



Raven 405

DESCRIPTION

Raven® 405 is a solvent-free 100% solids, ultra high build epoxy coating formulated with exceptionally high physical strengths and broad range chemical resistance. 405 exhibits superior bond to concrete, steel, masonry, fiberglass and other surfaces. Designed for operating temperatures up to 200°F, 405's unique ultra high-build ability allows it to be spray applied on vertical and overhead surfaces. The surface tolerance and high physical strengths of 405 allow it to be designed as a structural lining in manholes, pipelines, tanks and other deteriorated structures.

TYPICAL USES

Surfaces where rehabilitation of an existing structure requires enhancement of the structural integrity and where exposure to concentrated acids and caustics may be expected, including:

- Tunnels and pipelines
- Digesters
- Secondary containment
- Wastewater facilities
- Clarifiers
- Tanks
- Manholes
- Floors and walls

COLOR

Light blue is standard. Limited special colors are available on request. Contact RLS for information.

SOLIDS BY VOLUME

100% solids by volume

Volatile Organic Compounds: 0.0 lbs/gallon

FILM THICKNESS

Raven 405 is a 100% solids epoxy with zero shrinkage. Therefore, actual wet film thickness and final dry film thickness are the same (i.e. 10 mils WFT=10 mils DFT). Dependent upon surface profile, a maximum of 200 mils per coat is recommended to prevent sagging on vertical or overhead surfaces. Generally, application of two coats are recommended for quality assurance in coverage. A wet film thickness gauge can be used to determine coating coverage.

THEORETICAL COVERAGE

40 sq. ft. per gallon at 40 mils thickness. Actual surface coverage will depend on surface irregularities and desired result. Trials are recommended to determine the actual coverage required to yield a desired film thickness for each individual type of installation. Recommended coverage will vary from 40-250+ mils depending on the installation. Additional information is available by contacting RLS.

APPLICATION METHOD

Brush, roller, heated plural component airless or air-assisted spray. For specific information on application, spray system design, approved systems and Certified Applicators contact RLS.

THINNING

Do not thin with solvents; pinholing and loss of adhesion can result. If lower viscosity is desired, drum heaters and inline heaters can be used for larger quantities and on specialized spray equipment. Material components should not be heated beyond manufacturer's suggested limits. Contact RLS for detailed information.

CLEAN-UP

To clean tools, use acetone, xylene or MEK. To clean skin, immediately wash thoroughly with soap and water. Refer to the Material Safety Data Sheet for additional information on health and safety.

POT LIFE

20 minutes for 1 gallon at 75°F.

15 minutes for 2 gallons at 75°F.

The amount of pot life and working life will vary depending on the quantity and temperature of epoxy mixed, ambient temperature and the container in which the mixed material is held. Contact RLS for additional information.

CURE AND RECOAT TIME

Initial set generally occurs within 6 hours at 70°F. Curing continues for several days, even underwater. When applying multiple coats, no more than 24 hours at 70°F should be permitted to pass between coats. Environmental conditions may shorten this window. Protect surfaces from contamination of any type between coats. Before recoating, inspect, dry and clean surface thoroughly to remove all contaminants, including amine blush and condensation. If the recoat window is missed, clean and abrade surfaces prior to topcoating. For additional information contact RLS.

SURFACE TEMPERATURE

Minimum recommended: 40°F.

Maximum recommended: 120°F.

SURFACE PREPARATION

Surfaces to receive coating must be cleaned of all oil, grease, rust, scale, deposits and other contaminants. Contact RLS for additional recommendations.

STEEL surfaces may require "Solvent Cleaning" (SSPC-SP1) to remove oil, grease and other soluble contaminants. Surfaces to be coated should then be prepared according to SSPC-SP10 or NACE No. 2: "Near White Blast Cleaning". In certain situations, an alternate procedure may be to use high (>5,000psi) or ultrahigh (>10,000psi) pressure water cleaning or water with sand injection and an approved rust inhibitor. The anchor profile for surface preparation must be a minimum of 2 mils.

CONCRETE AND MASONRY surfaces can generally be prepared by high pressure water cleaning, water jetting, abrasive blasting, shotblasting, or a combination of methods. A penetrating primer such as low viscosity Raven 120 may be recommended.

FIBERGLASS surfaces should be rinsed and neutralized, scarified and cleaned with water or an emulsion of solvent and water to remove remaining dust and loose particles. Allow the surface to dry thoroughly.

AVAILABLE PACKAGES

5 gallon pails (20 gallon kit), 30 gallon drums (120 gallon kit), 55 gallon drums (220 gallon kit). Raven 405 is available through Certified Applicators.

COMPONENTS AND MIXED RATIO

Part A, Resin. Part B, Hardener. 3:1 by volume.

VISCOSITY

Part A, 160,000 cps at 23°C, Brookfield RVF

Part B, 40,000 cps at 23°C, Brookfield RVF

SHELF LIFE AND STORAGE

Shelf Life: 1 year in sealed, unmixed containers at room temperature. Store in a sheltered area between 60°F and 80°F (15°C and 27°C).

SAFETY

Consult the Material Safety Data Sheet for this product concerning health and safety information before using. Strictly follow all notices on the Material Safety Data Sheet and container label. If you do not fully understand the notices and procedures provided or if you cannot strictly comply with them, do not use this product. Actual safety measures are dependent on application methods and work environment. Contact RLS to obtain a copy of the Material Safety Data Sheet at 800-324-2810.

PERFORMANCE TESTING

DESCRIPTION	METHOD	RESULTS
Flexural Strength	ASTM D790	13,000 psi
Compressive Strength	ASTM D695	18,000 psi
Tensile Strength	ASTM D638	7,600 psi
Tensile Ultimate Elongation	ASTM D638	1.5%
Hardness, Shore D	ASTM D2240	88
Water Vapor Transmission	ASTM D1653, Method B	3.8 gms/sq.m. per 24 hours
Taber Abrasion, CS17 Wheel	ASTM D4060, 1000 g load/1000 cycles	<112 mg loss
Adhesion	ASTM D4541, Concrete Steel (SSPC SP-10)	Substrate Failure >1,400 psi

Warranty and Disclaimer: RLS, a division of CIPAR, Inc., warrants its products to be free of manufacturing defects and that they will meet RLS current published physical properties when applied in accordance with directions and tested in accordance with ASTM and RLS standards. If, within one year from purchase, any product does not meet the physical properties or is defective in manufacture, RLS, at its sole option, will either replace the defective product or refund the purchase price. This warranty is void if the product is used contrary to RLS written directions.

THE AFORESAID IS THE EXCLUSIVE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. THERE IS NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. UNDER NO CIRCUMSTANCES SHALL RLS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OR FOR LOST PROFITS. NO ACTION AGAINST RLS MAY BE COMMENCED MORE THAN ONE YEAR AFTER THE CLAIM ARISES.

MATERIAL SAFETY DATA SHEET

Trade Name: **Raven 405 - Part A**

SECTION I

Manufacturer: Raven Lining Systems
13105 East 61st Street, Suite A
Broken Arrow, OK 74012

Emergency Telephone #: 800-424-9300
Chemtrec

Revision Date: 3/15/06

Information Telephone #: 918-615-0020

Reason for Revision: New Address
800-324-2810

SECTION II: INGREDIENT INFORMATION

<u>INGREDIENT</u>	<u>CAS NUMBER</u>	<u>PEL</u>	<u>TLV</u>
Epoxy Resin	25068-38-6	NE	NE

SARA Title III, Section 313 Ingredients: None

The remaining ingredient(s) is / are being withheld as a trade secret.

SECTION III: PHYSICAL DATA

Boiling Point: > 200 deg F

Vapor Pressure: N/A

Vapor Density: N/A

Solubility in Water: negligible

Appearance and Odor: White colored liquid with a heavy paint consistency – mild epoxy odor

Specific Gravity: 1.23 - 1.28

Melting Point: N/A

Evaporation Rate: Not established

% Volatile by Volume: < 1 %

SECTION IV: FIRE & EXPLOSION HAZARD DATA

Flash Point: > 200 deg F, PMCC Method

Extinguishing Media: Foam, CO₂, Dry Chemical

Special Fire Fighting Procedures: The use of self-contained breathing apparatus is recommended for firefighters. Water may be helpful in keeping adjacent containers cool. Avoid spreading burning liquid with water used for cooling purposes.

Unusual Fire and Explosion Hazards: Keep work areas free of hot metal surfaces and other sources of ignition.

DOT Flammability Classification: non-flammable

SECTION V: REACTIVITY DATA

Stability: Stable

Incompatibility: Strong acids and bases, selected amines, oxidizing agents.

Hazardous Decomposition or Byproducts: Thermal decomposition in the presence of air may yield carbon monoxide, carbon dioxide, aldehydes and ketones.

Hazardous Polymerization: Will not occur.

SECTION VI: HEALTH HAZARD DATA

Primary Routes of Entry:

EYES: May cause moderate eye irritation. Corneal injury is possible.
SKIN: May cause allergic skin reaction in susceptible individuals. Prolonged exposure likely to cause significant skin irritation. Repeated exposure may cause skin irritation.
INHALATION: Vapors are unlikely due to physical properties.
INGESTION: Moderately toxic may be harmful if swallowed.
SYSTEMIC and OTHER EFFECTS: Preexisting eye and skin disorders may be aggravated by exposure to this product.

Emergency and First Aid Procedures:

EYES: Flush with large quantities of water for at least 15 minutes. Consult a physician.
SKIN: Wash off in flowing water or shower. Remove contaminated clothing.
INHALATION: Remove to fresh air if affects occur. Consult a physician.
INGESTION: Give 2 glasses of water and induce vomiting. Consult a physician.

SECTION VII: PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to Be Taken in Case Material is Released or Spilled: Keep sources of ignition and hot metal surfaces isolated from the spill. Material may flow slowly. Scrape into containers for disposal.

Waste Disposal Methods: Dispose of according to all local, state and federal regulations.

Precautions to Be Taken in Handling and Storing: Keep containers closed when not in use. Avoid prolonged or repeated contact with skin. DO NOT handle or store near flame, heat or strong oxidants. Avoid prolonged storage above 38 deg C (100 deg F).

SECTION VIII: CONTROL MEASURES

RESPIRATORY: Respiratory protection should not be needed. If respiratory irritation is experienced or during spray application, use a MSHA or NIOSH approved respirator.

VENTILATION: General mechanical ventilation is sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

EYES: Use safety glasses, splash-proof eye goggles or goggles with full faceshield.

CLOTHING/GLOVES: Use impermeable gloves to prevent skin irritation in sensitive individuals. Wear clean, long-sleeved, body covering clothing.

SECTION IX: TRANSPORT DATA

Proper Shipping Name: not regulated

Hazard Class: not regulated

Identification Number: N/A

Packing Group: N/A

SECTION X: DISCLAIMER

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MATERIAL SAFETY DATA SHEET

Trade Name: **Raven 405 - Part B**

SECTION I

Manufacturer: Raven Lining Systems
13105 East 61st Street, Suite A
Broken Arrow, OK 74012

Emergency Telephone #: 800-424-9300
Chemtrec

Revision Date: 3/15/06

Information Telephone #: 918-615-0020

Reason for Revision: New Address
800-324-2810

SECTION II: INGREDIENT INFORMATION

<u>INGREDIENT</u>	<u>CAS NUMBER</u>	<u>PEL</u>	<u>TLV</u>
Aliphatic amines	Mixture	NE	NE
Cycloaliphatic amines	Mixture	NE	NE
Bisphenol A	80-05-7	NE	NE

SARA Title III, Section 313 Ingredients: Bisphenol A

The remaining ingredient(s) is / are being withheld as a trade secret.

SECTION III: PHYSICAL DATA

Boiling Point: > 200 deg F

Vapor Pressure: N/A

Vapor Density: N/A

Solubility in Water: negligible

Appearance and Odor: Blue gel with a characteristic amine odor.

Specific Gravity: 1.00 - 1.05

Melting Point: N/A

Evaporation Rate: Not established

% Volatile by Volume: < 1 %

SECTION IV: FIRE & EXPLOSION HAZARD DATA

Flash Point: > 200 deg F, Setaflash Method

Fire Hazard Classification (OSHA/NFPA): Class III B.

Extinguishing Media: Foam, CO₂, Dry Chemical, Water Spray

Special Fire Fighting Procedures: The use of self-contained breathing apparatus is recommended for firefighters. Water may be helpful in keeping adjacent containers cool.

Unusual Fire and Explosion Hazards: May generate toxic or irritating combustion products. Sudden reaction and fire may result if product is mixed with an oxidizing agent. Delayed lung damage (pulmonary edema) can be experienced after exposure to combustion products.

SECTION V: REACTIVITY DATA

Stability: Stable

Incompatibility: Strong acids and bases, selected amines, oxidizing agents.

Hazardous Decomposition or Byproducts: Thermal decomposition in the presence of air may yield carbon monoxide, carbon dioxide, aldehydes, ketones and nitrogen oxides.

Hazardous Polymerization: Will not occur.

SECTION VI: HEALTH HAZARD DATA

Primary Routes of Entry:

EYES: Severe eye irritant. May cause burns. Vapors may be irritating.

Raven 405 – Part B

SKIN: Severe skin irritant. May cause injury to skin following prolonged or repeated contact. Repeated exposure may cause sensitization of the individual.

INHALATION: Excessive inhalation is likely to cause irritation of mucous membranes. Repeated exposure can result in lung damage.

INGESTION: Corrosive and may cause severe and permanent damage to mouth throat and stomach.

SYSTEMIC and OTHER EFFECTS: Product can be alkaline, corrosive and irritating to skin, ears, eyes and mucous membranes. Aliphatic amines can cause changes in the lungs, liver, kidneys and heart.

Emergency and First Aid Procedures:

EYES: Flush with large quantities of water for at least 15 minutes. Get medical attention immediately.

SKIN: Wash immediately with soap and water. If irritation or sensitization occurs, remove individual from further contact with material. Remove contaminated clothing.

INHALATION: Remove to fresh air if affects occur. Get medical attention.

INGESTION: If this product is swallowed, administer one glass of water. Do not induce vomiting. Seek medical attention immediately.

SECTION VII: PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to Be Taken in Case Material is Released or Spilled: Keep sources of ignition and hot metal surfaces isolated from the spill. Material may flow slowly. Scrape into containers for disposal.

Waste Disposal Methods: Dispose of according to all local, state and federal regulations.

Precautions to Be Taken in Handling and Storing: Keep containers closed when not in use. Avoid prolonged or repeated contact with skin. DO NOT handle or store near flame, heat or strong oxidants. Avoid prolonged storage above 38 deg C (100 deg F).

SECTION VIII: CONTROL MEASURES

RESPIRATORY: To avoid overexposure, wear a properly fitted NIOSH/MSHA respirator with organic vapor cartridges.

VENTILATION: General mechanical ventilation is sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

EYES: Use chemical safety glasses, splash-proof eye goggles or goggles with full faceshield.

CLOTHING/GLOVES: Use nitrile or other chemically resistant gloves. Wear clean, long-sleeved, body covering clothing and rubber boots.

SECTION IX: TRANSPORT DATA

Proper Shipping Name: Amines, liquid, corrosive, n.o.s. (cycloaliphatic amines)

Hazard Class: Corrosive Material - 8

Identification Number: UN 2735

Packing Group: II

SECTION X: DISCLAIMER

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