2.2 Reagents** The concentration of the analyte and disturbing elements in reagent and water etc. must be negligibly low compared to the detection limit. **a) Water:** Use the first class water that is stipulated in KS M ISO 3696 for all sample solution pre-processing and dilution. **b) Sulphuric acid:** p (H_2SO_4) = 1.84 g/mL,95% (*m/m*) "Trace Metal" grade, **c) Nitric acid:** p (HNO_3) = 1.40 g/mL, 65% (*m/m*), "Trace Metal" grade. **d) Nitric acid,** 10% (*m/m*), "Trace Metal" grade. **e) Hydrogen peroxide:** p (H_2O_2) = 1.10 g/mL, 30% (*m/m*) "Trace Metal" grade, **f) Hydrochloric acid:** p (HCI) = 1.19 g/mL, 37% (*m/m*) "Trace Metal" grade, **g) Hydrofluoric acid:** p (HF) = 1.18 g/mL,40% (*m/m*) "Trace Metal" grade, **h) Boric acid (H_3BO_3)** ; 5% (*m/m*) (50 mg/mL), "Trace Metal" grade, **i) Standard solution of lead (1,000 mg/L)** **j) Internal standard substances** Use internal standard substances that do not disturb the analyte, and a small quantity of internal standard element. Typically, Sc, In, Tb, Lu, Re, Rh, Bi and Y are used as the internal standard elements. Usually Sc and Y are recommended for ICP-OES. Concentration must be lower than 1,000 mg/kg. **Note:** The toxicity of each reagent used in this method cannot be determined exactly. However, each chemical compound must be considered as a	

potential health threatening element. Therefore, it is recommended to reduce exposure to those chemicals as possible.

Note: Pre-processing with strong acids can cause corrosions and burns. Lab coats, gloves and goggles must be worn when dealing with acids.

Note: Nitric acid may generate toxic gas. Always add acid into the sample inside an air exhauster (hood).

Note: Gases from plasma must come out through air exhauster hood.

Note: A special measure must be taken when using hydrofluoric acid. For example, if hydrofluoric acid had smudged on skin, wash it thoroughly with water for more than 5 minutes, and apply an antidote ointment (water-soluble gel with 2.5% calcium gluconate) to the skin as a first aid, and then see a doctor. If it requires long term care, foods containing lots of calcium will be good for healing.

A.2.3 Instruments and tools

a) Atomic Absorption Spectrophotometer (AAS): Consists of sample container, nebulizer/burner system with air/acetylene burner head, hollow cathode tube, detector, data processing and control system.

b) Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES): Consists of sample container, plasma torch, spray chamber, nebulizer, optical system, detector, control system and data output system.

c) Inductively Coupled Plasma Optical Mass Spectrometer (ICP-MS): Consists of sample container, plasma torch, spray chamber, nebulizer, interface, mass filter, detector, discharger, control system and data output system.

d) Scale: Must be able to measure precisely up to 0.1mg.

e) Glassware: Wash all glassware with 10% (% by volume) nitric acid before using.

1) **Kjeldhal flasks**-100 mL
2) **Beakers**-100 mL, 200 mL etc.
3) **Measuring flasks** -100 mL, 200 mL, 500 mL etc.
   Other measuring tools can be used provided they are precise and accurate.
4) **Single channel pipettes**- 1mL, 5 mL, 10 mL, 20 mL etc.
5) **Funnels**
6) **Watch glasses**

f) Platinum crucibles – 50 mL, 150 mL etc.

g) Porcelain crucibles – 50 mL, 150 mL etc.

h) Micro pipettes - 10µL, 100 µL, 200 µL etc.

i) Heating plates or Sand bath

j) Electric furnace (550 ± 25) °C

k) Bunsen burner or Gas burner

l) Microwave digestion system: Use a sample container and containers that are made of high-pressure TFM (tetrafluoro-methaxil) or PFA (perfluoro-alkoxyfluorocarbon) or other fluorinated carbon substances.

Note: The safety guidelines on handling the device vary depending on the microwave device used at each laboratory. The analyst must refer to the instructions on proper and safe use of the microwave device and

containers.

m) Containers for Microwave digestion – 100 mL etc**.**

Note: TFM (tetrafluoro-methaxil), PFA (perfluoro-alkoxyfluorocarbon), PTFE (polytetrafluoroethylene) etc.

A.2.4 Sample preparation

A.2.4.1 Test sample

It is better to start with the largest available quantity of the sample depending on the selected decomposition method. When sampling with acid decomposition, take 400 mg of cut and grinded sample precisely to every 0.1mg. When sampling with dry ashing or acid decomposition with airtight containers, grind, trim, or cut the sample and take 200 mg precisely to every 0.1mg.

A.2.4.2 Preparation of test solution

a) Dry ashing

If the sample does not contain a halogen element, follow the method below.

1) Put the weighed sample in a crucible and heat on a heating plate.

2) Heat the crucible inside a well ventilated hood with burner. Be careful that the sample does not catch fire.

3) Heat slowly until volatile matters that were generated while the sample was being carbonized to charcoal are completely discharged and only ashes are left.

4) Put the crucible containing the sample into an electric furnace of 550 ± 25 °C. Leave the furnace door ajar to supply enough air for oxidization.

5) Continue to heat until the carbon completely oxidizes and only ashes are left.

6) Take the crucible out of the electric furnace and cool to room temperature.

7) Add 5 mL of nitric acid [A.2.2.c)] and heat slowly to dissolve the residues. Move this solution into a 50 mL measuring flask [A.2.3 e) 3)] and add water up to the scale mark to dilute. Dilute the sample solution to have an appropriate concentration for the measuring device. When using internal standard substances [A.2.2.j)], add internal standard solution [A.2.2.j)] before diluting the solution in a flask. Add 500 µL when using ICP-OES, and dilute the solution to 1:1000 for ICP-MS.

If the sample contains a halogen element, follow the steps below.

1) Put the sample into a crucible [A.2.3.g)] and weigh.

2) Add 5mL ~ 15 mL of sulphuric acid [A.2.2.b)], put the crucible on a heating plate or sand bath [A.2.3.i)] and then slowly heat until the sample is being carbonized to black.

3) When it cools down, add 5 mL of nitric acid [A.2.2.c)] and continue to heat until the sample has completely decomposed and white lead of sulphuric acid is being generated.

4) Cool the heated crucible [A.2.3.g)]. Move it into an electric furnace [A.2.3.j)] that has temperature adjusted to 550 ± 25 °C, and heat until all carbon has completely burned and all the water has boiled away.

5) Take the crucible out of the furnace and cool to room temperature. Add 5 mL of nitric acid [A.2.2.c)] and heat slowly to dissolve the residues. Move this solution into a 50 mL measuring flask and add water up to the scale mark to dilute. Dilute the sample solution to have an appropriate concentration for the measuring device. If the internal standard substances [A.2.2.j)] are being used, add internal standard solution [A.2.2.j)] before diluting the solution in a flask.

Add 500 μL when using ICP-OES, and dilute the solution to 1:1000 for ICP-MS.

6) If there are any residues, separate them through centrifugation or filtration. Use an appropriate method to check the existence of lead elements in the residue.

b) Microwave decomposition

1) General decomposition method

Put the weighed sample in a microwave digestion vessel, and add 5mL of nitric acid [A.2.2.c)] and 0.1 mL ~ 1.0 mL of hydrogen peroxide [A.2.2.e)]. When the chemical reaction between the sample and acids has calmed down, put a stopper on the vessel. Assemble the microwave digestion system [A.2.3.l)]; operate the microwave oven according to the pre-set decomposition program to dissolve the sample. Cool the vessel and move the solution into a 50 mL measuring flask, then fill water up to the scale mark to dilute. Dilute the sample solution with water to meet the appropriate concentration standard of each measuring tool. If the internal standard substances [A.2.2.j)] are being used, add internal standard solution [A.2.2.j)] before diluting the solution in a flask. Add 500 μL when using ICP-OES, and dilute the solution to 1:1000 for ICP-MS.

2) For irresoluble samples or samples containing silicon dioxide or titanium, do as follows.

Put the weighed sample in a microwave digestion vessel, and add 5mL of nitric acid [A.2.2.c)], 1 mL of hydrofluoric acid [A.2.2.g)], and 0.1 mL ~ 1.0 mL of hydrogen peroxide [A.2.2.e)]. Put a stopper on the vessel and operate microwave oven according to the pre-set decomposition program to dissolve the sample. Cool the vessel and move the solution into a 50 mL low density polyethylene (LDPE) or PFA measuring flask, then fill water up to the scale mark to dilute. Add boric acid [A.2.2.h)] to form fluoride to protect quartz plasma torch (if there is no anti-acid sample injection system). Dilute the sample solution with water to meet the appropriate concentration level of each measuring tool. If the internal standard substances [A.2.2.j)] are being used, add internal standard solution [A.2.2.j)] before diluting the solution in a flask. Add 500 μL when using ICP-OES, and dilute the solution to 1:1000 for ICP-MS.

Note: Add hydrogen peroxide only to know the reactants of the sample. It must not be added when there are lots of easily oxidizable substances in the sample, because they react quickly and intensely with easily oxidizable substances.

3) If there are any residues in the sample solution, separate them through centrifugation or filtration. Use an appropriate method to check if there are lead elements in the residue.

A.2.5 Preparation of the base solution

Prepare the base solution with the same way as the sample solution was prepared using all reagents except the sample.

A.2.6 Testing process

It is generally assumed that the sample consists of unknown compositions, and the internal standard method (sensitivity comparison method) is recommended. A standard addition method can be used if necessary. If there is no disturbing element and the compositions of the sample are known, the calibration curve method (medium correction method) can be used as well.

Note: The acid must be adjusted to the concentration of the sample in all circumstances.

A.2.6.1 Preparation of solution for the calibration curve

Take 0μg ~ 100μg of lead standard solution gradually and put into a100 mL measuring flask [A.2.3.e) 3)]. When measuring with the internal standard addition method, make sure the acid concentration of both the sample solution and the internal standard substance [A.2.2.j)] calibration curve solution are the same.

A.2.6.2 Creating calibration curve

Use the spectrometer for quantitative analysis. Spray some of the prepared calibration curve solution into the argon plasma or into air/acetylene flame. If Measuring the samples that contain hydrofluoric acid, use a sample introduction system that can stand hydrofluoric acid.

a) Atomic Absorption Spectrometry (AAS)

Quantitate by measuring the optical density of lead elements. Create a curve that shows the relationship between the optical density and the concentration of lead elements as a calibration curve when using the calibration curve method (medium correction method). For the standard addition method, put the standard into the sample solution. Determine unknown concentration by extrapolating addition curve with an optical density of zero.

< A Linear Regression Line with less than 0.998 of linear coefficient (R^2) can be used for the initial calibration. If the result of calibration standard (i.e. standard substance, standard solution etc.) measurement differs more than 20% from the expected value, all relevant calibration standards and samples must be measured again.>

b) Inductively Coupled Plasma Optical Emission Spectrometry(ICP-OES)

Quantitate by measuring the intensity of lead elements. When quantitate lead elements with calibration curve method, create a calibration curve that shows the relationship between intensity and concentration of lead elements. For standard addition method, create a calibration curve that shows the relationship between intensity ratio and concentration of lead elements as a calibration curve.

c) Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Quantitate by measuring the charge number against the mass of lead elements. For calibration curve method, create a calibration curve that shows the relationship between the ratio of mass/charge number and concentration of lead elements.

A.2.7 Measure of the sample

Measure the base solution and sample solution after the calibration curve has been created. If the concentration of the sample is higher than the calibration curve, dilute the sample solution to be within the range of the calibration curve and measure again.

	Check the precision at regular intervals with standard substances, calibration curve solution, etc.(once per every 10 samples). Re-create the calibration curve when necessary. **Note:** When the sample solution has been diluted within the range of calibration curve, adjust the internal standard concentration in the diluted solution to concentration of the standard solution. **A.2.8 Calculation** Calculate lead element content (mg/kg) within the sample with the equation below. $C = (A_1-A_2)/m * V$ C: The lead concentration in the sample (mg/kg) A_1 = The lead concentration in the sample solution (mg/L) A_2 = The lead concentration in the base test solution (mg/mL) V = Total volume of the sample solution (mL) m = Amount of the sample (g)	

<New>	**Safety Certificate Standards** **Baby Walking Frames** **-Lead in painted or coated materials –** **Annex 9.A3**	
	A.3.1 The principle In this method, separate the painted and coated surface according to 5.4, and then quantitate the total lead content. **A.3.2 Instruments and tools** **a)Disposable plastic containers for digestion or glass test tubes** 50 mL. **b)Heating plates** with holes to place test tubes in. **A.3.3 Reagents** **a) Deionized water** **b) Nitric acid** **c) Methylene chloride** **A.3.4 Operation** a) Put approximately 30 mg ~ 50 mg of sample prepared from 5.4 (painted and coated part) into a 50 mL beaker. b) Take paint standard material (**NIST SRM 2581**-powdered paint, 0.5 % of lead) and operate the same way as the sample. c) Dissolve the sample accordingly to **AOAC 974.02** or **ASTM E 1645**. d) Dilute the sample to make the concentration of lead be fitted within the range of the calibration curve. e) Quantitate the lead within the sample solution according to **ASTM E 1613**. In this case, the ICP analysis must be valid for the public announcements from CPSC[1], guidelines for the process to quantitate leads, and the guidelines for validity of lead concentration within metal accessories for children (**CPSC-CH-EI001-08)**.	
<New>	**Safety Certificate Standards** **Baby Walking Frames** **-Lead in other materials –** **Annex 9.A4**	
	A.4.1 The principle Provided in this Annex are methods to quantitate lead content in materials other than high molecular materials and metal materials in baby walking frames. The most proper method among Atomic Absorption Spectrometry (AAS), Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) can be chosen to quantitate leads. Decompose the test sample with aqua regia, or use the microwave digestion method using chemicals such as nitric acid, boron fluoride, hydrogen peroxide and hydrochloric acid.	

[1] Consumer Product Safety Commission

Use AAS or ICP-OES for samples that have more than 10 mg/kg of lead content, and use ICP-MS for samples that have more than 0.1 mg/kg of lead content.

Note: If HBF_4 has lower purity, use HF instead.

A.4.2. Reagents

The concentration of the lead elements or of the disturbing elements in reagents and water etc. must be negligibly low compared to the detection limit. Also, the reagents for ICP-MS analysis must be high-purity acids or chemical compounds and have less than $1*10^{-6}$ % (*m/m*) of trace metals.

a) Water: Use the first class water that is stipulated in KS M ISO 3696. Trace Metal grade –total amount less than 10 ppb.
b) Hydrochloric acid: p (HCl) = 1.16 g/mL,37% (*m/m*) "Trace Metal" grade
c) Weak hydrochloric acid (1:2): dilute strong hydrochloric acid [A.4.2.b] with water [A.4.2.a] to ratio of 1:2. "Trace Metal" grade
d) 5 % (*m/m*) hydrochloric acid solutions, "Trace Metal" grade.
e) 10 % (*m/m*) hydrochloric acid solutions, "Trace Metal" grade.
f) Nitric acid: p (HNO_3) = 1.4 g/mL, 65% (*m/m*) , "Trace Metal" grade.
g) 0.5 mol/L nitric acid solution, "Trace Metal" grade.
h) 10 % nitric acid solutions, "Trace Metal" grade.
i) Mixed acid HCl [A.4.2.b)] : HNO_3 [A.4.2.f)] = 3:1.
j) 50 % (*m/m*) boron fluorides (HBF_4), "Trace Metal" grade.
k) Hydrogen peroxide: p (H_2O_2) = 1.10 g/mL, 30% (*m/m*) "Trace Metal" grade,
l) Standard lead solution (1,000 mg/L)
m) Internal standard solution

Internal standard elements must not disturb the analyte. Also the existence of internal standard elements in the sample solution must be negligibly low. Sc. In, Tb, Lu, Re, Rh, Bi and Y can be used as internal standard elements for this particular spectrometry.

Note: The toxicity of each reagent used in this method cannot be exactly determined. However, each chemical compound must be considered as a potential health threatening element. Therefore, it is recommended to reduce exposure to those chemicals as much as possible.

Note: Pre-processing with strong acids can cause corrosion and burns. Lab coats, gloves and goggles must be worn when dealing with acids.

Note: Nitric acid may generate toxic gas. Always add acid into the sample inside an air exhauster (hood).

Note: Gases from plasma must come out through the air exhauster hood.

Note: A special measure must be taken when using hydrofluoric acid. For example, if hydrofluoric acid has contacted the skin, wash it thoroughly with water for more than 5 minutes and apply an antidote ointment (water-soluble gel with 2.5% calcium gluconate) to the skin as a first aid, and then see a doctor. If it requires long term care, foods containing lots of calcium will be good for healing.

A.4.3 Instruments and tools

a) Atomic Absorption Spectrophotometer (AAS): Consists of sample container, nebulizer/burner system with air/acetylene burner head, hollow cathode tube, detector, data processing and control system.

b) Inductively coupled plasma Optical Emission Spectrometer(ICP-OES): Consists of sample container, plasma torch, spray chamber, nebulizer ,optical system, detector, control and data output system.

c) Inductively coupled plasma Optical Mass Spectrometer(ICP-MS): Consists of sample container, plasma torch, spray chamber, nebulizer, interface, mass filter, detector, discharger, control and data output system.

d) Sample injection system that can stand against hydrofluoric acid: A hydrofluoric acid proof sample injection system that is consisted of a sample injection part and a torch.

e) Decomposition with aqua regia: Automatic temperature control system, container, reflux condenser and absorption cell.

f) Microwave digestion system:

A microwave sample decomposition system that basically has a sample container with a capacity of 40 mL and containers that are made of high-pressure PTFE, TFM, PFA or other fluorinated carbon substances.

Note: Each manufacturer and the model of the microwave system used at each laboratory have their own guidebooks for the safety and handling of the system. The analyst must refer to the manual, the manufacturer, and relevant documents to be familiar with the proper and safe use of the system.

g) Scale: Must be able to measure precisely up to 0.1mg.

h) Glassware: Wash all glassware with 10% (% by volume) nitric acid [10.3.h)] before using.

1) Beakers-100 mL, 200 mL, 500 mL etc.

2) Measuring flasks -100 mL, 200 mL, 500 mL etc.

Other kinds of volume measuring tools can be used provided that they are precise and accurate.

3) Pipettes- 1mL, 5 mL,10 mL, 20 mL etc.

4) Cylinders -1mL, 5 mL,10 mL etc.

5) Watch glasses

i) Micro pipettes – 200 µL, 500 µL, 1000 µL etc.

j) Wash PTFE or PFA devices with 10% (% by volume) nitric acid [A.4.2.h)] before using.

1) Beakers -100 mL, 200 mL, 500 mL etc

2) Measuring flasks -100 mL, 200 mL etc.

k) Heating plats or sand baths

l) Microwave digestion system- 40 mL, 100 mL etc.

A.4.4 Preparation of sample

The pre-processing of the samples described in this section does not apply to all parts which are not made of metals and high molecular materials. Generally, hydrochloric acid, nitric acid or mixed acid are used. For samples that are difficult to dissolve with those acids, add perchloric acid, sulphuric acid etc. wherever necessary. However, keep in mind that use of sulphuric acid carries a risk of lead element loss, and therefore seriously affects the quantitative test of

lead. The sample must be completely dissolved without residue by heating at high temperature.
If there are any residues, check if they contain lead elements with another analyzing method (e.g. XRF), or completely dissolve the residues with other decomposition methods (use alkali melting or an airtight pressurized container). Mix the solution that has been processed with this method to undiluted solution, and proceed to the lead analysis.

A.4.5 Test sample

a) Dissolve with aqua regia

Put approximately 2g of powdered sample (maximum particle size : 250 μm) into a reaction vessel and add 22.5 mL of hydrochloric acid [A.4.2.b)] and 7.5 mL of nitric acid [A.4.2.f)]. Set up a reflux condenser and absorption cell containing 10 mL of 0.5 mol/L nitric acid [A.4.2.g)] on the reaction vessel. Dissolve for 12 hours at room temperature and then for 2 hours at 120 °C. Cool to room temperature and put the contents of the absorption cell into the reaction vessel. If there are insolubles, filter the sample solution with a 0.45 μm glass fibre strainer. Wash the insolubles 4 times with 5 % hydrochloric acid [A.4.2.d)]. Move the resulting solution into a 100 mL measuring flask [A.4.2.h) 2)] and add 5 % hydrochloric acid [A.4.2.d)] to the scale mark to dilute.
Dilute the sample solution to fit the concentration of the calibration curve. When using internal standard substances, add them before diluting the solution. Before filling up to the final volume of 100 mL, add 1,000 μL of internal standard when using ICP-OES, and then add an internal standard diluted to 1:1000 for ICP-MS.
If there are any residues, separate them through centrifugation or filtration. Check the residues with appropriate method (e.g. XRF) to see if there are remaining leads. When it is not possible to use a test instrument described in this section, another simple method can be used if the tester trusts its compatibility. Errors generated from the provided test operation must be verified and be recorded in the test report.
The following is the procedure for the simple method. Cover the glass beaker containing the sample with a watch glass, then put mixed acid [A.4.2.i)] into the beaker and heat for 2 hours at 120 °C. Leave it at room temperature for 12 hours, wash the bottom of the watch glass and inner wall of the beaker with water and then remove the watch glass. If there are insolubles, filter the sample solution with a 0.45 μm glass microfiber strainer. Wash the insolubles with 5 % (*m/m*) hydrochloric acid solution [A.4.2.d)]. Move the resulting solution into a 100 mL measuring flask and add water to the scale mark to dilute. The final solution will be used for the next measurement.

b) Digestion with microwave

Put approximately 200 mg of powdered sample (maximum particle size : 250 μm) into PTFE, TFM, PFA or other containers made of fluorocarbon [A.4.3.j) 2)]. Add 4 mL of nitric acid [A.4.2.f)], 2 mL of boron fluoride [A.4.2.j)], 1 mL of hydrogen peroxide [A.4.2.k)], and 1 mL of water. Carefully shake the container for about 10 seconds to get rid of the generating gas. Once the reaction stops, cover the container with a stopper. Set up the microwave digestion system [A.4.3.l)] and operate the microwave oven according to the pre-set decomposition program to dissolve the sample.

Note: If the HBF_4 has lower purity, use HF instead.

Cool to room temperature (leave for approx.1 hour). Open the container, add 4 mL of hydrochloric acid solution [A.4.2.b)], and put a stopper on it. Set up the microwave digestion system [A.4.3.l)] again and operate the microwave oven according to the pre-set decomposition program to dissolve the sample.
Cool to room temperature (leave for approx. 1 hour). Open the container, and filter with a glass microfiber strainer into 25 mL measuring flask. Wash with 5 % hydrochloric acid solution [A.4.2.d)] and dilute to the scale mark. If there are any residues, check with an appropriate method to see if there are remaining lead elements in the residue.
The operation process described above is the minimum requirement for the microwave digestion system and need to test 2~3 times per sample.

Note: It is recommended to not put more than 200 mg of powdered sample in a container. The mixture of powdered test sample and nitric acid, HBF_4, hydrogen peroxide, hydrochloric acid reacts quickly and intensely to generate carbon dioxide and nitrogen oxide. This will cause the increase of pressure in the container. A safety device of the micro oven can react and the container can be opened due to the sudden high pressure. Also elements of the analyte can be lost and in the worst case, it can explode. Therefore when reagents are added to the sample, leave it until the reaction stops and then set up the system.

Note: The same amount and kind of acid must be used when testing the same sample 2~3 times.

A.4.6 Test process

Use the calibration curve method to measure the sample. The internal standard method (sensitivity comparison method) is used for ICP-MS.

Note: The standard addition method can be used to increase reliability of the test method.

Note: If the medium effect is not correctable, the medium needs to be removed by separation methods such as the solvent extraction method and ion exchange.

A.4.7 Preparation of solution for calibration curve

Two methods are used for the preparation of calibration standard solution.

a) Calibration curve method (medium correction method)

Prepare a base solution for a calibration curve and a standard solution for three calibration curves. Extract 0 μg ~ 100 μg of lead elements gradually and put them into 100 mL measuring flask. When preparing the standard solution with the medium correction method, add the same amount of reagents and medium elements as the sample solution to make it as the standard solution for the calibration curve.
If boron fluoride is used, use a measuring flask that is made of low

density poly ethylene (IDPE) or PFA.

b) Internal standard method

Add the same amount of reagents as those used for sample solution preparation to the standard solution for calibration curves. Put the internal standard elements into both the sample solution and the standard solution for the calibration curve.

If boron fluoride is used, use a measuring flask that is made of low density poly ethylene or PFA.

c) Atomic Absorption Spectrometry and Inductively Coupled Plasma Optical Emission Spectrometry (AAS, IPS-OES)

When measuring leads with the medium correction method, a proper spectral line must be selected and the calibration must use the standard solution for the calibration curve that has the medium corrected.

d) Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

The appropriate internal standard method can be used for this.

A.4.8 Preparation of standard solution

The preparation of a standard solution varies based on the instrument to be used.

a) Inductively Coupled Plasma Optical Emission Spectrometry and Atomic Absorption Spectrometry (IPS-OES, AAS)

The medium compositions between the sample solution by aqua regia decomposition and the solution by microwave digestion are different. The standard solution prepared for ICP-OES can be used for AAS within the concentration range from which the linearity of lead, the analyte element, is generated. Prepare a base solution for a calibration curve and a standard solution for four calibration curves.

Note: If the HBF_4 has lower purity, use HF instead.

b) Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Prepare a base solution for a calibration curve and a standard solution for three calibration curves. Extract 0 μg ~ 5 μg of lead elements gradually and then put them into a 100 mL measuring flask. Add the same amount of reagents as the reagents used for the sample solution preparation to the standard solution for calibration curves. Put 1 μg of rhodium as the internal standard elements into the sample solution and into the standard solution for the calibration curve.

A.4.9 Calibration curve creation

Creating a calibration curve varies based on the instrument to be used.

a) Atomic Absorption Spectrometry (AAS)

Inject some of the prepared standard solution for a calibration curve under optimal conditions into the air-acetylene flame of the AAS to measure the atomic wavelength absorption of the lead element. For the calibration curve method (medium correction method), create a curve as a calibration curve showing the relationship between the strength and concentration in the element spectral line.

The wavelength of lead element must be selected taking into account the typical

measuring wavelength. If there is interference due to coexisting substances, the strength of the interference must be corrected by selecting an interference-free wavelength within the range of selected calibration or other appropriate means.

b) Inductively Coupled Plasma Optical Emission Spectrometry(ICP-OES)

Inject some of the prepared standard solution for a calibration curve under optimal conditions into the argon plasma of the ICP-OES to measure the strength of atomic spectral line of the lead element. For the calibration curve method (medium correction method), create a curve as a calibration curve showing the relationship between the strength and concentration in the atomic spectral line. For the internal standard method, create a curve as a calibration curve showing the relationship between the sensitivity ratio and concentration for the internal standard element.

When measuring a sample containing hydrofluoric acid, use sample containers that can resist hydrofluoric acid.

The wavelength of lead element is selected from the spectral line. The wavelength of lead element must be selected by taking into account the typical measuring wavelength. A thorough study of the detection limit and accuracy must be carried out. If there is any interference due to coexisting substances, the degree of the interference must be corrected by selecting an interference-free wavelength within the range of selected calibration or other appropriate means.

c) Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Spray sample solution into the argon plasma through the spray chamber. When measuring a sample containing hydrofluoric acid, use a sample that can resist hydrofluoric acid. Read the value of the mass versus the number of electric charge of lead, and then measure the internal standard elements. Calculate the ratio of the measured value of the lead element to the measured value of the internal standard elements.

A.4.10 Measuring the sample

Measure the calibration base solution and the sample solution after the calibration curve has been created. If the concentration of the sample solution is higher than the calibration curve, dilute the solution to fit within the range of the calibration curve and measure again.

Check the precision of measurement at regular intervals with standard substances, calibration curve solution, etc. (per every 10 samples). Re-create the calibration curve if necessary.

< A Linear Regression Line with more than 0.998 of linear coefficient (R^2) can be used for the initial calibration. If the check result of the ecalibration standard (i.e. standard substance, standard solution etc.) differs more than 20% from the expected value, measure all relevant calibration standards and samples again.>

A.4.11 Calculation

Obtain the strength of spectrum for the lead element, then calculate the concentration (mg/kg) of the lead element in the sample according to the equation below.

$$C = (A_1 – A_2)/m * V$$

C: The lead concentration in the sample (mg/kg)

A_1 = The measured lead concentration from sample solution (mg/L)

A_2 = The measured lead concentration from base test solution (mg/mL)

	V = Total volume of the sample solution (mL) m = Amount of the sample (g) **Note:** The above equation is generalized because the first dilution of test solution is applied due to the potential diversity of analysis methods in this section. Keep in mind that all of the dilution must be included for the calculation.	
<New>	**Safety Certificate Standards** **Baby Walking Frames** **- Phthalate Plasticizer –** **Annex 9.C**	
	C.1 The principle Measure phthalate plasticizer content in plastic using Gas Chromatograph Mass Spectrometry (GC-MS). **C.1.1 Reagents and instruments** Only validated grades of analytical reagents must be used. **a) n-hexane** Those stipulated in KS M 8221-3. **b) Filters for Soxhlet (thimble filter)** 28mm * 100mm of size. Made of cellulose and the oil content must be less than 0.1 %. **c) Syringe filters** Less than 0.45 μm. Filters exclusively for organic solvent that are made of Teflon. **d) Vials** Use vial stoppers for GC that are made of Teflon. **Note:** Wash all glassware (including flask and stoppers) with cleanser and rinse several times with water before using. Rinse more with acetone, then with 10 mL of n-hexane twice. Dry at 105 °C. **C.1.2 Preparation of the sample** **C.1.2.1 Sample homogenization** Cut high molecular sample into 5 mm * 5 mm with shearing machine or scissors. Put these into a cryogenic crusher and grind to the particle size of smaller than 500 μm. For samples that cannot be used with a cryogenic crusher, cut into 1 mm or smaller. **C.1.2.2 Sample extraction** a) Put 1,000 mg ± 10 mg of sample into a filter for Soxhlet. Record the mass up to 0.1 mg. b) Cover the filter for Soxhlet with glass wool to prevent the sample floating. Using n-hexane as the solvent, put 60 mL in a 100 mL round bottom flask. Heat the solvent to reflux at the n- hexane's boiling point (69 °C). Extract for at least 6 hours. c) Fill the extracted solution with the solvent. (Concentrate if necessary). **C.1.2.3 Alternative extraction method for soluble high molecular substances** a) Put a 1,000 mg of sample in a 300 mL beaker. Measure the sample to every 0.1 mg. b) Add 50 mL of solvent (n-hexane) into the beaker and then sonicate it for 60	

minutes to decompose the sample.
c) Deposit high molecular substances or filter the compound with 0.45 μm PTFE screen.

C.1.4 Preparation of the standard solution

Weigh 100 mg of each standard precisely to every 0.1 mg and put it in a 100mL measuring flask. Dissolve with n-hexane, fill up the n-hexane up to the scale mark and shake to mix well. This will serve as a standard undiluted solution. Dilute the standard undiluted solution properly to prepare diluted standard solution for each concentration.

C.1.5 Preparation of the base solution

Prepare with the same way as to prepare the sample solution, but do not put the sample in.

C.1.6 Measuring the samples

Inject 1 μL of test solution into Gas Chromatography Mass Spectrometer. Perform the same process for phthalic acid at the same condition. Create a calibration curve at the peak area, compare it to the peak area from the test solution and then quantitate the sample.

1) Gas Chromatograph

a) Detector- Mass analyzing detector
b) Column- J&W DB-1, inner diameter 0.25 , thickness 0.1 m, length 30 m or equivalent ones.
c) Carrier gas- Helium gas with purity of 99.9 % or more
d) Column temperature-100 °C ~ 270 °C
e) Injector temperature-325 °C
f) Detector temperature-280 °C
g) Carrier gas flux- 1.0 mL/min
h) Sample injection amount - 1 μL (split-less mode)

2) Mass Spectrometer

a) Ionization part- Electronionization (EI)
b) Analyzer part- quadrupole
c) Detection range- 50 m/z ~ 500 m/z

Note: The condition of detector column etc. can be changed according to the instrument and analysis.

C.1.7 Calculation

The concentration of sample and calibration curve that has been recorded in the base test solution is used to obtain the amount of each plasticizer. The content of each plasticizer (mg/kg) can be calculated with an equation below.

$$C = (A_1 - A_2)/m * V$$

C: The plasticizer concentration in the sample (mg/kg)
A_1 = The plasticizer concentration in the sample solution (mg/L)
A_2 = The plasticizer concentration in the base test solution (mg/L)
V = Total volume of the sample solution (mL)
m = Weight of the sample (g)

□ **Safety Certification Annex 14: Baby Carriages** (Omit the contents when to be published in the official gazette)

Current	Proposed Revision	Remarks
2. Related standards (Omitted) **KS A 3151** Random sampling method **KS K 0611** A method to measure formaldehyde in textile products: Water extraction method **<New>** **KS K ISO 105-B02** Textile - colour fastness test method - Part B02: colour fastness against artificial lights: Xenon arc method **KS K ISO 105-C01** Textile – colour fastness test method -Part C01: wash fastness test method 1.	2. Related standards (The same as at present) ---------- ---------- ---------- formaldehyde ---------- **KS M 1991** A method to detect phthalate plasticizer in synthetic resins. **KS M 8221** N-hexane (reagent) **KS G ISO 8124-3** Stability in toys – Part 3: Effluent of specific element **KS M ISO 3696** Water for analytical laboratory use – Standard and test method ---------- ---------- ---------- ----------	Added lead (Pb) and plasticizer effluent test method to related standards

Current	Proposed Revision	Remarks
3.Types (Omitted) **Table 1. Types of baby carriages** **Type** **Description** A Carriages that can be used by babies in lie-flat position with full stretch. B Carriages that can be used by babies in sitting position, reclining on backrest. However convertible carriages that allow shifting baby's positions between lying and sitting by adjusting back recline or footholds are classified as type 'A'. Box Type Hammock Carriages that have flat floor, and surrounded by protection covers on all four sides. These can be used by babies in lie-flat or sitting position. The height of protection covers must be over 15 cm.	**3.Types (The same as at present)** **Table 1. Types of baby carriages** **Type** **Description** A ---------- B ---------- <Deleted> Box Type Hammock ----------	Deleted unnecessary descriptions.
4. Safety Requirements **4.1 General** **4.1.1** If there is a removable railing to prevent the baby slipping off from the seat, a crotch strap must be attached. Carriage without railing must have crotch strap and seat belt firmly attached to it.	**4. Safety Requirements** **4.1 General** **4.1.1** ---------- However, Box Type Hammock baby carriages can have seat belts only.	Added box hammock type baby carriages.
4.2.1 Bursting strength The bursting strength of fabric for the hammock must be over 400 kPa.	<Deleted>	Changed to recommendation
4.2.2 Colour fastness to daylight The colour fastness to daylight of fabric for the hammock must be higher than Grade 4.	<Deleted>	Changed to recommendation
4.2.3 Colour fastness to washing The colour fastness for washing of fabric for the hammock must be higher than Grade 4.	<Deleted>	Changed to recommendation

Current	Proposed Revision	Remarks
4.2.4 Tire hardness The hardness of the tire springs must be between Hs 65 ~ 85. However, foam tires are excluded.	<Deleted>	Changed to recommendation
4.2.5 Any parts that are made of plastics or coated with synthetic paint must meet the following standards after harmful elements testing. However, parts that do not have contact with the baby are excluded. a) Lead (Pb) : less than 90 mg/kg b) Antimony (Sb): less than 60 mg/kg c) Arsenic (As): less than 25 mg/kg d) Barium (Ba): less than 1,000 mg/kg e) Cadmium (Cd): less than 75 mg/kg f) Chrome (Cr): less than 60 mg/kg g) Mercury (Hg): less than 60 mg/kg h) Selenium (Se): less than 500 mg/kg	**4.2.1. Harmful elements** **4.2.1.1 Effluent of the harmful elements** The materials used for baby carriages must be suited to the Table 2 below. **Table 2:** Permitted effluent limits of certain elements in baby carriage materials (Unit: mg/kg) Element Standard Element Standard Antimony(Sb) Below 60 Arsenic(As) Below 25 Barium(Ba) Below 1 ,000 Cadmium(Cd) Below 75 Chromium(Cr) Below 60 Lead(Pb) Below 90 Mercury (Hg) Below 60 Selenium (Se) Below 500	Simplified the expression
4.2.6 Corrosion resistance of metallic coatings: There must not be any spot that is greater than 2mm in diameter per area of $50cm^2$.	<Deleted>	Changed to recommendation
4.2.7 Film of paint hardness There should not be any burst on coating.	<Deleted>	Changed to recommendation
<New>	4.2.1.2 **Phthalate plasticizer** The contents of diethylhexylphthalate (DEHP), dibutylphthalate (DBP), and Butylbenzylphthalate (BBP) in plastic materials which has been used for baby carriages must not exceed 0.1%.	Added the safety requirements for plasticizer.
4.2.8 Formaldehyde detection in fabrics The content of the liberated formaldehyde must be less than 75 mg/kg in the products that have used formalin resin finished fabrics. However, parts that do not have contact with the baby are excluded.	**4.2.2 Formaldehyde detection in fabrics** (The same as at present)	Changed the place.
4.3.3 Seat belt A seat belt must be wider than 25 mm and easy to fasten. When tied up to a size model, it must be able to press the abdomen of the model.	<Deleted>	Changed to recommendation
4.3.4 Crotch Strap A crotch strap must be wider than 50 mm.	<Deleted>	Changed to

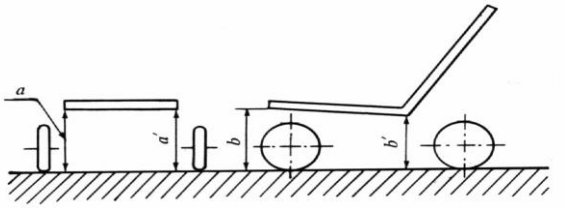
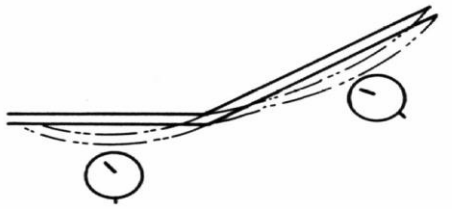
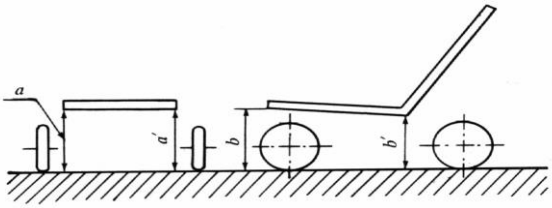
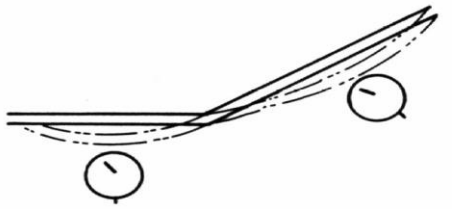
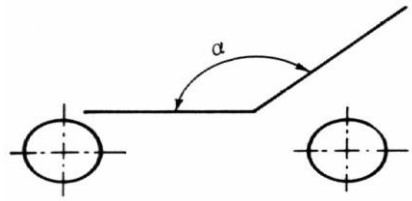
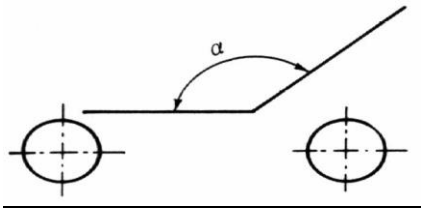
Current	Proposed Revision	Remarks
		recommendation
4.3.5 Foothold All baby carriages other than box type Hammock must be equipped with foothold.	**4.3.3 Foothold** (The same as at present)	Changed the place.
4.3.6 Stopper A stopper that prevents the wheels from rolling must be equipped. The stopper control must be out of the baby's reach when the baby is safely seated on the seat. It must be located in a place where the operating person can handle easily without putting a hand on it. For example, the operator must be able to handle the stopper with a foot.	**4.3.4 Stopper** (The same as at present)	Changed the place.
4.3.7 Opening Other than easily movable parts and parts that become wider when moving, there must not be any injurious openings that are more than 5mm and no more than 13mm within a reachable distance from the baby's limbs. Other harmful openings must be covered with protection cover to prevent injuries.	**4.3.5 Opening** ---------- not more than 12 mm----------. However, the openings which have less than 10 mm of depth are excluded.	Reflected EN standards.
4.3.8 Horizontal angle of the back When the front wheels are lifted 200mm, the horizontal angle of the carriage's rear must be greater than 5°. However, box type hammocks and some Type 'A' carriages which structured with slip-protections on right, left and rear side of backrest that are higher than 10cm are excluded.	**4.3.6 Horizontal angle of the back** ----------Type A, Type B----------.	Added Type B baby carriages
4.3.9 Products that are sold in parts General consumers must be able to assemble products that are sold in parts without difficulty.	<Deleted>	Changed to recommendation
4.3.10 Joining parts and locking devices (Omitted) When tested with the method specified in 5.3.8.1, the handle bar must not move more than 15 degree from the lock position toward the baby. Also tested with 5.3.8.1, the locking device must not be unlocked and must not have any damage that will hamper the functionality and operation of the locking device. **4.3.10.1** There must be (1) at least two locking devices on a folding system of baby carriages except baby carriages pertinent to 4.3.10.2. One of them must work when an infant is placed into the	**4.3.7 Joining parts and locking devices** (The same as at present) ----------5.3.5.1, ----------5.3.5.1,----------. **4.3.7.1** ------ must be (3) ----------4.3.7.2. ----------	Changed the places.

Current	Proposed Revision	Remarks
carriage. Also, at least one of the locking devices must automatically work when the baby carriage opens for use. Note (1) Baby carriages that can be folded with lock/unlock and a locking device and baby carriages that can be folded with two simultaneous movements from both sides are all considered as having two lock devices. When tested according to 5.3.8, even if one of the locking devices were unlocked, the folding system must not work to any direction in a way the baby's finger to be jammed by another locking device.	----------. ---------- ---------- ----------. Note(3) ---------- ---------- ---------- ---------- ---------- ----------. ----------5.3.5, ---------- ---------- ---------- ---------- ----------.	
4.3.10.2 A user must be able to fold a simplified carriage with hinged link, of which the centre part is moving geometrically to hold the carriage in normal use position, with two separate movements. It also needs to be structured as such to secure the safety with only one movement in normal use position.	**4.3.7.2** (The same as at present)	Changed the places.
4.3.11 Small parts Small parts that can be removed by the baby must not completely fit into the cylinder for small parts (Refer Figure 7).	**4.3.8 Small parts** ---------- ---------- ----------(Refer Figure 6).	Changed the place.
4.3.12 Parts that might cause entanglement or suffocation Straps in box type hammock and in the seat of carriage, and any similar parts with textile materials must satisfy one of the following requirements. a) When pulled with a force of 25N, the free length must not exceed 220 mm. b) When pulled with a force of less than 50N, it must completely break at the centre of the length.	**4.3.9 Parts that might cause entanglement or suffocation** (The same as at present)	Changed the places.
4.4.2 Overturn When inclining a hammock 15° to all four directions with a model loaded in it with the correct posture, it should not overturn.	**4.4.2 Overturn** ---------- inclined a hammock 12°----------mass model----------.	Reflected EN standards.

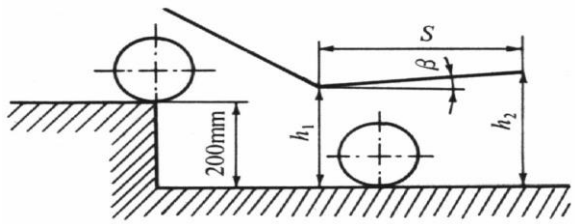
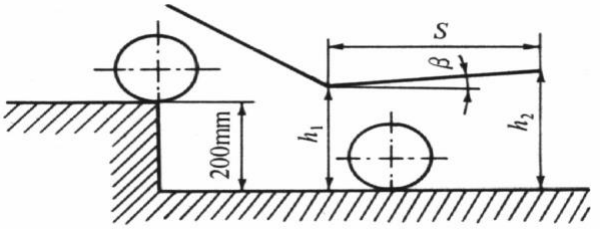
Current	Proposed Revision	Remarks
4.4.8 Acceleration of vibrations Equip the frame with a shock-absorbing device, and load a weight model. Place front and rear wheels respectively on a drum which has a 10mm height rim on it. When rotating the drum at a speed of 100 times per minute (100 rpm), the acceleration of vibration perpendicularly from the centre of seat must be 30% less than the acceleration of vibration perpendicularly from the axle for Type A, and 50% for Type B.	**4.4.8 Acceleration of vibrations** When tested according to 5.4.8, the acceleration of vibration at abdomen of the baby must not exceed 9.8 m/s^2.	Improved test reproducibility.
4.4.10 Impact durability When hitting a hammock with a weight model in it against the steel stair, it must not cause any abnormal condition.	**4.4.10 Impact durability** ---------- mass model ----------.	Improved test reproducibility.
5.2.1 Bursting Strength Check with Mullen Bursting Tester.	<Deleted>	Changed to recommendation
5.2.2 Colour fastness to daylight Test according to the rules in KS K ISO 105-B02. Adopt exposure conditions that are preferred in Americas, and use method 5 for illumination. Use radiant energy level of 1728 kJ/m^2 at 300~400nm, or 43 kJ/m^2 at 420nm.	<Deleted>	Changed to recommendation
5.2.3 Colour fastness Test according to the rules in KS K ISO 105-C01.	<Deleted>	Changed to recommendation
5.2.4 Tire hardness Check the hardness of the wheel tread with a KS M 6518 regulated spring type hardness tester (Shore A). However, foam tires are excluded.	<Deleted>	Changed to recommendation
5.2.5 Parts that are made of plastic or coated with synthetic paint (Omitted)	<Deleted>	Changed to recommendation
5.2.6 Corrosion resistance of metallic coatings Disassemble the most typical plated part (e.g. frame), and put it in 5% sodium chloride aqueous solution (20 ± 5 °C) for 2 hours. Take it out and check whether it is rusted or not.	<Deleted>	Changed to recommendation
5.2.7 Film of paint hardness Grip a pencil (HB) as shown in Figure 2. Press just hard enough not to break the pencil's core and push 3mm. Test 5 spots, clean black lead with eraser and examine the scratches.	<Deleted>	Changed to recommendation

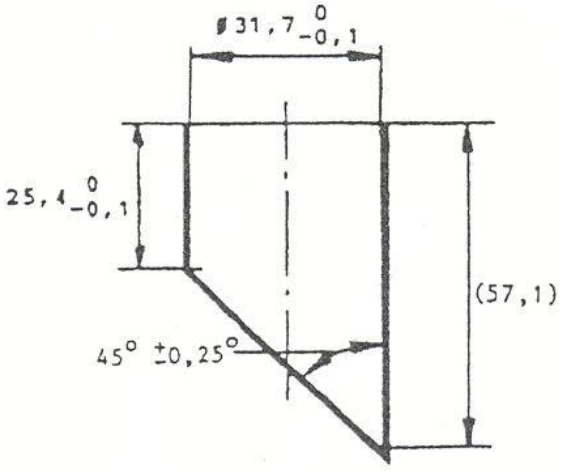
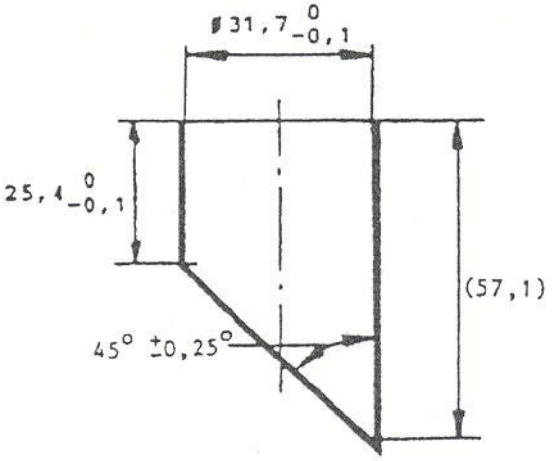
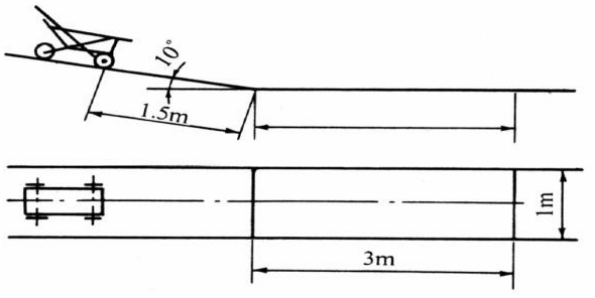
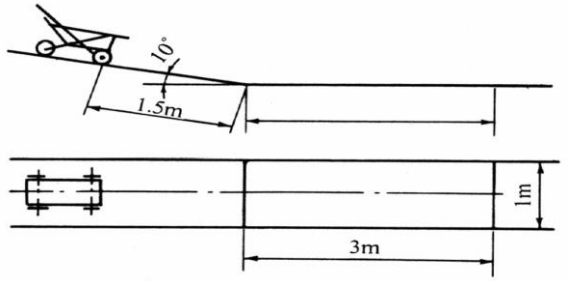
Current	Proposed Revision	Remarks
<New>	**5.2.1 Harmful elements** **5.2.1.1 Getting samples** Baby carriages exist in various forms and there could be important differences according to the lead content level in each component. Therefore each item in a baby carriage needs to be treated individually. In other words, if a product is composed of several substances, break down each substance into different components, and then test the sample for each individual component. The sampling requires the separation of each component by their characters either by hand or cut out with tools while ensuring no damage is done to each component. Therefore, buckles, hooks or other components can be separated one by one by hand or by cutting them off to use as samples for individual testing. If there are components in a baby carriage that were painted or coated, separate the coated layers from the base material. When doing so, apply a few drops of a solvent such as ethylene chloride to make the painted or coated parts emulsify and therefore to fall off easily. When a solvent is used, it must be evaporated before the testing. If the amount of sample is not enough for testing, take samples from multiple products of the same kind and cut the separated samples into proper size or grind them into minute size. In the case of effluent test for baby carriages, be careful to not make any damage to the surface of the test product. Depending on the test sample separation method, many samples may be needed to keep the surface perfectly undisturbed as it is during the effluent test. The coatings of each individual part can be tainted while cutting the samples out, therefore yielding an incorrect result. If damage is unavoidable, test the part without separation.	Clarified the sampling method.

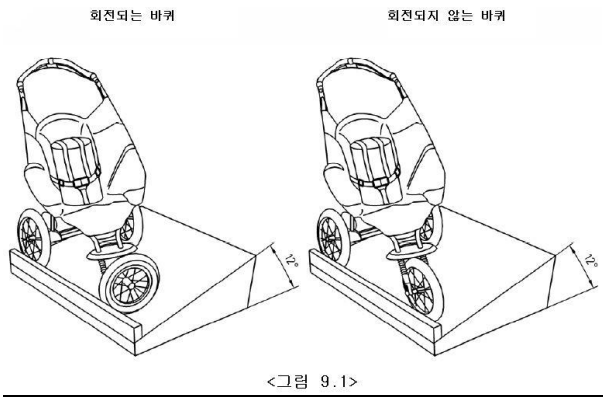
Current	Proposed Revision	Remarks
	5.2.1.2 Lead content **5.2.1.2.1 Leads in metal base material** Follow the Safety Certification Standards Annex 14.A1. **5.2.1.2.2 Leads in high molecular base material** Follow the Safety Certification Standards Annex 14.A2. **5.2.1.2.3 Leads in paint or paint like coating** Follow the Safety Certification Standards Annex 14.A3. **5.2.1.3 Effluent of harmful elements** Manipulate according to the rules in KS G ISO 8124-3. **5.2.1.4 Phthalate plasticizer** Follow Safety Certification Standards 14.B for Diethylhexylphthalate (DEHP), dibutylphthalate (DBP), and Butylbenzylphthalate (BBP) contents.	Added methods for lead and plasticizer test
5.2.8 Formaldehyde detection in Fabrics Measure the quantity of liberated formaldehyde according to the methods in KS K 0611-A.	**5.2.8 Formaldehyde detection in Fabrics** (The same as at present)	Changed the place.

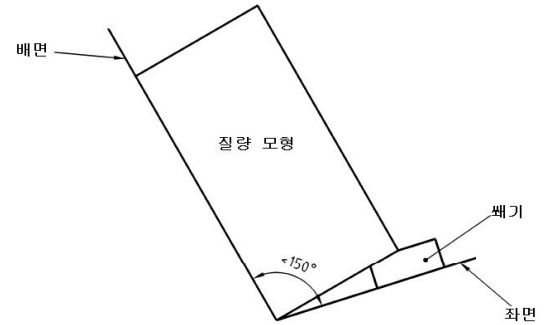
Current	Proposed Revision	Remarks
5.3 Structure **5.3.1 Shape** (Omitted) **5.3.2 Inclination of the seat level** Place the carriage on level and flat place and measure a,a' and b,b' of Figure 3 (Measure the centre of sitting area). The difference between a and a' must be less than 10mm, and b must be greater than b'. For box type hammocks, the difference between b and b' must be less than 10mm.  **<Figure 3>** **5.3.3 Droop** Load a weight model in a hammock with correct posture, check maximum droops for sitting area and back area like Figure 4.  **<Figure 4>**	**5.3 Structure** **5.3.1 Shape** (The same as at present) **5.3.2 Inclination of the seat level** ---------- ---------- ---------- Figure 2 ---------- ---------- ---------- ---------- ---------- ----------.  **<Figure 2>** **5.3.3 Droop** ---------- ---------- ----------Figure 3.  **<Figure 3>**	
5.3.4 Backrest **5.3.4.1 Reclining angle** Pull the backrest backward as possible and check the angle 'a' as shown in Figure 5.  **<Figure 5>** **5.3.4.2 Erected angle** Erect the backrest in full and check the angle that is shown in Figure 5. **5.3.4.3 Angle adjuster** (Omitted)	**5.3.4 Backrest** **5.3.4.1 Reclining angle** ---------- ---------- ---------- Figure 4.  **<Figure 4>** **5.3.4.2 Erected angle** ---------- ---------- Figure 4. **5.3.4.3 Angle adjuster** (The same as at present)	

Current	Proposed Revision	Remarks
5.3.5 Seat belt Measure the width with a tool, such as a ruler. Load a size model and see if there are any problems with fastening the model's abdomen.	<Deleted>	Changed to recommendation
5.3.6 Crotch Strap Measure the width with a tool, such as a ruler.	<Deleted>	Changed to recommendation
5.3.7 Foothold Check with naked eyes.	<Deleted>	Changed to recommendation
5.3.8 Folding and locking devices For box type hammocks, load a weight model of 9kg at the position where the baby is to lie down. For all other types of carriages, load a weight model of 15kg at the position where the baby is to sit. For carriages designed to load more than one baby, add proper weight by the number of passengers. (Omitted)	**5.3.5 Folding and locking devices** ---------- a mass model(4) of 9kg---------- ---------- a mass model(5) of 15kg ---------- ----------. Note (4) A solid cylinder which is 160±5 mm in diameter, 300±5 mm in height and weighs 9kg. The main part lies at the centre of the model. The radius of all surroundings is 5±1 mm. This cylinder has two supports at 150± 2.5 mm position that are apart 180 degree each other. Note (5) A solid cylinder which is 200±5 mm in diameter, 300±5 mm in height and weighs 15kg. The main part lies at the centre of the model. The radius of all surroundings is 5±1 mm. This cylinder has two supports at 150± 2.5 mm position that are apart 180 degree each other. (The same as at present)	Added the description for the mass model
5.3.8.1 Durability test for folding and locking devices Unfold the carriage in normal use position and lock all locking devices. Then unlock them all and fold the carriage. Repeat this process 100 times. Examine whether the locking devices suit to 4.3.10. For carriages which have unfolding mattress or seat, do this test only against the sash. For type A carriages, repeat this test 25 times in lying position and 75 times in sitting position.	**5.3.5.1 Durability test for folding and locking devices** ---------- ---------- ---------- ---------- 4.3.7---------- ---------- ---------- ----------.	

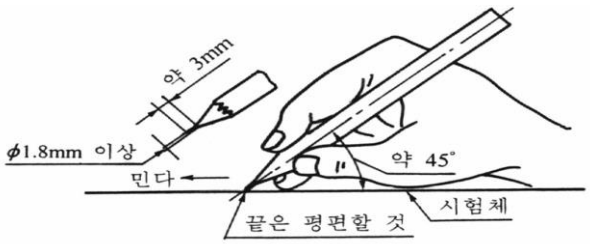
Current	Proposed Revision	Remarks
5.3.8.2 Durability test for auxiliary locking devices (Omitted)	**5.3.5.2 Durability test for auxiliary locking devices** (The same as at present)	Changed the place.
5.3.9 Openings (Omitted)	**5.3.6 Openings** (The same as at present)	Changed the place.
5.3.10 Horizontal angle of the back Pull the backrest backward as possible and place a front wheel onto a prop of 200 mm height. Measure h_1, h_2 and S in Figure 6 then produce β using an equation below; $\tan\beta = (h_2 - h_1)/S$  **<Figure 6>**	**5.3.7 Horizontal angle of the back** ---------- ---------- ---------- ---------- Figure 5---------- ----------; ----------  **<Figure 5>**	

Current	Proposed Revision	Remarks
5.3.11 Small parts (Omitted) 3) Parts that have fallen off in Paragraph 2) above should not completely fit into cylinder as shown in Figure 7.  그림 6 **<Figure 7>**	**5.3.8 Small parts** (The same as at present) ---------- Figure 6  그림 6 **<Figure 6>** **5.4 Performance** **5.4.1 Travelling stability** ---------- Figure 7---------- ----------. ----------.  **<Figure 7>**	
5.4 Performance **5.4.1 Travelling stability** Place the carriage on a 10° incline as shown in Figure 8 under calm and windless condition. If the carriage has a backrest, fully straighten it. Push unloaded carriage through the level and flat course. Check if it runs 1m width and 3m length of provided lane without deviation. If the carriage has separated wheels, casters and axles, test with its wheels backward.  **<Figure 8>**		

Current	Proposed Revision	Remarks
5.4.2 Overturn Sit the weight model properly with its buttock at intersection of the seat and backrest. Fasten seat belt to baby's comfort (by allowing some room between the seat belt and the model, so that an adult's hand can go in and out with fingers spread). Place the carriage on a 15° incline as shown in Figure 9. Place the wheels at the crossing of a flat plane and an inclined plane. Test for all four directions whether it overturns or not. For carriages with a head protector, make sure the weight model's back of the head is properly placed inside of the protector. For carriages with an adjustable backrest, test when the backrest fully erected and fully reclined, respectively. For a two-seater carriage, sit weight models on each seat and fasten seatbelts to test overturn. If the carriage has separated wheels, casters and axles, test with its wheels backward. When the carriage is likely to slip down the testing stand, skid-proof support can be used.	**5.4.2 Overturn** **5.4.2.1 Equipments** **5.4.2.1.1** A flat floor which can be reclined horizontally at an angle of 12 degrees, and is wrapped with grade 80 sandpaper. **5.4.2.1.2** A rectangular stopping bumper that has the same height as the carriage wheel's axle. **5.4.2.2 Process** **5.4.2.2.1 Position the carriages** Place carriages on the flat floor forward, backward and perpendicularly sideways to the 12° inclined plane. Put the stopping bumper at the wheels that are on the lower part of the inclined plane. Set up the carriages with rotating wheels at the most vulnerable position. For three-wheelers, the line which the contact point of lower rear wheel is passing must be perpendicular to the inclined plane. Stopping bumper must be placed as shown in Figure 8.  <그림 9.1> **<Figure 8>** **5.4.2.2.2 Stability of (single-seater) box type hammocks** Place a box type hammock loaded with a 9kg mass model as described in 5.4.2.2.1. The model must be horizontally at the centre of the hammock. A light weighted wedge can be used to fix the model, if necessary. **5.4.2.2.3 Stability of (single-seater) Type A, Type B baby carriages** Place a baby carriage loaded with a 15 kg mass model as described in 5.4.2.2.1. If the angle between the seat and the backrest is less than 150°, make sure the model has full contact with the backrest. If the angle between the seat and the backrest is greater than 150°, place the mass model	Reflected EN standards.

Current	Proposed Revision	Remarks
	like Figure 9. Restrict the mass model's movement to less than 50 mm to all directions except upper direction with the seat belt. The baby carriage must be tested in the most vulnerable condition at all test positions toward the inclined plane. A light weighted wedge can be used to fix the model, if necessary.  <그림 9.3> **<Figure 9>** **5.4.2.2.4 Stability of baby carriages for several babies** If the box type hammock is structured for several babies, test with a number of 9 kg mass models according to the method in 5.4.2.2.2 (one per every position). If the Type A or Type B baby carriage is structured for several babies, test with a number of 15 kg mass models according to the method in 5.4.2.2.3 (one per every position). If the baby carriage is structured for several babies, and a box type hammock and other hammocks can be installed together on the frame, test this combination with 9 kg and 15 kg mass models. The box type hammock and other hammocks can be combined in the most vulnerable condition. **Note:** When the number of models in the carriage is less than total number of mass models, it could be the most vulnerable condition. A light weighted wedge can be used to fix the mass model, if necessary.	

Current	Proposed Revision	Remarks
5.4.8 Acceleration of vibration Load a weight mode properly in the hammock. Attach an accelerometer to the centre of seat and axle. Rotate front wheels and rear wheels with a tester shown in Figure 15 respectively and measure the acceleration of vibration to each perpendicular direction. Then produce a ratio with the equation below. For two-seaters, test each seat with weight models on separately. Produce the ratio using larger acceleration between two seats. If there is a backrest, test with the backrest fully reclined. If the carriage does not have an axle, attach an accelerometer to the very foot of frame that is connected with wheel. (Acceleration at the seat(G)/ Acceleration at the axle (G)) * 100%	**5.4.8 Acceleration of vibration** ---------- the abdomen of the model. Perform vibration and shock test for front wheels and rear wheels, then measure the acceleration of vibration.	Simplified the expression.
5.4.10 Impact durability Load a weight model on the hammock and secure it with the seat belt. Let the hammock roll freely from a 10° inclined plane facing downward as in Figure 16. Repeat this 10 times. Do the same towards the opposite direction.	**5.4.10 Impact durability** Load a 9 kg mass model on the box type hammock, and a 15 kg mass model on the Type A or Type B baby carriages and secure the models with seat belts. If any basket or the similar items to carry objects are installed, put in some items that correspond to the user manual and weigh at least 2kg at the centre of the basket. Let it roll freely from 10° inclined plane facing downward as in Figure 16. Repeat this 10 times. Do the same towards the opposite direction. Note: Make sure the carriage would not be overturned during the test.	Reflected the EN standards.
<New>	**8. Recommendations** **8.1 Materials** **8.1.1 Bursting strength** Bursting strength of fabrics used for hammocks must be greater than 400 kPa. **8.1.2 Colour fastness to daylight** The colour fastness to daylight of fabric must be higher than Grade 4. **8.1.3 Colour fastness to washing** The colour fastness of fabric must be higher than Grade 4. **8.1.4 Tire hardness** The hardness of tire springs must be Hs 65 ~ 85. However, foam tires are excluded. **8.1.5 Corrosion resistance of metallic coatings** There must not be any spot that is greater than 2mm in diameter per area of $50cm^2$. **8.1.6 Film of paint hardness** There should not be any burst on the film of coating.	Newly added recommendations for items that are less relevant to the safety.

Current	Proposed Revision	Remarks
	8.2 Structure **8.2.1 Seat belt** The seat belt must be wider than 25mm and easy to fasten. When tightened to size model, it must be able to press the abdomen of the model. **8.2.2 Crotch Strap** The crotch strap must wider than 50mm. **8.3 Test methods** **8.3.1 Bursting strength** Check with Mullen Bursting Tester. **8.3.2 Colour fastness to daylight** Test according to the rules in KS K ISO 105-B02.Adopt exposure conditions that are preferred in Americas, and use the method 5 for illumination. Use radiant energy level of 1728 kJ/m^2 at 300~400nm, or 43 kJ/m^2 at 420nm. **8.3.3 Colour fastness** Test with KS K ISO 105-C01. **8.3.4 Tire hardness** Check the hardness of wheel treads with KS M 6518 regulated spring type hardness tester (Shore A). However, foam tires are excluded. **8.3.5 Corrosion resistance of metallic coatings** Disassemble the most typical plated part (e.g. frame), and put it in 5% sodium chloride aqueous solution (20 ± 5 °C) for 2 hours. Take it out and check whether it is rusted or not. **8.3.6 Film of paint hardness** Grip a pencil (HB) as shown in the figure. Press just hard enough not to break the pencil's core and push 3mm. Test 5 spots, clean black lead with eraser and examine the scratches. 	

Current	Proposed Revision	Remarks
<New>	**Safety Certificate Standards** **Baby Carriages** **Annex 14.A1** **-Lead in metal base materials –**	
	A.1.1 The principle Provided in this Annex are methods to quantitate lead content in baby carriages that have metal as their base material. Atomic Absorption Spectrometry (AAS), Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), Inductively Coupled Plasma Mass Spectrometry (ICP-MS), and some of chemical sample preparation methods are provided. Dissolve the sample using acids such as hydrochloric acid or nitric acid, and then quantitate lead content with AAS, ICP-OES, ICP-MS etc. **Note:** Poisonous and dangerous substances are used in this method; therefore the detailed precautions below must be followed. **A.1.2 Reagents** The concentration of the analyte and disturbing elements in reagent and water etc. must be negligibly low compared to the detection limit. **a) Water:** Use the first class water that is stipulated in KS M ISO 3696 for all sample solution preparations and dilution. **b) Nitric acid:** p (HNO_3) = 1.4 g/mL, 65% (*m/m*), "Trace Metal" grade. **c) Weak nitric acid (1:2):** dilute strong nitric acid [A.1.2.b)] with water [A.1.2.a] to ratio of 1:2 (by volume). **d) Boron fluoride:** HBF_4, 50% (*m/m*), "Trace Metal" grade. Or solution of boric acid [A.1.2.m)] 75g dissolved in 200 mL of 40% (*m/m*) hydrofluoric acid [A.1.2.j)] can be used. **e) Hydrogen peroxide:** p (H_2O_2) = 1.10 g/mL, 30% (*m/m*) "Trace Metal" grade, **f) Perchloric acid:** p ($HClO_4$) = 1.67 g/mL,70% (*m/m*) "Trace Metal" grade, **g) Phosphoric acid:** p (H_3PO_4) = 1.69 g/mL, more than 85% (*m/m*) "Trace Metal" grade, **h) Sulphuric acid:** p (H_2SO_4) = 1.84 g/mL,95% (*m/m*) "Trace Metal" grade, **i) Weak Sulphuric acid (1:2):** dilute strong sulphuric acid [A.1.2.h)] with water [A.1.2.a)] and ratio of 1:2 (by volume). **j) Hydrofluoric acid:** p (HF) = 1.18 g/mL,40% (*m/m*) "Trace Metal" grade, **k) Hydrochloric acid:** p (HCI) = 1.16 g/mL,37% (*m/m*) "Trace Metal" grade, **l) Hydrobromic acid:** p (HBr) = 1.48 g/mL,47%~49% (*m/m*) "Trace Metal" grade, **m) Boric acid (H_3BO_3)** ; 1.48 mg/mL, 5% (*m/m*) "Trace Metal" grade, **n) Mixed acid 1** (Hydrochloric acid [A.1.2 k)] : Nitric acid [A.1.2 b)]: Water [A.1.2 a)] = 2:1:2) **o) Mixed acid 2** (Nitric acid [A.1.2 b)]: Hydrofluoric acid [A.1.2 j)] = 1:3)	

Current	Proposed Revision	Remarks
	p) Mixed acid 3 (Hydrochloric acid [A.1.2 k)] : Nitric acid [A.1.2 b)] = 3:1) **q) Lead standard solution (1,000 mg/L)** **r) Internal standard solution** The internal standard elements must not interfere with the analyte. Also, the internal standard elements in the sample solution must be in negligible quantity. Sc, In, Tb, Lu, Re, Rh, Bi and Y can be used as the internal standard elements. **Note:** The toxicity of each reagent used in this method cannot be determined exactly. However, each chemical compound must be considered as a potential health threatening element. Therefore, it is recommended to reduce exposure to those chemicals as much as possible. **Note:** Pre-processing with strong acids can cause corrosion and burns. Lab coats, gloves and goggles must be worn when dealing with acids. **Note:** Nitric acid may generate toxic gas. Always add acid into the sample inside an air exhauster (hood). **Note:** Gases from plasma must come out through the air exhauster hood. **Note:** A special measure must be taken when using hydrofluoric acid. For example, if hydrofluoric acid has contacted the skin, wash thoroughly with water for more than 5 minutes and apply an antidote ointment (water-soluble gel with 2.5% calcium gluconate) to the skin as a first aid then see a doctor. If it requires a long term care, foods containing lots of calcium will be good for healing. **A.1.3 Instruments and tools** a) **Atomic Absorption Spectrophotometer (AAS):** Consists of sample container, nebulizer/burner system with air/acetylene burner head, hollow cathode tube, detector, data processing and control system. b) **Inductively coupled plasma Optical Emission Spectrometer (ICP-OES):** Consists of sample container, plasma torch, spray chamber, nebulizer, optical system, detector, control and data output system. c) **Inductively coupled plasma Optical Mass Spectrometer (ICP-MS):** Consists of sample container, plasma torch, spray chamber, nebulizer, interface, mass filter, detector, discharger, control and data output system. d) **Scale**: Must be able to measure precisely up to 0.1mg. e) **Glassware**: Wash all glassware with 10% (% by volume) nitric acid before using. 1) **Kjeldhal flasks**-100 mL 2) **Beakers**-100 mL, 200 mL etc. 3) **Measuring flasks** -100 mL, 200 mL, 500 mL etc. Other measuring tools can be used provided they are precise and accurate. 4) **Single channel pipettes**- 1mL, 5 mL, 10 mL, 20 mL etc. 5) **Funnels** 6) **Watch glasses** f) **Platinum crucibles** – 50 mL, 150 mL etc. g) **Porcelain crucibles** – 50 mL, 150 mL etc.	

Current	Proposed Revision	Remarks
	h) **Micro pipettes** - 10µL, 100 µL, 200 µL etc. i) **Heating plates or Sand bath** j) **Electric furnace** (550 ± 25) °C k) **Bunsen burner or Gas burner** l**) Microwave digestion system:** Use a sample container and containers that are made of high-pressure TFM (tetrafluoro-methaxil) or PFA (perfluoro-alkoxyfluorocarbon) or other fluorinated carbon substances. **Note:** The safety guidelines on handling the device vary depending on the microwave device used at each laboratory. The analyst must refer to the instructions on proper and safe use of the microwave device and containers. m) **Containers for Microwave digestion –** 100 mL etc**.** **Note:** TFM (tetrafluoro-methaxil), PFA (perfluoro-alkoxyfluorocarbon), PTFE (polytetrafluoroethylene) etc. **A.1.4 Sample preparation** **A.1.4.1 Test sample** Weigh 1g of sample to every 0.1mg and put it in a beaker (Use PTFE or PFA beaker if using hydrofluoric acid [A.1.2.j)]). **A.1.4.2 Preparation of test sample solution** The pre-processing of sample described in this section does not apply to all metals and their compounds. Generally, the solution is prepared using hydrochloric acid, nitric acid or mixed acid. For samples that are difficult to dissolve with those acids, add perchloric acid and sulphuric acid wherever necessary. However, keep in mind that the use of sulphuric acid carries a risk of lead element loss, and therefore seriously affects the quantitative test of lead. The sample must be completely dissolved without residue by heating at high temperature. Phosphoric acid also can be used to dissolve the sample. Dissolving metals and their compounds with strong acids carries a risk of deposit (Pb, Ba from sulphuric acid, and Ag, Au, Ag Oxide, or hydroxide from hydrochloric acid will be formed).The substances in the analyte might decrease due to co-precipitation. The analyte must be checked to see whether there is any loss in the substances. Many elements and related compounds (aluminum oxide, silicon oxide, chromium carbide and niobium carbide etc.) cannot be completely dissolved with this method. If there are any of these substances, completely dissolve the residue by alkali melting or by using airtight pressurized container after the decomposition of acids, and then mix with the undiluted sample solution. **a) General method to dissolve the sample** Cover the glass beaker [A.1.3.e) 2)] containing the sample with a watch glass. Put 20 mL of mixed acid 1 [A.1.2.n)] into it and heat until it dissolves. Cool down to room temperature, and then wash inside of the watch glass and the side of the beaker with water. Remove the watch glass. Move the solution into a 100 mL measuring flask [A.1.3 e) 3)] and fill water up to the scale mark to dilute. Dilute each sample solution with water to the appropriate concentration level of each measuring tool. Put all sample solutions together to make the final solution. Add	

Current	Proposed Revision	Remarks
	an internal standard element containing rhodium [A.1.2. r)] and add water to the scale mark of the flask to dilute when necessary. The type and amount of element are determined based on the selected method of analysis, and each dilution process must be taken into account when calculating the result. The dilutions made and additions of internal standard elements must be recorded in the test report. **b) For samples containing tin** Cover the glass beaker [A.1.3.e) 2)] containing the sample with a watch glass. Put 10 mL of mixed acid 3 [A.12 p)] little by little into it. Once the intense reaction has stopped, slowly heat the beaker and dissolve completely. Cool down to room temperature, and then wash inside of the watch glass and the side of the beaker with water. Remove the watch glass. Add 10 mL of sulphuric acid [A.1.2.h)] and heat until white lead is being generated from the sulphuric acid. Cool for a few minutes, add 20 mL of hydrobromic acid [A.1.2.l)], and reheat until white lead is being generated. Repeat this process 3 times and cool to room temperature. Then add 10 mL of nitric acid [A.1.2 b)] to liquefy soluble salts in it. Cool to room temperature, then move the solution into a 100 mL measuring flask [A.1.3 e) 3)] and fill water up to the scale mark to dilute. Dilute each sample solution with water to appropriate concentration level of each measuring tool. Put all sample solutions together to make the final solution. Add an internal standard element [A.1.2. r)] containing rhodium and add water to the scale mark of the flask to dilute when necessary. The type and amount of element are determined based on the selected method of analysis. Each dilution process must be taken into account when calculating the result. The dilutions made and additions of internal standard elements [A.1.2. r)] must be recorded in the test report. Another method is to dissolve 1g of the sample using water 40mL, nitric acid [A.1.2.b)] 12 mL and boron fluoride [A.1.2.d)] 6mL {or a solution that has 75g of boracic acid [5.5.3.2 m] melted into 200 mL of hydrofluoric acid [A.1.2.j)] 40% (*m/m*)} . In this case, use PTFE or PFA beakers or PFA measuring flask. **c)** If there are any residues, separate them through centrifugation or filtration. Use an appropriate method to make sure there are no remaining lead elements in the residue. **Note:** If there exists silver and a large amount of tin (i.e. lead-free solder), melt with hydrofluoric acid and 10 mL of hydrogen peroxide little by little until it is completely dissolved. **A.1.5 Preparation of the base solution** Prepare the base solution the same way as the sample solution was prepared using all reagents except for the sample. **A.1.6 Test operation** If the composition of the sample is clearly known, use the calibration curve method (medium correction method). Otherwise use the internal standard method (sensitivity comparison method). The standard addition method can be used if necessary.	

Current	Proposed Revision	Remarks
	Note: The internal standard method is not applicable for AAS. **Note:** A medium correction method is better for samples with high medium concentration. **Note:** If the effect of the medium is incorrect, the medium must be removed by methods such as solvent extraction and ion exchange. **A.1.6.1 Preparation of the standard solution for calibration curve** The following two methods can be used to prepare a standard solution for a calibration curve. **a) Calibration curve method (medium correction method)** Put standard lead solution into 100 mL measuring flask and dilute with water to obtain a concentration of 0μg ~ 100 μg. In case of using the medium correction method, it is necessary to correct the medium of sample solution and the medium of standard solution to be as close as possible. Add each reagent and medium element to prepare a mixed standard solution for the calibration curve that corresponds to the sample solution. When using hydrofluoric acid, use PTFE or PFA beaker and low-density polyethylene (LDPE) or PFA measuring flask. **b) Standard addition method** Prepare a standard solution for a calibration curve by adding reagents and internal standard elements to obtain the same concentration as the sample solution. When using hydrofluoric acid, use PTFE or PFA beakers and LDPE or PFA measuring flasks. **5.5.3.6.2 Standard solution for calibration curve** **a) Atomic Absorption Spectrometry (AAS)** Inject some of the prepared standard solution for calibration curve into the air-acetylene flame of the AAS under optimal conditions and measure the atomic wavelength absorption of the lead element. For the calibration curve method (medium correction method), create a curve that shows the relationship between strength and concentration in the lead element spectral line as a calibration curve. If there is interference due to co-existing substances, select an interference-free wavelength within the range of selected calibration or the strength of the interference must be corrected by appropriate means. < A Linear Regression Line with less than 0.998 of linear coefficient (R^2) can be used for the initial calibration. If the difference between expected value and the result of checked standard (i.e. standard substance, standard solution etc) is greater than 20%, all relevant calibration materials and samples must be measured again. **b) Inductively Coupled Plasma Optical Emission Spectrometry(ICP-OES)** Inject some of the prepared standard solution for calibration curve into the argon plasma of the ICP-OES under optimal conditions and measure the atomic wavelength absorption of the lead element. For the calibration curve method (medium correction method), create a curve that shows the relationship between strength and concentration in the lead element	

Current	Proposed Revision	Remarks
	spectral line as a calibration curve. For the internal standard method, create a curve showing the relationship between the sensitivity ratio and concentration of lead for internal standard element as a calibration curve. When measuring the sample containing hydrofluoric acid, use sample containers and torches that can stand hydrofluoric acid. The wavelength is selected from the spectral line of lead element. If there is interference due to co-existing substances, select an interference-free wavelength within the range of selected calibration or the interference level must be corrected by appropriate means. **c) Inductively Coupled Plasma Mass Spectrometry (ICP-MS)** Spray the sample solution into the argon plasma through the spray chamber. When measuring the samples containing hydrofluoric acid, use sample containers and torches that can stand hydrofluoric acid. Read the value of the mass versus electric charge of lead and measure the internal standard elements. Calculate the ratio of the measured values to that of the measuring element for the internal standard elements. **A.1.7 Measuring the sample** Once the calibration curve has created, measure the base solution for calibration and the sample solutions. If the concentration of the sample solution is higher than the calibration curve, dilute the sample solution to be within the range of the calibration curve and measure again. Check the precision at regular intervals with standard substances, calibration curve, etc. (per every 10 samples). Re-create the calibration curve when necessary. **Note:** When the sample solution has been diluted within the range of the calibration curve, adjust the internal standard concentration in the diluted solution to the concentration of the standard solution. **A.1.8 Calculation** Obtain the strength of the spectral line of the lead element from the sample solution in A.1.7 and the amount of lead element from the calibration curve. Then calculate the lead element content (mg/kg) with the equation below. $C = (A_1-A_2)/m * V$ C: The lead concentration in the sample (mg/kg) A_1 = The measured lead concentration in the sample solution (mg/L) A_2 = The measured lead concentration in the base test solution (mg/L) V = Total volume of the sample solution (mL) m = Amount of the sample (g)	

<New>	**Safety Certificate Standards** **Baby Carriages** **-Lead in high molecular base materials –** **Annex 14.A2**	
	A.2.1 The principle Defined in this annex are methods to quantitate lead contents in high molecular base materials used for baby carriages. Choose the most proper method for quantitative analysis among Atomic Absorption Spectrometry (AAS), Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), and Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Dry ashing, acid decomposition using sulphuric acid or nitric acid, and acid decomposition using microwave digestion system can be used as methods to decompose the sample. a microwave digestion system is recommended when using sulphuric acid for decomposition to reduce the measurement error of analyte. It is because the use of sulphuric acid carries the risk of losing lead. If the sample solution contains insoluble substances, analyze the deposit separately with X-ray fluorescence spectrometry or any other means, and then mix it with undiluted solution to quantitate lead. **Note:** Poisonous and dangerous substances are used in this method; therefore the detailed precautions below must be followed. **A.2.2 Reagents** The concentration of the analyte and disturbing elements in reagent and water etc. must be negligibly low compared to the detection limit. **a) Water:** Use the first class water that is stipulated in KS M ISO 3696 for all sample solution pre-processing and dilution. **b) Sulphuric acid:** p (H_2SO_4) = 1.84 g/mL,95% (*m/m*) "Trace Metal" grade, **c) Nitric acid:** p (HNO_3) = 1.40 g/mL, 65% (*m/m*), "Trace Metal" grade. **d) Nitric acid,** 10% (*m/m*), "Trace Metal" grade. **e) Hydrogen peroxide:** p (H_2O_2) = 1.10 g/mL, 30% (*m/m*) "Trace Metal" grade, **f) Hydrochloric acid:** p (HCI) = 1.19 g/mL, 37% (*m/m*) "Trace Metal" grade, **g) Hydrofluoric acid:** p (HF) = 1.18 g/mL,40% (*m/m*) "Trace Metal" grade, **h) Boric acid (H_3BO_3)** ; 5% (*m/m*) (50 mg/mL), "Trace Metal" grade, **i) Standard solution of lead (1,000 mg/L)** **j) Internal standard substances** Use internal standard substances that do not disturb the analyte, and a small quantity of internal standard element. Typically, Sc, In, Tb, Lu, Re, Rh, Bi and Y are used as the internal standard elements. Usually Sc and Y are recommended for ICP-OES. Concentration must be lower than 1,000 mg/kg. **Note:** The toxicity of each reagent used in this method cannot be determined	

exactly. However, each chemical compound must be considered as a potential health threatening element. Therefore, it is recommended to reduce exposure to those chemicals as much as possible.

Note: Pre-processing with strong acids can cause corrosions and burns. Lab coats, gloves and goggles must be worn when dealing with acids.

Note: Nitric acid may generate toxic gas. Always add acid into the sample inside an air exhauster (hood).

Note: Gases from plasma must come out through air exhauster hood.

Note: A special measure must be taken when using hydrofluoric acid. For example, if hydrofluoric acid has contacted the skin, wash it thoroughly with water for more than 5 minutes, and apply an antidote ointment (water-soluble gel with 2.5% calcium gluconate) to the skin as a first aid, and then see a doctor. If it requires long term care, foods containing lots of calcium will be good for healing.

A.2.3 Instruments and tools

a) Atomic Absorption Spectrophotometer (AAS): Consists of sample container, nebulizer/burner system with air/acetylene burner head, hollow cathode tube, detector, data processing and control system.

b) Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES): Consists of sample container, plasma torch, spray chamber, nebulizer, optical system, detector, control system and data output system.

c) Inductively Coupled Plasma Optical Mass Spectrometer (ICP-MS): Consists of sample container, plasma torch, spray chamber, nebulizer, interface, mass filter, detector, discharger, control system and data output system.

d) Scale: Must be able to measure precisely up to 0.1mg.

e) Glassware: Wash all glassware with 10% (% by volume) nitric acid before using.

1) **Kjeldhal flasks**-100 mL
2) **Beakers**-100 mL, 200 mL etc.
3) **Measuring flasks** -100 mL, 200 mL, 500 mL etc.
   Other measuring tools can be used provided they are precise and accurate.
4) **Single channel pipettes**- 1mL, 5 mL, 10 mL, 20 mL etc.
5) **Funnels**
6) **Watch glasses**

f) Platinum crucibles – 50 mL, 150 mL etc.

g) Porcelain crucibles – 50 mL, 150 mL etc.

h) Micro pipettes - 10µL, 100 µL, 200 µL etc.

i) Heating plates or Sand bath

j) Electric furnace (550 ± 25) °C

k) Bunsen burner or Gas burner

l) Microwave digestion system: Use a sample container and containers that are made of high-pressure TFM (tetrafluoro-methaxil) or PFA (perfluoro-alkoxyfluorocarbon) or other fluorinated carbon substances.

Note: The safety guidelines on handling the device vary depending on the microwave device used at each laboratory. The analyst must refer to the

instruction on proper and safe use of the microwave device and containers.

m) **Containers for Microwave digestion** – 100 mL etc**.**

Note: TFM (tetrafluoro-methaxil), PFA (perfluoro-alkoxyfluorocarbon), PTFE (polytetrafluoroethylene) etc.

A.2.4 Sample preparation

A.2.4.1 Test sample

It is better to start with the largest available quantity of the sample depending on the selected decomposition method. When sampling with acid decomposition, take 400 mg of cut and grinded sample precisely to every 0.1mg. When sampling with dry ashing or acid decomposition with airtight containers, grind, trim, or cut the sample and take 200 mg precisely to every 0.1mg.

A.2.4.2 Preparation of test solution

a) Dry ashing

If the sample does not contain a halogen element, follow the method below.

1) Put the weighed sample in a crucible and heat on a heating plate.

2) Heat the crucible inside a well ventilated hood with burner. Be careful that the sample does not catch fire.

3) Heat slowly until volatile matters that were generated while the sample has being carbonized to charcoal are completely discharged and only ashes are left.

4) Put the crucible containing sample into an electric furnace of 550 ± 25 °C. Leave the furnace door ajar to supply enough air for oxidization.

5) Continue to heat until the carbon completely oxidizes and only ashes are left.

6) Take the crucible out of the electric furnace and cool down to room temperature.

7) Add 5 mL of nitric acid [A.2.2.c)] and heat slowly to dissolve the residues. Move this solution into a 50 mL measuring flask [A.2.3 e) 3)] and add water up to the scale mark to dilute. Dilute the sample solution to have an appropriate concentration for the measuring device. When using internal standard substances [A.2.2.j)], add internal standard solution [A.2.2.j)] before diluting the solution in a flask. Add 500 µL when using ICP-OES, and dilute the solution to 1:1000 for ICP-MS.

If the sample contains a halogen element, follow the steps below.

1) Put the sample into a crucible [A.2.3.g)] and weigh.

2) Add 5mL ~ 15 mL of sulphuric acid [A.2.2.b)], put the crucible on a heating plate or sand bath [A.2.3.i)] and then slowly heat until the sample is being carbonized to black.

3) When it cools down, add 5 mL of nitric acid [A.2.2.c)] and continue to heat until the sample has completely decomposed and white lead of sulphuric acid is being generated.

4) Cool the heated crucible [A.2.3.g)]. Move it into an electric furnace [A.2.3.j)] that has temperature adjusted to 550 ± 25 °C, and heat until all carbon has completely burned and all the water has boiled away.

5) Take the crucible out of the furnace and cool to room temperature. Add 5 mL of nitric acid [A.2.2.c)] and heat slowly to dissolve the residues. Move this solution into a 50 mL measuring flask and add water up to the scale mark to dilute. Dilute the sample solution to have an appropriate concentration for the measuring device. If the internal standard substances [A.2.2.j)] are being used,

add internal standard solution [A.2.2.j)] before diluting the solution in a flask. Add 500 μL when using ICP-OES, and dilute the solution to 1:1000 for ICP-MS.

6) If there are any residues, separate them through centrifugation or filtration. Use an appropriate method to check the existence of lead elements in the residue.

b) Microwave decomposition

1) General decomposition method

Put the weighed sample in a microwave digestion vessel, and add 5mL of nitric acid [A.2.2.c)] and 0.1 mL ~ 1.0 mL of hydrogen peroxide [A.2.2.e)]. When the chemical reaction between the sample and acids has calmed down, put a stopper on the vessel. Assemble the microwave digestion system [A.2.3.l)], operate the microwave oven according to the pre-set decomposition program to dissolve the sample. Cool the vessel and move the solution into a 50 mL measuring flask, then fill water up to the scale mark to dilute. Dilute the sample solution with water to meet the appropriate concentration standard of each measuring tool. If the internal standard substances [A.2.2.j)] are being used, add internal standard solution [A.2.2.j)] before diluting the solution in a flask. Add 500 μL when using ICP-OES, and dilute the solution to 1:1000 for ICP-MS.

2) For irresoluble samples or samples containing silicon dioxide or titanium, do as follows.

Put the weighed sample in a microwave digestion vessel, and add 5mL of nitric acid [A.2.2.c)] , 1 mL of hydrofluoric acid [A.2.2.g)], and 0.1 mL ~ 1.0 mL of hydrogen peroxide [A.2.2.e)]. Put a stopper on the vessel and operate microwave oven according to the pre-set decomposition program to dissolve the sample. Cool the vessel and move the solution into a 50 mL low density polyethylene (LDPE) or PFA measuring flask, then fill water up to the scale mark to dilute. Add boric acid [A.2.2.h)] to form fluoride to protect quartz plasma torch (if there is no anti-acid sample injection system). Dilute the sample solution with water to meet appropriate concentration level of each measuring tool. If the internal standard substances [A.2.2.j)] are being used, add internal standard solution [A.2.2.j)] before diluting the solution in a flask. Add 500 μL when using ICP-OES, and dilute the solution to 1:1000 for ICP-MS.

Note: Add hydrogen peroxide only to know the reactants of the sample. It must not be added when there are lots of easily oxidizable substances in the sample, because they react quickly and intensely with easily oxidizable substances.

3) If there are any residues in the sample solution, separate them through centrifugation or filtration. Use an appropriate method to check if there are lead elements in the residue.

A.2.5 Preparation of the base solution

Prepare the base solution with the same way as the sample solution was prepared using all reagents except the sample.

A.2.6 Testing process

It is generally assumed that the sample consists of unknown compositions, and the internal standard method (sensitivity comparison method) is recommended. A standard addition method can be used if necessary. If there is no disturbing element and compositions of the sample are known, the calibration curve method (medium correction method) can be used as well.

Note: The acid must be adjusted to the concentration of the sample in all circumstances.

A.2.6.1 Preparation of solution for the calibration curve

Take 0μg ~ 100μg of lead standard solution gradually and put it into a100 mL measuring flask [A.2.3.e) 3)]. When measuring with the internal standard addition method, make sure the acid concentration of both the sample solution and internal standard substance [A.2.2.j)] calibration curve solution are the same.

A.2.6.2 Creating calibration curve

Use the spectrometer for quantitative analysis. Spray some of the prepared calibration curve solution into the argon plasma or into air/acetylene flame. If measuring samples that contain hydrofluoric acid, use a sample introduction system that can stand hydrofluoric acid.

a) Atomic Absorption Spectrometry (AAS)

Quantitate by measuring the optical density of lead elements. Create a curve that shows the relationship between the optical density and the concentration of lead elements as a calibration curve when using the calibration curve method (medium correction method). For the standard addition method, put the standard into the sample solution. Determine the unknown concentration by extrapolating the addition curve with an optical density of zero.

< A Linear Regression Line with less than 0.998 of linear coefficient (R^2) can be used for the initial calibration. If the result of calibration standard (i.e. standard substance, standard solution etc.) measurement differs more than 20% from the expected value, all relevant calibration standards and samples must be measured again.>

b) Inductively Coupled Plasma Optical Emission Spectrometry(ICP-OES)

Quantitate by measuring the intensity of lead elements. When quantitate lead elements with calibration curve method, create a calibration curve that shows the relationship between intensity and concentration of lead elements. For the standard addition method, create a calibration curve that shows the relationship between intensity ratio and concentration of lead elements as a calibration curve.

c) Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Quantitate by measuring the charge number against the mass of lead elements. For the calibration curve method, create a calibration curve that shows the relationship between the ratio of mass/charge number and concentration of lead elements.

A.2.7 Measure of the sample

Measure the base solution and sample solution after the calibration curve has been created. If the concentration of the sample is higher than the calibration curve, dilute the sample solution to be within the range of the calibration curve and

	measure again. Check the precision at regular intervals with standard substances, calibration curve solution, etc.(once per every 10 samples). Re-create the calibration curve when necessary. **Note:** When the sample solution has been diluted within the range of calibration curve, adjust the internal standard concentration in the diluted solution to concentration of the standard solution. **A.2.8 Calculation** Calculate lead element content (mg/kg) within the sample with the equation below. $C = (A_1-A_2)/m * V$ C: The lead concentration in the sample (mg/kg) A_1 = The lead concentration in the sample solution (mg/L) A_2 = The lead concentration in the base test solution (mg/mL) V = Total volume of the sample solution (mL) m = Amount of the sample (g)	

<New>	**Safety Certificate Standards** **Baby Carriages** **-Lead in painted or coated materials –** **Annex 14.A3**	
	A.3.1 The principle In this method, separate the painted and coated surface according to 5.4, and then quantitate the total lead contents. **A.3.2 Instruments and tools** **a)Disposable plastic containers for digestion or glass test tubes** 50 mL. **b)Heating plates** with holes to place test tubes in. **A.3.3 Reagents** **a) Deionized water** **b) Nitric acid** **c) Methylene chloride** **A.3.4 Operation** a) Put approximately 30 mg ~ 50 mg of sample prepared from 5.4 (painted and coated part) into a 50 mL beaker. b) Get paint standard material (**NIST SRM 2581**-powdered paint, 0.5 % of lead) and operate as the same way as the sample. c) Dissolve the sample accordingly to **AOAC 974.02** or **ASTM E 1645**. d) Dilute the sample to make the concentration of lead be fitted within the range of the calibration curve. e) Quantitate the lead within the sample solution according to **ASTM E 1613**. In this case, the ICP analysis must be valid for the public announcements from CPSC, guidelines for the process to quantitate leads, and the guidelines for	

	validity of lead concentration within metal accessories for children (**CPSC-CH-EI001-08)**.	
<New>	**Safety Certificate Standards** **Baby Carriages** **-Lead in other materials –** **Annex 14.A4**	
	A.4.1 The principle Provided in this Annex are methods to quantitate lead content in materials other than high molecular materials and metal materials in baby carriages. The most proper method among Atomic Absorption Spectrometry (AAS), Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) can be chosen to quantitate leads. Decompose the test sample with aqua regia, or use microwave digestion method using chemicals such as nitric acid, boron fluoride, hydrogen peroxide and hydrochloric acid. Use AAS or ICP-OES for samples that have more than 10 mg/kg of lead content, and use ICP-MS for samples that have more than 0.1 mg/kg of lead content. **Note:** If HBF_4 has lower purity, use HF instead. **A.4.2. Reagents** The concentration of the lead elements or of the disturbing elements in reagents and water etc. must be negligibly low compared to the detection limit. Also, the reagents for ICP-MS analysis must be high-purity acids or chemical compounds and have less than $1*10^{-6}$ % (*m/m*) of trace metals. **a) Water:** Use the first class water that is stipulated in KS M ISO 3696. Trace Metal grade –total amount less than 10 ppb. **b) Hydrochloric acid:** p (HCl) = 1.16 g/mL,37% (*m/m*) "Trace Metal" grade **c) Weak hydrochloric acid (1:2):** dilute strong hydrochloric acid [A.4.2.b] with water [A.4.2.a] to ratio of 1:2. "Trace Metal" grade **d) 5 % (*m/m*) hydrochloric acid solutions,** "Trace Metal" grade. **e) 10 % (*m/m*) hydrochloric acid solutions,** "Trace Metal" grade. **f) Nitric acid:** p (HNO_3) = 1.4 g/mL, 65% (*m/m*) , "Trace Metal" grade. **g) 0.5 mol/L nitric acid solution,** "Trace Metal" grade. **h) 10 % nitric acid solutions,** "Trace Metal" grade. **i) Mixed acid** HCl [A.4.2.b)] : HNO_3 [A.4.2.f)] = 3:1. **j) 50 % (*m/m*) boron fluorides (HBF_4),** "Trace Metal" grade. **k) Hydrogen peroxide:** p (H_2O_2) = 1.10 g/mL, 30% (*m/m*) "Trace Metal" grade, **l) Standard lead solution (1,000 mg/L)** **m) Internal standard solution** Internal standard elements must not disturb the analyte. Also the existence of	

internal standard elements in the sample solution must be negligibly low. Sc. In, Tb, Lu, Re, Rh, Bi and Y can be used as internal standard elements for this particular spectrometry.

Note: The toxicity of each reagent used in this method cannot be exactly determined. However, each chemical compound must be considered as a potential health threatening element. Therefore, it is recommended to reduce exposure to those chemicals as much as possible.

Note: Pre-processing with strong acids can cause corrosion and burns. Lab coats, gloves and goggles must be worn when dealing with acids.

Note: Nitric acid may generate toxic gas. Always add acid into the sample inside an air exhauster (hood).

Note: Gases from plasma must come out through the air exhauster hood.

Note: A special measure must be taken when using hydrofluoric acid. For example, if hydrofluoric acid has contacted the skin, wash it thoroughly with water for more than 5 minutes and apply an antidote ointment (water-soluble gel with 2.5% calcium gluconate) to the skin as a first aid, and then see a doctor. If it requires long term care, foods containing lots of calcium will be good for healing.

A.4.3 Instruments and tools

a) Atomic Absorption Spectrophotometer (AAS): Consists of sample container, nebulizer/burner system with air/acetylene burner head, hollow cathode tube, detector, data processing and control system.

b) Inductively coupled plasma Optical Emission Spectrometer(ICP-OES): Consists of sample container, plasma torch, spray chamber, nebulizer ,optical system, detector, control and data output system.

c) Inductively coupled plasma Optical Mass Spectrometer(ICP-MS): Consists of sample container, plasma torch, spray chamber, nebulizer, interface, mass filter, detector, discharger, control and data output system.

d) Sample injection system that can stand against hydrofluoric acid: A hydrofluoric acid proof sample injection system that is consisted of a sample injection part and a torch.

e) Decomposition with aqua regia: Automatic temperature control system, container, reflux condenser and absorption cell.

f) Microwave digestion system:

A microwave sample decomposition system that basically have a sample container with a capacity of 40 mL and containers that are made of high-pressure PTFE, TFM, PFA or other fluorinated carbon substances.

Note: Each manufacturer and the model of the microwave system used at each laboratory have their own guidebooks for the safety and handling of the system. The analyst must refer to the manual, the manufacturer, and relevant documents to be familiar with the proper and safe use of the system.

g) Scale: Must be able to measure precisely up to 0.1mg.

h) Glassware: Wash all glassware with 10% (% by volume) nitric acid [10.3.h)]

before using.

1) **Beakers**-100 mL, 200 mL, 500 mL etc.

2) **Measuring flasks** -100 mL, 200 mL, 500 mL etc.

Other kinds of volume measuring tools can be used provided that they are precise and accurate.

3) P**ipettes**- 1mL, 5 mL,10 mL, 20 mL etc.

4) **Cylinders** -1mL, 5 mL,10 mL etc.

5) **Watch glasses**

i) Micro pipettes – 200 µL, 500 µL, 1000 µL etc.

j) Wash PTFE or PFA devices with 10% (% by volume) nitric acid [A.4.2.h)] before using.

1) Beakers -100 mL, 200 mL, 500 mL etc

2) Measuring flasks -100 mL, 200 mL etc.

k) Heating plats or sand baths

l) Microwave digestion system- 40 mL, 100 mL etc.

A.4.4 Preparation of sample

The pre-processing of the samples described in this section does not apply to all parts which are not made of metals and high molecular materials. Generally, hydrochloric acid, nitric acid or mixed acid are used. For samples that are difficult to dissolve with those acids, add perchloric acid, sulphuric acid etc .wherever necessary. However, keep in mind that use of sulphuric acid carries the risk of losing lead elements, and therefore seriously affects quantitative test of lead. The sample must be completely dissolved without residue by heating at high temperature.

If there are any residues, check if they contain lead elements with other analyzing method (e.g. XRF), or completely dissolve the residues with other decomposition methods (use alkali melting or airtight pressurized container). Mix the solution that has been processed with this method to undiluted solution, and proceed to the lead analysis.

A.4.5 Test sample

a) Dissolve with aqua regia

Put approximately 2g of powdered sample (maximum particle size : 250 µm) into a reaction vessel and add 22.5 mL of hydrochloric acid [A.4.2.b)] and 7.5 mL of nitric acid [A.4.2.f)]. Set up reflux condenser and absorption cell containing 10 mL of 0.5 mol/L nitric acid [A.4.2.g)] on the reaction vessel. Dissolve for 12 hours at room temperature and then for 2 hours at 120 °C. Cool to room temperature and put the contents of the absorption cell into the reaction vessel. If there are insolubles, filter the sample solution with a 0.45 µm glass fibre strainer. Wash the insolubles 4 times with 5 % hydrochloric acid [A.4.2.d)]. Move the resulting solution into a 100 mL measuring flask [A.4.2.h) 2)] and add 5 % hydrochloric acid [A.4.2.d)] to the scale mark to dilute.

Dilute the sample solution to fit the concentration of the calibration curve. When using internal standard substances, add them before diluting the solution. Before filling up to the final volume of 100 mL, add 1,000 µL of internal standard when using ICP-OES, and then add internal standard diluted to 1:1000 for ICP-MS.

If there are any residues, separate them through centrifugation or filtration. Check the residues with appropriate method (e.g. XRF) to see if there are

remaining leads. When it is not possible to use a test instrument described in this section, another simple method can be used if the tester trusts its compatibility. Errors generated from the provided test operation must be verified and be recorded in the test report.

The following is the procedure for the simple method. Cover the glass beaker containing the sample with a watch glass, then put mixed acid [A.4.2.i)] into the beaker and heat for 2 hours at 120 °C. Leave it at room temperature for 12 hours, wash the bottom of the watch glass and inner wall of the beaker with water and then remove the watch glass. If there are insolubles, filter the sample solution with a 0.45 μm glass microfiber strainer. Wash the insolubles with 5 % (*m/m*) hydrochloric acid solution [A.4.2.d)]. Move the resulting solution into a 100 mL measuring flask and add water to the scale mark to dilute. The final solution will be used for the next measurement.

b) Digestion with microwave

Put approximately 200 mg of powdered sample (maximum particle size : 250 μm) into PTFE, TFM, PFA or other containers made of fluorocarbon [A.4.3.j) 2)]. Add 4 mL of nitric acid [A.4.2.f)], 2 mL of boron fluoride [A.4.2.j)], 1 mL of hydrogen peroxide [A.4.2.k)], and 1 mL of water. Carefully shake the container for about 10 seconds to get rid of the generating gas. Once the reaction stops, cover the container with a stopper. Set up the microwave digestion system [A.4.3.l)] and operate the microwave oven according to the pre-set decomposition program to dissolve the sample.

Note: If the HBF4 has lower purity, use HF instead.

Cool to room temperature (leave for approx. 1 hour). Open the container, add 4 mL of hydrochloric acid solution [A.4.2.b)], and put a stopper on it. Set up the microwave digestion system [A.4.3.l)] again and operate microwave oven according to the pre-set decomposition program to dissolve the sample.

Cool to room temperature (leave for approx 1 hour). Open the container, and filter with a glass microfiber strainer into 25 mL measuring flask. Wash with 5 % hydrochloric acid solution [A.4.2.d)] and dilute to the scale mark. If there are any residues, check with an appropriate method to see if there are remaining lead elements in the residue.

The operation process described above is the minimum requirement for a microwave digestion system and need to test 2~3 time per sample.

Note: It is recommended to not put more than 200 mg of powdered sample in a container. The mixture of powdered test sample and nitric acid, HBF_4, hydrogen peroxide, hydrochloric acid reacts quickly and intensely to generate carbon dioxide and nitrogen oxide. This will cause the increase of pressure in the container. A safety device of the micro oven can react and the container can be opened due to the sudden high pressure. Also elements of the analyte can be lost and in the worst case, it can explode. Therefore when reagents are added to the sample, leave it until the reaction stops and then set up the system.

Note: The same amount and kind of acid must be used when testing the same sample 2~3 times.

A.4.6 Test process

Use the calibration curve method to measure the sample. The internal standard method (sensitivity comparison method) is used for ICP-MS.

Note: The standard addition method can be used to increase the reliability of the test method.

Note: If the medium effect is not correctable, the medium needs to be removed by separation methods such as solvent extraction method and ion exchange.

A.4.7 Preparation of solution for calibration curve

Two methods are used for the preparation of calibration standard solution.

a) Calibration curve method (medium correction method)

Prepare a base solution for a calibration curve and a standard solution for three calibration curves. Extract 0 μg ~ 100 μg of lead elements gradually and then put them into 100 mL measuring flask. When preparing the standard solution with the medium correction method, add the same amount of reagents and medium elements as the sample solution to make it as the standard solution for calibration curve.

If boron fluoride were used, use a measuring flask that is made of low density poly ethylene (IDPE) or PFA.

b) Internal standard method

Add the same amount of reagents as those used for sample solution preparation to the standard solution for calibration curves. Put the internal standard elements into both the sample solution and the standard solution for the calibration curve.

If boron fluoride is used, use a measuring flask that is made of low density poly ethylene or PFA.

c) Atomic Absorption Spectrometry and Inductively Coupled Plasma Optical Emission Spectrometry (AAS, IPS-OES)

When measuring leads with the medium correction method, a proper spectral line must be selected and the calibration must use a standard solution for calibration curve that has the medium corrected.

d) Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

An appropriate internal standard method can be used for this.

A.4.8 Preparation of standard solution

Preparation of a standard solution varies based on the instrument to be used.

a) Inductively Coupled Plasma Optical Emission Spectrometry and Atomic Absorption Spectrometry (IPS-OES, AAS)

The medium compositions between the sample solution by aqua regia decomposition and the solution by microwave digestion are different. The

	standard solution prepared for ICP-OES can be used for AAS within the concentration range from which the linearity of lead, the analyte element, is generated. Prepare a base solution for a calibration curve and a standard solution for four calibration curves. **Note:** If the HBF4 has lower purity, use HF instead. **b) Inductively Coupled Plasma Mass Spectrometry (ICP-MS)** Prepare base solution for a calibration curve and standard solution for three calibration curves. Extract 0 μg ~ 5 μg of lead elements gradually and then put them into 100 mL measuring flask. Add the same amount of reagents as the reagents used for sample solution preparation to the standard solution for calibration curves. Put 1 μg of rhodium as the internal standard elements into the sample solution and into the standard solution for calibration curve. **A.4.9 Calibration curve creation** Creating a calibration curve varies based on the instrument to use. **a) Atomic Absorption Spectrometry (AAS)** Inject some of the prepared standard solution for calibration curve under optimal conditions into the air-acetylene flame of the AAS to measure the atomic wavelength absorption of the lead element. For the calibration curve method (medium correction method), create a curve as a calibration curve showing the relationship between the strength and concentration in the element spectral line. The wavelength of lead element must be selected taking into account the typical measuring wavelength. If there is interference due to coexisting substances, the strength of the interference need to be corrected by selecting an interference-free wavelength within the range of selected calibration or other appropriate means. **b) Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES)** Inject some of the prepared standard solution for the calibration curve under optimal conditions into the argon plasma of the ICP-OES to measure the strength of atomic spectral line of the lead element. For the calibration curve method (medium correction method), create a curve as a calibration curve showing the relationship between the strength and concentration in the atomic spectral line. For the internal standard method, create a curve as a calibration curve showing the relationship between the sensitivity ratio and concentration for the internal standard element. When measuring a sample containing hydrofluoric acid, use sample containers that can resist hydrofluoric acid. The wavelength of lead element is selected from the spectral line. The wavelength of lead element must be selected by taking into account the typical measuring wavelength. A thorough study of the detection limit and accuracy must be carried out. If there is an interference due to coexisting substances, the degree of the interference must be corrected by selecting an interference-free wavelength within the range of selected calibration or other appropriate means. **c) Inductively Coupled Plasma Mass Spectrometry (ICP-MS)** Spray the sample solution into the argon plasma through the spray chamber. When measuring a sample containing hydrofluoric acid, use a sample that can	

resist hydrofluoric acid. Read the value of the mass versus the number of electric charge of lead, and then measure the internal standard elements. Calculate the ratio of measured value of lead element to measured value of the internal standard elements.

A.4.10 Measuring the sample

Measure the calibration base solution and the sample solution after the calibration curve has been created. If the concentration of the sample solution is higher than the calibration curve, dilute the solution to fit within the range of the calibration curve and measure again.

Check the precision of measurement at regular intervals with standard substances, calibration curve solution, etc.(per every 10 samples). Re-create the calibration curve if necessary.

< A Linear Regression Line with more than 0.998 of linear coefficient (R^2) can be used for the initial calibration. If the check result of calibration standard (i.e. standard substance, standard solution etc) differs more than 20% from the expected value, measure all relevant calibration standards and samples again.>

A.4.11 Calculation

Obtain the strength of spectrum for lead element, and then calculate the concentration (mg/kg) of lead element in the sample according to the equation below.

$$C = (A_1 – A_2)/m * V$$

C: The lead concentration in the sample (mg/kg)
A_1 = The measured lead concentration from sample solution (mg/L)
A_2 = The measured lead concentration from base test solution (mg/mL)
V = Total volume of the sample solution (mL)
m = Amount of the sample (g)

Note: The above equation is generalized because the first dilution of test solution is applied due to the potential diversity of analysis methods in this section. Keep in mind that all of the dilution must be included for the calculation.

<New>	**Safety Certificate Standards** **Baby Carriages** **- Phthalate Plasticizer –** **Annex 14.C**	
	C.1 The principle Measure phthalate plasticizer content in plastic using Gas Chromatograph Mass Spectrometry (GC-MS). **C.1.1 Reagents and instruments** Only validated grades of analytical reagents must be used. **a) n-hexane** Those stipulated in KS M 8221-3. **b) Filters for Soxhlet (thimble filter)** 28mm * 100mm of size. Made of cellulose and the oil content must be less than 0.1 %. **c) Syringe filters** Less than 0.45 μm. Filters exclusively for organic solvent that are made of Teflon. **d) Vials** Use vial stoppers for GC that are made of Teflon. **Note:** Wash all glassware (including flask and stoppers) with cleanser and rinse several times with water before using. Rinse more with acetone, then with 10 mL of n-hexane twice. Dry at 105 °C. **C.1.2 Preparation of the sample** **C.1.2.1Sample homogenization** Cut high molecular sample into 5 mm * 5 mm with shearing machine or scissors. Put these into a cryogenic crusher and grind to the particle size of smaller than 500 μm. For samples that cannot be used with a cryogenic crusher, cut into 1 mm or smaller. **C.1.2.2 Sample extraction** a) Put 1,000 mg ± 10 mg of sample into a filter for Soxhlet. Record the mass up to 0.1 mg. b) Cover the filter for Soxhlet with glass wool to prevent the sample floating. Using n-hexane as the solvent, put 60 mL in a 100 mL round bottom flask. Heat the solvent to reflux at the n- hexane's boiling point (69 °C). Extract for at least 6 hours. c) Fill the extracted solution with the solvent. (Concentrate if necessary). **C.1.2.3 Alternative extraction method for soluble high molecular substances** a) Get a 1,000 mg of sample in a 300 mL beaker. Measure the sample to every 0.1 mg. b) Add 50 mL of solvent (n-hexane) into the beaker and then sonicate it for 60 minutes to decompose the sample. c) Deposit high molecular substances or filter the compound with 0.45 μm PTFE screen. **C.1.4 Preparation of the standard solution** Weigh 100 mg of each standard precisely to every 0.1 mg and put it in a 100mL measuring flask. Dissolve with n-hexane, fill up the n-hexane up to the scale mark and shake to mix well. This will serve as a standard undiluted solution.	

Dilute the standard undiluted solution properly to prepare a diluted standard solution for each concentration.

C.1.5 Preparation of the base solution

Prepare with the same way as to prepare the sample solution, but do not put in the sample.

C.1.6 Measuring the samples

Inject 1 µL of test solution into Gas Chromatography Mass Spectrometer. Perform the same process for phthalic acid at the same condition. Create a calibration curve at the peak area, compare it to the peak area from the test solution and then quantitate the sample.

1) Gas Chromatograph

a) Detector- Mass analyzing detector

b) Column- J&W DB-1, inner diameter 0.25 , thickness 0.1 m, length 30 m or equivalent ones.

c) Carrier gas- Helium gas with purity of 99.9 % or more

d) Column temperature-100 °C ~ 270 °C

e) Injector temperature-325 °C

f) Detector temperature-280 °C

g) Carrier gas flux- 1.0 mL/min

h) Sample injection amount - 1 µL (split-less mode)

2) Mass Spectrometer

a) Ionization part- Electronionization (EI)

b) Analyzer part- quadrupole

c) Detection range- 50 m/z ! 500 m/z

Note: The condition of detector column etc. can be changed according to the instrument and analysis.

C.1.7 Calculation

The concentration of the sample and the calibration curve that has been recorded in the base test solution is used to obtain the amount of each plasticizer. The content of each plasticizer (mg/kg) can be calculated with an equation below.

$$C = (A_1 - A_2)/m * V$$

C: The plasticizer concentration in the sample (mg/kg)

A_1 = The plasticizer concentration in the sample solution (mg/L)

A_2 = The plasticizer concentration in the base test solution (mg/L)

V = Total volume of the sample solution (mL)

m = Weight of the sample (g)

4. Presenting written opinions

Any individual, business or group who has opinion(s) about this revision (proposal) are welcomed to present opinions in writing to Korean Agency for Technology and Standards, Consumer Product Safety Division with the following information by May 20th, 2009:

A. Opinions about the proposal (Whether you are for or against it and the reasoning)
B. Personal information (Address and phone number)
C. If a group (The name of group, name of the representative, address and phone number)

*** Contact:** Consumer Product Safety Division
Korean Agency for Technology and Standards
Ministry of Knowledge Economy

- ○ Address: 96, Gyoyukwongil, Gwacheon-Si,Gyonggi-Do,Republic of Korea, 427-723
- ○ Phone : 02-509-7248
- ○ Fax : 02-509-7302