





Your assurance of environmental preferability.

The objective of the CTI Green Leaf program is to use environmentally preferable chemistry to reduce the environmental impact of cleaning products associated with the manufacture, use and waste disposal to the extent technologically and economically feasible.

The CTI Green Leaf program ensures that environmental considerations are included as criteria in the product formulation. These considerations include the regulatory standards and other information available from the Occupational Safety and Health Administration (OSHA), the American Conference of Governmental Industrial Hygienists (ACGIH[®]), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), Environmental Protection Agency (EPA) and California Proposition 65 as well as standards developed by industry.

Cleaning with water only may be sufficient for some areas and soil types. But most frequently, a cleaning agent is required to break the attachment of contamination from the surface being cleaned. With this understanding, Green Leaf formulation guidelines assure a higher level of worker safety and minimize environmental impact without stripping away the ability of a product to accomplish its most important task... contamination removal from the indoor environment.



Basis of approval for Green Leaf seal.

Products carrying the green leaf formulation seal must meet the following criteria.

Toxic Compounds:

The product must be non-toxic to humans at recommended in use dilutions per the following criteria.

The product is considered “non-toxic” if the following criteria are met.

1. The oral lethal dose (LD50) for rat is greater than 2,000 mg/kg.
2. The inhalation lethal concentration (LC50) is greater than 20 mg/L (20 ppm)

This threshold assumes that the toxicity of the individual component compounds are weighted and summed and that synergistic effects are not present. (Reference evaluation of toxicity data appendix.)

Carcinogens:

The product must not contain carcinogenic components identified in the regulatory standards and other information available from the Occupational Safety and Health Administration (OSHA), the American Conference of Governmental Industrial Hygienists (ACGIH[®]), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), and California Proposition 65 as of the date of this publication.

Skin and Eye irritation:

The product must not be corrosive to skin at recommended in use dilution. This threshold assumes that the irritation level of the individual component compounds established by Draize, BCOP, or comparable testing are weighted and summed and that synergistic effects are not present. (See evaluation of toxicity data appendix.)

Flammability:

This product undiluted must have a flash point of greater than 150 F. Flash point testing results must meet or exceed those of closed cup ISO testing standard 13736 or 2719. Alternatively the product must not sustain flame per ASTM 4206.

Volatile organic compounds (impact on smog, ozone, and indoor air quality):

In use concentrations of the product must contain less than .1 Volatile organic compounds (as defined by the California Environmental Protection Agency).

Aquatic Biodegradability

The ingredients of this product must exhibit ready biodegradability. (See appendix for evaluation criteria.)



Prohibited Ingredients

The product must not contain:

- Heavy metals including arsenic, lead, cadmium, cobalt, chromium, mercury, nickel, or selenium.
- Ozone-depleting compounds
- Optical Brighteners

Packaging:

This product must be sold in reusable or recyclable primary packaging.

Labeling:

This product must be sold with labeling that clearly states dilution ratios, and methods of use. The label must also contain basic first aid instructions.

Animal Testing:

Animal testing is discouraged when alternative usable information is available. In lieu of testing, information provided by the manufacturers' of the compounds comprising this product may be used for the calculations required for verification of compliance with the green leaf formulation.

APPENDIX

Evaluation of Toxicity

The effective toxicity of the product is established by the sum of the ingredient(s) effective toxicity values weighted by their % of the product. LD 50 is to be expressed in mg/kg. For example:

$$\text{LD 50 ingredient} \div \text{weight \% of ingredient} = \text{effective LD 50}$$

Exceptions

For any compound with a vapor pressure of 1.0 mm Hg or less, inhalation toxicity is considered acceptable and no further testing is required.

For any compound with a vapor pressure greater than 1.0 mm Hg where LC 50 data is not available the following formula is used to establish the inhalation LC50.

$\text{LC 50} = \text{LD 50 oral} \times \text{ABS}_{\text{GI}} \times \text{BW} \div \text{ABS}_{\text{inh}} \times \text{R} \times \text{ET} \times \text{CF}$. Where:

LD 50 oral = single dose oral mg/kg

ABS_{GI} = gastrointestinal rate

ABS_{inh} = inhalation absorption rate

R = Respiration rate for experimental animal (L/min)

ET = exposure time (hour)

CF = conversion factor (60 min/hr)

BW = body weight of animal (kg)



When data is not available the EPA recommended gastrointestinal absorption factor of 0.8 for VOC's and 0.5 for semi-volatile organic compounds will be substituted. The rate of inhalation absorption will be established at 1.0 for all organic compounds. The weight of 0.35 kg and respiration rate of 0.14 L/min is assumed to be average for a rat.

Evaluation of corrosives

The level of irritation likely to be caused by direct contact with the product must be “none to mild” based on actual in vivo or comparable in vitro testing of the product at in use concentration. As an alternative, data provided by the manufactures of the individual component compounds may be used. When toxicity levels are provided as descriptive interpretations, the highest numerical value for that description in the Draize test score matrix will be used for the Green Leaf valuation calculation. The toxicity threshold assumes that the test valuations of the individual component compounds are weighted and summed and that synergistic effects are not present.

Draize in vivo Eye Irritancy Test

The Draize Eye Irritancy Test is designed to show whether chemicals, especially those used on the face, hands and other parts of the body, can damage the eyes. It involves placing chemicals, which may be irritants to the eyes, on the surface of the eyes of restrained animals, particularly rabbits. Any irritation the chemicals cause is assessed from tears, redness or swelling. The test is very much milder today than it used to be. That is because very low concentrations of chemicals are used and at the first sign of irritation they are washed out of the eye. In some countries there is a legal requirement for the Draize Test to be done on drugs, cosmetics and other chemicals, which might come in contact with the eyes. Non-animal alternatives to the Draize Test are being actively researched. As yet no alternatives that are acceptable to safety authorities have been found, but the search is continuing, and some new approaches look promising.

Draize Test Results Interpretation

Numerical valuation	Descriptive valuation
0 - .9	Non irritating
1 25	Mild irritation
26 56	Moderate irritation
57 84	Severe irritation
85 110	Very severe



BCOP in vitro Irritancy Test (Bovine Corneal Opacity and Permeability test)

This test evaluates the increase of opacity and permeability in a bovine corneal sample when subjected to a given chemical. The test uses excised bovine corneas normally discarded by slaughterhouses and measures the changes in opacity as an indication of protein denaturation and corneal injury, and fluorescein permeability as an indicator of damage to corneal epithelium.

BCOP Test Results Interpretation

Numerical

valuation Descriptive

valuation

0 3 Non irritating

3.1 25 Mild irritation

25.1 55 Moderate irritation

55.1 80 Severe irritation

80.1 up Very severe

Biodegradability evaluation

The ingredients of the product must not exhibit environmentally persistent toxicity. Verification by ingredient manufacturers MSDS or laboratory testing may be used for verification.

Disclaimer of Liability

The Green Leaf Formulation seal does not assume or undertake to discharge any responsibility of the manufacturer, the user, or any other party. The Green Leaf seal shall not incur any obligations or liability for damages, including consequential damages arising out of or in connection with the interpretation of, reliance upon or any other use of this standard.

These criteria may be updated without notice. For the latest version of this document go to www.greenleaf.org

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Bibliographic References

- Cooper, J.A., Saracci R. and Cole P. (1979). Describing the validity of carcinogen screening tests. *British Journal of Cancer*. 39, 87-89.
- Draize J.H., Woodard G.K. and Calvery H.O. (1944). Methods for the study of irritation and toxicity of substances applied topically to the skin and mucous membranes. *Journal of Pharmacology and Experimental Therapeutics*. 82, 377-390.

Gautheron, P., Dukic, M., Alix, D., and Sina, J.F. (1992). Bovine Corneal Opacity and Permeability Test: an *in vitro* Assay of Ocular Irritancy.