



EcoLogo™ Program Standard Development: Discussion Document Pool and Spa Chemical Products



August, 2009

The EcoLogo™ Program is inviting stakeholders to participate in the development of a new environmental leadership standard for *Pool and Spa Chemical Products*. The scope of this standard has been established to encompass chemical products used to maintain conventional above and below ground residential pools and residential spas. More specifically, the scope is limited to chemically treated swimming pools and spas, and their associated maintenance chemical products which are added directly to pool and spa water.

The intent of this discussion document is to pose stakeholders a series of questions pertaining to the scope and direction of the *Pool and Spa Chemical Products* standard currently under development. The EcoLogo Program is seeking both your expertise and feedback on this matter, and greatly appreciates the time you take to respond to these questions and identify potential areas of environmental leadership.

This first stakeholder consultation period is intended to serve as an open discussion regarding the scope and potential criteria statements, and will be open for 45 days beginning August 13, 2009. Comments must be received by September 28, 2009. For your convenience, the EcoLogo Program will accept comments by e-mail, fax, phone, and our internet-based forum.

How do stakeholders register for the discussion forum?

1. Send a request to forums@ecologo.org. State your full name, indicate your affiliation, and specify that you wish to participate in the pool and spa chemical products usergroup.
2. Visit <http://ecologo.forumactif.net> and register an account; for the username please use first initial and full last name.

By registering on the forum, stakeholders can post contributions in several pre-determined topic areas, or they can propose new topics for discussion.

Your time and input is very much appreciated; stakeholder comments are essential to the development of the most stringent environmental standards. We will send you a reminder as our closing date for comments approaches.

Sincerely,
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1 Introduction

The EcoLogo Program conducted preliminary research to identify potential environmental impacts across the life cycle of the **Pool and Spa Chemical Products** category and has prepared this discussion document for public consultation. Stakeholder contributions play a pivotal role in the EcoLogo standard development process. As such, EcoLogo welcomes and actively encourages the participation of a wide variety of stakeholders familiar with this product category. This includes environmental NGOs and other not-for-profit organizations, academics and other scientific experts, manufacturers, industry associations, government representatives, and purchasing professionals.

This document is designed to provide broad information regarding the market for pool and spa chemical products in Canada and the United States, and to present details on how the EcoLogo Program intends to establish certification criteria for these chemical products. The goal of the EcoLogo Program is to establish standards that will promote environmental leadership in the marketplace.

More importantly, the purpose of this discussion document is to initiate discussion with stakeholders so as to refine both the potential scope and criteria statements that will ultimately define the standard. To help initiate and guide the discussion, this document presents stakeholders with an initial scope and potential criteria statements, in addition to posing stakeholders a series of questions to garner information on the product category.

At various points throughout the discussion document the term 'environmental leadership' is made reference to. Environmental leadership is defined as approximately the top 20 percent of products available in the market at the time of a standard's development or revision, which have the lowest environmental impacts across all stages of the life cycle. EcoLogo considers all products which meet its standards to represent environmental leadership. Furthermore, it is the intent of the EcoLogo Program that product performance requirements be established in all standards so that EcoLogo certified products perform as well as the average product available in the market.

The information presented in this discussion document was gathered from internal research found on various government, manufacturer, and other institutional web sites, in addition to input and literature provided directly by current EcoLogo licensees and/or stakeholders.

2 Scope and Category Definitions

At first glance, the product category for *Pool and Spa Chemical Products* is vast. The scope of this standard has been established to encompass the chemical products used to maintain above and below ground conventional residential pool and residential spas. More specifically, the scope is limited to chemically treated swimming pools and spas, and their associated maintenance chemical products which are added directly to pool and spa water.

Subcategories for this standard represent the chemical products used to maintain a chemically treated residential pool and residential spa. The EcoLogo Program suggests that these be limited to products which are added directly to swimming pool water. The subcategories preliminarily identified include: water sanitizers, algacides, balancers, clarifying agents, metal sequestering agents, phosphate removers and water conditioners. EcoLogo currently has another active criteria document that speaks to hard surface cleaners and intends to propose its use for around-the-pool maintenance chemical products.

Rationale: It is the intention of the EcoLogo Program to restrict the standard's scope to the above categories for several reasons. Limiting the scope to residential pools and spas was decided in light of the fact that there is an increasing prevalence of these types of recreational facilities across North America. There are approximately 7.6 million backyard pools in the United States and 650 000 in Canada. Despite an increasing awareness of alternative residential pool and spa disinfection mechanisms (such as electric oxidation, salt chlorination, ozone, mineral sanitation systems, etc.), the EcoLogo Program is restricting the scope of this standard to chemically treated pools and spas because they continue to be the most prevalent type used. The alternative systems often involve the installation of a new technological unit; as such, we classified them as pool and spa technologies as opposed to chemical products. Although the proposed scope does not address technologies, should their use continue to increase, EcoLogo will consider their inclusion during the standard's first review period (~3 years post initial standard development).

Q1) Do you believe that the scope and associated subcategories are reasonable? Why?

3 Background

3.1 Activities of Other Eco-Labels

To our knowledge no standard or eco-label exists for this product category.

4 Environmental Considerations and Proposed Criteria Statements

The intention of the following section is to solicit insight and research from stakeholders for the purpose of generating criteria statements specific to pool and spa chemical products which reflect environmental leadership. Eventually, these criteria statements will appear in the *Product Specific Requirements* section of the standard. The paragraphs that follow present stakeholders with the findings from preliminary research. It is a brief synthesis of readily available information.

4.1 Preliminary Research

4.1.1. Category 1 – Water Sanitizers

When dealing with swimming pool water sanitizers it would appear that “chlorine” type products dominate the market and “bromine” type dominate for spas. Chlorine has been the choice sanitization product for “*nine out of ten residential pools in the U.S.*”ⁱ. Reasons for such wide use include, but are not limited to, its effective ability to disinfect, comparatively inexpensive cost to manufacture and purchase, and the ease with which chlorine levels can be adjusted and monitored. To date, our preliminary research reveals that there are primarily two types of chlorinating agents:

- “Inorganic chlorinating agents such as calcium hypochlorite, lithium hypochlorite, and sodium hypochlorite; and
- Organic chlorinating agents such as trichloroisocyanuric acid, potassium dichloroisocyanurate, and sodium dichloroisocyanurate.”ⁱⁱ

The active ingredients of the chlorine products that appeared in the literature as most commonly used for residential pool sanitization include:

- Calcium hypochlorite (tablet or granule form);
- Lithium hypochlorite (granule form);
- Sodium dichloroisocyanurate (granule form); and
- Trichloroisocyanuric acid (granule form).ⁱⁱⁱ

Both environmental and health impacts exist for these chemicals. The labels of these products carry both poison and corrosive symbols. Oxidizing and corrosive materials can cause damage to human skin, eyes, respiratory and digestive tracts, and can also cause damage to metals. The chlorine products are flammable and toxic if ingested. Moreover, should the chlorine products spill, their fate in the natural environment could be imminently detrimental to surrounding organisms.^{iv}

Seemingly, the efficacy and dosing quantities vary for each of the chemicals products listed above. It would appear that there are tradeoffs depending on the product chosen. For instance, in outdoor pools it is recommended to use calcium hypochlorite in conjunction with

a cyanuric acid stabilizer to decrease the degradation of chlorine by U.V. radiation. However, calcium can cause scale build up and, therefore, anti-scaling additives are often added to these products.^v Additional health and environmental impacts need to be considered for each of these additives. Conversely, chlorinated isocyanurates are stable, but require free chlorine levels in a pool to be maintained between 2 and 5 ppm (mg/L) as opposed to 1 to 2 ppm (mg/L) for calcium hypochlorite. As a result, more of the product is needed.^{vi}

With respect to spas, bromine-based products have been marketed as the preferred sanitizing agent. Typically it is in the form organic chemical bromo-chloro-dimethylhydantoin (BCDMH) and sold in tablet form. When added to water, BCDMH “is hydrolyzed and forms hypochlorous acid. [...] The hypochlorite ion reacts with bromides to form hypobromous acid”, which is the active sanitizing agent^{vii}. In addition to sanitation, this product oxidizes organic material. BCDMH is less dependent on pH than chlorine, and is “less affected by high temperature and nitrogen wastes” making it a viable option for spas.^{viii}

In terms of environmental and health implications, bromine is a very reactive element; it is potentially corrosive. When spa bromine concentrations reach ~0.5 mg/L side effects can potentially include eye and mucous membrane irritation and the emission of odors. Similar to chlorine, when bromine is released into the natural environment, it has deleterious properties. Furthermore, bromine disinfection by-products have been known to negatively impact human health.^{ix}

In light of the preliminary research results, the EcoLogo Program has questioned whether there is potential for environmental leadership within this suggested category.

Q2a) Do you believe the EcoLogo Program should establish a subcategory for pool and spa sanitizers?

- **2b) If yes, which water sanitizing product and which spa water sanitizing product represents environmental leadership** (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?
 - **2c) Can you provide life-cycle-based information for these products that speak to its environmental leadership merit (resource extraction phase, manufacturing phase, use phase, disposal phase)?**

4.1.2. Category 2 – Algaecides

Algaecides are regulated by both the U.S. Department of Agriculture and by the Pest Management Regulatory Agency of Health Canada – Pest Control Products Act – as a pesticide due to its ability to control for algae growth. Preliminary research has found that algaecides most often used for pool and spa maintenance include:

- Copper Sulfate (liquid copper);

- Colloidal (suspended) Silver;
- Quaternary Ammonium Compounds (QUATs); and
- Polyquats.^x

There are benefits and drawbacks for each of these types of algaecides. While copper is effective at killing algae it tends to cause staining. In response, some copper-based products contain chelating agents to counteract this effect. Furthermore, copper sulfates are highly caustic and, therefore, classified by the EPA as being class 1 – highly toxic – and require the signal words “Danger” and “Poison”^{xi}. The significant environmental impacts of this compound caused the European Union to entertain banning all copper-based algaecides because of the “effects of its use on the aquatic environment, impact on aquatic organisms, and soil accumulation”. The concerns over using a colloidal silver parallel those for copper sulfate.

Similarly, quaternary ammonium compounds (QUATs) have environmental, health and pool specific impacts. In addition to the questionable biodegradability of these compounds and their potential to irritate skin and worsen asthma, QUATs can cause foaming in pools. With respect to algaecide formulation, linear QUAT composition and % concentrate appears to vary depending on the manufacturer. For instance where most QUATs are available with active concentrations of 5-10%, one QUAT product reviewed was labeled as 60% concentrate: 30% dimethyl benzyl ammonium chloride, 30% dimethyl ethylbenzyl ammonium chloride, and 40% inert ingredients^{xii}. This is relatively misleading as the product contains two linear QUATs at 30% each. Also, it would appear that QUATs are marketed as a broad spectrum algaecide. If EcoLogo were to suggest that QUATs displayed environmental leadership, theoretically, these products would be selected for use over other algaecides. In suggesting the use of a broad spectrum product, more of that product may have to be used to kill algae as opposed to the smaller amount required if a narrow spectrum algaecide were used. According to Franz Daschner in the article *Disinfection and the Prevention of Infectious Disease: No Adverse Effect?*,

“Quats are unsafe for the environment both during manufacture and when they are discharged into the waste stream. They are not readily biodegradable. Swisher²² reported dialkyldimethyl quaternary compound levels ranging from 0.04 to 0.08ppm for the Ohio River and 0.01to0.04ppm in other United States rivers. The manufacturing process of quats and phenolics releases carcinogens such as benzene and other volatile organic chemicals”.^{xiii}

Our preliminary review on polyquats, suggest that they are the “leading products” to use. *Buckman Laboratories*, the only manufacturer of the product in the United States, has a formulation of 60% poly [oxyethylene (dimethyliminio) ethylene (dimethyliminio) ethylene dichloride] with 40% inert ingredients.^{xiv} Both health and environmental impacts similar to those of QUATs exist for polyquats.

Please rank the following products from 1-4

4 being the product that represents the greatest environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle) and 1 being the least environmentally preferable product for that category.

TABLE 1. Ranking of Greatest Environmental Leadership (1 least; 4 greatest)

Criteria Statement Considerations	Product 1 Copper salts	Product 2 Colloidal silver	Product 3 QUATs	Product 4 Polyquats
Health hazards				
Biodegradability				
Bioaccumulation potential				
Eco-toxicity				
Cytotoxicity				
Skin sensitization potential				
VOC content				
Effectiveness against the relevant target organism				
Water consumption requirements for manufacturing of the product				

Q3) Should any of the products mentioned above be restricted in the standard? Do you know of any "better alternatives" to the products listed?

For the product you believe represents environmental leadership, please attempt to fill in all or any of the categories of the table below. If a subcategory is created for algaecides EcoLogo will need to know how a product differentiates itself from the rest and create criteria statements accordingly (we are looking for values that represent environmental leadership) (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle).

Criteria Statement Considerations	Top Product	Response
Active ingredient(s)	Please list the active ingredient and the suggested % concentrate:	
Suggested prohibited ingredient(s)	Please list any ingredients you believe should be prohibited in the formulation:	
Health hazards	What are the main health hazards associated with this product:	
Biodegradability	Is the product readily biodegradable? Inherently biodegradable?	
Bioaccumulation potential	What is the bioaccumulation potential?	
Cytotoxicity	Suggested value:	
Eco-toxicity	Suggested value:	
Skin sensitization potential	Suggested criteria statement: Demonstrate low potential for skin irritancy through an appropriate test of either the whole formulation or active ingredients. An acceptable standard would be an irritation index score of <12.0, as determined from the HET-CAM test. Do you agree with this statement?	
VOC content	What % VOC content should the product have?	
Water consumption requirements for manufacturing of the product	On average what is the required quantity of water needed to manufacture this product?	
Suggested performance test (if exists)	Are there performance tests for this product?	

Q4a) Should EcoLogo make a subcategory for these algaecides?

- **4b) If yes, are the products used as pool algaecides the same as those used for spa maintenance. If not, can you suggest a spa algaecide that displays environmental leadership** (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

4.1.3. Category 3 – Water Balancers : pH Increasers

With respect to pH increasers, preliminary research has revealed that a significant portion of the products currently available to consumers are anhydrous sodium carbonate (also known as soda crystals or soda ash) products. Sodium is the fourth most-abundant element on earth, comprising about 2.6% of the earth's crust; it makes up many salt compounds with nonmetal materials. Soda ash (Na_2CO_3) – the commercial grade of sodium carbonate – is among the salt compounds with industrial importance.^{xv} Understandably, pH increasers are important for proper water management; in their absence:

- Water can become acidic;
- Chlorine residuals may dissipate rapidly;
- Eye irritation can occur;
- Metal fittings, pump impeller, heater core may corrode;
- Dissolved metals may leave stains on walls; and
- Rapid Loss of alkalinity may occur.^{xvi}

We are currently unsure of the exact percentage soda ash products hold in the market place. Preliminary research has yet to reveal products with a pH increasing function that have an alternative active ingredient and are for use in a residential pool. This raises concern with respect to potential environmental leadership in this subcategory.

Q5a) Is it the case that more than 80% of pH increasing products are manufactured with a sodium carbonate formulation, therefore, not allowing for environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

- **5b) If this is not the case can you please state which alternative product does display greater environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?**
 - **5c) What % of the market do these products hold?**
 - **5d) Can you explain why this product has lower environmental and health impacts?**

Q6) Are the products used as pool pH increasers the same as those used for spa maintenance. If no, can you suggest a spa pH increaser that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

4.1.4. Category 4 – Water Balancers: pH Decreasers.

When searching for a pH deceiver, a product with a high acidimetry appears to be most desirable; with a high acidimetry a smaller quantity of the product is needed to achieve the desired result. The two most common acids used to mitigate pH fluctuations are muriatic acid and sodium bisulfate. Muriatic Acid is sold as full strength (~31% hydrochloric acid) and half strength (~15% hydrochloric acid). Half strength is said to fume less and, therefore, be less of an irritant compared to the full strength. Sodium bisulfate is sold as a dry acid with a ~93% sodium bisulfate formulation (additional ingredients are typically sodium sulfate salts).^{xvii}

In terms of usability, a case can be made for each of these products. Muriatic acid adds to chlorites whereas sodium bisulfate introduces sulfates to the water. Conversely, muriatic acid tends to release potent fumes during the use phase of its life cycle. Information obtained from MSDSs lists the health impacts associated with coming into contact with the concentrated form of these products as: damaging effects on the mucous membranes and upper respiratory tract, severe burns of the mouth, throat, and stomach if swallowed, pain, and tearing and redness if gotten in the eye. Close to no information was found on the environmental impacts of the product throughout its life cycle (resource extraction phase, manufacturing phase, product use phase, and disposal phase). One concern was found amongst the chemical specifications of a sodium bisulfate monohydrate reagent crystals product. The product itself was said to have an allowable phosphate quantity of 20ppm.^{xviii} Phosphates are a food source for algae; limiting the amount of phosphates in pool water can in turn decrease the need to use additional chemical products such as algaecides and phosphate removers. A reduction in chemical use reduces environmental impacts.

Our preliminary research has indicated that citric acid may be a plausible alternative to both sodium bisulfate and muriatic acid. It would appear that its pH decreasing ability per litre is superior to products currently on the market. Furthermore, citric acid is:

- Listed on the Generally Recognized As Safe (GRAS) list;
- Compatible with pool structural materials; and
- Biodegradable.

Q7a) Do you believe that citric acid is a feasible alternative to sodium bisulfate and muriatic acid? Why?

- **7b) If yes, is it reasonable for EcoLogo to make a criteria statement that requires pH deceasers to have a certain amount of bio-based content?**
- **7c) If not, is there an alternative pH decreasing product that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?**
 - **7d) Can you list the environmental and health impacts associated with this product?**

Q8) Are the products used as pool pH decreaseers the same as those used for spa maintenance. If no, can you suggest a spa pH decreaseer that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

4.1.5. Category 5 – Clarifying/Flocculent Agents

Preliminary research suggests there are two kinds of clarifying agents: polymer-based and alum-based. The polymer-types are either “cationic polymer blends” or “anionic polymer blends”; as such, they bind to charged particles, which cause them to amass into conglomerates large enough to get picked up by the filter. In terms of products, polyquats – the same used in algaecides – are also sold as clarifiers. Their formulation typically consists of Poly{oxyethylene (dimethyliminio)Ethylene (dimenthyliminio)ethylene dichloride)ethylene dichloride}. With respect to raw materials, synthetic polymers are petroleum-based.

Aluminium sulphate was identified as a common flocculent and can be produced by dissolving aluminum hydroxide in sulfuric acid^{xx}. Under neutral or slightly-alkaline aqueous conditions this compound reacts with solid particles to form an aluminum hydroxide precipitate.^{xx}

Alternatives to polyquats and aluminum sulfates are aluminum chlorohydrates and poly aluminum chlorides. The ingredients for these type of products, found via MSDSs, included, but are not limited to, aluminum chlorohydrate concentration 30-60% and polynuclear inorganic salts (formula $Al_2(OH)_xCl_{6-x}$, $0 < x < 6$).^{xxi} This type of coagulant has been used in water treatment for the better part of 30 years. Its manufacturing process typically involves the partial hydrolysis of acid aluminum chloride. With this fluid method technique there are issues around high energy costs, high impurity, and high energy costs. With that being said, it would appear that this is the favored clarifying product. The aluminum in these products is highly charged; as a result, the dosing requirements are less. This potentially translates into a more cost effective alternative to other coagulants because less is required to do more.^{xxii}

We are also aware that chitosan-based products are an alternative to the above products. Information is readily available on the coagulating property of chitosan. It is made from chitin – a linear chain of acetylglucosamine groups – which is a non-toxic biodegradable polymer. Chitosan is created via deacetylation which gives rise to chitosan’s cationic characteristic.^{xxiii} Upon reviewing publically available MSDSs, chitosan acetate clarifying agents appear to have % (w/w) concentrations of ~1.5 to 2%. These products are made of readily available, renewable, bio-based material.^{xxiv}

Q9) Are the functions of clarifying and flocculent agents sufficiently similar that they can be lumped together in one subcategory?

Q10a) Of the products listed, is there a product that displays greater environmental leadership than the others (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

- 10b) Is there a product not listed that represents greater environmental leadership?
- 10c) For the product you have chosen, could you list environmental impacts associated with it for the different phases of its life-cycle?

Q11: Are the products used as pool clarifying/ flocculent agents the same as those used for spa maintenance? If not, can you suggest a spa clarifying/ flocculent agent that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

4.1.6. Category 6 – Metal Sequestering Agents

Preliminary research suggests the majority of metal sequestering agents available for pool maintenance are either 1-Hydroxyethylidene-1, 1-Diphosphonic Acid (HEDP) or Ethylenediaminetetraacetic (EDTA). The environmental and health impacts for each differ.

HEDP is an organophosphoric acid; it forms strong complexes with transition metals and with calcium and magnesium. It is made from reacting anhydrous phosphorous acid with acetic anhydride. In addition to its function as a chelating agent, it is a marketed scale and corrosion inhibitor. Interestingly, “its acid/alkali and chlorine oxidation tolerance are better than that of other organophosphoric acids (salt)”.^{xxv} Inherent biodegradation tests indicate a low degree of biodegradation under the standard test conditions. Although this particular type of metal sequestering agent is slow to break down, when it does, it releases phosphate, a food source for algae

The second product is formulated with Ethylenediaminetetraacetic acid (EDTA). These chelating agents are anionic; they form “tertanegative anion, and [are] strongly attracted to alkaline earth and transition metal ions”.^{xxvi} According to Holleman (2001), EDTA “forms especially strong complexes with Mn(II), Cu(II), Fe(III), Pb (II) and Co(III)”.^{xxvii} Moreover, it can dissolve metal oxide stain deposits and carbonate scale.

EDTA use is prominent enough that it has been listed as a persistent organic pollutant. Preliminary research suggests that EDTA and associated salts are, “cytotoxic and weakly genotoxic, but not carcinogenic”.^{xxviii} With that being said, research also revealed that they can contain heavy metals, such as Pb.^{xxix} Also, the Dow Chemical Company reported that “mixtures comprised mainly of potassium EDTA can contain ‘very small amounts’ of nitrilotriacetate”.^{xxx} This product is listed on the National Toxicology Program as a potential

carcinogen. Strong oxidizing agents such as chlorine can attack EDTA. Comparatively, EDTA breaks much more quickly than HEDP.

Similar to the clarifying/ flocculent agent subcategory, chitosan-based products could also potentially be used as a metal sequestering agent.

Q12a) Are chitosan-based products as effective as EDTA and HEDP?

- 12b) Which one of the three products listed represents environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)? If you do not believe any are representative of environmental leadership, can you please suggest an alternative product?
 - 12c) Can you list the environmental and health impacts associated with this product?
 - 12d) Would it be appropriate to create a criteria statement for this category that requires a minimum % of bio-based materials?

Q13) Are the products used as pool metal sequestering agents the same as those used for spa maintenance? If not, can you suggest a spa metal sequestering agent that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

4.1.7. Category 7 – Phosphate Removers

The function of a phosphate remover is to precipitate phosphates out of pool water. Preliminary research suggests that phosphate removers are an unnecessary chemical product for pool maintenance, as was the case for algaecides. If the free chlorine and cyanuric acid levels are balanced, phosphates should not be a problem because algae growth will have been inhibited by the sanitizing agent. Moreover, phosphate removers, such as lanthanum chloride correct only for inorganic phosphate (orthophosphate) as opposed to inorganic **and** organic, which can both be a food source for algae.

The phosphate removers currently on the market tend to be lanthanum chlorides or lanthanum carbonates. The content of several reviewed products include, but are not limited to: lanthanum salt derivative, 64%; lanthanum sulfate, 3-10%; lanthanum chloride, 5-12%; sodium chloride, 2-5%; lanthanum chloride heptahydrate, unknown %.^{xxxi}

There are other chemicals such as aluminum salts, aluminum sulfates, ammonium aluminum sulfate and iron oxides also marketed as phosphate removers. However, products such as iron oxide introduce metals to the pool which can create a new problem that requires additional chemical products for treatment. Despite the use of these products, it would

appear lanthanum chloride formulations are the preferred phosphate removers in the market place.

Interestingly, the mechanism by which phosphate removers perform their function can result in unfavorable environmental impacts. They amass phosphates into a suspended solid large enough to be caught by the filter. When backwashing, the phosphates and associated phosphate remover readily finds itself in the natural environment. The MSDS of several phosphate remover products state to “not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters”.^{xxxii}

Q14a) Should EcoLogo create a subcategory for phosphate removers in light of the fact that they may not be essential for proper maintenance?

- **14b) If yes, is there one product of those listed above (or can you suggest an alternative product) that represents environmental leadership** (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?
 - **14c) Can you list the environmental and health impacts associated with this product?**

Q15) If a subcategory for phosphate removers is created, should there be a criteria statement that calls for a minimum % of bio-based materials?

Q16) Are the products used as pool phosphate removers the same as those used for spa maintenance? If not, can you suggest a spa phosphate remover that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

4.1.8. Category 8 – Water Conditioners

This final category is meant to address pool and spa products whose function is to reduce the amount of chemical products required to maintain an optimal pool and/or spa water chemistry. Preliminary research has revealed there are products available on the market that use bio-based materials to accomplish this function. To date, research has pointed to plant-based materials and enzyme-based formulations.

These products break down/consume the organic matter present in pools and prevent the formation of biofilms.^{xxxiii} The Centre for Biofilm Engineering at Montana State University has preformed research which shows that chlorine and other sanitizing agents are effective against planktonic bacteria, but relatively inefficient against biofilm or the bacteria it encompasses.^{xxxiv} For pools and spas that have a high use frequency and organic

contamination, these products can assist in reducing pool and spa chemical product demand by assisting in the decomposition of “oils, fats, detergents, dirt, pollen, and all other sorts of organic material”.^{xxxv} The presence of these contaminants deactivates the free chlorine/bromine available in pools/spas to kill bacteria. With these products, the chlorine/bromine added is more targeted and effective and, therefore, less is needed.^{xxxvi}

There are also companies that have marketed sodium tetraborate pentahydrate products as a pool additive. The product itself is sold under names such as Proteam's Supreme, Bioguard's Optimizer Plus, Poollife Endure, Guardex Maximizer, etc.^{xxxvii} These products are borates, which have more negative environmental impacts than the enzymes and plant-based conditioners. For example, the MSDS for one of these products states, “Borax can be harmful to plants and other species. Releases to the environment should be minimized”; granted, this ecological consideration is for large spills.^{xxxviii} Comparatively, preliminary research suggests that borates may not display as much environmental leadership as similar products.

Q17) Is ‘water conditioners’ the appropriate subcategory name for these products?

Q18a) Should EcoLogo create a subcategory for water conditioners?

- **18b) If yes, is there one product of those listed above (or can you suggest an alternative product) that represents environmental leadership** (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?
 - **18c) Can you list the environmental and health impacts associated with this product (resource extraction phase, manufacturing phase, use phase, disposal phase)?**

Q19) If a subcategory for water conditioners is created, should there be a criteria statement that calls for a minimum % of bio-based materials?

4.2 Prohibited and Restricted Substances

At present, the eight potential subcategories for the EcoLogo Pool and Spa Chemical Products standard are:

- Water sanitizers
- Algaecides
- Water balancers – pH increasers
- Water balancers – pH decreasers
- Clarifying/flocculent agents
- Metal sequestering agents
- Phosphate removers
- Water conditioners

Q20a) Do you believe the EcoLogo Program should prohibit and/or restrict any substances from the formulation of any/all the subcategory products?

Examples of substances to prohibit or restrict are, but are not limited to:

- Solvents;
- Specific elements or chemical compounds;
- VOCs;
- Carcinogens (IARC; Group 1, Group 2A, Group 2B, Group 3, and Group 4); and
- Substances designated as asthma causing agents by the Association of Occupational and Environmental Clinics (AOEC).

20b) If yes, can you list what the prohibited and/or restricted substances for each are, and suggest maximum limit amounts for the restricted substances?

4.3 Health Hazards

At present, the eight potential subcategories for the EcoLogo Pool and Spa Chemical Products standard are:

- Water sanitizers
- Algaecides
- Water balancers – pH increasers
- Water balancers – pH decreaseers
- Clarifying/flocculent agents
- Metal sequestering agents
- Phosphate removers
- Water conditioners

EcoLogo proposes to include criteria for health hazards in the *Product Specific Requirements*. The following statements are representative of what a criteria statement could potentially be:

- (a) *Not be toxic to humans in its concentrated form.*
- a. Toxicity would be measured according limits set for oral lethal dose ($LD_{50} > X$), inhalation lethal concentration ($LC_{50} > X$), dermal lethal dose ($LD_{50} > X$); pursuant to OECD Guidelines for Testing of Chemicals TG 401, TG 403, and TG 402.

Note: We currently are unaware of what the X value should be if we adopt this criteria statement and, therefore, welcome suggestions that cater to products that display environmental leadership.

- (b) *Not be corrosive or irritating to the skin or cause eye damage in its concentrated form.*
- a. Skin and eye irritation would be tested pursuant to OECD Guidelines for Testing of Chemicals Section 404 and as tested by Local Lymph Node assay (LLNA) or OECD Guideline 429, OPPTS 870.2600.
- (c) *Not contain products that cause chronic inhalation toxicity*
- a. Pursuant to OECD Harmonized Integrated Classification System for Human Health and Environmental Hazards of Chemical Substances and Mixtures or listed by the European Chemicals Bureau as R48/23: Danger of serious damage to health by prolonged exposure through inhalation.

Q21a) Do you believe the EcoLogo Program's Pool and Spa Chemical Products standard should make criteria statements that address human health impacts (human toxicity, skin and eye irritation, respiratory sensitization) for each of the eight subcategories?

- **21b) If yes, which health impacts should be addressed for each subcategory? Do you have alternative health impacts and/or testing methods to suggest?**

4.4 Environmental Hazards

At present, the eight potential subcategories for the EcoLogo Pool and Spa Chemical Products standard are:

- Water sanitizers
- Algaecides
- Water balancers – pH increasers
- Water balancers – pH decreasers
- Clarifying/flocculent agents
- Metal sequestering agents
- Phosphate removers
- Water conditioners

EcoLogo proposes to include criteria statements for environmental hazards in the *Product Specific Requirements*. The following statements are representative of what a criteria statement could potentially be:

- (a) *Not be not be formulated or manufactured with classes of active ingredients that are not readily biodegradable*
 - a. Tested according to: ISO 7827, 9439, 10707, 10708, 9408, 14593; OECD Methods 301A-F; OECD 310.

- (b) *Not be toxic to aquatic life.*
 - a. Measured according limits set for acute LC₅₀ for algae, daphnia, or fish; ISO 7346-2; OECD test guidance 203, 202, 20; ASTM D5660-96; ISO 11348.

Q22a) Do you believe the EcoLogo Program's Pool and Spa Chemical Products standard should make criteria statements that address environmental hazards (biodegradability, aquatic toxicity) for each of the eight subcategories?

- **22b) If yes, which environmental impacts should be addressed for each subcategory? Do you have alternative environmental impacts and/or testing methods to suggest?**

4.5 Energy, Water, and Waste

The following are examples of typical types of impacts often included in EcoLogo standards:

- Renewable energy/RECs/carbon offsets;
- Energy reduction/conservation;
- Water reduction/conservation; and
- Waste reduction.

Preliminary research has failed to find relevant data to validate whether energy conservation, water conservation, and waste reduction are critical aspects of leadership in manufacturing pool and spa chemical products. In other words, it is unclear if the manufacturers of pool and spa chemical products are currently buying RECs and/or carbon offsets, or using technology to reduce energy and water consumption. Without data, the EcoLogo Program does not intend to propose such requirements in the standard.

Q23) Do you believe that in order to distinguish environmental leadership, the EcoLogo Program should establish strict requirements for energy and/or water consumption and waste reduction at the manufacturing site of the product? Why?

4.6 Packaging

The following are examples of typical types of impacts often included in EcoLogo standards:

- Recycled content
- Recyclable
- No PVC

Preliminary research suggests that packaging made without PVC plastic and with a percentage of recycled resin are readily available on the market. However, it is unclear what environmental leadership for the packaging category is. Furthermore, Health Canada's Consumer Product Safety: Regulations for Swimming Pool and Spa Chemicals states to, "not reuse the empty containers [and] dispose of them in household garbage". Consequently, the EcoLogo Program does not intend to propose a "recyclable" requirement in the standard, but does propose to create criteria statements for recycled content and no PVC.^{xxxix}Potential options include asking for a minimum post-consumer material content of 25% for product containers. With respect to primary packaging it is proposed, for material other than plastic, that a minimum of 25% post-consumer material be required.

Q24) In terms of packaging material for pool and spa chemical products, what represents environmental leadership?

Note: All of the products will be required to be in accordance with all pertinent and current regulatory requirements for packaging.

4.7 Performance

Preliminary research has failed to find relevant data to validate whether performance tests are available for pool and spa chemical products. It is important that EcoLogo certified products perform as well as non-certified products if consumers are to trust the efficacy of environmentally preferred products.

Q25) Do you believe the EcoLogo Program should establish strict requirements regarding product performance? If yes, what performance tests should be required?

4.8 Labelling Requirements and Conditions for EcoLogo Use

The following are examples of the types of criteria related statements often included in EcoLogo standards:

- Product information (i.e. Type III labels)
- FTC and CSA regulations (greenwashing)

4.8.1. *Product Information on Labels*

EcoLogo proposes to include a criteria statement for product information on labels in the *Product Specific Requirements*. Preliminary research has revealed that various products such as water sanitizers are already mandated to state the percentage of active ingredients on the label. The following statement is representative of what a criteria statement could potentially be:

- (a) *State the percentage of active ingredients on the label.*

Rationale:

EcoLogo wants to ensure that consumers are aware of the active ingredients in the product they intend to purchase.

4.8.2. *Environmental Claims Labelling*

EcoLogo proposes to include a criteria statement for environmental claims labeling in the *Product Specific Requirements*. The following statement is representative of what a criteria statement could potentially be:

- (a) *Meet all FTC and CSA regulations relating to environmental claims made on labels.*

Rationale:

This requirement is to assure that EcoLogo products avoid greenwashing claims.

Note: All of the products will be required to be in accordance with all pertinent and current regulatory requirements for labelling.

FTC: <http://www.ftc.gov/bcp/gnrule/guides980427.htm>

CSA: <http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/02701.html>

Q26) Do you believe the EcoLogo Program should establish requirements for product information on labels and environmental claims labelling? Why?

4.9 General Requirements

An EcoLogo standard addresses *Product Specific Requirements* as well as *General Requirements*. The *General Requirements* are criteria statements that are additional to the *Product Specific Requirements* and must be met by all products, regardless of which category they fall under. Preliminary research suggests there are several statements that would benefit

from being included in this section. The following statements are suggested subheadings and potential criteria statements.

4.9.1. *Petroleum-Based Materials*

EcoLogo proposes to include a statement in the *General Requirements* which addresses petroleum-based materials. The following statement is representative of what a criteria statement could potentially be.

- (a) *Not be manufactured with petroleum-based materials.*

Rationale:

To date, preliminary research suggests there are a sufficient number of products manufactured without petroleum-based materials currently available in the market place. Alternative products generally tend to be more environmentally sensitive than petroleum-based products.

4.9.2. *Prohibited Substances*

EcoLogo proposes to include a statement in the *General Requirements* which prohibits a particular substance from the formulation of all of the products looking to be certified regardless of subcategory. For example:

- (a) *Not be formulated or manufactured with phosphates, simazine and/or atrazine, and heavy metals.*

Rationale:

Each of these chemicals have both environmental and health implications. Simazine is still currently used in swimming pool and spa chemicals in Australia; however, Atrazine has,

"already been banned or restricted in a number of EU member states. Denmark, Sweden, Germany, France and Norway have banned it while Austria has cancelled its licence and Belgium and Slovenia have restricted its use. Simazine was already banned in Norway, Belgium and France. This ban will now be extended to all member states of the EU."^{xi}

These products were also banned in the United States by the EPA in 1994. Classified as a herbicide, simazine functions as algaecides but is also found in pool cleaning products. Simazine is thought to be a hormone (endocrine) and enzyme system disrupter;

"Hormone disruptors work at extremely low concentrations. They also upset our immune system and are very strong skin sensitizers i.e. are allergenic, and alter the functioning of our genes i.e. cause epigenetic changes".^{xii}

Preliminary research has not revealed that these compounds are readily part of the formulation of the products typically found in one of the eight subcategories. With that being said, in keeping with the precautionary principle, the EcoLogo Program is suggesting to prohibit its allowance.

Q27) Do you agree that these statements (Petroleum-Based Materials and Prohibited Substances) should be included under the *General Requirements*?

5 Additional Questions

Q28) The scope of this standard speaks to pool and spa chemical products that are added directly to pool and spa water. As for the products used around-the-pool (pool cover, tiles, furniture, etc.) the EcoLogo Program proposes certifying them against CCD-146: Hard Surface Cleaners. Do you agree with this proposal? Why or why not?

Q29) EcoLogo standards are established so that the top 20 percent of products within a specific category can achieve certification. Do you believe there is enough separation among subcategory products to support the creation of an environmental leadership standard by the EcoLogo Program?

Q30) Do you believe this Discussion Document has addressed the predominant and important aspects pertinent to the establishment an environmental leadership standard for pool and spa chemical products?

* Please feel free to comment on any aspects that were not addressed by the discussion document.

REITERATION OF QUESTIONS

Q1) Do you believe that the scope and associated subcategories are reasonable? Why?

Q2a) Do you believe the EcoLogo Program should establish a subcategory for pool and spa sanitizers?

- 2b) If yes, which water sanitizing product and which spa water sanitizing product represents environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

- 2c) Can you provide life-cycle-based information for these products that speak to its environmental leadership merit (resource extraction phase, manufacturing phase, use phase, disposal phase)?

Please rank the following products from 1-4

4 being the product that represents the greatest environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle) and 1 being the least environmentally preferable product for that category.

TABLE 1. Ranking of Greatest Environmental Leadership (1 least; 4 greatest)

Criteria Statement Considerations	Product 1 Copper salts	Product 2 Colloidal silver	Product 3 QUATs	Product 4 Polyquats
Health hazards				
Biodegradability				
Bioaccumulation potential				
Eco-toxicity				
Cytotoxicity				
Skin sensitization potential				
VOC content				
Effectiveness against the relevant target organism				
Water consumption requirements for manufacturing of the product				

Q3) Should any of the products mentioned above be restricted in the standard? Do you know of any "better alternatives" to the products listed?

For the product you believe represents environmental leadership, please attempt to fill in all or any of the categories of the table below. If a subcategory is created for algaecides EcoLogo will need to know how a product differentiates itself from the rest and create criteria statements accordingly (we are looking for values that represent environmental leadership) (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle).

Criteria Statement Considerations	Top Product	Response
Active ingredient(s)	Please list the active ingredient and the suggested % concentrate:	
Suggested prohibited ingredient(s)	Please list any ingredients you believe should be prohibited in the formulation:	
Health hazards	What are the main health hazards associated with this product:	
Biodegradability	Is the product readily biodegradable? Inherently biodegradable?	
Bioaccumulation potential	What is the bioaccumulation potential?	
Cytotoxicity	Suggested value:	
Eco-toxicity	Suggested value:	
Skin sensitization potential	Suggested criteria statement: Demonstrate low potential for skin irritancy through an appropriate test of either the whole formulation or active ingredients. An acceptable standard would be an irritation index score of <12.0, as determined from the HET-CAM test. Do you agree with this statement?	
VOC content	What % VOC content should the product have?	
Water consumption requirements for manufacturing of the product	On average what is the required quantity of water needed to manufacture this product?	
Suggested performance test (if exists)	Are there performance tests for this product?	

Q4a) Should EcoLogo make a subcategory for these algaecides?

- 4b) If yes, are the products used as pool algaecides the same as those used for spa maintenance. If not, can you suggest a spa algaecide that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

Q5a) Is it the case that more than 80% of pH increasing products are manufactured with a sodium carbonate formulation, therefore, not allowing for environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

- 5b) If this is not the case can you please state which alternative product does display greater environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?
 - 5c) What % of the market do these products hold?
 - 5d) Can you explain why this product has lower environmental and health impacts?

Q6) Are the products used as pool pH increasers the same as those used for spa maintenance. If no, can you suggest a spa pH increaser that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

Q7a) Do you believe that citric acid is a feasible alternative to sodium bisulfate and muriatic acid? Why?

- 7b) If yes, is it reasonable for EcoLogo to make a criteria statement that requires pH decreaseers to have a certain amount of bio-based content?
- 7c) If not, is there an alternative pH decreasing product that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?
 - 7d) Can you list the environmental and health impacts associated with this product?

Q8) Are the products used as pool pH decreaseers the same as those used for spa maintenance. If no, can you suggest a spa pH decreaseer that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

Q9) Are the functions of clarifying and flocculent agents sufficiently similar that they can be lumped together in one subcategory?

Q10a) Of the products listed, is there a product that displays greater environmental leadership than the others (20 percent of products/services available in the market at the time

of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

- 10b) Is there a product not listed that represents greater environmental leadership?
- 10c) For the product you have chosen, could you list environmental impacts associated with it for the different phases of its life-cycle?

Q11) Are the products used as pool clarifying/ flocculent agents the same as those used for spa maintenance? If not, can you suggest a spa clarifying/ flocculent agent that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

Q12a) Are chitosan-based products as effective as EDTA and HEDP?

- 12b) Which one of the three products listed represents environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)? If you do not believe any are representative of environmental leadership, can you please suggest an alternative product?
 - 12c) Can you list the environmental and health impacts associated with this product?
 - 12d) Would it be appropriate to create a criteria statement for this category that requires a minimum % of bio-based materials?

Q13) Are the products used as pool metal sequestering agents the same as those used for spa maintenance? If not, can you suggest a spa metal sequestering agent that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

Q14a) Should EcoLogo create a subcategory for phosphate removers in light of the fact that they may not be essential for proper maintenance?

- 14b) If yes, is there one product of those listed above (or can you suggest an alternative product) that represents environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?
 - 14c) Can you list the environmental and health impacts associated with this product?

Q15) If a subcategory for phosphate removers is created, should there be a criteria statement that calls for a minimum % of bio-based materials?

Q16) Are the products used as pool phosphate removers the same as those used for spa maintenance? If not, can you suggest a spa phosphate remover that displays environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?

Q17) Is 'water conditioners' the appropriate subcategory name for these products?

Q18a) Should EcoLogo create a subcategory for water conditioners?

- 18b) If yes, is there one product of those listed above (or can you suggest an alternative product) that represents environmental leadership (20 percent of products/services available in the market at the time of the development or revision of a standard, which have the lowest environmental impacts across all stages of the life cycle)?
 - 18c) Can you list the environmental and health impacts associated with this product (resource extraction phase, manufacturing phase, use phase, disposal phase)?

Q19) If a subcategory for water conditioners is created, should there be a criteria statement that calls for a minimum % of bio-based materials?

Q20a) Do you believe the EcoLogo Program should prohibit and/or restrict any substances from the formulation of any/all the subcategory products?

Examples of substances to prohibit or restrict are, but are not limited to:

- Solvents;
 - Specific elements or chemical compounds;
 - VOCs;
 - Carcinogens (IARC; Group 1, Group 2A, Group 2B, Group 3, and Group 4); and
 - Substances designated as asthma causing agents by the Association of Occupational and Environmental Clinics (AOEC).
- 20b) If yes, can you list what the prohibited and/or restricted substances for each are, and suggest maximum limit amounts for the restricted substances?

Q21a) Do you believe the EcoLogo Program's Pool and Spa Chemical Products standard should make criteria statements that address human health impacts (human toxicity, skin and eye irritation, respiratory sensitization) for each of the eight subcategories?

- 21b) If yes, which health impacts should be addressed for each subcategory? Do you have alternative health impacts and/or testing methods to suggest?

Q22a) Do you believe the EcoLogo Program's Pool and Spa Chemical Products standard should make criteria statements that address environmental hazards (biodegradability, aquatic toxicity) for each of the eight subcategories?

- 22b) If yes, which environmental impacts should be addressed for each subcategory? Do you have alternative environmental impacts and/or testing methods to suggest?

Q23) Do you believe that in order to distinguish environmental leadership, the EcoLogo Program should establish strict requirements for energy and/or water consumption and waste reduction at the manufacturing site of the product? Why?

Q24) In terms of packaging material for pool and spa chemical products, what represents environmental leadership?

Q25) Do you believe the EcoLogo Program should establish strict requirements regarding product performance? If yes, what performance tests should be required?

Q26) Do you believe the EcoLogo Program should establish requirements for product information on labels and environmental claims labelling? Why?

Q27) Do you agree that these statements (Petroleum-Based Materials and Prohibited Substances) should be included under the *General Requirements*?

Q28) EcoLogo standards are established so that the top 20 percent of products within a specific category can achieve certification. Do you believe there is enough separation among subcategory products to support the creation of an environmental leadership standard by the EcoLogo Program?

Q29) Do you believe this Discussion Document has addressed the predominant and important aspects pertinent to the establishment an environmental leadership standard for pool and spa chemical products?

* Please feel free to comment on any aspects that were not addressed by the discussion document.

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