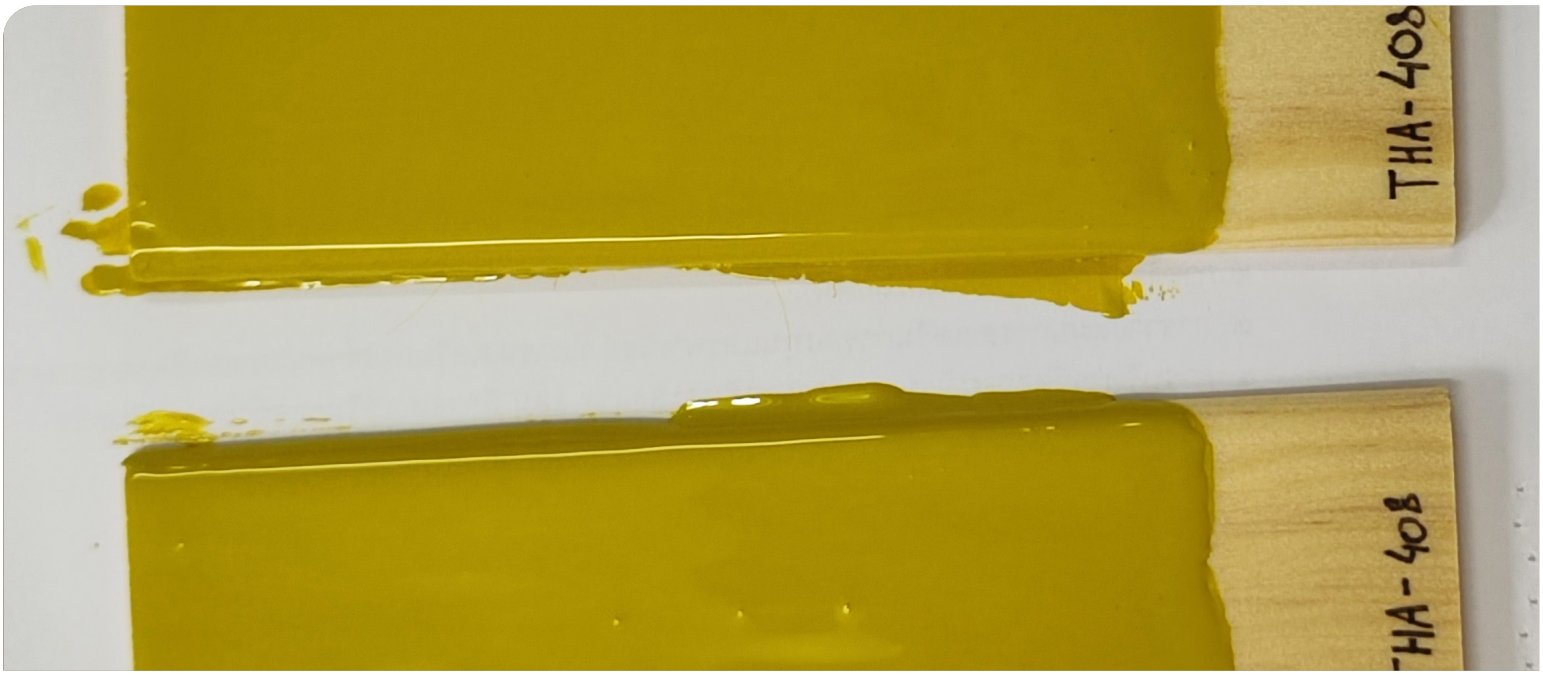

LEAD IN SOLVENT-BASED PAINTS IN THAILAND

January 2025

IPEN
for a toxics-free future

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ECOLOGICAL ALERT AND RECOVERY-THAILAND (EARTH)

Sweden
Sverige

NATIONAL REPORT: LEAD IN SOLVENT-BASED PAINTS IN THAILAND

January 2025

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IPEN is a network of non-governmental organizations working in more than 100 countries to reduce and eliminate the harm to human health and the environment from toxic chemicals.
www.ipen.org

EARTH, a non-profit organization, works for social and environmental justice by advocating for public access to information, transparency, and polluter accountability to reduce the harmful impacts of industrial pollution and toxic chemicals on human health and the environment.
www.earththailand.org

Cite this publication as: Brosché, S., et al. 2025. Lead in Solvent-Based Paints in Thailand. IPEN and EARTH.

ACKNOWLEDGMENTS

We take this opportunity to thank all those who were instrumental in compiling and shaping this paint study.

This report was undertaken as part of IPEN's Global Lead Paint Elimination Campaign and funded by the New York Community Trust (NYCT) and the Swedish Government. It was conducted in Thailand by the Ecological Alert and Recovery – Thailand (EARTH) in partnership with IPEN.

While this study was undertaken with funding assistance from the New York Community Trust (NYCT) and the Swedish Government, responsibility for the content lies entirely with IPEN and EARTH. The funders do not necessarily share the expressed views and interpretations.

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PREFACE

Lead paints for home use continue to be widely produced, sold, and used in developing countries despite the fact that most highly industrial countries banned lead paints for household use more than 40 years ago. IPEN and Participating Organizations are part of the global movement to eliminate lead paint by 2020 to protect children's health.

In 2007 and 2008, NGOs in the IPEN network first collected and analyzed decorative (home use) paints on the market in 11 developing countries, and in countries with economies in transition. The results were startling. In every one of these countries, many of the paints contained exceedingly high lead levels. In response, IPEN launched its Global Lead Paint Elimination Campaign, which seeks to eliminate lead in paint and raise widespread awareness among business entrepreneurs and consumers about the adverse human health impacts of lead paint, particularly on the health of children. Since then, IPEN-affiliated NGOs and others have sampled and analyzed paints on the market in more than 50 low- and middle-income countries.

This compliance monitoring report presents new data on the total lead content of solvent-based paints available on the market in Thailand. It also presents background information on why the use of lead paint is a source of serious concern, especially to children's health; a review of national policy frameworks that are in place to ban or restrict the manufacture, import, export, distribution, sale, and use of lead paint, and provides a strong justification to strengthen compliance monitoring and enforcement of lead paint regulatory controls in Thailand. Finally, it proposes action steps by different stakeholders to protect children and others from lead paint.

This study was conducted by Ecological Alert and Recovery – Thailand (EARTH) in partnership with IPEN.

IPEN is an international NGO network of health and environmental organizations from all regions of the world of which EARTH is a member. IPEN is a leading global organization working to establish and implement safe chemicals policies and practices to protect human health and the environment. Its mission is a toxics-free future for all. IPEN helps build the capacity of its member organizations to implement on-the-ground activities, learn from each other's work, and work at the international level to set priorities and achieve new policies.

Ecological Alert and Recovery – Thailand (EARTH) is an independent non-governmental organization striving for social and environmental sustainability and justice in Thai society. EARTH serves as a watchdog monitoring the Thai government's industrialization policy, industrial pollution and unsustainable consumption patterns. EARTH promotes climate justice, good governance and accountability of governmental and international agencies. EARTH focuses on the impacts of hazardous substances on ecosystems, local communities and workers' health.

EXECUTIVE SUMMARY

Lead is a toxic metal that causes adverse effects on both human health and the environment. While lead exposure is also harmful to adults, lead exposure harms children at much lower levels, and the health effects are generally irreversible and can have a lifelong impact.

The younger the child, the more harmful lead can be, and children with nutritional deficiencies absorb ingested lead at an increased rate. The human fetus is the most vulnerable, and a pregnant woman can transfer lead that has accumulated in her body to her developing child. Lead is also transferred through breast milk when lead is present in a nursing mother.

Evidence of reduced intelligence caused by childhood exposure to lead has led the World Health Organization (WHO) to list "lead-caused mental retardation" as a recognized disease. WHO also lists it as one of the top ten diseases whose health burden among children is due to modifiable environmental factors.

Lead paint is a major source of childhood lead exposure. The term lead paint is used in this report to describe any paint to which one or more lead compounds have been added. The cut-off concentration for lead paint used in the report is 90 parts per million (ppm, dry weight of paint), the strictest legal limit enacted in the world today. All lead concentrations in the report are total lead levels, unless otherwise specified.

Most highly industrial countries adopted laws or regulations to control the lead content of decorative paints—the paints used on the interiors and exteriors of homes, schools, and other child-occupied facilities—beginning in the 1970s and 1980s. In January 2016, the Thai government issued a royal decree stipulating that alkyd paint industrial products must comply with the mandatory standard: *TIS 2625-2557 (2014) Alkyd Enamel: Safety Requirement* issued by Thai Industrial Standards Institute (TISI) which mandated a 100 ppm limit for lead in paint and took effect in January 2017.

The standard TIS 2625-2557 requires the need for all alkyd enamel paints produced or distributed in Thailand to display warning labels, signaling potential hazards associated with the product. These warning labels typically bear phrases such as "contains toxic substances" or "keep out of reach of children." These measures aim to safeguard public health and enhance consumer awareness regarding the inherent risks of using such products.

During the period spanning March to May 2023, EARTH procured a total of 55 containers of solvent-based paints—42 decorative paints, six anticorrosive paints, five spray paints, and two industrial paints—from paint stores in Bangkok and its surrounding regions, including Rayong province in eastern Thailand. The paints represented 45 different brands produced by 35 manufacturers. All paints were analyzed by an accredited laboratory in the United States of America for their lead content, based on dry weight of the paint. The laboratory participates in the Environmental Lead Proficiency Analytical Testing (ELPAT) program operated by the American Industrial Hygiene Association (AIHA), assuring the reliability of the analytical results.

RESULTS

Eleven out of 55 analyzed solvent-based paints (20 percent of paints) were lead paints, i.e., they contained lead concentrations above 100 parts per million (ppm, dry weight of paint). This is also the regulatory limit for lead in decorative paint in, e.g., Switzerland, Pakistan, Egypt, and Ecuador. Moreover, seven paints (13 percent of paints) contained extremely high lead concentrations, above 10,000 ppm. The highest lead concentration detected was 64,000 ppm in a yellow enamel paint sold for decorative or home use.

On the other hand, 44 out of 55 solvent-based paints (80 percent of paints) did not contain intentionally added lead,[1] suggesting that the technology to produce paint without lead ingredients exists in Thailand.

Ten out of 45 analyzed brands (22 percent of paint brands) sold at least one lead paint, i.e., a paint with lead concentration above 100 ppm. Also, seven out of 45 analyzed brands (16 percent of paint brands) sold at least one lead paint with extremely high lead concentrations above 10,000 ppm.

This study reveals the presence of highly elevated lead concentrations exceeding 10,000 ppm among yellow paints. In fact, all seven paints with lead levels above 10,000 ppm were yellow paints (18 percent of 38 yellow paints).

In general, paint can labels did not carry meaningful information about lead content or the hazards of lead paint. Only 22 out of 55 paints (40 percent of paints) provided information about lead on their labels, i.e., "no added lead," "lead-free," and "free of lead hazard" claims. Among these, three paints were falsely marked as "free of lead hazard," "lead-free," or "no added lead" despite containing 41,000 ppm, 30,000 ppm, and 25,000 ppm lead, respectively.

Most paints carried little information about any ingredients on can labels. Most paints were merely labelled as "solvents, pigments and resin," with no further details on the type of solvents and pigments (organic or inorganic) provided on paint can labels. Warning symbols on most of the paint cans indicated the flammability of the paints, but no precautionary warnings on the effects of lead dust on children and pregnant women were provided.

Manufacturing dates were included on the labels of 47 out of 55 paints (85 percent of paints) included in this study. The batch numbers of 42 of 55 paints (76 percent of paints) were provided on the labels.

The results of the three studies conducted by EARTH and IPEN in 2013, 2015, and 2023 indicated an increase in the percentage of compliant solvent-based paints with lead concentrations below 100 ppm. The percentage of similar paints exceeding 100 ppm and 10,000 ppm, on the other hand, had considerably decreased. For example, the study conducted in 2013 prior to the issuance of the lead paint regulation showed that 79 percent of 120 analyzed paints had lead content above 100 ppm. In contrast, only 20 percent of 55 analyzed paints in 2023 exceeded the 100-ppm limit after the lead paint regulation was enacted in January 2017. The percentage of paints with lead levels above 10,000 ppm also decreased: from 40 percent of 120 paints in 2013 to 13 percent of 55 paints in 2023.

However, the number of lead paints in 2023 is still considerably high six years after the regulation took effect. What's worse, some of these paints falsely claim that they are "lead-free" or "no added lead" despite study results saying otherwise.

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1 Among the 44 paints, there were 34 paints with lead concentrations reported as "less than 200 ppm." In this report, we say that these 34 paints did not contain "intentionally added lead." Intentionally adding lead compounds to paint either as pigment or drier will yield concentrations of lead that are higher than 200 ppm. According to Module A-3 (Paint Basics) of UNEP's Toolkit for Establishing Laws to Eliminate Lead Paint, "Lead-based pigments may contribute around 1,500 ppm to over 100,000 ppm" concentrations of lead in paint, while "lead-based driers may contribute around 1,200 ppm to 6,000 ppm" concentrations of lead in paint. (https://wedocs.unep.org/bitstream/handle/20.500.11822/37030/PAINT.pdf, p.14-15)

CONCLUSIONS

This study demonstrates that solvent-based paints with high concentrations of lead are still available in Thailand despite the enactment of a lead paint regulation banning the manufacture and sale of lead paints in January 2017. However, the fact that 44 out of 55 paints (80 percent of paints) did not contain intentionally added lead indicates that the technology to produce paints without added lead exists in Thailand. The study results provide a strong justification to strengthen compliance monitoring and enforcement mechanisms to ensure adherence to the current Thai Industrial Standard (TIS) regulation banning the manufacture and sale of paints with total lead concentrations greater than 100 ppm. It will also be good to consider a more stringent lead limit of 90 ppm at par with legal limits in the US, Canada, Philippines, Vietnam, Laos, China, South Korea, India, Nepal, Bangladesh, Saudi Arabia, Jordan, Morocco, Cameroon, Ethiopia, Kenya, Nigeria, and Colombia.

RECOMMENDATIONS

In the interest of upholding the national ban on lead-containing paints, thereby protecting the health of children and other vulnerable populations, EARTH and IPEN propose the following recommendations:

FOR GOVERNMENT AND GOVERNMENT AGENCIES

While Thailand has Industrial Standards, "TIS 2625-2557: Safety Standard for Alkyd Enamel Paints," for paint manufactured and sold in the country (no more than 100 ppm total lead), it lacks provisions for regulating the import, export, and usage of non-compliant paints. As a result, regulatory standards on lead in paint are not effectively enforced. To address this, Thai authorities should establish comprehensive and obligatory standards for heavy metals in paint. Additionally, some paints claimed to be "lead-free" but tested positive for extremely high levels of lead. Regulatory agencies should emphasize the significance of the TIS 2625-2557: Safety Standard for Alkyd Enamel Paints and the Consumer Protection Act, B.E. 2522 (1979), to rectify misleading claims of "lead-free" paints and minimize consumer confusion.

FOR THE PAINT INDUSTRY

For paint companies that still produce lead paints to expeditiously stop the use of leaded paint ingredients in paint formulations. Paint companies that have shifted to non-lead paint production should get their products certified through independent, third-party verification procedures to increase the customer's ability to choose paints with no added lead.

FOR INDIVIDUAL, HOUSEHOLD, AND INSTITUTIONAL CONSUMERS

Paint consumers should demand paints with no added lead from paint manufacturers and retailers, as well as full disclosure of a paint product's content. Household and institutional consumers should ask for, consciously buy, and apply only paints with no added lead in places frequently used by children such as homes, schools, day care centers, parks, and playgrounds.

FOR ORGANIZATIONS AND PROFESSIONAL GROUPS

Public health groups, consumer organizations and other concerned entities should support the elimination of lead paint, and conduct activities to inform the public and protect children from lead exposure through lead paint, lead in dust and soil, and other sources of lead.

FOR ALL STAKEHOLDERS

Stakeholders from the government, business and industry, health care sector, academia, and the civil society should actively support policies and programs that will contribute to the reduction of children's, women's, and workers' exposures to lead from lead-containing paint, as well as from lead-contaminated dust and soil towards a lead-safe future for all.

LEAD PAINT TERMINOLOGY

As used in this booklet:

- "Paint" includes varnishes, lacquers, stains, enamels, glazes, primers, or coatings used for any purpose. Paint is typically a mixture of resins, pigments, fillers, solvents, and other additives.
- "Lead paint" is paint to which one or more lead compounds have been added.
- "Lead pigments" are lead compounds used to give a paint product its color.
- "Lead anti-corrosive agents" are lead compounds used to protect a metal surface from rusting or other forms of corrosion.
- "Lead driers" are lead compounds used to make paint dry more quickly and evenly.
- "Decorative paint" refers to paints or coating materials that are produced for use on inside or outside walls, and surfaces of homes, schools, commercial buildings, and similar structures. Decorative paints are frequently used on doors, gates, and windows, and to repaint household furniture such as cribs, playpens, tables, and chairs.
- "Solvent-based, enamel decorative paint" or "enamel decorative paint" refers to oil-based paints.
- "ppm" means parts per million total lead content by weight in a dried paint sample. All lead concentrations in the report are total lead levels, unless otherwise specified.

1. BACKGROUND

1.1 HEALTH AND ECONOMIC IMPACTS OF LEAD EXPOSURE

Children are exposed to lead from paint when lead-containing paint on walls, windows, doors, or other painted surfaces begins to chip or deteriorate, since this causes lead to be released to dust and soil. When a surface previously painted with lead paint is sanded or scraped in preparation for repainting, very large amounts of lead-contaminated dust is produced, which, when spread, can constitute a severe health hazard.[1]

Children playing indoors or outdoors get house dust or soil on their hands, and then ingest it through normal hand-to-mouth behavior. If the dust or the soil is contaminated with lead, the children will ingest lead. Hand-to-mouth behavior is especially prevalent in children aged six years and under, the age group most easily harmed by exposure to lead. A typical one- to six-year-old child ingests between 100 and 400 milligrams of house dust and soil each day.[2]

In some cases, children pick up paint chips and put them directly into their mouths. This can be especially harmful because the lead content of paint chips is typically much higher than what is found in dust and soils. When toys, household furniture, or other articles are painted with lead paint, children may directly ingest the lead-contaminated, dried paint when chewing on them. Nonetheless, the most common way that children ingest lead is through lead-contaminated dust and soil that gets onto their hands.[3]

While lead exposure is also harmful to adults, lead exposure harms children at much lower levels. In addition, children absorb up to five times as much of ingested lead than adults. Children with nutritional deficiencies absorb ingested lead at an even increased rates.[2]

The younger the child, the more harmful lead can be, and the health effects are generally irreversible and can have a lifelong impact. The human fetus is the most vulnerable, and a pregnant woman can transfer lead that has accumulated in her body to her developing child.[4] Lead is also transferred through breast milk when lead is present in a nursing mother.[5]

Once lead enters a child's body through ingestion, inhalation, or across the placenta, it has the potential to damage several biological systems and pathways. The primary target is the central nervous system and the brain, but lead can also affect the blood system, the kidneys, and the skeleton.[6] Lead is also categorized as an endocrine-disrupting chemical (EDC).[7]

It is generally agreed that one key element in lead toxicity is its capacity to replace calcium in neurotransmitter systems, proteins, and bone structure, altering function and structure and thereby leading to severe health impacts. Lead is also known to affect and damage cell structure.[8]

According to the World Health Organization (WHO): "Lead has no essential role in the human body, and lead poisoning accounts for about 0.6 percent of the global burden of disease."[2] Evidence of reduced intelligence caused by childhood exposure to lead has led WHO to list "lead-caused mental retardation" as a recognized disease. WHO also lists it as one of the top ten diseases whose health burden among children is due to modifiable environmental factors.[9]

In recent years, medical researchers have been documenting significant health impacts in children from lower and lower levels of lead exposure.[2, 6] According to the factsheet on Lead Poisoning and Health from WHO: "There is no known level of lead exposure that is considered safe."[10]

When a young child is exposed to lead, the harm to her or his nervous system makes it more likely that the child will have difficulties in school and engage in impulsive and violent behavior.[11] Lead exposure in young children is also linked to increased rates of hyperactivity, inattentiveness, failure to graduate from high school, conduct disorder, juvenile delinquency, drug use, and incarceration.[2] Lead exposure impacts on children continue throughout life and have a long-term impact on a child's work performance, and—on average—are related to decreased economic success.

A study investigating the economic impact of childhood lead exposure on national economies in all low- and middle-income countries estimated a total cumulative cost burden of $977 billion international dollars[2] per year.[12] The study considered the neurodevelopmental effects on lead-exposed children, as measured by reduced IQ points, and it correlated lead exposure-related reductions in children's IQ scores to reductions in lifetime economic productivity, as expressed in lifelong earning power. The study identified many different sources of lead exposure in children, with lead paint as one major source. Broken down by region, the economic burden of childhood lead exposure as estimated by this study was:

- Africa: $134.7 billion of economic loss, or 4.03 percent of Gross Domestic Product (GDP);
- Latin America and the Caribbean: $142.3 billion of economic loss, or 2.04 percent of GDP; and
- Asia: $699.9 billion of economic loss, or 1.88 percent of GDP.

The country estimates utilized for this study are accessible through a publicly available website: http://www.med.nyu.edu/pediatrics/research/environmentalpediatrics/leadexposure. These estimates highlight an economic loss in Thailand estimated at $12.5 billion, equivalent to 2 percent of the nation's Gross Domestic Product (GDP).

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2 An International dollar is a currency unit used by economists and international organizations to compare the values of different currencies. It adjusts the value of the U.S. dollar to reflect currency exchange rates, purchasing power parity (PPP), and average commodity prices within each country. According to the World Bank, "An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States." The international dollar values in this report were calculated from a World Bank table that lists GDP per capita by country based on purchasing power parity and expressed in international dollars.

1.2 THE USE OF LEAD IN PAINT

Paints contain high levels of lead when the paint manufacturer intentionally adds one or more leaded compounds to the paint for some purpose. A paint product may also contain some amount of lead when paint ingredients contaminated with lead are used, or when there is cross-contamination from other product lines in the same factory. Leaded paint ingredients are most commonly intentionally used in solvent-based paint due to their chemical properties, and solvent-based paints have been found to have high lead content in many countries.[13-15]

The leaded compounds most commonly added to paints are pigments. Pigments are used to give the paint its color, make the paint opaque (so it covers well), and protect the paint and the underlying surface from degradation caused by exposure to sunlight. Lead-based pigments are sometimes used alone, and sometimes used in combination with other pigments.

Leaded compounds may also be added to enamel paints for use as driers (sometimes called drying agents or drying catalysts). Leaded compounds are also sometimes added to paints used on metal surfaces to inhibit rust or corrosion. The most common of these is lead tetroxide, sometimes called red lead or minium.

Non-leaded pigments, driers, and anticorrosive agents have been widely available for decades and are used by manufacturers producing the highest quality paints. When a paint manufacturer does not intentionally add lead compounds in the formulation of its paints and takes care to avoid the use of paint ingredients that are contaminated with lead, the lead content of the paint will be very low—less than 90 parts per million (ppm) lead by dry weight, and frequently down to 10 ppm or less.

Most highly industrial countries adopted laws or regulations to control the lead content of decorative paints beginning in the 1970s and 1980s. Many also imposed controls on the lead content of paints used on toys and for other applications likely to contribute to lead exposure in children. These regulatory actions were taken based on scientific and medical findings that lead paint is a major source of lead exposure in children, and that lead exposure in children causes serious harm, especially to children aged six years and under.

The use of lead in production of decorative paint is prohibited in the European Union through regulations related to safety of consumer products and specific prohibitions for most leaded raw materials. In the U.S., Canada, Australia and other countries with regulations restricting the use of leaded ingredients in decorative paint, standards specifying a maximum lead limit are in place. The current standard for decorative household paints in e.g., the U.S., Canada, China, Nepal, Bangladesh, South Korea, the Philippines, Vietnam, Laos, Israel, Iraq, Jordan, Saudi Arabia, South Africa, Ethiopia, Kenya, Nigeria, Cameroon, Tanzania, Morocco, Georgia, Ukraine, Jamaica, Colombia, Peru, and Paraguay is a total maximum lead content of 90 ppm, and adherence to this ensures that a manufacturer can sell its paint anywhere in the world. This standard is also recommended in the *Model Law and Guidance for Regulating Lead Paint*,[3] which was developed by the Global Alliance to Eliminate Lead Paint (GAELP) and published by the UN Environment Programme. Some other countries such as Switzerland, Pakistan, Egypt, and Ecuador have established legal limits of 100 ppm total lead, while Argentina,Brazil, Chile, Costa Rica, Dominica, Guyana, Mexico, Panama, Trinidad and Tobago, Uruguay, Sri Lanka, Kuwait, Oman, and Qatar have adopted national standards of 600 ppm total lead.

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3 https://www.unenvironment.org/resources/publication/model-law-and-guidance-regulating-lead-paint

1.3 PAINT MARKET AND REGULATORY FRAMEWORK IN TANZANIA

The overall paint market in Thailand holds a substantial value of approximately 50 billion baht ($1.5 billion USD). Projections for the house and building paint market in 2023 forecast a notable expansion of around 10%, resulting in a substantial market value increase to 30 billion baht ($900 million USD), compared to the 27 billion baht (approximately $810 million USD) recorded in 2022.[16] This growth is characterized by a diverse distribution across different trade channels. Specifically, the Modern Trade channel (e.g., supermarket, department stores, and minimarts, etc.) anticipates a robust increase of 12-15%, the Traditional Trade channel (e.g., marketing in markets, stalls, general stores, etc.) maintains stable growth at 50%, and the Direct Sale channel (e.g., online selling platforms, social media, etc.) projects a commendable expansion of 8-10%.[16]

In the landscape of the Thai house paint market, the top revenue-generating entities in 2022 were TOA (TOA Paint (Thailand) Public Company Ltd.), amassing an income of 20.826 billion baht (approximately $624 million USD), followed by NIPPON PAINT (Nippon Paint (Thailand) Co., Ltd.) with 6.243 billion baht (roughly $187 million USD), and Dulux (Akzo Nobel Paints (Thailand) Ltd.) with revenues of 4.916 billion baht (about $147 million USD). Notably, these companies have consistently observed an upward trajectory in revenue over the past three years (from 2020 to 2022). Of particular interest, TOA and Delta PAINT (Delta Paint Public Company Ltd.) have emerged as dominant forces within the Thai market, notably linked through familial ownership.[17] This dynamic underscore the concentrated influence wielded by these entities in shaping and steering the trajectory of the Thai decorative household paint industry.

In Thailand, "TIS 2625-2557: Safety Requirement for Alkyd Enamel Paints," is a regulatory measure that entered into force in January 2017 and set the permissible level of lead (100 ppm) as well as other heavy metals present in enamel paints such as mercury (100 ppm), cadmium (100 ppm), and hexavalent chromium (1,000 ppm).[18] All alkyd enamel paints produced or distributed in Thailand are mandated by this safety requirement to display warning labels, signaling potential hazards associated with the product. These warning labels typically bear phrases such as "contains toxic substances" or "keep out of reach of children." These measures aim to safeguard public health and enhance consumer awareness regarding the inherent risks of using such products.

While Thailand has the industrial standard (TIS 2625-2557) which set a regulatory limit of 100 ppm total lead for paint manufactured and sold in the country, it lacks provisions for regulating the import, export, and usage of non-compliant paints. As a result, regulatory standards on lead in paint are not effectively enforced. To address this, Thai authorities should establish comprehensive and obligatory standards for heavy metals in paint. Additionally, some paints claimed to be "lead-free" but tested positive for extremely high levels of lead – regulatory agencies should emphasize the significance of the Consumer Protection Act, B.E. 2522, to rectify misleading claims of "lead-free" paints and minimize consumer confusion.

Before the regulatory standard TIS 2625-2557 came into force, voluntary standards for lead content in alkyd gloss enamel for indoor and outdoor coating wood surfaces and metal surfaces coated with primer (TIS 327-2553),[19] and for quick-drying automotive nitrocellulose lacquer (TIS 608-2559)[20] were issued in January 2011 and Novmber 2016 respectively. While these two earlier standards provided guidelines for manufacturers to develop and maintain product quality, these are only voluntary and not legally-binding and manufacturers were not required to provide safety requirements for these paints.

2. MATERIALS AND METHODS

During the period spanning March to May 2023, EARTH procured a collective total of 55 containers of solvent-based paints—42 decorative paints, six anticorrosive paints, five spray paints, and two industrial paints—from stores situated in Bangkok and its surrounding regions, as well as in Rayong, Thailand. The paints represented 45 different brands produced by 35 manufacturers.

In most cases, one white paint and one or more bright-colored paint such as red, orange, or yellow were selected. Additionally, six anticorrosive (primer) paints for consumer use, five spray paints for automotive use, and two paints for industrial use were included in this study. The availability of these paints in retail establishments suggested that they were intended to be used within home environments.

During the paint sample preparation, information such as color, brand, manufacturer, country where manufactured, product codes, production dates, and other details as provided on the label of the paint can were recorded. Generic paint colors were recorded, e.g., "yellow" instead of "sunflower." For all colored paints, the protocol called for obtaining "bright" or "strong" red and yellow paints when available.

Paint sampling preparation kits containing individually numbered, untreated wood pieces, single-use paintbrushes and stirring utensils made from untreated wood sticks were assembled and shipped to EARTH by the staff of the IPEN partner NGO, Arnika, in The Czech Republic.

Each can of paint was thoroughly stirred and was subsequently applied onto individually numbered triplicates of untreated, labeled wood pieces using different unused, single-use paintbrushes by a researcher of EARTH as shown in Figure 1.

Each stirring utensil and paintbrush was used only for the same paint, and extra caution was taken to avoid cross contamination. All samples were then allowed to dry at room temperature for five to six days. After drying, the painted wood pieces were placed in individually labeled, resealable plastic bags and shipped for analysis of lead content to SGS Forensic Laboratories in the United States of America. The laboratory participates in the Environmental Lead Proficiency Analytical Testing (ELPAT) Program operated by the American Industrial Hygiene Association. In the laboratory selection process, IPEN further assessed the reliability of the laboratory results by conducting an independent quality assurance testing. This was made by sending paint samples with a known lead content to the laboratory, and evaluating the results received.

The laboratory's lower limit of detection for the lead concentration in the paint samples is dependent on the amount of paint in the samples. Generally, the lowest detection limit for the method used is 60 ppm, but if only a small amount of paint is available, the detection limit increases. Therefore, the detection limit was higher (up to 200 ppm) for some of the samples.

The paint samples were analyzed using method EPA3050B/7000B, i.e., through acid digestion of the samples, followed by Flame Atomic Absorption Spectrometry, as recognized by the WHO as appropriate for the purpose.[21]

Figure 1 Sample preparation conducted by staff of EARTH.

3. RESULTS

3.1 SUMMARY OF RESULTS

This study shows that:

- 11 out of 55 analyzed solvent-based paints (20 percent of paints) were lead paints, i.e., they contained lead concentrations above 100 parts per million (ppm, dry weight of paint). In addition, seven paints (13 percent of paints) contained extremely high lead concentrations above 10,000 ppm. The highest lead concentration detected was 64,000 ppm in a yellow enamel paint sold for decorative or home use.
- 10 out of 45 analyzed brands (22 percent of paint brands) sold at least one lead paint, i.e., a paint with lead concentration above 100 ppm. Also, seven out of 45 analyzed brands (16 percent of paint brands) sold at least one lead paint with extremely high lead concentrations above 10,000 ppm.
- Nine out of 49 bright-colored paints (18 percent of bright-colored paints) were lead paints, i.e., they contained lead concentrations above 100 parts per million (ppm), dry weight.
- The highest lead concentration detected was 64,000 ppm in a yellow SUPER SEF High Gloss Enamel paint sold for home use.
- Only 22 out of 55 paints (40 percent of paints) provided information about lead on their labels and most paints carried little information about ingredients. Most paints were merely labeled as "solvents, pigments and resin," with no further details on the type of solvents and pigments (organic or inorganic) provided. Most warning symbols on the paint cans indicated the flammability of the paints or advised keeping the products out of reach of children, but noticeably absent were precautionary warnings on the potential effects of lead dust to children and pregnant women.

3.2 LEAD CONTENT ANALYSIS

Eleven out of 55 analyzed solvent-based paints (20 percent of paints) were lead paints, i.e., contained a lead concentration above 100 ppm — seven of these contained extremely high lead concentrations above 10,000 ppm (13 percent of paints).

A yellow SUPER SEF High Gloss Enamel paint recorded the highest lead concentration at 64,000 ppm. Conversely, the lowest concentration of lead less than 80 ppm was found in a red NAKOYA Super Spar Quick Dry Primer.

The ten solvent-based paints with the highest amounts of lead are summarized in Table 1.

Table 1 Top Eight Solvent-Based Paints with the Highest Lead Content.

RANK	SAMPLE NO.	BRAND	TYPE OF PAINT	MANUFACTURER	COLOR	LEAD CONTENT (ppm)
1	THA-436	SUPER SEF	Decorative Paint	MAXZO Paint Co., Ltd.	yellow	64,000
2	THA-447	PYLAC 1000	Spray Paint	Nippon Paint Decorative Coating (Thailand) Co., Ltd.	yellow	42,000
3	THA-446	Leyland	Spray Paint	Nakoya Paint (Thailand) Co., Ltd.	yellow	41,000
4	THA-425	MINOR	Decorative Paint	Rhino Chemical Industries Co., Ltd.	yellow	30,000
5	THA-444	NAKOYA	Industrial Paint	Nakoya Paint (Thailand) Co., Ltd.	yellow	26,000
6	THA-415	IEC	Decorative Paint	COLOUR I.E.C. PAINT (Thailand) Co., Ltd.	yellow	25,000
7	THA-428	NATIONAL	Decorative Paint	Delta Paint Co., Ltd.	yellow	17,000
8	THA-445	KING COBRA	Spray Paint	LENA (Thailand) Co., Ltd.	yellow	3,500
9	THA-403	BUNDAI	Decorative Paint	LENA (Thailand) Co., Ltd.	white	1,800
10	THA-443	SEFCO Y2K	Decorative Paint	SEFCO Chemical (2001) Co., Ltd.	white	1,800

On the other hand, 44 out of 55 analyzed solvent-based paints (80 percent of paints) did not contain intentionally added lead. These include 34 paints with lead concentrations reported as "less than 200 ppm," and in this report, we say that these 34 paints did not contain "intentionally added lead."

Intentionally adding lead compounds to paint either as pigment or drier will yield concentrations of lead that are higher than 200 ppm. According to Module A-3 (Paint Basics) of UNEP's Toolkit for Establishing Laws to Eliminate Lead Paint, "Lead-based pigments may contribute around 1,500 ppm to over 100,000 ppm" concentrations of lead in paint, while "lead-based driers may contribute around 1,200 ppm to 6,000 ppm" concentrations of lead in paint.[4]

3.3 PAINT BRAND ANALYSIS

Seven out of 45 analyzed brands (16 percent of paint brands) sold at least one paint with extremely high lead concentration above 10,000 ppm.

Among 42 decorative enamel paints, a SUPER SEF High Gloss Enamel paint (yellow) recorded the highest lead concentration at 64,000 ppm. Contrariwise, at least one paint from each of the following brands contained lead below 100 ppm: IBC (yellow), JBP (yellow), MP3 (yellow), TURBO (orange), and WINDY (yellow). These results underscore the presence of paint manufacturing technology in Thailand capable of producing paints without added lead.

Among five spray paints (aerosol lacquer or acrylic lacquer), a PYLAC 1000 car paint manufactured by Nippon Paint Decorative Coating (Thailand) Co., Ltd. and headquartered in Japan contained the highest concentration of lead at 42,000 ppm. In contrast, at least one paint from two brands—Samurai (yellow) and Win (yellow)—had lead levels below 90 ppm.

4 https://wedocs.unep.org/bitstream/handle/20.500.11822/37030/PAINT.pdf?sequence=3&isAllowed=y, p.14-15

Between two analyzed industrial paints, a Nakoya Industrial Lacquer paint (yellow) had 26,000 ppm lead, while a Chugoku Evamarine Exterior paint (yellow) had lead content below 200 ppm.

All six red anticorrosive paints or primers from six paint brands did not contain intentionally added lead: Nakoya (below 80 ppm), Jotun (below 100 ppm), RUST-OLEUM (below 100 ppm), Ben-Tone (below 200 ppm), Bull (below 200 ppm), and MD 2in1 (below 200 ppm).

3.4 PAINT COLOR ANALYSIS

Nine yellow paints out of 49 bright-colored paints such as yellow, red, and orange (18 percent of bright-colored paints) contained intentionally added lead greater than 1,000 ppm, seven paints of which contained extremely high lead concentrations above 10,000 ppm (14 percent of bright-colored paints).

The present study encompassed an analysis of 38 yellow paints, eight red paints, six white paints, and three orange paints. Notably, yellow paints exhibited the highest concentrations of lead.

Among bright-colored paints (i.e., yellow, red, and orange paints), seven out of 38 yellow paints (24 percent of yellow paints) contained lead concentrations above 10,000 ppm. None of the 11 red and orange paints contained intentionally added lead.

On the other hand, two white paints both contained 1,800 ppm lead (33 percent of white paints).

3.5 LABELING

In general, most paint can labels did not carry meaningful information about lead content or the hazards of lead paint.

Only 22 out of 55 paints (40 percent of paints) provided information about lead on their labels, i.e., "no added lead," "lead-free," and "free of lead hazard" claims. Among these, three paints were falsely marked as "free of lead hazard," "lead-free," or "no added lead" despite containing 41,000 ppm lead (Leyland Aerosol Lacquer paint); 30,000 ppm lead (Minor Synthetic Gloss Enamel paint); and 25,000 ppm lead (IEC High Gloss Enamel paint), respectively.

Most paints carried little information about any ingredients on can labels. Most paints were merely labeled as "solvents, pigments and resin," with no further details on the type of solvents and pigments (organic or inorganic) provided on paint can labels. Warning symbols on most of the paint cans indicated the flammability of the paints or advised keeping the products out of reach of children, but no precautionary warnings on the effects of lead dust to children and pregnant women were provided.

Manufacturing dates were included on the labels of 47 out of 55 paints (85 percent of paints) included in this study. The batch numbers of 42 of 55 paints (76 percent of paints) were provided on the labels.

3.6 COMPARISON WITH RESULTS FROM EARLIER STUDIES

The results of the three studies conducted by EARTH and IPEN in 2013, 2015, and 2023 (this study) indicated an increase in the percentage of compliant solvent-based paints with lead concentrations below 100 ppm. The percentage of similar paints exceeding 100 ppm and 10,000 ppm, on the other hand, had considerably decreased. For example, the study conducted in 2013 prior to the issuance of the lead paint regulation showed that 79 percent of 120 analyzed paints had lead content above 100 ppm. In contrast, only 20 percent of 55 analyzed paints in 2023 exceeded the 100-ppm limit after the lead paint regulation was enacted in January 2017. The percentage of paints with lead levels above 10,000 ppm also decreased: from 40 percent of 120 paints in 2013 to 13 percent of 55 paints in 2023.

However, the number of lead paints in 2023 is still considerably high six years after the regulation took effect. What's worse, some of these paints falsely claim that they are "lead-free" or "no added lead" despite study results saying otherwise.

Twenty-nine decorative paints analyzed in previous studies were also analyzed in this study. Among these, six decorative paints remained non-compliant with the legal limit and still contains intentionally added lead in 2023. These include BUNDAI Gloss Finish paint (white), IEC High Gloss Enamel paint (yellow), Nakoya Super Spar Quick Dry Enamel paint (yellow), National Gloss Synthetic Resin Enamel paint (yellow), SUPER SEF High Gloss Enamel paint (yellow), and SEFCO Y2K Synthetic High Gloss Enamel paint (white).

On the other hand, three paints analyzed in 2015 remained without intentionally added lead in 2023. These include BODELAC Premium High Gloss Enamel paint (yellow), LONGLIFE High Gloss Enamel paint (yellow), and Mandarin Duck Synthetic Gloss Enamel paint (white).

Moreover, 20 paints which still contained lead in 2015 have been reformulated and were now complaint with the 100 ppm limit. These paints include: Bundai (yellow and orange); Columbia (yellow); Compac (yellow); DENZO (yellow); D.I.Y. (yellow); DYNO PRO (yellow); Ftalit (yellow); IBC (yellow); IEC (white); JBP (yellow); LOBSTER (yellow); LOTTO (yellow); National (orange); N.O.C. (yellow); RUST-OLEUM (yellow); SEFCO (yellow); TEMCO (yellow and white); and TURBO (orange).

Table 2 Comparison of Lead Concentrations in Some Solvent-Based Paints.

SAMPLE NO.	BRAND NAME	COLOR	2023 LEAD CONTENT (ppm)	2015 LEAD CONTENT (ppm)	2013 LEAD CONTENT (ppm)	REMARKS
THA-436	SUPER SEF High Gloss Enamel Paint	yellow	64,000	66,000	63,000	Still contains intentionally added lead (most likely pigment) compared to 2015
THA-415	IEC High Gloss Enamel Paint	yellow	25,000	24,000	51,000	Still contains intentionally added lead (most likely pigment) compared to 2015
THA-428	National Gloss Synthetic Resin Enamel Paint	yellow	17,000	41,000	-	Still contains intentionally added lead (most likely pigment) compared to 2015
THA-403	BUNDAI Gloss Finish Paint	white	1,800	2,882	-	Still contains intentionally added lead (most likely drier) compared to 2015
THA-443	SEFCO Y2K Synthetic High Gloss Enamel Paint	white	1,800	1,686	-	Still contains intentionally added lead (most likely drier) compared to 2015
THA-427	Nakoya Super Spar Quick Dry Enamel Paint	yellow	1,700	50,000	-	May not contain lead pigment anymore compared to 2015, but still contains intentionally added lead (most likely drier)
THA-412	FTALIT Synthetic Resin Enamel Paint	yellow	< 200	112,000	50,000	Reformulated paint; no intentionally added lead compared to 2015
THA-416	JBP Smart Glaze Ultra Gloss Enamel Paint	yellow	< 100	79,000	87,000	Reformulated paint; no intentionally added lead compared to 2015
THA-433	SEFCO Sythetic Enamel Paint	yellow	< 200	68,000	-	Reformulated paint; no intentionally added lead compared to 2015
THA-409	DENZO Synthetic Gloss Enamel Paint	yellow	< 200	59,000	56,000	Reformulated paint; no intentionally added lead compared to 2015
THA-411	DYNO PRO High Protective Enamel Paint	yellow	< 200	55,480	31,000	Reformulated paint; no intentionally added lead compared to 2015
THA-410	D.I.Y. Synthetic Gloss Enamel Paint	yellow	< 200	54,000	60,000	Reformulated paint; no intentionally added lead compared to 2015
THA-430	N.O.C. Synthetic Enamel Paint	yellow	< 200	54,000	56,000	Reformulated paint; no intentionally added lead compared to 2015
THA-405	BUNDAI Gloss Finish Paint	yellow	< 200	50,000	-	Reformulated paint; no intentionally added lead compared to 2015
THA-432	RUST-OLEUM Protective Enamel Paint	yellow	< 200	47,000	95,000	Reformulated paint; no intentionally added lead compared to 2015

Table 2 Comparison of Lead Concentrations in Some Solvent-Based Paints. (continued)

SAMPLE NO.	BRAND NAME	COLOR	2023 LEAD CONTENT (ppm)	2015 LEAD CONTENT (ppm)	2013 LEAD CONTENT (ppm)	REMARKS
THA-422	LOTTO Classic Super Gloss Enamel Paint	yellow	< 200	46,000	-	Reformulated paint; no intentionally added lead compared to 2015
THA-407	Compac Gloss Enamel Paint	yellow	< 200	37,000	-	Reformulated paint; no intentionally added lead compared to 2015
THA-406	Columbia Super Gloss Enamel Paint	yellow	< 200	29,000	34,000	Reformulated paint; no intentionally added lead compared to 2015
THA-437	TEMCO Enamel Paint	yellow	< 200	27,736	-	Reformulated paint; no intentionally added lead compared to 2015
THA-429	National Gloss Synthetic Resin Enamel Paint	orange	< 200	24,284	-	Reformulated paint; no intentionally added lead compared to 2015
THA-404	BUNDAI Synthetic Gloss Finish Paint	orange	< 200	24,000	-	Reformulated paint; no intentionally added lead compared to 2015
THA-439	TURBO Super High Gloss Enamel Paint	orange	< 100	20,423	9,800	Reformulated paint; no intentionally added lead compared to 2015
THA-413	IBC High Gloss Enamel Paint	yellow	< 100	12,100	-	Reformulated paint; no intentionally added lead compared to 2015
THA-414	IEC High Gloss Enamel Paint	white	< 200	6,300	-	Reformulated paint; no intentionally added lead compared to 2015
THA-438	TEMCO Enamel Paint	white	< 200	4,860	4,100	Reformulated paint; no intentionally added lead compared to 2015
THA-420	LOBSTER Synthetic Resin Alkyd Enamel Paint	yellow	< 200	2,800	28,000	Reformulated paint; no intentionally added lead compared to 2015
THA-421	LONGLIFE High Gloss Enamel Paint	yellow	< 200	47	13,500	Remains no intentionally added lead since 2015
THA-402	BODELAC Premium High Gloss Paint	yellow	< 200	< 5	-	Remains no intentionally added lead since 2015
THA-423	Mandarin Duck Synthetic Gloss Enamel Paint	white	< 200	< 5	< 9	Remains no intentionally added lead since 2015

Legend:

orange - still contains lead in 2023
green - no added lead in 2023; now reformulated as compared to 2015
light green - no added lead since 2015

4. CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that solvent-based paints with high concentrations of lead are still available in Thailand despite the enactment of a lead paint regulation banning the manufacture and sale of lead paints in January 2017. However, the fact that 44 out of 55 paints (80 percent of paints) did not contain intentionally added lead indicates that the technology to produce paints without added lead exists in Thailand. The study results provide a strong justification to strengthen compliance monitoring and enforcement mechanisms to ensure adherence to the current Thai Industrial Standard (TIS) regulations banning the manufacture and sale of paints with total lead concentrations greater than 100 ppm. It will also be good to consider a more stringent lead limit of 90 ppm at par with legal limits in the US, Canada, Philippines, Vietnam, Laos, China, South Korea, India, Nepal, Bangladesh, Saudi Arabia, Jordan, Morocco, Cameroon, Ethiopia, Kenya, Nigeria, and Colombia.

In the interest of upholding the national ban on lead-containing paints, thereby protecting the health of children and other vulnerable populations, EARTH and IPEN propose the following recommendations:

FOR GOVERNMENT AND GOVERNMENT AGENCIES

While Thailand has Industrial Standards, "TIS 2625-2557: Safety Standard for Alkyd Enamel Paints," for paint manufactured and sold in the country (no more than 100 ppm total lead), it lacks provisions for regulating the import, export, and usage of non-compliant paints. As a result, regulatory standards on lead in paint are not effectively enforced. To address this, Thai authorities should establish comprehensive and obligatory standards for heavy metals in paint. Additionally, some paints claimed to be "lead-free" but tested positive for extremely high levels of lead. Regulatory agencies should emphasize the significance of the Consumer Protection Act, B.E. 2522, to rectify misleading claims of "lead-free" paints and minimize consumer confusion.

FOR THE PAINT INDUSTRY

For paint companies that still produce lead paints to expeditiously stop the use of leaded paint ingredients in paint formulations. Paint companies that have shifted to non-lead paint production should get their products certified through independent, third-party verification procedures to increase the customer's ability to choose paints with no added lead.

FOR INDIVIDUAL, HOUSEHOLD, AND INSTITUTIONAL CONSUMERS

Paint consumers should advocate for lead-free paints from manufacturers and retailers, while emphasizing the necessity for complete transparency regarding a paint product's lead content. To ensure safety, households and institutions should intentionally procure and utilize exclusively lead-free paints in spaces regularly frequented by children, including homes, schools, day care centers, parks, and playgrounds.

FOR ORGANIZATIONS AND PROFESSIONAL GROUPS

Organizations and professional groups, including public health entities and consumer organizations, must champion the eradication of lead paint. They should engage in informative initiatives directed at the public to shield children from lead exposure via paint, dust, soil, and other lead sources.

FOR ALL STAKEHOLDERS

All stakeholders encompassing governmental bodies, business sectors, healthcare entities, academic institutions, and civil society must proactively endorse policies and initiatives geared toward diminishing children's, women's, and workers' contact with lead from paint, as well as lead-tainted dust and soil. Their collective support will pave the way for a future free from lead exposure in Thailand and for all.

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PHOTOGRAPHY

Cover photos from EARTH
page iv: photo from EARTH
pages 1-2: photos from EARTH
page 5: photo from IPEN/Colnodo
pages 10-11: photos from EARTH

ANNEX

Table 3 Solvent-Based Paints Included in the Study.

SAMPLE NO.	BRAND	COLOR	VOLUME (L)	PRICE IN 1L (TH BAHT)	DATE OF MANUFACTURE (Y/M/D)	BATCH NO.	DATE OF PURCHASE (Y/M/D)	IS THERE WEBSITE ON LABEL?
THA-401	ADVANCE	Yellow	1	217	2021-07-08	#-513	2023-05-16	No
THA-402	BODELAC	Yellow	1	538	2023-03-06	20230228.00	2023-05-23	No
THA-403	BUNDAI	White	1	159	2002-11-02	-	2023-05-22	No
THA-404	BUNDAI	Orange	1	188	2019-04-22	19040374.00	2023-05-22	No
THA-405	BUNDAI	Yellow	1	188	2019-01-02	19010002.00	2023-05-22	No
THA-406	COLUMBIA	Yellow	1	171	2021-08-06	Lot No. 36/209	2023-05-16	No
THA-407	COMPAC	Yellow	1	164	-	202938 61???3	2023-05-19	No
THA-408	CHUGOKU	Yellow	1	177	2021-12-08	TC21Z0400 (Product no. TH2400)	2023-05-24	No
THA-409	DENZO	Yellow	1	141	2023-04-06	688501.00	2023-05-16	No
THA-410	D.I.Y.	Yellow	1	186	2019-03-06	O62/0080	2023-05-16	No
THA-411	DYNO PRO	Yellow	1	362	2022-05-24	S22052403	2023-05-23	No
THA-412	FTALIT	Yellow	1	196	2017-04-28	Lot No. 7030824	2023-05-16	No
THA-413	IBC	Yellow	1	188	2022-04-25	F65040419	2023-05-03	No
THA-414	IEC	White	1	167	-	-	2023-05-24	No
THA-415	IEC	Yellow	1	167	-	-	2023-05-24	No
THA-416	JBP	Yellow	1	312	2020-10-26	Lot No. 31/497	2023-05-19	No
THA-417	JOTUN	Yellow	1	420	2019-11-07	-	2023-05-23	No
THA-418	JUNIOR 99	White	1	143	2021-01-12	20201209.00	2023-05-16	No
THA-419	JUNIOR 99	Red	1	160	2020-10-08	20??1005	2023-05-24	No
THA-420	LOBSTER	Yellow	1	294	2022-06-25	L22062403	2023-05-16	No
THA-421	LONGLIFE	Yellow	1	174	2018-10-26	LOT 1810244260	2023-05-16	No
THA-422	LOTTO	Yellow	1	182	2021-05-29	6405228.00	2023-05-16	No
THA-423	MANDARIN DUCK	White	1	177	2022-10-05	22100301T1	2023-05-19	No
THA-424	MAY	Yellow	1	195	2017-12-06	LOT 11712100	2023-05-16	No
THA-425	MINOR	Yellow	1	149	2023-05-25	-	2023-05-24	No
THA-426	MP3	Yellow	1	188	2020-07-02	OF630337	2023-05-03	No
THA-427	NAKOYA	Yellow	1	171	xxxx-04-16	-	2023-05-22	No

Table 3 Solvent-Based Paints Included in the Study. (continued)

SAMPLE NO.	BRAND	COLOR	VOLUME (L)	PRICE IN 1L (TH BAHT)	DATE OF MANUFACTURE (Y/M/D)	BATCH NO.	DATE OF PURCHASE (Y/M/D)	IS THERE WEBSITE ON LABEL?
THA-428	NATIONAL	Yellow	1	194	2017-01-xx	P602020531	2023-05-16	No
THA-429	NATIONAL	Orange	1	182	2022-03-18	F65030404	2023-05-03	No
THA-430	N.O.C.	Yellow	1	137	2020-12-07	LP019401-S-234	2023-05-16	No
THA-431	ROCKET	Yellow	1	136	2016-07-12	160704101.00	2023-05-16	No
THA-432	RUST-OLEUM	Yellow	1	412	2021-12-02	D21D0203	2023-05-23	No
THA-433	SEFCO	Yellow	1	176	2021-07-08	F64070111	2023-05-16	No
THA-434	SHARK	Yellow	1	137	2019-12-23	191218101.00	2023-05-16	No
THA-435	SUPAR HERO	Yellow	1	171	2019-03-11	C01190311-PB1901130	2023-05-16	No
THA-436	SUPER SEF	Yellow	1	150	-	-	2023-05-16	No
THA-437	TEMCO	Yellow	1	175	2021-12-11	-	2023-05-16	No
THA-438	TEMCO	White	1	386	2023-02-01	-	2023-05-24	No
THA-439	TURBO	Orange	1	171	2022-06-16	?206320	2023-05-16	No
THA-440	V-COAT	Yellow	1	217	2019-05-29	1508.00	2023-05-16	No
THA-441	VECO	Red	1	200	2023-03-14	8392036.00	2023-05-24	No
THA-442	WINDY	Yellow	1	150	-	-	2023-05-16	No
THA-443	SEFCO Y2K	White	1	176	2016-10-xx	36690.00	2023-05-24	No
THA-444	NAKOYA	Yellow	1	254	2019-01-22	-	2023-05-22	No
THA-445	KING COBRA	Yellow	1	125	2022-03-19	22030139.00	2023-05-22	No
THA-446	LEYLAND	Yellow	1	125	-	-	2023-05-22	No
THA-447	PYLAC 1000	Yellow	1	170	2022-01-28	20220127.00	2023-05-16	Yes
THA-448	SAMURAI	Yellow	1	288	2022-06-10	0000202L10	2023-05-16	Yes
THA-449	WIN	Yellow	1	223	2022-07-11	11220018880.00	2023-05-23	No
THA-450	BEN-TONE	Red	1	171	-	220919205178.00	2023-05-23	No
THA-451	BULL	Red	1	109	-	210104200013.00	2023-05-16	Yes
THA-452	JOTUN	Red	1	305	2023-03-17	2X4REDBVA	2023-05-02	No
THA-453	MD 2IN1	Red	1	189	2023-03-11	23030901T1	2023-05-02	No
THA-454	NAKOYA	Red	1	86	2023-03-13	-	2023-05-16	No
THA-455	RUST-OLEUM	Red	1	385	2023-02-15	D2321404	2023-05-16	No

Table 4 Results of Laboratory Analysis of Solvent-Based Paints.

SAMPLE NO.	BRAND	COLOR	LEAD CONTENT, DRY WEIGHT (PPM)	COUNTRY OF BRAND HEADQUARTERS	COUNTRY OF MANUFACTURE	IS THERE INFORMATION ON CAN ABOUT LEAD CONTENT OF PAINT?
THA-401	ADVANCE	Yellow	< 200	Thailand	Thailand	No
THA-402	BODELAC	Yellow	< 200	Thailand	Thailand	No
THA-403	BUNDAI	White	1,800	Thailand	Thailand	No
THA-404	BUNDAI	Orange	< 200	Thailand	Thailand	Yes. "No added lead"
THA-405	BUNDAI	Yellow	< 200	Thailand	Thailand	No
THA-406	COLUMBIA	Yellow	< 200	Thailand	Thailand	No
THA-407	COMPAC	Yellow	< 200	Thailand	Thailand	Yes. "No added lead"
THA-408	CHUGOKU	Yellow	< 200	Thailand	Thailand	No
THA-409	DENZO	Yellow	< 200	Thailand	Thailand	Yes. "No added lead"
THA-410	D.I.Y.	Yellow	< 200	Thailand	Thailand	No
THA-411	DYNO PRO	Yellow	< 200	Thailand	Thailand	No
THA-412	FTALIT	Yellow	< 200	Japan	Thailand	Yes. "No added lead"
THA-413	IBC	Yellow	< 100	Thailand	Thailand	No
THA-414	IEC	White	< 200	Thailand	Thailand	Yes. "No added lead"
THA-415	IEC	Yellow	25,000	Thailand	Thailand	Yes. "No added lead"
THA-416	JBP	Yellow	< 100	Thailand	Thailand	Yes. "No added lead"
THA-417	JOTUN	Yellow	< 200	Norway	Thailand	No
THA-418	JUNIOR 99	White	< 200	Japan	Thailand	No
THA-419	JUNIOR 99	Red	< 200	Japan	Thailand	No
THA-420	LOBSTER	Yellow	< 200	Thailand	Thailand	Yes. "No added lead"
THA-421	LONGLIFE	Yellow	< 200	Thailand	Thailand	Yes. "No added lead"
THA-422	LOTTO	Yellow	< 200	Thailand	Thailand	Yes. "No added lead"
THA-423	MANDARIN DUCK	White	< 200	Thailand	Thailand	Yes. "No added lead"
THA-424	MAY	Yellow	< 200	Thailand	Thailand	No
THA-425	MINOR	Yellow	30,000	Thailand	Thailand	Yes. "Lead-free"
THA-426	MP3	Yellow	< 100	Thailand	Thailand	No
THA-427	NAKOYA	Yellow	1,700	Thailand	Thailand	No
THA-428	NATIONAL	Yellow	17,000	Thailand	Thailand	No

Table 4 Results of Laboratory Analysis of Solvent-Based Paints. (continued)

SAMPLE NO.	BRAND	COLOR	LEAD CONTENT, DRY WEIGHT (PPM)	COUNTRY OF BRAND HEADQUARTERS	COUNTRY OF MANUFACTURE	IS THERE INFORMATION ON CAN ABOUT LEAD CONTENT OF PAINT?
THA-429	NATIONAL	Orange	< 200	Thailand	Thailand	No
THA-430	N.O.C.	Yellow	< 200	Thailand	Thailand	Yes. “No added lead”
THA-431	ROCKET	Yellow	< 200	-	Thailand	Yes. “No added lead”
THA-432	RUST-OLEUM	Yellow	< 200	Thailand	Thailand	No
THA-433	SEFCO	Yellow	< 200	Thailand	Thailand	No
THA-434	SHARK	Yellow	< 200	Thailand	Thailand	Yes. “No added lead”
THA-435	SUPAR HERO	Yellow	< 200	Thailand	Thailand	Yes. “No added lead”
THA-436	SUPER SEF	Yellow	64,000	Thailand	Thailand	No
THA-437	TEMCO	Yellow	< 200	Thailand	Thailand	Yes. “No added lead”
THA-438	TEMCO	White	< 200	Thailand	Thailand	Yes. “No added lead”
THA-439	TURBO	Orange	< 100	Thailand	Thailand	Yes. “No added lead”
THA-440	V-COAT	Yellow	< 200	Thailand	Thailand	No
THA-441	VECO	Red	< 200	Thailand	Thailand	No
THA-442	WINDY	Yellow	< 100	Thailand	Thailand	No
THA-443	SEFCO Y2K	White	1,800	Thailand	Thailand	No
THA-444	NAKOYA	Yellow	26,000	Thailand	Thailand	No
THA-445	KING COBRA	Yellow	3,500	Thailand	Thailand	No
THA-446	LEYLAND	Yellow	41,000	Thailand	Thailand	Yes. “Free of lead hazard”
THA-447	PYLAC 1000	Yellow	42,000	Japan	Thailand	No
THA-448	SAMURAI	Yellow	< 90	Malaysia	Malaysia	No
THA-449	WIN	Yellow	< 90	Thailand	Thailand	No
THA-450	BEN-TONE	Red	< 200	Thailand	Thailand	Yes. “No added lead”
THA-451	BULL	Red	< 200	Thailand	Thailand	No
THA-452	JOTUN	Red	< 100	Norway	Thailand	No
THA-453	MD 2IN1	Red	< 200	Thailand	Thailand	Yes. “No added lead”
THA-454	NAKOYA	Red	< 80	Thailand	Thailand	No
THA-455	RUST-OLEUM	Red	< 100	USA	USA	No

Table 5 Distribution of Lead Concentration by Brand.

BRAND	NO. OF SAMPLES	NO. OF SAMPLES ABOVE 100 ppm	NO. OF SAMPLES ABOVE 10,000 ppm	MINIMUM LEAD CONTENT (ppm)	MAXIMUM LEAD CONTENT (ppm)
ADVANCE	1	none	none	< 200	< 200
BEN-TONE	1	none	none	< 200	< 200
BODELAC	1	none	none	< 200	< 200
BULL	1	none	none	< 200	< 200
BUNDAI	3	1	none	< 200	1,800
CHUGOKU	1	none	none	< 200	< 200
COLUMBIA	1	none	none	< 200	< 200
COMPAC	1	none	none	< 200	< 200
D.I.Y.	1	none	none	< 200	< 200
DENZO	1	none	none	< 200	< 200
DYNO PRO	1	none	none	< 200	< 200
FTALIT	1	none	none	< 200	< 200
IBC	1	none	none	< 100	< 100
IEC	2	1	1	< 200	25,000
JBP	1	none	none	< 100	< 100
JOTUN	2	none	none	< 100	< 200
JUNIOR 99	2	none	none	< 200	< 200
KING COBRA	1	1	none	3,500	3,500
LEYLAND	1	1	1	41,000	41,000
LOBSTER	1	none	none	< 200	< 200
LONGLIFE	1	none	none	< 200	< 200
LOTTO	1	none	none	< 200	< 200
MANDARIN DUCK	1	none	none	< 200	< 200
MAY	1	none	none	< 200	< 200
MD 2IN1	1	none	none	< 200	< 200
MINOR	1	1	1	30,000	30,000
MP3	1	none	none	< 100	< 100
N.O.C.	1	none	none	< 200	< 200
NAKOYA	3	2	1	< 80	26,000
NATIONAL	2	1	1	< 200	17,000
PYLAC 1000	1	1	1	42,000	42,000
ROCKET	1	none	none	< 200	< 200
RUST-OLEUM	2	none	none	< 100	< 200
SAMURAI	1	none	none	< 90	< 90

Table 5 Distribution of Lead Concentration by Brand. (continued)

BRAND	NO. OF SAMPLES	NO. OF SAMPLES ABOVE 100 ppm	NO. OF SAMPLES ABOVE 10,000 ppm	MINIMUM LEAD CONTENT (ppm)	MAXIMUM LEAD CONTENT (ppm)
SEFCO	1	none	none	< 200	< 200
SEFCO Y2K	1	1	none	1,800	1,800
SHARK	1	none	none	< 200	< 200
SUPAR HERO	1	none	none	< 200	< 200
SUPER SEF	1	1	1	64,000	64,000
TEMCO	2	none	none	< 200	< 200
TURBO	1	none	none	< 100	< 100
V-COAT	1	none	none	< 200	< 200
VECO	1	none	none	< 200	< 200
WIN	1	none	none	< 90	< 90
WINDY	1	none	none	< 100	< 100

Table 6 Distribution of Lead Concentration by Color.

COLOR	NO. OF SAMPLES	NO. OF SAMPLES ABOVE 100 ppm	NO. OF SAMPLES ABOVE 10,000 ppm	MINIMUM LEAD CONTENT (ppm)	MAXIMUM LEAD CONTENT (ppm)
Yellow	38	9	7	< 90	64,000
Red	8	none	none	< 80	< 200
White	6	2	none	< 200	1,800
Orange	3	none	none	< 100	< 200

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