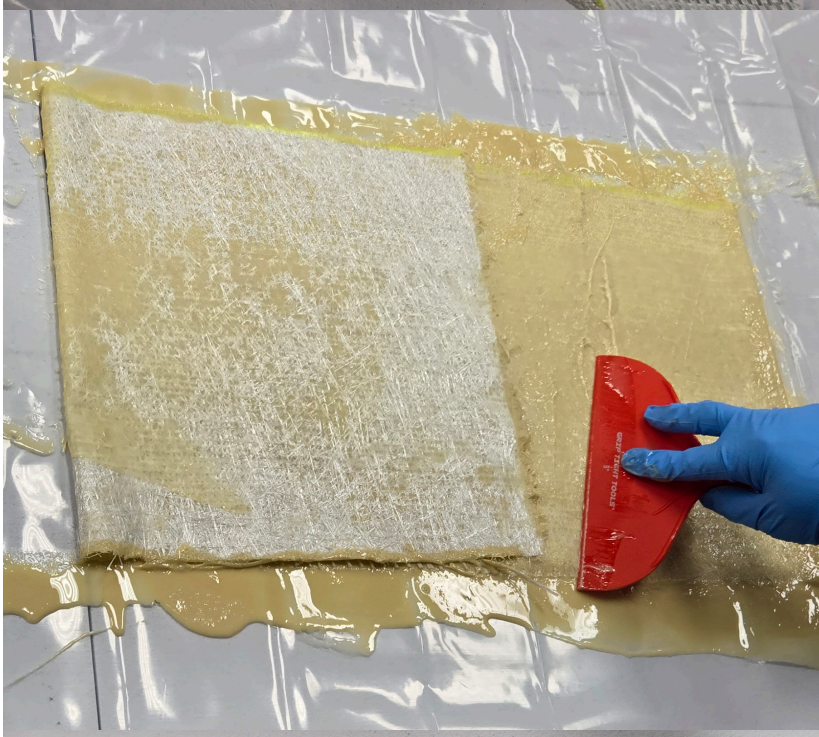
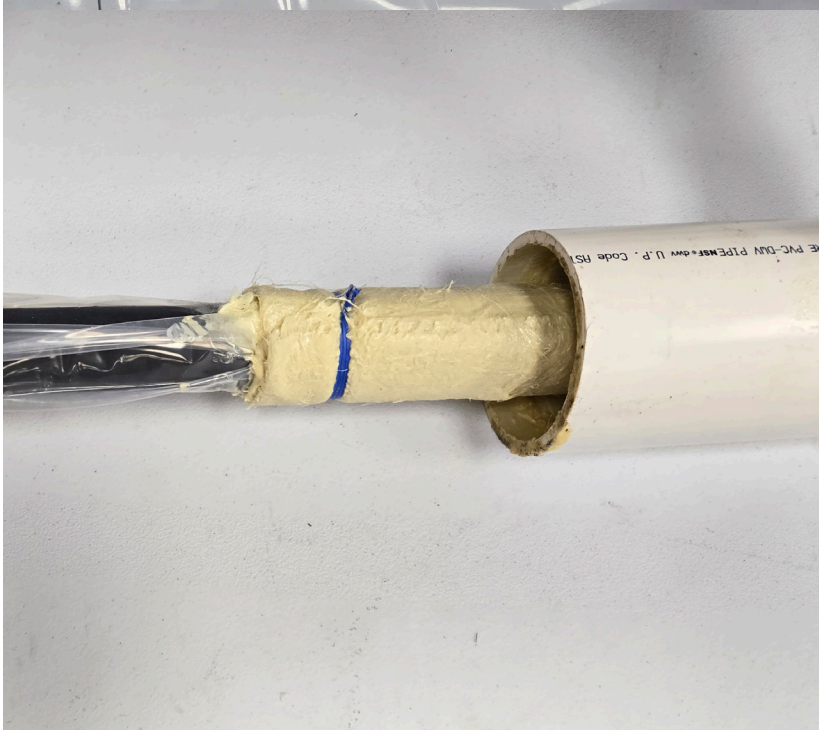
UNITED FELTS
A VORTEX COMPANY

Submittal for

United Point Repair

SECTIONAL PIPE REHABILITATION OF GRAVITY SEWER PIPES 3”-72” IN DIAMETER





MADE IN AMERICA

(276) 656-1904 | www.unitedfelts.com

REV. 05-31-2024

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UNITED FELTS
A VORTEX COMPANY

Company Experience & Expertise

United Felts Company Overview

In January 2024, United Felts was formed as a result of a Vortex Companies acquisition of Applied Felts Inc., FerraTex Solutions, and MaxLiner. United Felts is the continuation of the premier supplier of Cured-In-Place Pipe (CIPP) in the Americas, signaling a new era in trenchless infrastructure solutions. United Felts embodies a commitment to innovation, quality, and customer-centricity, proudly representing American Made excellence in the trenchless industry. With a focus on delivering exceptional liners when and where customers need them, United Felts will continue to define industry standards.

At the heart of this launch was the **celebration of its 100,000th liner**, representing more than 200 million feet of manufactured tube, a testament to an unwavering dedication to excellence and customer satisfaction. **United Felts is the oldest manufacture from raw materials to finished CIPP liner goods manufacturer in the world.** Putting a stamp of **Made in America** quality on every material that comes from our facilities**.**

United Felts' commitment to excellence is encapsulated in its brand ethos: "**UNITED TO DELIVER BIG**." This ethos reflects a dedication to exceeding customer expectations by delivering quality finished goods with precision, speed, and reliability. United Felts embodies the retired brands of Applied Felts Inc. and FerraTex Solutions.

The Vortex Companies is a leading provider of advanced trenchless water and sewer technologies. Through its products and services divisions, Vortex delivers a comprehensive suite of rehabilitation products, equipment, services, and field support to the municipal, industrial, and commercial marketplaces. This includes pipe and manhole lining systems; sewer robotics; mortars; epoxies and resin materials; liners and wet out services, installation equipment; contracting services, training, and field support. Operating globally, Vortex is focused on providing customers a broad range of industry leading, cost-effective trenchless solutions and technical expertise best suited for their project needs.

UNITED FELTS HISTORY

The process of CIPP was invented in England in the early 1970s by Eric Wood. He brainstormed the idea, "How can I repair a pipe without digging it up or replacing it?" He conceptualized the idea to make a liner and soak it in resin and then realized he could install it inside the broken host pipe, cure it, and create a cured-in-place pipe within a pipe.

Wood partnered with W.E. Rawson, Ltd. the original owner of Applied Felts, which is now United Felts, to manufacture the first CIPP liners. They began to develop a marketplace for the rehabilitation product and mutually develop a demand for the lining system.

As a result, Applied Felts was formed to support the growing need in the market for additional providers. Applied Felts expanded to Martinsville, Virginia in 1997.

United Felts (formerly Applied Felts) now has the largest distribution of CIPP pipelining in the world. **As the original manufacturer of CIPP, United Felts has supported the market and spearheaded the global growth and industry product development.**

Through material innovations, United Felts developed fiberglass reinforced sewer pipe liners for gravity and pressure applications, then ventured into potable water liners. United Felts has an unwavering commitment to developing new technologies to support the world's growing need to rehabilitate infrastructure cost effectively.

Vortex Companies: Products Division

Founded in 2015, the Vortex Companies is a collection of business segments with both a national and international footprint. As both a horizontally and vertically integrated business, the Company executes on its vision of providing a comprehensive suite of trenchless solutions that deliver quality engineered solutions, products and services that improve the efficiency, safety and long-term reliability of its client's assets.

This unique approach allows the Company to effectively design, develop, manufacture and/or commercialize a wide variety of products and services for its broad customer base. The business segments, which represent the broader Vortex family, have origins dating back to 1972, and include some of the most respected, experienced, and driven staff in each of their respective industry focuses.

At present Vortex Products has two strategically located manufacturing and service facilities:
Vortex Products - Sandy Utah
Formulation, toll blending and distribution of all Quadex Repair Materials including epoxies, resins, grouts,and industrial coatings.

Vortex Products - Greenville, SC
Sales, service, fabrication, and training of advanced robotics, lining systems, high-speed drain tools, custom rehab rigs, and other infrastructure repair solutions.

Vortex Products has partnered with United Felts to develop EnviroCure UV, a UV cured CIPP liner uniquely positioned in the market to address quality, installation feasibility and modern day logistics. As the exclusive commercial and distribution partner for EnviroCure UV, Vortex Products offers design services, field training, equipment sales/rentals, and a full-range of sales and technical support. All of this is backed by United Felts' decades of quality ISO compliant manufacturing expertise and convenient wet-out locations throughout the US. Together, we have delivered EnviroCure UV liner to the market with the most comprehensive UV CIPP system and components in the industry.

VORTEX PRODUCTS BUSINESS UNITS

Products/Manufacturing
- Vortex Products
- Schwalm USA
- Quadex®, LLC
- Vortex Technology Group, LLC

United Point Repair Product Information

Product Overview

WHAT IS UNITED POINT REPAIR?

Developed by industry leading experts and perfected over time by filed technicians, United Point Repair is a no-dig sectional repair solution designed to provide a long-term, leak free repair to longitudinal cracks, radial cracks, and offset joints.

Brought to you by United Felts (formerly Applied Felts, Inc.), a leading global supplier of felt and fiberglass liners used for Cured-In-Place Pipe (CIPP) rehabilitation, this approach to repairing damaged pipe sections is a proven, fast, and cost-effective solution.

Compact and portable, United Point Repair kits require no special equipment to install. All access is made through an open pit, manhole. or clean-out section, depending on where the pipe is located.

United Point Repair kits are designed for pipes from 3"–72" in diameter United Point Repair kits come in either a 24" or 48" length repair, with three ambient curing resins to choose from Summer, Winter and Turbo.

HOW IT WORKS

The resin saturated United Point Repair fiberglass, is wrapped around either an inflatable carrier or flow through packer, depending on the pipe's diameter.

Once the carrier or packer is positioned in place over the damaged section of pipe, the liner is pressed against the inner wall of the pipe and held under pressure until the thermosetting resin has cured. When cured, the short liner acts like a pipe with a pipe. The corrosion resistant liner material ensures the existing pipe in service and leak free for many years to come.

The United Point Repair solution is backed by decades of experienced technicians, not only at United Felts, but also by its parent, Vortex Companies, a leader in trenchless infrastructure products, equipment and services.

WORKS WITH

Concrete | Clay | Ductile Iron | GRP | PVC | HDPE | AC | Cast Iron | Orangeburg | Steel

UNITED FELTS
A VORTEX COMPANY

United Point Repair Kits

(SUMMER, WINTER, TURBO)

TECHNICAL DATA

TYPICAL PERFORMANCE CHARACTERISTICS*

PROPERTY	TEST METHOD	MIN./ASTM	UNITED POINT REPAIR
Flexural Strength	ASTM D790	4,500 psi	27,500 psi
Flexural Modulus	ASTM D790	250,000 psi	1,345,000 psi
Tensile Strength	ASTM D638	3,000 psi	24,500 psi

**The values stated in inch-pound units are to be regarded as the standard. The values given in international system are for information only.*

TECHNICAL INFORMATION

- **Contains no VOCs, PFAs or styrenes**
- **Impregnated fiberglass maximum temperature may reach 105°F | 40.5°C**
- **Structural properties exceed requirements of ASTM F1216**

FEATURES AND BENEFITS

- **Resistant to 63+ chemicals & oils**
- **Non-flammable, non-hazardous, cures in the presence of water**
- **Safe for storm and sanitary sewers**
- **Safe on point repair carriers**

Silicate Resin for Sectional and Point Repairs

DESCRIPTION

The family of Quad-Cure® Silicate Resins are formulated for sectional liners suited for isolated pipe repair and patching. Depending on the season and/or project conditions, we offer three different silicate resins designed for fast (Turbo), medium (Winter) and slow (Summer) cure times.

Quad-Cure Silicate Resins are specifically engineered and designed to optimize sectional and point repair applications. The point repair process eliminates the need for digging by utilizing a process that creates a pipe within a pipe with minimal change to the original diameter.

APPLICATION ADVANTAGES

- **Available to repair 3”-72” diameter pipe in 24” and 48” lengths**
- **Eliminates the need for costly and disruptive excavations**
- **Only standard sewer cleaning and inspection equipment required**
- **Short repair times, multiple repairs in one day**
- **Field tested for over 10 years**
- **50 year design life**
- **Odorless and ideal for working in confined spaces**

UNITED POINT REPAIR

MADE IN AMERICA

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MIXING INSTRUCTIONS

Ratio: 2:1 (2 parts Silicate Resin [Part B] to 1 part Water Glass [Part A]) by volume

POT LIFE

Amount of time to install a liner before resin starts to set.

CURE TIME

Amount of time for the resin to cure once part A and B have been mixed together.

NOTE

Resin cure time will vary depending on environmental factors such as Temperature, Humidity, Hydrostatic Pressure and Thermal Wicking due to Cold Water Infiltration.

UNITED POINT REPAIR SILICATE RESIN CURING GUIDELINES

Quad-Cure® Summer

AMBIENT TEMP.	WORK TIME (MINS)	CURE TIME (MINS)
55°F | 12.8°C	32 - 35	210 - 240
64°F | 17.8°C	32 - 35	180 - 240
73°F | 22.8°C	30 - 32	180 - 210
82°F | 28.3°C	20 - 23	180 - 210
91°F | 32.8°C	14 - 16	150 - 210

Quad-Cure® Winter

AMBIENT TEMP.	WORK TIME (MINS)	CURE TIME (MINS)
33°F | 0.56°C	20 - 22	100 - 120
55°F | 12.8°C	18 - 20	90 - 110
67°F | 19.4°C	16 - 19	75 - 100
73°F | 22.8°C	15 - 17	60 - 70

Quad-Cure® Turbo

AMBIENT TEMP.	WORK TIME (MINS)	CURE TIME (MINS)
40°F | 4.4°C	9 - 10	55 - 60
50°F | 10°C	8 - 9	45 - 50
59°F | 15°C	7 - 8	35 - 40
68°F | 20°C	6 - 7	25 - 30

Quad-Cure® Water Glass

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	• Quad-Cure® Water Glass Part A
Trade Name	• Quad-Cure® WG
Company	• Quadex LLC, 564 W. 9320 S., Sandy, UT 84070
Company Contact	• Matthew Peterson
Company Phone	• 844-782-4832
Emergency	• Domestic Shipments and to Canada: 1-800-633-8253 • International Shipments: 1-801-629-0667

2. HAZARDS IDENTIFICATION

Classification of the substance or mixture		
GHS Classification		
	Skin Irrit.	• 2
	Eye Dam.	• 1
Hazards Summary		
	Alkaline.	
	Risk of serious damage to eyes.	
	Irritating to skin.	
Label Elements	*Pictogram* 	
Signal word(s)	*Danger*	
Hazard statement(s)		
	H315	• Causes skin irritation.
	H318	• Causes serious eye damage.
Precautionary statement(s)		
	P262	• Do not get in eyes, on skin, or on clothing.
	P280	• Wear protective gloves/protective clothing/eye protection/face protection.

2. HAZARDS IDENTIFICATION (CONTINUED)

Precautionary statement(s) (continued)		
	P303+P361+P353	• IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
	P305+P351+P338	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Other hazards	Dries to form glass film, which can easily cut skin. Spilled material is very slippery. Can etch glass if not promptly removed.	

3. COMPOSITION/INFORMATION ON INGREDIENTS

Regulation (EC) No. 1272/2008 (CLP)

Ingredient(s)	%W/W	CAS No.	EINECS No. / REACH Registration.	Hazard symbol(s) and hazard statement(s)
Silicic acid, sodium salt (1.6<MR<=2.6)	46.0	1344-09-8	215-687-4 01-2119448725-31	*H315 :* Skin Irrit. 2 *H318 :* Eye Dam. 2 *H335 :* STOT SE 3
Water	54.0	7732-18-5	231-791-2	

4. FIRST AID MEASURE

Description of first aid measures	
Eye contact	• Irrigate with eyewash solution or clean water, holding the eyelids apart, for at least 15 minutes. Obtain immediate medical attention.
Skin contact	• Wash affected skin with plenty of water. If symptoms develop, obtain medical attention.
Inhalation	• Remove patient from exposure, keep warm and at rest. Obtain medical attention.
Ingestion	• Do not induce vomiting. Wash out mouth with water and give 200-300 ml (half a pint) of water to drink. Obtain medical attention.
Most important symptoms and effects, both acute and delayed	• Alkaline. • Risk of serious damage to eyes. • Irritating to skin. • The toxicity of sodium silicate is dependent on the silica to alkali ratio and on the pH.
Indication of any immediate medical attention and special treatment needed	• Obtain immediate medical attention

5. FIRE FIGHTING MEASURES

Extinguishing media	
Suitable extinguishing media	• Compatible with all standard fire fighting techniques.
Unsuitable extinguishing media	• None known.
Special hazards arising from the substance or mixture	• Not applicable. Aqueous solution. Non-combustible.
Advice for firefighter	• None.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	• Wear suitable protective clothing. • Wear eye/face protection. • See Section: *Exposure controls*.
Environmental precautions	• Do not allow to enter drains, sewers or watercourses. • Advise Authorities if spillage has entered water course or sewer or has contaminated soil or vegetation.
Methods and material for containment and cleaning up	• Caution - spillages may be slippery. • Contain spillages with sand, earth or any suitable adsorbent material. Transfer to a container for disposal or recovery.
Reference to other sections	• See Also Section: *Exposure controls/Personal protection*.

7. HANDLING AND STORAGE

Precautions for safe handling	• Avoid contact with eyes, skin and clothing. • Avoid generation of mist. • Provide adequate ventilation. • Emergency shower and eye wash facilities should be readily available. • See Also Section: *Exposure controls/Personal protection.*
Conditions for safe storage, including any incompatibilities	• Storage temperature 0-95º C. Loading temperature 45-95º C. • Do not allow material to freeze. • Provide an adequate bund wall. • Unsuitable containers: Aluminium • See Also Section: *Stability and reactivity.*

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters	
Substance: Silicic acid, sodium salt	• No Occupational Exposure Limit assigned. • An exposure limit of 2 mg/m3 (15 min TWA) is recommended by analogy with sodium hydroxide (UK EH40).
Exposure controls	• Wear protective equipment to comply with good occupational hygiene practice. Do not eat, drink or smoke at the work place.
Appropriate engineering controls	• Engineering methods to prevent or control exposure are preferred. Methods include process or personnel enclosure, mechanical ventilation (dilution and local exhaust), and control of process conditions.
Personal protection	
Respiratory protection	• Respiratory protection not normally required. Advice on respiratory protective equipment is given in the HSE (Health and Safety Executive) publication HS(G)53.
Eye/face protection	• Chemical goggles (EN 166).
Skin protection	• Wear suitable protective clothing and gloves. Plastic or rubber gloves. For example EN374-3, level 6 breakthrough time (>480min). Wear suitable overalls. For example EN ISO 13982 (dust), EN 14605 (liquid splashes).
Environmental exposure controls	• The primary hazard of sodium silicate is the alkalinity. Avoid release to the environment

9. PHYSICAL & CHEMICAL PROPERTIES

Appearance	• Liquid. Almost colorless. White or translucent.
Odor	• Odorless. (musty)
Odor threshold (ppm)	• Not applicable.
pH (Value)	• Strongly alkaline. 11-13
Freezing Point (°C)	• Not applicable.
Melting Point (°C)	• Not applicable.
Boiling Point (°C)	• 100
Flash Point (°C) [Closed cup]	• Not applicable.
Evaporation rate	• Not applicable.
Flammability (solid, gas)	• Not applicable.
Explosive limit ranges	• Not applicable.
Vapor pressure (mm Hg)	• Not applicable.
Vapor density (Air=1)	• No data.
Density (g/ml)	• No data.
Solubility (Water)	• Soluble.
Solubility (Other)	• No data.
Partition coefficient	• No data.
Auto ignition point (°C)	• Not applicable.
Decomposition temperature (°C)	• Not applicable.
Viscosity (mPa. s)	• Not applicable.
Explosive properties	• Not applicable.
Oxidizing properties	• Not applicable.
Other information	• No data.

10. CHEMICAL STABILITY & REACTIVITY INFORMATION

Reactivity	• See Section: *Possibility of hazardous reactions.*
Chemical stability	• Stable.
Possibility of hazardous reactions	• When arc welding vessels containing aqueous solutions of this material, take care to control any explosion risk from hydrogen evolved by electrolysis. Aqueous solutions will react with aluminium, zinc, tin and their alloys evolving hydrogen gas which can form an explosive mixture with air. Can react violently if in contact with acids. Can react with sugar residues to form carbon monoxide.
Conditions to avoid	• See Section: *Possibility of hazardous reactions.*
Incompatible materials	• See Section: *Possibility of hazardous reactions.*
Hazardous decomposition product(s)	• None known

11. TOXICOLOGICAL INFORMATION

Information on toxicological effects acute toxicity	
Ingestion	• All symptoms of acute toxicity are due to high alkalinity. Material will cause irritation. Oral LD50 (rat) 3400 mg/kg bw.
Inhalation	• Mist is irritant to the respiratory tract. All symptoms of acute toxicity are due to high alkalinity. Inhalation LC50 (rat) >2.06 g/m^3.
Skin contact	• Material will cause irritation. Dermal LD50 (rat) >5000 mg/kg bw
Eye contact	• Material will cause severe irritation. Risk of serious damage to eyes.
Reference substance	• Silicic acid, potassium salt (Molar ratio K2O : SiO_2 = 1 : 3.9-4.0; 28-30%) • Species: rat • LD_{50}: > 2000 mg/kg • Source: data of supplier
Skin corrosion/irritation	• Irritating to skin.
Serious eye damage/ irritation	• Irritating to eyes. Risk of serious damage to eyes.
Sensitisation	• Not sensitising
Mutagenicity	• No evidence of genotoxicity. In vitro/in vivo negative.
Carcinogenicity	• No structural alerts. IARC, NTP, OSHA, ACGIH do not list this product as known or suspected carcinogen.
Reproductive toxicity	• No evidence of reproductive toxicity or developmental toxicity.
STOT - single exposure	• Not classified.
STOT - repeated exposure	• Not classified. NOAEL oral (rat) >159 mg/kg bw/d.
Aspiration hazard	• Not classified
Other information	

12. ECOLOGICAL INFORMATION

Toxicity	• Fish (Brachydanio rerio) LC50 (96 hour) 1108 mg/l Aquatic invertebrates: (Daphnia magna) EC50 (48 hour) 1700 mg/l
Persistence and degradability	• Inorganic. Soluble silicates, upon dilution, rapidly depolymerise into molecular species indistinguishable from natural dissolved silica.
Bioaccumulative potential	• Inorganic. The substance has no potential for bioaccumulation
Mobility in soil	• Not applicable.
Results of PBT and vPvB assessment	• Not classified as PBT or vPvB.
Other adverse effects	• The alkalinity of this material will have a local effect on ecosystems sensitive to changes in pH.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods	• Disposal should be in accordance with local, state or national legislation. Waste material is classified as a RCRA Hazardous waste if it exhibits the corrosive characteristic (pH greater than or equal to 12.5) Dispose of this material and its container to hazardous or special waste collection point. • Discharge of this product to sewage treatment works is dependent on local regulations with regard to pH controls.

14. TRANSPORT INFORMATION

UN number	• Not applicable.
Proper shipping name	• Not applicable.
Transport hazard class(es)	• Not applicable.
Packing group	• Not applicable.
Environmental hazards	• Not classified as a Marine Pollutant.
Special precautions for user	• Unsuitable containers: Aluminium.
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	• Not applicable.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/ legislation specific for the substance or mixture	• TSCA Inventory Status: Reported/Included. • AICS Inventory Status: Reported/Included. • DSL/NDSL Inventory Status: Reported/Included. • SARA TITLE III: This material is not a listed Toxic Chemical subject to the reporting requirements of SARA Title III §313 and 40 C.F.R. Part 372. • Hazard Categories under SARA Title III §§311/312: Acute. • German Water Hazard Classification VwVwS: Product ID number 1314, WGK class 1 (low hazard to water). 2,0,0

16. OTHER INFORMATION

Data referenced in this eSDS is from company-owned information and from data legitimately accessed by PQ Corporation through membership of Industry Consortia or other agreements. This includes data relating to toxicology, ecotoxicology, DNELs, PNECs and other information in this eSDS and its annex.
This SDS was last reviewed: 03/2023
The following sections contain revisions or new statements: No significant changes required upon last review.

GHS Classification	• Skin Irrit. 2 • Eye Dam. 1
Signal word(s)	• Danger
Hazard pictogram(s)	
Hazard statement(s)	• H315: Causes skin irritation. • H318: Causes serious eye damage.
Precautionary statement(s)	• P262: Do not get in eyes, on skin, or on clothing. • P280: Wear protective gloves/protective clothing/eye protection/face protection. • P303+P361+P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. • P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Glossary	
H315	• Causes skin irritation
H318	• Causes serious eye damage
H335	• May cause respiratory irritation
STOT SE 3	• Specific target organ toxicity — single exposure Category 3
R41	• Risk of serious damage to eyes
R38	• Irritating to skin
R37/38	• Irritating to respiratory system and skin.
DNEL	• Derived No Effect Level
PNEC	• Predicted No Effect Concentration
PBT	• Persistent, Bioaccumulative and Toxic
EC Classification	• According to Directive 67/548/EEC & Directive 1999/45/EC
Disclaimer	• The information provided in this Safety Data Sheet is correct to the best of our knowledge information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification, The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
Issue Date	• Not available.
This Data Sheet Contains	• Product and Company Identification: Synonyms changes from the previous Physical & Chemical Properties: Multiple Properties version in section(s): Transport Information: Material Transportation Information Regulatory Information.

Quad-Cure® Summer

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	• Quad-Cure® Summer
Trade Name	• Quad-Cure® SS
Company	• Quadex LLC, 564 W. 9320 S., Sandy, UT 84070
Company Contact	• Matthew Peterson
Company Phone	• 844-782-4832
Emergency	• Domestic Shipments and to Canada: 1-800-633-8253 • International Shipments: 1-801-629-0667

2. HAZARDS IDENTIFICATION

Hazard Statements	• Classification of the substance or mixture Classification according to Regulation (EC) No 1272/2008 (CLP)		
	H302	• Acute Tox. 4	• Harmful if swallowed.
	H315	• Skin Irrit. 2	• Causes skin irritation.
	H317	• Skin Sens. 1B	• May cause an allergic skin reaction.
	H319	• Eye Irrit. 2	• Causes serious eye irritation.
	H332	• Acute Tox. 4	• Harmful if inhaled.
	H334	• Resp. Sens. 1	• May cause allergy or asthma symptoms or breathing difficulties if inhaled.
	H335	• STOT SE 3	• May cause respiratory irritation.
	H351	• Carc. 2	• Suspected of causing cancer.
	H373	• STOT RE 2	• May cause damage to organs through prolonged or repeated exposure: respiratory system, inhalation.
	H412	• Aquatic Chronic 3	• Harmful to aquatic life with long-lasting effects.
Precautionary statements			
	P260	• Do not breathe dust/fume/gas/mist/vapors/spray.	
	P280	• Wear protective gloves/protective clothing/eye protection/face protection.	
	P284	• Wear respiratory protection.	
	P302+P352	• IF ON SKIN: Wash with plenty of soap and water.	
	P304+P340	• IF INHALED: Remove person to fresh air and keep comfortable for breathing.	
	P305+P351+P338	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.	
	P308+P313	• If exposed: Call a POISON CENTER or doctor/physician.	

2. HAZARDS IDENTIFICATION (CONTINUED)

Hazard determining component(s) for labelling	• Isocyanic acid, polymethylenepolyphenylene ester; Reaction products of phosphoryltrichloride and 2-methyloxirane
Other Hazards	• The mixture does not meet persistent (P) and bioaccumulation (B) criteria, but it meets the criteria for toxicity (T). The mixture is not PBT or vPvB.
Signal Word	• Danger
Pictogram	

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	EC No.	Cas No.	REACH Reg. No.	Content (%)	Content (%) Classification according to Regulation (EC) No 1272/2008 (CLP)	
					Hazard Categories[1]	H-phrase(s)[1]
Isocyanic acid, polymethylene-polyphenylene ester (Polymeric MDI)[2]	(polymer)	9016-87-9	(polymer)	> 60	Acute Tox. 4 Skin Irrit. 2 Eye Irrit. 2 Resp. Sens. 1 Skin Sens. 1B Carc. 2 STOT SE 3 STOT RE 2	*H332* *H315* *H319* *H334* *H317* *H351* *H335* *H373*
Reaction products of phosphoryl trichloride and 2-methyloxirane	807-935-0	1 244733-77-4	01-2119486772-26	> 10	Acute Tox. 4 Aquatic Chronic 3	*H302* *H412*
Hexamethylene-1,6-diisocyanate homopolymer	500-060-2	28182-81-2	01-2119488934-20	≤ 2	Acute Tox. 4 Skin Sens. 1 STOT SE 3	*H332* *H317* *H335*

[1] See Section 16 for the full text of the abbreviations declared above.

[2] Contains < 32% 4,4'-MDI (4,4'-methylenediphenyl diisocyanate) (CAS: 101-68-8).

4. FIRST AID MEASURES

Description of first aid measures	
General advice	• Soiled, fairly soaked clothing and shoes must be immediately removed.
In case of inhalation	• If inhaled, remove to fresh air. If not breathing, give artificial respiration. Get medical attention immediately.
In case of skin contact	• In the event of contact with the skin, at first wipe off with a paper towel/textile, then wash alternately with polyethylene glycol (if available) and water, or with plenty of warm water and soap for several minutes. Consult a doctor in the event of a skin reaction. Wash the less contaminated clothing before reuse. Clean shoes thoroughly before reuse.
In case of eye contact	• Hold the eyes open and rinse with water for a sufficiently long period of time (at least 10 minutes). Get medical attention immediately.
In case of ingestion	• DO NOT induce the patient to vomit, medical advice is required. Never give anything by mouth to an unconscious person. Provided the patient is conscious, wash out mouth with water.
Information to physician	• The product irritates the respiratory tract and may trigger sensitisation of the skin and respiratory tract. Treatment of acute irritation or bronchial constriction is primarily symptomatic. Following severe exposure the patient should be kept under medical review for at least 48 hours.
Most important symptoms and effects, both acute and delayed	• Headache, nausea, shortness of breath, sore throat, redness on the skin. Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation exposure may cause asthma.
Indication of any immediate medical attention and special treatment needed	• Depending on the degree of exposure, periodic medical examination is suggested.

5. FIRE FIGHTING MEASURES

Extinguishing media	
Suitable extinguishing media	• Foam, CO_2 or dry powder. Water spray may be used if no other available and then in copious quantities.
Unsuitable extinguishing media	• High volume water jet.
Special hazards arising from the substance or mixture	• Carbon dioxide, carbon monoxide, hydrogen cyanide, nitrogen oxides, isocyanate vapors. The substances/groups of substances mentioned can be released in case of fire.
Advice for firefighters	• Reaction between water and hot isocyanate may be vigorous (strongly exothermic). Prevent washings from entering watercourses. Keep fire-exposed containers cool by spraying with water.
Special protective equipment	• Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Safety boots, gloves, safety helmet and protective clothing should be worn.

5. FIRE FIGHTING MEASURES (CONTINUED)

Further information	• In the event of fire and/or explosion do not breathe fumes. Fire in vicinity poses risk of pressure build-up and rupture. Containers at risk from fire should be cooled with water and, if possible, removed from the danger area. Due to reaction with water producing CO_2 gas, a hazardous build-up of pressure could result if contaminated containers are re-sealed. Containers may burst if overheated. Do not allow contaminated extinguishing water to enter the soil, groundwater or surface waters.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	• Immediately contact emergency personnel. Evacuate the area. Keep upwind to avoid inhalation of vapors. Clean-up should only be performed by trained personnel. Keep unauthorized persons away.
For non-emergency personnel	• Remove not affected people. Inform the relevant emergency services and authorities.
For emergency responders	• People dealing with major spillages should wear full protective clothing including respiratory protection. Use suitable protective equipment.
Environmental precautions	• Do not allow contaminated extinguishing water to enter the soil, groundwater or surface waters. Avoid dispersal of spilt material and runoff and contact with drains and sewers.
Methods and material for containment and cleaning up	• Absorb spillages onto sand, earth or any suitable adsorbent material. Leave to react for at least 30 minutes. Do not absorb onto sawdust or other combustible materials. Contaminated adsorbent material shall be disposed according to Section 13. Wash the spillage area with water.
Reference to other sections	• Information regarding exposure controls/personal protection and disposal considerations can be found in Section 8 and 13.

7. HANDLING AND STORAGE

Precautions for safe handling	
Protective measures	• Provide sufficient air exchange and/or exhaust in work rooms. In all workplaces of the plant where high concentrations of isocyanate aerosols and/or vapours may be generated (e.g. during pressure release, mold venting or when cleaning mixing heads with an air blast), appropriately located exhaust ventilation must be provided in order to prevent occupational exposure limits from being exceeded. The air should be drawn away from the personnel handling the product. The efficiency of the ventilation system must be monitored regularly because of the possibility of blockage. Atmospheric concentrations should be minimised and kept as low as reasonably practicable below the occupational exposure limit.
Advice on general occupational hygiene	• No eating, drinking, smoking or tobacco use at the place of work. Contact with skin and eyes and inhalation of vapors must be avoided under all circumstances. Keep equipment clean. A basic essential in sampling, handling and storage is the prevention of contact with water. Keep stocks of decontaminant readily available.

7. HANDLING AND STORAGE (CONTINUED)

Conditions for safe storage, including any incompatibilities	• Store and transport in separate, airtight vessels, between +10 °C and +25 °C. The containers and vessels shall be protected from direct sunshine and other weather impacts. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate container to avoid environmental contamination.
Specific end use(s)	• For the relevant identified use(s) listed in Section 1 the advice mentioned in this section is to be observed.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION

Control parameters	
Occupational exposure limits in air	• A workplace exposure limit (WEL) of 0.02 mg/m³ for total isocyanates (as NCO) as an 8-hour TWA, and a short term WEL (15 min) of 0.07 mg/m³ have been assigned in the United Kingdom. A BMGV for isocyanates, based on the measurement of urinary diamines, has been set at 1 µmol diamine/mol creatinine.
DNEL/PNEC values	• The risk characterization of PMDI (CAS: 9016-87-9) is the following: **Workers:** Acute/short-term exposure – systemic effects (dermal): DNEL = 50 mg/kg bw/day Acute/short-term exposure – systemic effects (inhalation): DNEL = 0.1 mg/m³ Acute/short-term exposure – local effects (dermal): DNEL = 28.7 mg/cm² Acute/short-term exposure – local effects (inhalation): DNEL = 0.1 mg/m³ Long-term exposure – systemic effects (inhalation): DNEL = 0.05 mg/m³ Long-term exposure – systemic effects (dermal): Not applicable. Long-term exposure – local effects (inhalation): DNEL = 0.05 mg/m³ Long-term exposure – local effects (dermal): Not applicable. **PNEC sediment:** As PMDI is a reactant with water, access of water to PMDI and vice versa is strictly controlled. Furthermore, PMDI polymerizes in the presence of water and thus exposure of PMDI to sediment is highly likely to be negligible. Therefore, PNEC sediment cannot be derived for PMDI. **PNEC soil:** 1 mg/kg soil dw **PNEC oral:** There are no data on effects of oral PMDI to birds. Exposure to birds is not expected and data from experimental animals show PMDI to be of low oral toxicity.
Exposure controls	
Respiratory protection	• Respiratory protection in case of vapor/aerosol release. Combination filter for organic, inorganic, acid inorganic, and basic gases/vapors (e.g. EN 14387 Type ABEK) shall be used.
Hand protection	• Chemical resistant protective gloves (EN 374) **Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):** butyl rubber (butyl) – 0.7 mm coating thickness nitrile rubber (NBR) – 0.4 mm coating thickness chloroprene rubber (CR) – 0.5 mm coating thickness **Unsuitable materials:** polyvinyl chloride (PVC) – 0.7 mm coating thickness polyethylene (PE) laminate – ca. 0.1 mm coating thickness
Eye protection	• Safety glasses with side shields (frame goggles) (e.g. EN 166).

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION (CONTINUED)

Body protection	• Safety shoes (e.g. according to EN 20346) and closed workwear.
General safety and hygiene measures	• Do not breathe vapor/spray. With products freshly manufactured from isocyanates body protection and chemical resistant protective gloves is recommended. Wearing of closed workwear is required additionally to the personal protective equipment. No eating, drinking, smoking or tobacco use at the place of work. Take off immediately all contaminated clothing. Hands and/or face should be washed before breaks and at the end of the shift. After work the skin should be cleaned and skin-care agents applied.

9. PHYSICAL & CHEMICAL PROPERTIES

Information on basic physical and chemical properties	
Appearance	• liquid, dark-brown
Odor	• damp
Odor threshold	• not known
pH-value	• not applicable (reacts with water)
Melting point/freezing point	• *not defined (mixture)*
Boiling range	• > 200 °C
Flash point	• > 200 °C (MDI)
Evaporation rate	• not defined (mixture)
Flammability (solid, gaseous)	• not applicable (liquid)
Ignitable, explosive range	• not defined (mixture)
Vapor pressure	• < 0.00001 mbar (at 20 °C)
Vapor density	• not defined (mixture)
Density	• 1.24 ± 0.02 g/cm^3 (at 25 °C)
Solubility	• reacts with water with slow CO_2 appearance at the border area into non-soluble, high melting point or not melting polyurea
Partition coefficient n-octanol/water	• not applicable (mixture)
Self-ignition temperature	• 4,4'-MDI does not ignite till 601 °C
Decomposition temperature	• not applicable (mixture)
Viscosity	• 180–240 mPas (at 25 °C)
Explosive properties	• non-explosive
Oxidizing properties	• non-oxidizing
Other information	• No data

10. CHEMICAL STABILITY & REACTIVITY INFORMATION

Reactivity	• Reacts with water, acids, alcohols, amines, bases, and oxidants
Chemical stability	• The main removal mechanism of MDIs in the environment is hydrolysis. MDI reacts quickly with water to form predominantly solid, insoluble polyureas. Under conditions typical of many types of environmental contact, i.e. with relatively poor dispersion of the isocyanate, the interfacial reaction leads to the formation of a solid crust encasing partially reacted product. This crust restricts ingress of water and egress of amine, and hence slows and modifies hydrolysis.
Stability in organic solvents	• All MDI isomers and forms are highly unstable in dimethyl sulphoxide (DMSO) solvent, water content of the DMSO is increasing breakdown. MDI is more stable in EGDE (ethylene glycol dimethyl ether) solvent. (Read-across based on 4,4'-methylenediphenyl diisocyanate – CAS 101-68-8.)
Possibility of hazardous reactions	• Reaction is slow with cold or warm water (<50 °C), with hot water or steam the reaction is faster, producing carbon-dioxide causing pressure increase. Acids, alcohols, amines, bases, and oxidants may cause fire and explosion hazard.
Conditions to avoid	• High temperature, moisture, strong light.
Incompatible materials	• Substances to avoid: water, acids, alkalis, alcohols, amines.
Hazardous decomposition products	• No hazardous decomposition products if stored and handled as prescribed/indicated.

11. TOXICOLOGICAL INFORMATION

The mixture has not been tested. Information is related to 4,4'-Methylenediphenyl diisocyanate if no other is mentioned.

Information on hazard classes as defined in Regulation (EC) No 1272/2008	
Acute toxicity – Oral	• Harmful • Rats LD_{50} > 2000 mg/kg Method: 84/449/EEC (Read-across based on methylenediphenyl diisocyanate, isomer mixture CAS 26447-40-5) • Rats (female) LD_{50} = 632 mg/kg Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Acute toxicity – Inhalation (Aerosol)	• Harmful • Rats LD_{50} = 0.49 mg/l air (4 h) OECD Guideline 403 • Rats LD_{50} > 7 mg/l air (4 h), dusts/mists OECD 403 Acute Inhalation Toxicity/433 Acute Inhalation Toxicity: Fixed Concentration Procedure Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)

11. TOXICOLOGICAL INFORMATION (CONTINUED)

Acute toxicity – Dermal	• Not classified. Based on available data, the classification criteria are not met. • Rabbit LD_{50} 9400 mg/kg bw (24 h) OECD Guideline 402 • Rabbit LD_{50} > 2000 mg/kg Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Irritation/Corrosion	• Summarized the results of the studies together with human occupational case reports support the official classification. • Skin corrosion/Skin irritation: Irritating Irritating in rabbits. (4 h/14 days) OECD Guideline 404 • Eye damage/Irritation: Irritating in rabbits. (24 h/21 days) OECD Guideline 404 • (Read-across based on methylenediphenyl diisocyanate, isomer mixture – CAS 26447-40-5.) • Summarized the available animal data would not support classification of MDI as an eye irritant. But together with human occupational case reports in which symptoms of eye irritation were reported the legal classification as eye irritant should be applied.
Sensitization	• Animal data as well as studies in humans provide evidence of possible skin sensitization, and of respiratory sensitization due to MDI. Animal studies indicate that MDI is a strong allergen. Human case reports describe the occurrence of allergic contact dermatitis due to MDI exposure. • Skin sensitization: Mice Sensitizing OECD Guideline 429 (LLNA) • Respiratory sensitization: Rats (male) Sensitizing OECD Guideline 39
Germ cell mutagenicity	• Not classified. Based on available data, the classification criteria are not met.
Carcinogenicity	• Carc. 2 • Rats (inhalation, aerosol): NOAEC = 0.2 mg/m³ air (toxicity) (2 years; 6 h/day, 5 days/week) NOAEC = 1 mg/m³ air (carcinogenicity) (2 years; 6 h/day, 5 days/wk) LOAEC = 6 mg/m³ air (carcinogenicity) (2 years; 6 h/day, 5 days/wk) OECD Guideline 453
Reproductive toxicity	• Not classified. Based on available data, the classification criteria are not met • Effects on fertility: No fertility, nor multigeneration studies are available. • Rats (inhalation): NOAEL = 4 mg/m³ air (developmental toxicity) (10 days; 1/day, 6 h) NOAEL = 4 mg/m³ air (maternal toxicity) (10 days; 1/day, 6 h) OECD Guideline 414
STOT – single exposure	MDI is irritant to the respiratory tract.

11. TOXICOLOGICAL INFORMATION (CONTINUED)

STOT – repeated exposure	• Harmful • Rats (inhalation, aerosol): NOAEC = 0.2 mg/m³ air (2 years; 6 h/day, 5 days/week) LOAEC = 1.0 mg/m³ air (2 years; 6 h/day, 5 days/week) Target organs: respiratory – lung OECD Guideline 453
Aspiration hazard	• Not classified due to lack of data.
Toxicokinetics	• No data.
Genetic toxicity	• No data.
Information on other hazards	• No data available.

12. ECOLOGICAL INFORMATION

The mixture has not been tested. Information is related to 4,4'-methylenediphenyl diisocyanate if no other is mentioned.

Toxicity: Aquatic	
Short-term toxicity to fish	• Freshwater fish (Danio rerio): LC_{50} > 1000 mg/l (96 h) • OECD Guideline 203 • Danio rerio (zebrafish): LC_{50} = 56.2 mg/l (96 h) • Pimephales promelas (fathead minnow): LC_{50} = 51 mg/l (96 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Long-term toxicity to fish	• Data waiving. In accordance with column 2 of REACH Annex IX the long-term toxicity testing on fish shall be proposed if the chemical safety assessment according to Annex I indicates the need to investigate further the effects on aquatic organisms. The corresponding PEC/PNEC ratios would be less than 1. Taking into account the scientific and exposure arguments, it appears appropriate to waiver the long-term fish/plant/soil and sediment toxicity studies.
Short-term toxicity to aquatic invertebrates	• Freshwater invertebrates (Daphnia magna): EC_{50} > 1000 mg/l (24 h) • OECD Guideline 202 • Daphnia magna EC_{50} = 131 mg/l (48 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Long-term toxicity to aquatic invertebrates	• Daphnia magna NOEC >= 10 mg/l (21 days) • OECD Guideline 211 • Daphnia magna NOEC = 32 mg/l (21 days) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)

12. ECOLOGICAL INFORMATION (CONTINUED)

Toxicity to aquatic algae and cyanobacteria	• Freshwater algae (Desmodesmus subspicatus) EC_{50} > 1640 mg/l (72 h) • OECD Guideline 201 • Freshwater algae (Pseudokirchneriella subcapitata) EC_{50} = 82 mg/l (72 h) NOEC = 13 mg/l (72 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Toxicity to aquatic plants other than algae	• Data waiving. Not required by REACH annexes. However, a mesocosm study with PMDI exists in which the toxicity towards macrophytes (Potamogeton crispus and Zannichellia palustris) was assessed. No toxicity was observed at a loading of 1000 and 10000 mg/l, approximately 100% of the substance was found in the sediment as hardened material.
Toxicity to microorganisms	• Microorganisms (activated sludge) EC_{50} > 100 mg/l (3 h) • OECD Guideline 209 • Activated sludge EC_{50} = 784 mg/l (3 h): EC_{10} = 191 mg/l (3 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Toxicity to other aquatic organisms	• This information is not available, but not required under REACH.
Sediment toxicity	• Data waiving. Annex X states that this study need not be conducted if the chemical safety assessment does not indicate a need to further investigate the effects on sediment organisms.
Terrestrial toxicity	• Toxicity to soil macroorganisms except arthropods: • Eisenia fetida LC_{50} > 1000 mg/kg soil dw (14 days) • OECD Guideline 207
Toxicity to terrestrial arthropods	• Data waiving. Based on the chemical safety assessment and the risk assessment, there is no need to further investigate the terrestrial arthropods toxicity as there is no risk for the terrestrial environment as indicated by the PEC/PNEC ratio being < 0.239. Direct/indirect exposure to soil is unlikely.
Toxicity to terrestrial plants	• Avena sativa EC_{50} > 1000 mg/kg soil dw (14 days) • Lactuca sativa EC_{50} > 1000 mg/kg soil dw (14 days) • OECD Guideline 208
Toxicity to soil microorganisms	• Data waiving. Annex X states that this study need not be conducted if the chemical safety assessment does not indicate a need to further investigate the effects on sediment organisms.
Toxicity to other above-ground organisms	• Data waiving. Not required by REACH annexes.
Conclusion on classification	• Hazardous to the aquatic environment (acute): Based on available data, the classification criteria are not met. (EC/LC_{50} for fish, invertebrates and algae > 1000 mg/l) • Hazardous to the aquatic environment (chronic): Based on available data, the classification criteria are not met. (NOEC for algae > 1640 mg/L; NOEC for invertebrates > 10 mg/l)

12. ECOLOGICAL INFORMATION (CONTINUED)

Persistence and degradability	
Phototransformation in air	• Half-life (DT_{50}): 0.92 days
Hydrolysis	• MDI reacts with water to form predominantly inert polyurea. • Half-life (DT_{50}): ca. 20 h (at 25 °C) (Read-across based on oligomeric MDI – CAS 32055-14-4)
Phototransformation in water and soil	• No data is available.
Biodegradation in water	• Under test conditions no biodegradation was observed. (28 days) • OECD Guideline 302C
Biodegradation in water and sediment	• Data waiving. In accordance with Annex XI, simulation biodegradation tests are technically not feasible as the test substance reacts quickly with water. The corresponding PEC/PNEC ratios would be less than 1. Taking into account the scientific and exposure arguments, it appears appropriate to waiver the long-term fish/plant/soil and sediment toxicity studies.
Biodegradation in soil	• Data waiving. See at Biodegradation in water and sediment.
Bioaccumulative potential	
Bioaccumulation–aquatic/sediment	• Due to the high reactivity of the substances of the MDI category with water, bioaccumulation tests can in principle not be performed with these substances. However, one bioaccumulation test with 4,4'-MDI and a mesocosm study with PMDI with an indication of bioaccumulation potential have been performed. As no analytical measurements were done, it cannot be determined if the values are truly related to MDI. However, based on the available information and the reactivity of MDI substances of the category approach, no new bioaccumulation study is deemed necessary. BCF (Cyprinus carpio): 200 (28 days) Method: OECD Guideline 305E
Terrestrial bioaccumulation	• No data is available on terrestrial bioaccumulation, but it is not required under REACH.
Mobility in soil	
Adsorption/desorption	• Data waiving. According to Annex VIII the study need not be done if the test substance degrades rapidly. The corresponding PEC/PNEC ratios would be less than 1. Taking into account the scientific and exposure arguments, it appears appropriate to waiver the long-term fish/plant/soil and sediment toxicity studies.
Volatilization	• The Henry's Law Constant, estimated from the measured vapor pressure and the calculated water solubility, is 2.263 x 10^{-7} atm-m^3/mole. Hence, volatilization is unlikely to be a significant removal mechanism for MDI substances of the category approach.
Results of PBT and vPvB assessment	
Conclusion for the P criterion	• The results from the biodegradation test indicate that PMDI is not biodegradable. Based on experimental hydrolysis and indirect photolysis half-lives, PMDI is not considered to be persistent in the environment and is identified as not P. Based on the justification in the category approach, it is assumed that all MDI analogues included in the category are not P.

12. ECOLOGICAL INFORMATION (CONTINUED)

Conclusion for the B criterion	• Although MDI has a high measured log Pow value (4.51), a full bioaccumulation test with 4,4′-MDI indicated that the bioaccumulation potential is low. Due to the fast hydrolysis, exposure of the environment to the substance is unlikely or very low, there is no potential for significant bioaccumulation possible. Hence, 4,4′-MDI does not fulfil the requirements for the B criterion and is not identified as B. Based on the justification in the category approach, it is assumed that all MDI analogues included in the category are not B.
Conclusion for the T criterion	• The concentrations tested were far above the water solubility of the MDI substances (7.5 mg/l). However, the water solubility limit of MDI is far above the criteria for T and on the basis of aquatic toxicity tests MDI is identified as not T. However, according to Annex I of 67/548/EEC MDI is classified as Xn, R48, which automatically triggers a T. Based on this classification MDI is identified as T.
Endocrine disrupting properties	• No data is available.
Other adverse effects	• It is not expected that substance has an effect on global warming, ozone depletion in the stratosphere or ozone formation in the troposphere.
Secondary poisoning	• Based on the available information, there is no indication of a bioaccumulation potential and, hence, secondary poisoning is not considered relevant. • Exposure to birds is not expected and data from experimental animals show MDI to be of low oral toxicity.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods	• The products becoming useless and the contaminated containers not suitable for product storage must be handled as hazardous waste in accordance with EU and regional hazardous waste regulations. • European Waste Catalogue code: 08 05 01
Product/Packaging disposal	• Contaminated packaging should be emptied as far as possible; than it can be passed on for recycling after being thoroughly cleaned. Wrappings cleaned from contamination with suitable cleaning process (e.g. by steaming, treating with washing fluid, etc.) must be considered as non-hazardous waste.
Waste treatment options	• Incinerate in suitable incineration plant, observing local authority regulations.

14. TRANSPORT INFORMATION

Land transport (ADR/RID/GGVSE)
Sea transport (IMDG Code/GGVSee)
Air transport (ICAO-IATA/DGR)

UN number or ID number	• Not dangerous goods
UN proper shipping name	• Not dangerous goods
Transport hazard class(es)	• Not dangerous goods
Packing group	• Not dangerous goods
Environmental hazards	• Marine pollutant: no
Special precautions for user	• EmS number: Not dangerous goods
Maritime transport in bulk according to IMO instruments	• Not relevant

15. REGULATORY INFORMATION

Safety, health and environmental regulations/ legislation specific for the substance or mixture	• Information regarding relevant EU safety, health and environmental provisions • ISOPA, the European Diisocyanate & Polyol Producers Association has elaborated a Guideline document for the safe treatment of MDI containing products. The Guidelines have been built into this data sheet.
Chemical safety assessment	• In accordance with REACH chemical safety assessment (CSA) has not been carried out for the product. However, the results from the CSA for 4,4′-MDI were transposed into this SDS.

16. OTHER INFORMATION

The information given corresponds with our actual knowledge and experience. This information is meant to describe our product in view of possible safety requirements. Classification of the mixture is based on the classification of components.

Indication of changes	• This is the modified version of the first edition of the datasheet.
Abbreviations and acronyms	
BCF	Bioconcentration factor
BMGV	Biological monitoring guidance value
bw	bodyweight
CAS No.	Chemical Abstracts Service number
CLP	Regulation on classification, labelling and packaging
DNEL	Derived no effect level
dw	dry weight
EC No.	EINECS and ELINCS number
EC_{10}	Concentration at which 10% of the organisms tested exhibit a statistically significant effect of the chemical
EC_{50}	Half maximal effective concentration
EEC	European Economic Community

16. OTHER INFORMATION (CONTINUED)

EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of Notified Chemical Substances
EU	European Union
LC_{50}	Lethal concentration, 50%
LD_{50}	Median lethal dose
LLNA	Local lymph node assay
LOAEC	Lowest Observed Adverse Effect Concentration
NOAEC	No Observed Adverse Effect Concentration
NOAEL	No Observed Adverse Effect Level
NOEC	No Observed Effect Concentration
OECD	Organization for Economic Cooperation and Development
PBT	Persistent, Bioaccumulative and Toxic
PEC	Predicted Environmental Concentration
PMDI	Polymeric MDI (CAS: 9016-87-9)
PNEC	Predicted No Effect Concentration
REACH	The Registration, Evaluation, Authorization and Restriction of Chemicals
SDS	Safety Data Sheet
TWA	Time-weighted average
vPvB	Very Persistent and Very Bioaccumulative
WEL	Workplace exposure limit
Key literature references and sources for data	• Safety data sheets, received from the raw materials suppliers.
Full text of abbreviations	
H-Phrases	
H302	Harmful if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure: respiratory system, inhalation.
H412	Harmful to aquatic life with long-lasting effects.
P-Phrases	
P260	Do not breathe dust/fume/gas/mist/vapors/spray.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P284	Wear respiratory protection.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.

16. OTHER INFORMATION (CONTINUED)

P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P308+P313	If exposed: Call a POISON CENTER or doctor/physician.
Hazard Classes	
Acute Tox.	Acute toxicity
Aquatic Chronic	Hazardous to the aquatic environment, chronic
Carc.	Carcinogenicity
Eye Irrit.	Serious eye irritation
Resp. Sens.	Respiratory sensitization
Skin Irrit.	Skin irritation
Skin Sens.	Skin sensitization
STOT RE	Specific target organ toxicity – repeated exposure
STOT SE	Specific target organ toxicity – single exposure
Disclaimer	• The information provided in this Safety Data Sheet is correct to the best of our knowledge information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification, The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
Issue Date	• Not available.
This Data Sheet Contains	• Product and Company Identification: Synonyms changes from the previous Physical & Chemical Properties: Multiple Properties version in section(s): Transport Information: Material Transportation Information Regulatory Information.

Quad-Cure® Winter

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	• Quad-Cure® Winter
Trade Name	• Quad-Cure® SM
Company	• Quadex LLC, 564 W. 9320 S., Sandy, UT 84070
Company Contact	• Matthew Peterson
Company Phone	• 844-782-4832
Emergency	• Domestic Shipments and to Canada: 1-800-633-8253 • International Shipments: 1-801-629-0667

2. HAZARDS IDENTIFICATION

Hazard Statements	• Classification of the substance or mixture Classification according to Regulation (EC) No 1272/2008 (CLP)		
	H302	• Acute Tox. 4	• Harmful if swallowed.
	H315	• Skin Irrit. 2	• Causes skin irritation.
	H317	• Skin Sens. 1B	• May cause an allergic skin reaction.
	H319	• Eye Irrit. 2	• Causes serious eye irritation.
	H332	• Acute Tox. 4	• Harmful if inhaled.
	H334	• Resp. Sens. 1	• May cause allergy or asthma symptoms or breathing difficulties if inhaled.
	H335	• STOT SE 3	• May cause respiratory irritation.
	H351	• Carc. 2	• Suspected of causing cancer.
	H373	• STOT RE 2	• May cause damage to organs through prolonged or repeated exposure: respiratory system, inhalation.
	H412	• Aquatic Chronic 3	• Harmful to aquatic life with long-lasting effects
Precautionary statements			
	P260	• Do not breathe dust/fume/gas/mist/vapors/spray.	
	P280	• Wear protective gloves/protective clothing/eye protection/face protection.	
	P284	• Wear respiratory protection.	
	P302+P352	• IF ON SKIN: Wash with plenty of soap and water.	
	P304+P340	• IF INHALED: Remove person to fresh air and keep comfortable for breathing.	
	P305+P351+P338	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.	
	P308+P313	• If exposed: Call a POISON CENTER or doctor/physician.	

2. HAZARDS IDENTIFICATION (CONTINUED)

Hazard determining component(s) for labelling	• Isocyanic acid, polymethylenepolyphenylene ester; Reaction products of phosphoryltrichloride and 2-methyloxirane
Other Hazards	• The mixture does not meet persistent (P) and bioaccumulation (B) criteria, but it meets the criteria for toxicity (T). The mixture is not PBT or vPvB.
Signal Word	• Danger
Pictogram	

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	EC No.	Cas No.	REACH Reg. No.	Content (%)	Content (%) Classification according to Regulation (EC) No 1272/2008 (CLP)	
					Hazard Categories[1]	H-phrase(s)[1]
Isocyanic acid, polymethylene-polyphenylene ester (Polymeric MDI)[2]	(polymer)	9016-87-9	(polymer)	> 60	Acute Tox. 4 Skin Irrit. 2 Eye Irrit. 2 Resp. Sens. 1 Skin Sens. 1B Carc. 2 STOT SE 3 STOT RE 2	*H332* *H315* *H319* *H334* *H317* *H351* *H335* *H373*
Reaction products of phosphoryl trichloride and 2-methyloxirane	807-935-0	1 244733-77-4	01-2119486772-26	> 10	Acute Tox. 4 Aquatic Chronic 3	*H302* *H412*
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with 2,4'-diisocyanatodiphenyl methane,2,2'-methylenediphenyl diisocyanate and α-hydro-ω-hydroxy-poly[oxy(methyl-1,2-ethanediyl)][3]	951-860-7	158885-25-7	(polymer)	≤ 5	Acute Tox. 4 Skin Irrit. 2 Eye Irrit. 2 Resp. Sens. 1 Skin Sens. 1B Carc. 2 STOT SE 3 STOT RE 2	*H332* *H315* *H319* *H334* *H317* *H351* *H335* *H373*

[1] See Section 16 for the full text of the abbreviations declared above.

[2] Contains < 35% 4,4'-MDI (4,4'-methylenediphenyl diisocyanate) (CAS: 101-68-8)

[3] Contains ca. 10% 4,4'-MDI (4,4'-methylenediphenyl diisocyanate) (CAS: 101-68-8)

4. FIRST AID MEASURES

Description of first aid measures	
General advice	• Soiled, fairly soaked clothing and shoes must be immediately removed..
In case of inhalation	• If inhaled, remove to fresh air. If not breathing, give artificial respiration. Get medical attention immediately.
In case of skin contact	• In the event of contact with the skin, at first wipe off with a paper towel/textile, then wash alternately with polyethylene glycol (if available) and water, or with plenty of warm water and soap for several minutes. Consult a doctor in the event of a skin reaction. Wash the less contaminated clothing before reuse. Clean shoes thoroughly before reuse.
In case of eye contact	• Hold the eyes open and rinse with water for a sufficiently long period of time (at least 10 minutes). Get medical attention immediately.
In case of ingestion	• DO NOT induce the patient to vomit, medical advice is required. Never give anything by mouth to an unconscious person. Provided the patient is conscious, wash out mouth with water.
Information to physician	• The product irritates the respiratory tract and may trigger sensitization of the skin and respiratory tract. Treatment of acute irritation or bronchial constriction is primarily symptomatic. Following severe exposure the patient should be kept under medical review for at least 48 hours
Most important symptoms and effects, both acute and delayed	• Headache, nausea, shortness of breath, sore throat, redness on the skin. Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation exposure may cause asthma.
Indication of any immediate medical attention and special treatment needed	• Depending on the degree of exposure, periodic medical examination is suggested.

5. FIRE FIGHTING MEASURES

Extinguishing media	
Suitable extinguishing media	• Foam, CO_2 or dry powder. Water spray may be used if no other available and then in copious quantities.
Unsuitable extinguishing media	• High volume water jet.
Special hazards arising from the substance or mixture	• Carbon dioxide, carbon monoxide, hydrogen cyanide, nitrogen oxides, isocyanate vapors. The substances/groups of substances mentioned can be released in case of fire.
Advice for firefighters	• Reaction between water and hot isocyanate may be vigorous (strongly exothermic). Prevent washings from entering watercourses. Keep fire-exposed containers cool by spraying with water.
Special protective equipment	• Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Safety boots, gloves, safety helmet and protective clothing should be worn.

5. FIRE FIGHTING MEASURES (CONTINUED)

Further information	• In the event of fire and/or explosion do not breathe fumes. Fire in vicinity poses risk of pressure build-up and rupture. Containers at risk from fire should be cooled with water and, if possible, removed from the danger area. Due to reaction with water producing CO_2 gas, a hazardous build-up of pressure could result if contaminated containers are re-sealed. Containers may burst if overheated. Do not allow contaminated extinguishing water to enter the soil, groundwater or surface waters.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	• Immediately contact emergency personnel. Evacuate the area. Keep upwind to avoid inhalation of vapors. Clean-up should only be performed by trained personnel. Keep unauthorized persons away.
For non-emergency personnel	• Remove not affected people. Inform the relevant emergency services and authorities.
For emergency responders	• People dealing with major spillages should wear full protective clothing including respiratory protection. Use suitable protective equipment.
Environmental precautions	• Do not allow contaminated extinguishing water to enter the soil, groundwater or surface waters. Avoid dispersal of spilt material and runoff and contact with drains and sewers.
Methods and material for containment and cleaning up	• Absorb spillages onto sand, earth or any suitable adsorbent material. Leave to react for at least 30 minutes. Do not absorb onto sawdust or other combustible materials. Contaminated adsorbent material shall be disposed according to Section 13. Wash the spillage area with water.
Reference to other sections	• Information regarding exposure controls/personal protection and disposal considerations can be found in Section 8 and 13.

7. HANDLING AND STORAGE

Precautions for safe handling	
Protective measures	• Provide sufficient air exchange and/or exhaust in work rooms. In all workplaces of the plant where high concentrations of isocyanate aerosols and/or vapors may be generated (e.g. during pressure release, mold venting or when cleaning mixing heads with an air blast), appropriately located exhaust ventilation must be provided in order to prevent occupational exposure limits from being exceeded. The air should be drawn away from the personnel handling the product. The efficiency of the ventilation system must be monitored regularly because of the possibility of blockage. Atmospheric concentrations should be minimized and kept as low as reasonably practicable below the occupational exposure limit.
Advice on general occupational hygiene	• No eating, drinking, smoking or tobacco use at the place of work. Contact with skin and eyes and inhalation of vapors must be avoided under all circumstances. Keep equipment clean. A basic essential in sampling, handling and storage is the prevention of contact with water. Keep stocks of decontaminant readily available.

7. HANDLING AND STORAGE (CONTINUED)

Conditions for safe storage, including any incompatibilities	• Store and transport in separate, airtight vessels, between +10 °C and +25 °C. The containers and vessels shall be protected from direct sunshine and other weather impacts. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate container to avoid environmental contamination.
Specific end use(s)	• For the relevant identified use(s) listed in Section 1 the advice mentioned in this section is to be observed.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION

Control parameters	
Occupational exposure limits in air	• A workplace exposure limit (WEL) of 0.02 mg/m³ for total isocyanates (as NCO) as an 8-hour TWA, and a short term WEL (15 min) of 0.07 mg/m³ have been assigned in the United Kingdom. A BMGV for isocyanates, based on the measurement of urinary diamines, has been set at 1 µmol diamine/mol creatinine.
DNEL/PNEC-values	• The risk characterization of PMDI (CAS: 9016-87-9) is the following: **Workers:** Acute/short-term exposure – systemic effects (dermal): DNEL = 50 mg/kg bw/day Acute/short-term exposure – systemic effects (inhalation): DNEL = 0.1 mg/m³ Acute/short-term exposure – local effects (dermal): DNEL = 28.7 mg/cm² Acute/short-term exposure – local effects (inhalation): DNEL = 0.1 mg/m³ Long-term exposure – systemic effects (inhalation): DNEL = 0.05 mg/m³ Long-term exposure – systemic effects (dermal): Not applicable. Long-term exposure – local effects (inhalation): DNEL = 0.05 mg/m³ Long-term exposure – local effects (dermal): Not applicable. **PNEC sediment:** As PMDI is a reactant with water, access of water to PMDI and vice versa is strictly controlled. Furthermore, PMDI polymerizes in the presence of water and thus exposure of PMDI to sediment is highly likely to be negligible. Therefore, PNEC sediment cannot be derived for PMDI. **PNEC soil:** 1 mg/kg soil dw **PNEC oral:** There are no data on effects of oral PMDI to birds. Exposure to birds is not expected and data from experimental animals show PMDI to be of low oral toxicity.
Exposure controls	
Respiratory protection	• Respiratory protection in case of vapor/aerosol release. Combination filter for organic, inorganic, acid inorganic, and basic gases/vapors (e.g. EN 14387 Type ABEK) shall be used.
Hand protection	• Chemical resistant protective gloves (EN 374) **Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):** butyl rubber (butyl) – 0.7 mm coating thickness nitrile rubber (NBR) – 0.4 mm coating thickness chloroprene rubber (CR) – 0.5 mm coating thickness **Unsuitable materials:** polyvinyl chloride (PVC) – 0.7 mm coating thickness polyethylene (PE) laminate – ca. 0.1 mm coating thickness
Eye protection	• Safety glasses with side shields (frame goggles) (e.g. EN 166).

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION (CONTINUED)

Body protection	• Safety shoes (e.g. according to EN 20346) and closed workwear
General safety and hygiene measures	• Do not breathe vapor/spray. With products freshly manufactured from isocyanates body protection and chemical resistant protective gloves is recommended. Wearing of closed workwear is required additionally to the personal protective equipment. No eating, drinking, smoking or tobacco use at the place of work. Take off immediately all contaminated clothing. Hands and/or face should be washed before breaks and at the end of the shift. After work the skin should be cleaned and skin-care agents applied.

9. PHYSICAL & CHEMICAL PROPERTIES

Information on basic physical and chemical properties	
Appearance	• liquid, dark-brown
Odor	• damp
Odor threshold	• not known
pH-value	• not applicable (reacts with water)
Melting point/freezing point	• *not defined (mixture)*
Boiling range	• 200 °C
Flash point	• > 200 °C (MDI)
Evaporation rate	• not defined (mixture)
Flammability (solid, gaseous)	• not applicable (liquid)
Ignitable, explosive range	• not defined (mixture)
Vapor pressure	• < 0.00001 mbar (at 20 °C)
Vapor density	• not defined (mixture)
Density	• 1.24 ± 0.02 g/cm^3 (at 25 °C)
Solubility	• reacts with water with slow CO_2 appearance at the border area into non-soluble, high melting point or not melting polyurea
Partition coefficient n-octanol/water	• not applicable (mixture)
Self-ignition temperature	• 4,4'-MDI does not ignite till 601 °C
Decomposition temperature	• not applicable (mixture)
Viscosity	• 190–250 mPas (at 25 °C)
Explosive properties	• non-explosive
Oxidizing properties	• non-oxidizing
Other information	• No data

10. CHEMICAL STABILITY & REACTIVITY INFORMATION

Reactivity	• Reacts with water, acids, alcohols, amines, bases, and oxidants
Chemical stability	• The main removal mechanism of MDIs in the environment is hydrolysis. MDI reacts quickly with water to form predominantly solid, insoluble polyureas. Under conditions typical of many types of environmental contact, i.e. with relatively poor dispersion of the isocyanate, the interfacial reaction leads to the formation of a solid crust encasing partially reacted product. This crust restricts ingress of water and egress of amine, and hence slows and modifies hydrolysis.
Stability in organic solvents	• All MDI isomers and forms are highly unstable in dimethyl sulphoxide (DMSO) solvent, water content of the DMSO is increasing breakdown. MDI is more stable in EGDE (ethylene glycol dimethyl ether) solvent. (Read-across based on 4,4'-methylenediphenyl diisocyanate – CAS 101-68-8.)
Possibility of hazardous reactions	• Reaction is slow with cold or warm water (<50 °C), with hot water or steam the reaction is faster, producing carbon-dioxide causing pressure increase. Acids, alcohols, amines, bases, and oxidants may cause fire and explosion hazard.
Conditions to avoid	• High temperature, moisture, strong light.
Incompatible materials	• Substances to avoid: water, acids, alkalis, alcohols, amines.
Hazardous decomposition products	• No hazardous decomposition products if stored and handled as prescribed/indicated.

11. TOXICOLOGICAL INFORMATION

The mixture has not been tested. Information is related to 4,4'-Methylenediphenyl diisocyanate if no other is mentioned.

Information on hazard classes as defined in Regulation (EC) No 1272/2008	
Acute toxicity – Oral	• Harmful • Rats LD_{50} > 2000 mg/kg Method: 84/449/EEC (Read-across based on methylenediphenyl diisocyanate, isomer mixture CAS 26447-40-5) • Rats (female) LD_{50} = 632 mg/kg Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Acute toxicity – Inhalation (Aerosol)	• Harmful • Rats LD_{50} = 0.49 mg/l air (4 h) OECD Guideline 403 • Rats LD_{50} > 7 mg/l air (4 h), dusts/mists OECD 403 Acute Inhalation Toxicity/433 Acute Inhalation Toxicity: Fixed Concentration Procedure Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)

11. TOXICOLOGICAL INFORMATION (CONTINUED)

Acute toxicity – Dermal	• Not classified. Based on available data, the classification criteria are not met. • Rabbit LD_{50} 9400 mg/kg bw (24 h) OECD Guideline 402 • Rabbit LD_{50} > 2000 mg/kg Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Irritation/Corrosion	• Summarized the results of the studies together with human occupational case reports support the official classification. • Skin corrosion/Skin irritation: Irritating Irritating in rabbits. (4 h/14 days) OECD Guideline 404 • Eye damage/Irritation: Irritating in rabbits. (24 h/21 days) OECD Guideline 404 • (Read-across based on methylenediphenyl diisocyanate, isomer mixture – CAS 26447-40-5.) • Summarized the available animal data would not support classification of MDI as an eye irritant. But together with human occupational case reports in which symptoms of eye irritation were reported the legal classification as eye irritant should be applied.
Sensitization	• Animal data as well as studies in humans provide evidence of possible skin sensitization, and of respiratory sensitization due to MDI. Animal studies indicate that MDI is a strong allergen. Human case reports describe the occurrence of allergic contact dermatitis due to MDI exposure. • Skin sensitization: Mice Sensitizing OECD Guideline 429 (LLNA) • Respiratory sensitization: Rats (male) Sensitizing OECD Guideline 39
Germ cell mutagenicity	• Not classified. Based on available data, the classification criteria are not met.
Carcinogenicity	• Carc. 2 • Rats (inhalation, aerosol): NOAEC = 0.2 mg/m³ air (toxicity) (2 years; 6 h/day, 5 days/week) NOAEC = 1 mg/m³ air (carcinogenicity) (2 years; 6 h/day, 5 days/wk) LOAEC = 6 mg/m³ air (carcinogenicity) (2 years; 6 h/day, 5 days/wk) OECD Guideline 453
Reproductive toxicity	• Not classified. Based on available data, the classification criteria are not met • Effects on fertility: No fertility, nor multigeneration studies are available. • Rats (inhalation): NOAEL = 4 mg/m³ air (developmental toxicity) (10 days; 1/day, 6 h) NOAEL = 4 mg/m³ air (maternal toxicity) (10 days; 1/day, 6 h) OECD Guideline 414
STOT – single exposure	MDI is irritant to the respiratory tract.

11. TOXICOLOGICAL INFORMATION (CONTINUED)

STOT – repeated exposure	• Harmful • Rats (inhalation, aerosol): NOAEC = 0.2 mg/m³ air (2 years; 6 h/day, 5 days/week) LOAEC = 1.0 mg/m³ air (2 years; 6 h/day, 5 days/week) Target organs: respiratory – lung OECD Guideline 453
Aspiration hazard	• Not classified due to lack of data.
Toxicokinetics	• No data.
Genetic toxicity	• No data.
Information on other hazards	• No data available.

12. ECOLOGICAL INFORMATION

The mixture has not been tested. Information is related to 4,4'-methylenediphenyl diisocyanate if no other is mentioned.

Toxicity: Aquatic	
Short-term toxicity to fish	• Freshwater fish (Danio rerio): LC_{50} > 1000 mg/l (96 h) • OECD Guideline 203 • Danio rerio (zebrafish): LC_{50} = 56.2 mg/l (96 h) • Pimephales promelas (fathead minnow): LC_{50} = 51 mg/l (96 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Long-term toxicity to fish	• Data waiving. In accordance with column 2 of REACH Annex IX the long-term toxicity testing on fish shall be proposed if the chemical safety assessment according to Annex I indicates the need to investigate further the effects on aquatic organisms. The corresponding PEC/PNEC ratios would be less than 1. Taking into account the scientific and exposure arguments, it appears appropriate to waiver the long-term fish/plant/soil and sediment toxicity studies.
Short-term toxicity to aquatic invertebrates	• Freshwater invertebrates (Daphnia magna): EC_{50} > 1000 mg/l (24 h) • OECD Guideline 202 • Daphnia magna EC_{50} = 131 mg/l (48 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Long-term toxicity to aquatic invertebrates	• Daphnia magna NOEC >= 10 mg/l (21 days) • OECD Guideline 211 • Daphnia magna NOEC = 32 mg/l (21 days) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)

12. ECOLOGICAL INFORMATION (CONTINUED)

Toxicity to aquatic algae and cyanobacteria	• Freshwater algae (Desmodesmus subspicatus) EC_{50} > 1640 mg/l (72 h) • OECD Guideline 201 • Freshwater algae (Pseudokirchneriella subcapitata) EC_{50} = 82 mg/l (72 h) NOEC = 13 mg/l (72 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Toxicity to aquatic plants other than algae	• Data waiving. Not required by REACH annexes. However, a mesocosm study with PMDI exists in which the toxicity towards macrophytes (Potamogeton crispus and Zannichellia palustris) was assessed. No toxicity was observed at a loading of 1000 and 10000 mg/l, approximately 100% of the substance was found in the sediment as hardened material.
Toxicity to microorganisms	• Microorganisms (activated sludge) EC_{50} > 100 mg/l (3 h) • OECD Guideline 209 • Activated sludge EC_{50} = 784 mg/l (3 h): EC_{10} = 191 mg/l (3 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Toxicity to other aquatic organisms	• This information is not available, but not required under REACH.
Sediment toxicity	• Data waiving. Annex X states that this study need not be conducted if the chemical safety assessment does not indicate a need to further investigate the effects on sediment organisms.
Terrestrial toxicity	• Toxicity to soil macroorganisms except arthropods: • Eisenia fetida LC_{50} > 1000 mg/kg soil dw (14 days) • OECD Guideline 207
Toxicity to terrestrial arthropods	• Data waiving. Based on the chemical safety assessment and the risk assessment, there is no need to further investigate the terrestrial arthropods toxicity as there is no risk for the terrestrial environment as indicated by the PEC/PNEC ratio being < 0.239. Direct/indirect exposure to soil is unlikely.
Toxicity to terrestrial plants	• Avena sativa EC_{50} > 1000 mg/kg soil dw (14 days) • Lactuca sativa EC_{50} > 1000 mg/kg soil dw (14 days) • OECD Guideline 208
Toxicity to soil microorganisms	• Data waiving. Annex X states that this study need not be conducted if the chemical safety assessment does not indicate a need to further investigate the effects on sediment organisms.
Toxicity to other above-ground organisms	• Data waiving. Not required by REACH annexes.
Conclusion on classification	• Hazardous to the aquatic environment (acute): Based on available data, the classification criteria are not met. (EC/LC_{50} for fish, invertebrates and algae > 1000 mg/l) • Hazardous to the aquatic environment (chronic): Based on available data, the classification criteria are not met. (NOEC for algae > 1640 mg/L; NOEC for invertebrates > 10 mg/l)

12. ECOLOGICAL INFORMATION (CONTINUED)

Persistence and degradability	
Phototransformation in air	• Half-life (DT_{50}): 0.92 days
Hydrolysis	• MDI reacts with water to form predominantly inert polyurea. • Half-life (DT_{50}): ca. 20 h (at 25 °C) (Read-across based on oligomeric MDI – CAS 32055-14-4)
Phototransformation in water and soil	• No data is available.
Biodegradation in water	• Under test conditions no biodegradation was observed. (28 days) • OECD Guideline 302C
Biodegradation in water and sediment	• Data waiving. In accordance with Annex XI, simulation biodegradation tests are technically not feasible as the test substance reacts quickly with water. The corresponding PEC/PNEC ratios would be less than 1. Taking into account the scientific and exposure arguments, it appears appropriate to waiver the long-term fish/plant/soil and sediment toxicity studies.
Biodegradation in soil	• Data waiving. See at Biodegradation in water and sediment.
Bioaccumulative potential	
Bioaccumulation–aquatic/sediment	• Due to the high reactivity of the substances of the MDI category with water, bioaccumulation tests can in principle not be performed with these substances. However, one bioaccumulation test with 4,4'-MDI and a mesocosm study with PMDI with an indication of bioaccumulation potential have been performed. As no analytical measurements were done, it cannot be determined if the values are truly related to MDI. However, based on the available information and the reactivity of MDI substances of the category approach, no new bioaccumulation study is deemed necessary. BCF (Cyprinus carpio): 200 (28 days) Method: OECD Guideline 305E
Terrestrial bioaccumulation	• No data is available on terrestrial bioaccumulation, but it is not required under REACH.
Mobility in soil	
Adsorption/desorption	• Data waiving. According to Annex VIII the study need not be done if the test substance degrades rapidly. The corresponding PEC/PNEC ratios would be less than 1. Taking into account the scientific and exposure arguments, it appears appropriate to waiver the long-term fish/plant/soil and sediment toxicity studies.
Volatilization	• The Henry's Law Constant, estimated from the measured vapor pressure and the calculated water solubility, is 2.263 x 10^{-7} atm-m^3/mole. Hence, volatilization is unlikely to be a significant removal mechanism for MDI substances of the category approach.
Results of PBT and vPvB assessment	
Conclusion for the P criterion	• The results from the biodegradation test indicate that PMDI is not biodegradable. Based on experimental hydrolysis and indirect photolysis half-lives, PMDI is not considered to be persistent in the environment and is identified as not P. Based on the justification in the category approach, it is assumed that all MDI analogues included in the category are not P.

12. ECOLOGICAL INFORMATION (CONTINUED)

Conclusion for the B criterion	• Although MDI has a high measured log Pow value (4.51), a full bioaccumulation test with 4,4′-MDI indicated that the bioaccumulation potential is low. Due to the fast hydrolysis, exposure of the environment to the substance is unlikely or very low, there is no potential for significant bioaccumulation possible. Hence, 4,4′-MDI does not fulfil the requirements for the B criterion and is not identified as B. Based on the justification in the category approach, it is assumed that all MDI analogues included in the category are not B.
Conclusion for the T criterion	• The concentrations tested were far above the water solubility of the MDI substances (7.5 mg/l). However, the water solubility limit of MDI is far above the criteria for T and on the basis of aquatic toxicity tests MDI is identified as not T. However, according to Annex I of 67/548/EEC MDI is classified as Xn, R48, which automatically triggers a T. Based on this classification MDI is identified as T.
Endocrine disrupting properties	• No data is available.
Other adverse effects	• It is not expected that substance has an effect on global warming, ozone depletion in the stratosphere or ozone formation in the troposphere.
Secondary poisoning	• Based on the available information, there is no indication of a bioaccumulation potential and, hence, secondary poisoning is not considered relevant. • Exposure to birds is not expected and data from experimental animals show MDI to be of low oral toxicity.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods	• The products becoming useless and the contaminated containers not suitable for product storage must be handled as hazardous waste in accordance with EU and regional hazardous waste regulations. • European Waste Catalogue code: 08 05 01
Product/Packaging disposal	• Contaminated packaging should be emptied as far as possible; than it can be passed on for recycling after being thoroughly cleaned. Wrappings cleaned from contamination with suitable cleaning process (e.g. by steaming, treating with washing fluid, etc.) must be considered as non-hazardous waste.
Waste treatment options	• Incinerate in suitable incineration plant, observing local authority regulations.

14. TRANSPORT INFORMATION

Land transport (ADR/RID/GGVSE)
Sea transport (IMDG Code/GGVSee)
Air transport (ICAO-IATA/DGR)

UN number or ID number	• Not dangerous goods
UN proper shipping name	• Not dangerous goods
Transport hazard class(es)	• Not dangerous goods
Packing group	• Not dangerous goods
Environmental hazards	• Marine pollutant: no
Special precautions for user	• EmS number: Not dangerous goods
Maritime transport in bulk according to IMO instruments	• Not relevant

15. REGULATORY INFORMATION

Safety, health and environmental regulations/ legislation specific for the substance or mixture	• Information regarding relevant EU safety, health and environmental provisions • ISOPA, the European Diisocyanate & Polyol Producers Association has elaborated a Guideline document for the safe treatment of MDI containing products. The Guidelines have been built into this data sheet.
Chemical safety assessment	• In accordance with REACH chemical safety assessment (CSA) has not been carried out for the product. However, the results from the CSA for 4,4′-MDI were transposed into this SDS.

16. OTHER INFORMATION

The information given corresponds with our actual knowledge and experience. This information is meant to describe our product in view of possible safety requirements. Classification of the mixture is based on the classification of components.

Indication of changes	This is the modified version of the first edition of the datasheet.
Abbreviations and acronyms	
BCF	Bioconcentration factor
BMGV	Biological monitoring guidance value
bw	bodyweight
CAS No.	Chemical Abstracts Service number
CLP	Regulation on classification, labelling and packaging
DNEL	Derived no effect level
dw	dry weight
EC No.	EINECS and ELINCS number
EC_{10}	Concentration at which 10% of the organisms tested exhibit a statistically significant effect of the chemical
EC_{50}	Half maximal effective concentration
EEC	European Economic Community

16. OTHER INFORMATION (CONTINUED)

EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of Notified Chemical Substances
EU	European Union
LC_{50}	Lethal concentration, 50%
LD_{50}	Median lethal dose
LLNA	Local lymph node assay
LOAEC	Lowest Observed Adverse Effect Concentration
NOAEC	No Observed Adverse Effect Concentration
NOAEL	No Observed Adverse Effect Level
NOEC	No Observed Effect Concentration
OECD	Organization for Economic Cooperation and Development
PBT	Persistent, Bioaccumulative and Toxic
PEC	Predicted Environmental Concentration
PMDI	Polymeric MDI (CAS: 9016-87-9)
PNEC	Predicted No Effect Concentration
REACH	The Registration, Evaluation, Authorization and Restriction of Chemicals
SDS	Safety Data Sheet
TWA	Time-weighted average
vPvB	Very Persistent and Very Bioaccumulative
WEL	Workplace exposure limit
Key literature references and sources for data	Safety data sheets, received from the raw materials suppliers.
Full text of abbreviations	
H-Phrases	
H302	Harmful if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure: respiratory system, inhalation.
H412	Harmful to aquatic life with long-lasting effects.
P-Phrases	
P260	Do not breathe dust/fume/gas/mist/vapors/spray.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P284	Wear respiratory protection.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.

16. OTHER INFORMATION (CONTINUED)

P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P308+P313	If exposed: Call a POISON CENTER or doctor/physician.
Hazard Classes	
Acute Tox.	Acute toxicity
Aquatic Chronic	Hazardous to the aquatic environment, chronic
Carc.	Carcinogenicity
Eye Irrit.	Serious eye irritation
Resp. Sens.	Respiratory sensitization
Skin Irrit.	Skin irritation
Skin Sens.	Skin sensitization
STOT RE	Specific target organ toxicity – repeated exposure
STOT SE	Specific target organ toxicity – single exposure
Disclaimer	• The information provided in this Safety Data Sheet is correct to the best of our knowledge information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification, The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
Issue Date	• Not available.
This Data Sheet Contains	• Product and Company Identification: Synonyms changes from the previous Physical & Chemical Properties: Multiple Properties version in section(s): Transport Information: Material Transportation Information Regulatory Information.

Quad-Cure® Turbo

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	• Quad-Cure® Turbo
Trade Name	• Quad-Cure® SF
Company	• Quadex LLC, 564 W. 9320 S., Sandy, UT 84070
Company Contact	• Matthew Peterson
Company Phone	• 844-782-4832
Emergency	• Domestic Shipments and to Canada: 1-800-633-8253 • International Shipments: 1-801-629-0667

2. HAZARDS IDENTIFICATION

Hazard Statements	• Classification of the substance or mixture Classification according to Regulation (EC) No 1272/2008 (CLP)		
	H302	• Acute Tox. 4	• Harmful if swallowed.
	H315	• Skin Irrit. 2	• Causes skin irritation.
	H317	• Skin Sens. 1B	• May cause an allergic skin reaction.
	H319	• Eye Irrit. 2	• Causes serious eye irritation.
	H332	• Acute Tox. 4	• Harmful if inhaled.
	H334	• Resp. Sens. 1	• May cause allergy or asthma symptoms or breathing difficulties if inhaled.
	H335	• STOT SE 3	• May cause respiratory irritation.
	H351	• Carc. 2	• Suspected of causing cancer.
	H373	• STOT RE 2	• May cause damage to organs through prolonged or repeated exposure: respiratory system, inhalation.
Precautionary statements			
	P260	• Wear protective gloves/protective clothing/eye protection/face protection.	
	P280	• Wear respiratory protection.	
	P284	• IF ON SKIN: Wash with plenty of soap and water.	
	P302+P352	• IF INHALED: Remove person to fresh air and keep comfortable for breathing.	
	P304+P340	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.	
	P308+P313	• If exposed: Call a POISON CENTER or doctor/physician.	

2. HAZARDS IDENTIFICATION (CONTINUED)

Hazard determining component(s) for labelling	• Isocyanic acid, polymethylenepolyphenylene ester; Reaction products of phosphoryltrichloride and 2-methyloxirane
Other Hazards	• The mixture does not meet persistent (P) and bioaccumulation (B) criteria, but it meets the criteria for toxicity (T). The mixture is not PBT or vPvB.
Signal Word	• Danger
Pictogram	

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	EC No.	Cas No.	REACH Reg. No.	Content (%)	Content (%) Classification according to Regulation (EC) No 1272/2008 (CLP)	
					Hazard Categories[1]	H-phrase(s)[1]
Isocyanic acid, polymethylene-polyphenylene ester (Polymeric MDI)[2]	(polymer)	9016-87-9	(polymer)	> 60	Acute Tox. 4 Skin Irrit. 2 Eye Irrit. 2 Resp. Sens. 1 Skin Sens. 1B Carc. 2 STOT SE 3 STOT RE 2	*H332* *H315* *H319* *H334* *H317* *H351* *H335* *H373*
Reaction products of phosphoryl trichloride and 2-methyloxirane	807-935-0	1 244733-77-4	01-2119486772-26	> 10	Acute Tox. 4 Aquatic Chronic 3	*H302* *H412*
4,4'-Methylenediphenyl diisocyanate, oligomeric reaction products with 2,4'-diisocyanatodiphenyl methane,2,2'-methylenediphenyl diisocyanate and α-hydro-ω-hydroxy-poly[oxy(methyl-1,2-ethanediyl)][3]	951-860-7	158885-25-7	(polymer)	≤ 10	Acute Tox. 4 Skin Irrit. 2 Eye Irrit. 2 Resp. Sens. 1 Skin Sens. 1B Carc. 2 STOT SE 3 STOT RE 2	*H332* *H315* *H319* *H334* *H317* *H351* *H335* *H373*
Triisobutyl phosphate	204-798-3	126-71-61	01-2119957118-32	≤ 10	Skin Sens. 1B	*H317*

[1] See Section 16 for the full text of the abbreviations declared above.

[2] Contains < 35% 4,4'-MDI (4,4'-methylenediphenyl diisocyanate) (CAS: 101-68-8)

[3] Contains ca. 10% 4,4'-MDI (4,4'-methylenediphenyl diisocyanate) (CAS: 101-68-8)

4. FIRST AID MEASURES

Description of first aid measures	
General advice	• Soiled, fairly soaked clothing and shoes must be immediately removed.
In case of inhalation	• If inhaled, remove to fresh air. If not breathing, give artificial respiration. Get medical attention immediately.
In case of skin contact	• In the event of contact with the skin, at first wipe off with a paper towel/textile, then wash alternately with polyethylene glycol (if available) and water, or with plenty of warm water and soap for several minutes. Consult a doctor in the event of a skin reaction. Wash the less contaminated clothing before reuse. Clean shoes thoroughly before reuse.
In case of eye contact	• Hold the eyes open and rinse with water for a sufficiently long period of time (at least 10 minutes). Get medical attention immediately.
In case of ingestion	• DO NOT induce the patient to vomit, medical advice is required. Never give anything by mouth to an unconscious person. Provided the patient is conscious, wash out mouth with water.
Information to physician	• The product irritates the respiratory tract and may trigger sensitization of the skin and respiratory tract. Treatment of acute irritation or bronchial constriction is primarily symptomatic. Following severe exposure the patient should be kept under medical review for at least 48 hours.
Most important symptoms and effects, both acute and delayed	• Headache, nausea, shortness of breath, sore throat, redness on the skin. Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation exposure may cause asthma.
Indication of any immediate medical attention and special treatment needed	• Depending on the degree of exposure, periodic medical examination is suggested.

5. FIRE FIGHTING MEASURES

Extinguishing media	
Suitable extinguishing media	• Foam, CO_2 or dry powder. Water spray may be used if no other available and then in copious quantities.
Unsuitable extinguishing media	• High volume water jet.
Special hazards arising from the substance or mixture	• Carbon dioxide, carbon monoxide, hydrogen cyanide, nitrogen oxides, isocyanate vapors. The substances/groups of substances mentioned can be released in case of fire.
Advice for firefighters	• Reaction between water and hot isocyanate may be vigorous (strongly exothermic). Prevent washings from entering watercourses. Keep fire-exposed containers cool by spraying with water.
Special protective equipment	• Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Safety boots, gloves, safety helmet and protective clothing should be worn.

5. FIRE FIGHTING MEASURES (CONTINUED)

Further information	• In the event of fire and/or explosion do not breathe fumes. Fire in vicinity poses risk of pressure build-up and rupture. Containers at risk from fire should be cooled with water and, if possible, removed from the danger area. Due to reaction with water producing CO_2 gas, a hazardous build-up of pressure could result if contaminated containers are re-sealed. Containers may burst if overheated. Do not allow contaminated extinguishing water to enter the soil, groundwater or surface waters.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	• Immediately contact emergency personnel. Evacuate the area. Keep upwind to avoid inhalation of vapors. Clean-up should only be performed by trained personnel. Keep unauthorized persons away.
For non-emergency personnel	• Remove not affected people. Inform the relevant emergency services and authorities.
For emergency responders	• People dealing with major spillages should wear full protective clothing including respiratory protection. Use suitable protective equipment.
Environmental precautions	• Do not allow contaminated extinguishing water to enter the soil, groundwater or surface waters. Avoid dispersal of spilt material and runoff and contact with drains and sewers.
Methods and material for containment and cleaning up	• Absorb spillages onto sand, earth or any suitable adsorbent material. Leave to react for at least 30 minutes. Do not absorb onto sawdust or other combustible materials. Contaminated adsorbent material shall be disposed according to Section 13. Wash the spillage area with water.
Reference to other sections	• Information regarding exposure controls/personal protection and disposal considerations can be found in Section 8 and 13.

7. HANDLING AND STORAGE

Precautions for safe handling	
Protective measures	• Provide sufficient air exchange and/or exhaust in work rooms. In all workplaces of the plant where high concentrations of isocyanate aerosols and/or vapors may be generated (e.g. during pressure release, mould venting or when cleaning mixing heads with an air blast), appropriately located exhaust ventilation must be provided in order to prevent occupational exposure limits from being exceeded. The air should be drawn away from the personnel handling the product. The efficiency of the ventilation system must be monitored regularly because of the possibility of blockage. Atmospheric concentrations should be minimized and kept as low as reasonably practicable below the occupational exposure limit.
Advice on general occupational hygiene	• No eating, drinking, smoking or tobacco use at the place of work. Contact with skin and eyes and inhalation of vapors must be avoided under all circumstances. Keep equipment clean. A basic essential in sampling, handling and storage is the prevention of contact with water. Keep stocks of decontaminant readily available.

7. HANDLING AND STORAGE (CONTINUED)

Conditions for safe storage, including any incompatibilities	• Store and transport in separate, airtight vessels, between +10 °C and +25 °C. The containers and vessels shall be protected from direct sunshine and other weather impacts. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate container to avoid environmental contamination.
Specific end use(s)	• For the relevant identified use(s) listed in Section 1 the advice mentioned in this section is to be observed.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION

Control parameterss	
Occupational exposure limits in air	• A workplace exposure limit (WEL) of 0.02 mg/m³ for total isocyanates (as NCO) as an 8-hour TWA, and a short term WEL (15 min) of 0.07 mg/m³ have been assigned in the United Kingdom. A BMGV for isocyanates, based on the measurement of urinary diamines, has been set at 1 µmol diamine/mol creatinine.
DNEL/PNEC-values	• The risk characterization of PMDI (CAS: 9016-87-9) is the following: **Workers:** Acute/short-term exposure – systemic effects (dermal): DNEL = 50 mg/kg bw/day Acute/short-term exposure – systemic effects (inhalation): DNEL = 0.1 mg/m³ Acute/short-term exposure – local effects (dermal): DNEL = 28.7 mg/cm² Acute/short-term exposure – local effects (inhalation): DNEL = 0.1 mg/m³ Long-term exposure – systemic effects (inhalation): DNEL = 0.05 mg/m³ Long-term exposure – systemic effects (dermal): Not applicable. Long-term exposure – local effects (inhalation): DNEL = 0.05 mg/m³ Long-term exposure – local effects (dermal): Not applicable. **PNEC sediment:** As PMDI is a reactant with water, access of water to PMDI and vice versa is strictly controlled. Furthermore, PMDI polymerizes in the presence of water and thus exposure of PMDI to sediment is highly likely to be negligible. Therefore, PNEC sediment cannot be derived for PMDI. **PNEC soil:** 1 mg/kg soil dw **PNEC oral:** There are no data on effects of oral PMDI to birds. Exposure to birds is not expected and data from experimental animals show PMDI to be of low oral toxicity.
Exposure controls	
Respiratory protection	• Respiratory protection in case of vapor/aerosol release. Combination filter for organic, inorganic, acid inorganic, and basic gases/vapors (e.g. EN 14387 Type ABEK) shall be used.
Hand protection	• Chemical resistant protective gloves (EN 374) **Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):** butyl rubber (butyl) – 0.7 mm coating thickness nitrile rubber (NBR) – 0.4 mm coating thickness chloroprene rubber (CR) – 0.5 mm coating thickness **Unsuitable materials:** polyvinyl chloride (PVC) – 0.7 mm coating thickness polyethylene (PE) laminate – ca. 0.1 mm coating thickness
Eye protection	• Safety glasses with side shields (frame goggles) (e.g. EN 166).

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION (CONTINUED)

Body protection	• Safety shoes (e.g. according to EN 20346) and closed workwear
General safety and hygiene measures	• Do not breathe vapor/spray. With products freshly manufactured from isocyanates body protection and chemical resistant protective gloves is recommended. Wearing of closed workwear is required additionally to the personal protective equipment. No eating, drinking, smoking or tobacco use at the place of work. Take off immediately all contaminated clothing. Hands and/or face should be washed before breaks and at the end of the shift. After work the skin should be cleaned and skin-care agents applied.

9. PHYSICAL & CHEMICAL PROPERTIES

Information on basic physical and chemical properties	
Appearance	• liquid, dark-brown
Odor	• damp
Odor threshold	• not known
pH-value	• not applicable (reacts with water)
Melting point/freezing point	• *not defined (mixture)*
Boiling range	• 200 °C
Flash point	• > 200 °C (MDI)
Evaporation rate	• not defined (mixture)
Flammability (solid, gaseous)	• not applicable (liquid)
Ignitable, explosive range	• not defined (mixture)
Vapor pressure	• < 0.00001 mbar (at 20 °C)
Vapor density	• not defined (mixture)
Density	• 1.19 ± 0.01 g/cm³ (at 25 °C)
Solubility	• reacts with water with slow CO_2 appearance at the border area into non-soluble, high melting point or not melting polyurea
Partition coefficient n-octanol/water	• not applicable (mixture)
Self-ignition temperature	• 4,4'-MDI does not ignite till 601 °C
Decomposition temperature	• not applicable (mixture)
Viscosity	• 160–220 mPas (at 25 °C)
Explosive properties	• non-explosive
Oxidising properties	• non-oxidizing
Other information	• No data

10. CHEMICAL STABILITY & REACTIVITY INFORMATION

Reactivity	• Reacts with water, acids, alcohols, amines, bases, and oxidants.
Chemical stability	• The main removal mechanism of MDIs in the environment is hydrolysis. MDI reacts quickly with water to form predominantly solid, insoluble polyureas. Under conditions typical of many types of environmental contact, i.e. with relatively poor dispersion of the isocyanate, the interfacial reaction leads to the formation of a solid crust encasing partially reacted product. This crust restricts ingress of water and egress of amine, and hence slows and modifies hydrolysis.
Stability in organic solvents	• All MDI isomers and forms are highly unstable in dimethyl sulphoxide (DMSO) solvent, water content of the DMSO is increasing breakdown. MDI is more stable in EGDE (ethylene glycol dimethyl ether) solvent.(Read-across based on 4,4'-methylenediphenyl diisocyanate – CAS 101-68-8.).
Possibility of hazardous reactions	• Reaction is slow with cold or warm water (<50 °C), with hot water or steam the reaction is faster, producing carbon-dioxide causing pressure increase. Acids, alcohols, amines, bases, and oxidants may cause fire and explosion hazard.
Conditions to avoid	• High temperature, moisture, strong light.
Incompatible materials	• Substances to avoid: water, acids, alkalis, alcohols, amines.
Hazardous decomposition products	• No hazardous decomposition products if stored and handled as prescribed/indicated.

11. TOXICOLOGICAL INFORMATION

The mixture has not been tested. Information is related to 4,4'-Methylenediphenyl diisocyanate if no other is mentioned.

Information on hazard classes as defined in Regulation (EC) No 1272/2008	
Acute toxicity – Oral	• Harmful • Rats LD_{50} > 2000 mg/kg bw Method: 84/449/EEC (Read-across based on methylenediphenyl diisocyanate, isomer mixture CAS 26447-40-5) • Rats (female) LD_{50} > 2000 mg/kg bw LD_{50} = 632 mg/kg Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4) • Rats LD_{50} > 5000 mg/kg US EPA Test Guideline OPP 81-1 Triisobutyl phosphate (CAS 126-71-6)
Acute toxicity – Inhalation (Aerosol)	• Harmful • Rats LD_{50} = 0.49 mg/l air (4 h) OECD Guideline 403 • Rats LD_{50} > 7 mg/l air (4 h), dust/mist OECD 403 Acute Inhalation Toxicity Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4) • Rats LD_{50} > 5.14 mg/l (4 h), dust/mist OECD 403 Acute Inhalation Toxicity Triisobutyl phosphate (CAS 126-71-6)

11. TOXICOLOGICAL INFORMATION (CONTINUED)

Acute toxicity – Dermal	• Not classified. Based on available data, the classification criteria are not met. • Rabbit LD_{50} 9400 mg/kg bw (24 h) OECD Guideline 402 • Rabbit LD_{50} > 2000 mg/kg Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4) • Rabbit LD_{50} > 5000 mg/kg US EPA Test Guideline OPP 81-2 Acute Dermal Toxicity Triisobutyl phosphate (CAS 126-71-6)
Irritation/Corrosion	• Summarized the results of the studies together with human occupational case reports support the official classification.
	• Skin corrosion/Skin irritation: Irritating Irritating in rabbits. (4 h/4 days) OECD Guideline 404 • Eye damage/Irritation: Irritating in rabbits. (4 h/14 days) OECD Guideline 404 • (Read-across based on methylenediphenyl diisocyanate, isomer mixture – CAS 26447-40-5.) • Summarized the available animal data would not support classification of MDI as an eye irritant. But together with human occupational case reports in which symptoms of eye irritation were reported the legal classification as eye irritant should be applied.
Skin Senzitisation	• Animal data as well as studies in humans provide evidence of possible skin sensitization, and of respiratory sensitization due to MDI. Animal studies indicate that MDI is a strong allergen. Human case reports describe the occurrence of allergic contact dermatitis due to MDI exposure. • Ingredient name: Triisobutyl phosphate (CAS 126-71-6) • Route of exposure: Skin Mice Sensitizing OECD Guideline 429 (LLNA) Guinea pig Sensitizing OECD 406 Skin Sens Guinea pig Sensitizing OECD 406 Skin Sens
Respiratory sensitization	• Rats (male) Sensitizing OECD Guideline 39
Germ cell mutagenicity	• Not classified. Based on available data, the classification criteria are not met.
Carcinogenicity	• Carc. 2 • Rats (inhalation, aerosol): NOAEC = 0.2 mg/m³ air (toxicity) (2 years; 6 h/day, 5 days/week) NOAEC = 1 mg/m³ air (carcinogenicity) (2 years; 6 h/day, 5 days/week) LOAEC = 6 mg/m³ air (carcinogenicity) (2 years; 6 h/day, 5 days/week) OECD Guideline 453

11. TOXICOLOGICAL INFORMATION (CONTINUED)

Reproductive toxicity	• Not classified. Based on available data, the classification criteria are not met. • Effects on fertility: No fertility, nor multigeneration studies are available. • Rats (inhalation): NOAEL = 4 mg/m³ air (developmental toxicity) (10 days; 1/day, 6 h) NOAEL = 4 mg/m³ air (maternal toxicity) (10 days; 1/day, 6 h) OECD Guideline 414
STOT – single exposure	• MDI is irritant to the respiratory tract.
STOT – repeated exposure	• Harmful • Rats (inhalation, aerosol): NOAEC = 0.2 mg/m³ air (2 years; 6 h/day, 5 days/week) LOAEC = 1.0 mg/m³ air (2 years; 6 h/day, 5 days/week) • Target organs: respiratory – lung OECD Guideline 453
Aspiration hazard	• Not classified due to lack of data.
Toxicokinetics	• No data.
Genetic toxicity	• No data.
Information on other hazards	• No data available.

12. ECOLOGICAL INFORMATION

The mixture has not been tested. Information is related to 4,4'-methylenediphenyl diisocyanate if no other is mentioned.

Toxicity: Aquatic	
Short-term toxicity to fish	• Freshwater fish (Danio rerio): LC_{50} > 1000 mg/l (96 h) • OECD Guideline 203 • Danio rerio (zebrafish): LC_{50} = 56.2 mg/l (96 h) • Pimephales promelas (fathead minnow): LC_{50} = 51 mg/l (96 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4) • Leuciscus idus (golden orfe): LC_{50} = 17.8–21.5 mg/l (96 h); DIN 38412 • Triisobutyl phosphate (CAS 126-71-6)
Long-term toxicity to fish	• Data waiving. In accordance with column 2 of REACH Annex IX the long-term toxicity testing on fish shall be proposed if the chemical safety assessment according to Annex I indicates the need to investigate further the effects on aquatic organisms. The corresponding PEC/PNEC ratios would be less than 1. Taking into account the scientific and exposure arguments, it appears appropriate to waiver the long-term fish/plant/soil and sediment toxicity studies.
Short-term toxicity to aquatic invertebrates	• Freshwater invertebrates (Daphnia magna): EC_{50} > 1000 mg/l (24 h) • OECD Guideline 202 • Daphnia magna (large water flea): EC_{50} = 131 mg/l (48 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4) • Daphnia magna: Acute EC_{50} = 11 mg/l (48 h); DIN 38412 • Triisobutyl phosphate (CAS 126-71-6)

12. ECOLOGICAL INFORMATION (CONTINUED)

Long-term toxicity to aquatic invertebrates	• Freshwater invertebrates (Daphnia magna): NOEC >= 10 mg/l (21 days) • OECD Guideline 211 • Daphnia magna: NOEC = 32 mg/l (21 days) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4)
Toxicity to aquatic algae and cyanobacteria	• Freshwater algae (Desmodesmus subspicatus) EC_{50} > 1640 mg/l (72 h) • OECD Guideline 201 • Freshwater algae (Pseudokirchneriella subcapitata) EC_{50} = 82 mg/l (72 h) • NOEC = 13 mg/l (72 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4) • Algae (Desmodesmus subspicatus) ErC_{50} = 34.1 mg/l (72 h); DIN 38412 • Triisobutyl phosphate (CAS 126-71-6)
Toxicity to aquatic plants other than algae	• Data waiving. Not required by REACH annexes. However, a (soil) mesocosm study with PMDI exists in which the toxicity towards macrophytes (Potamogeton crispus and Zannichellia palustris) was assessed. No toxicity was observed at a loading of 1000 and 10000 mg/l, approximately 100% of the substance was found in the sediment as hardened material.
Toxicity to microorganisms	• Microorganisms (activated sludge) EC_{50} > 100 mg/l (3 h) • OECD Guideline 209 • Activated sludge EC_{50} = 784 mg/l (3 h): EC_{10} = 191 mg/l (3 h) • Reaction products of phosphoryl trichloride and 2-methyloxirane (CAS 1244733-77-4) • Bacteria – Activated sludge Chronic EC_{50} = 37.2 mg/l (28 days) • OECD 301B Ready Biodegradability – CO_2 Evolution Test • Triisobutyl phosphate (CAS 126-71-6)
Toxicity to other aquatic organisms	• This information is not available, but not required under REACH.
Sediment toxicity	• Data waiving. Annex X states that this study need not be conducted if the chemical safety assessment does not indicate a need to further investigate the effects on sediment organisms
Terrestrial toxicity	• Toxicity to soil macroorganisms except arthropods: • Eisenia fetida LC_{50} > 1000 mg/kg soil dw (14 days) • OECD Guideline 207
Toxicity to terrestrial arthropods	• Data waiving. Based on the chemical safety assessment and the risk assessment, there is no need to further investigate the terrestrial arthropods toxicity as there is no risk for the terrestrial environment as indicated by the PEC/PNEC ratio being < 0.239. Direct/indirect exposure to soil is unlikely.
Toxicity to terrestrial plants	• Avena sativa EC_{50} > 1000 mg/kg soil dw (14 days) • Lactuca sativa EC_{50} > 1000 mg/kg soil dw (14 days) • OECD Guideline 208
Toxicity to soil microorganisms	• Data waiving. Annex X states that this study need not be conducted if the chemical safety assessment does not indicate a need to further investigate the effects on sediment organisms.
Conclusion on classification	• Hazardous to the aquatic environment (acute): Based on available data, the classification criteria are not met. (EC/LC_{50} for fish, invertebrates and algae > 1000 mg/l)

12. ECOLOGICAL INFORMATION (CONTINUED)

Conclusion on classification	• Hazardous to the aquatic environment (chronic): Based on available data, the classification criteria are not met. (NOEC for algae > 1640 mg/L; NOEC for invertebrates > 10 mg/l)
Persistence and degradability	
Phototransformation in air	• Half-life (DT_{50}): 0.92 days • Hydrolysis: MDI reacts with water to form predominantly inert polyurea.
Hydrolysis:	• MDI reacts with water to form predominantly inert polyurea. • Half-life (DT_{50}): ca. 20 h (at 25 °C) (Read-across based on oligomeric MDI – CAS 32055-14-4)
Phototransformation in water and soil	• No data is available.
Biodegradation in water	• Under test conditions no biodegradation was observed. (28 days) • OECD Guideline 302C
Biodegradation in water and sediment	• Data waiving. In accordance with Annex XI, simulation biodegradation tests are technically not feasible as the test substance reacts quickly with water. The corresponding PEC/PNEC ratios would be less than 1. Taking into account the scientific and exposure arguments, it appears appropriate to waiver the long-term fish/plant/soil and sediment toxicity studies.
Biodegradation in soil	• Data waiving. See at Biodegradation in water and sediment.
Bioaccumulative potential	
Bioaccumulation–aquatic/sediment	• Due to the high reactivity of the substances of the MDI category with water, bioaccumulation tests can in principle not be performed with these substances. However, one bioaccumulation test with 4,4'-MDI and a mesocosm study with PMDI with an indication of bioaccumulation potential have been performed. As no analytical measurements were done, it cannot be determined if the values are truly related to MDI. However, based on the available information and the reactivity of MDI substances of the category approach, no new bioaccumulation study is deemed necessary. BCF (Cyprinus carpio): 200 (28 days) Method: OECD Guideline 305E
Terrestrial bioaccumulation	• No data is available on terrestrial bioaccumulation, but it is not required under REACH.
Mobility in soil	
Adsorption/desorption	• Data waiving. According to Annex VIII the study need not be done if the test substance degrades rapidly. The corresponding PEC/PNEC ratios would be less than 1. Taking into account the scientific and exposure arguments, it appears appropriate to waiver the long-term fish/plant/soil and sediment toxicity studies.
Volatilisation	• The Henry's Law Constant, estimated from the measured vapor pressure and the calculated water solubility, is 2.263 x 10^{-7} atm-m^3/mole. Hence, volatilization is unlikely to be a significant removal mechanism for MDI substances of the category approach.
Results of PBT and vPvB assessment	
Conclusion for the P criterion	• The results from the biodegradation test indicate that PMDI is not biodegradable. Based on experimental hydrolysis and indirect photolysis half-lives, PMDI is not considered to be persistent in the environment and is identified as not P. Based on the justification in the category approach, it is assumed that all MDI analogues included in the category are not P.

12. ECOLOGICAL INFORMATION (CONTINUED)

Conclusion for the B criterion	• Although MDI has a high measured log Pow value (4.51), a full bioaccumulation test with 4,4'-MDI indicated that the bioaccumulation potential is low. Due to the fast hydrolysis, exposure of the environment to the substance is unlikely or very low, there is no potential for significant bioaccumulation possible. Hence, 4,4'-MDI does not fulfil the requirements for the B criterion and is not identified as B. Based on the justification in the category approach, it is assumed that all MDI analogues included in the category are not B.
Conclusion for the T criterion	• The concentrations tested were far above the water solubility of the MDI substances (7.5 mg/l). However, the water solubility limit of MDI is far above the criteria for T and on the basis of aquatic toxicity tests MDI is identified as not T. However, according to Annex I of 67/548/EEC MDI is classified as Xn, R48, which automatically triggers a T. Based on this classification MDI is identified as T.
Endocrine disrupting properties	• No data is available.
Other adverse effects	• It is not expected that substance has an effect on global warming, ozone depletion in the stratosphere or ozone formation in the troposphere.
Secondary poisoning	• Based on the available information, there is no indication of a bioaccumulation potential and, hence, secondary poisoning is not considered relevant. • Exposure to birds is not expected and data from experimental animals show MDI to be of low oral toxicity.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods	• The products becoming useless and the contaminated containers not suitable for product storage must be handled as hazardous waste in accordance with EU and regional hazardous waste regulations. • European Waste Catalogue code: 08 05 01
Product/Packaging disposal	• Contaminated packaging should be emptied as far as possible; then it can be passed on for recycling after being thoroughly cleaned. Wrappings cleaned from contamination with suitable cleaning process (e.g. by steaming, treating with washing fluid, etc.) must be considered as non-hazardous waste.
Waste treatment options	• Incinerate in suitable incineration plant, observing local authority regulations

14. TRANSPORT INFORMATION

Land transport (ADR/RID/GGVSE)
Sea transport (IMDG Code/GGVSee)
Air transport (ICAO-IATA/DGR)

UN number or ID number	• Not dangerous goods
UN proper shipping name	• Not dangerous goods
Transport hazard class(es)	• Not dangerous goods
Packing group	• Not dangerous goods
Environmental hazards	• Marine pollutant: no
Special precautions for user	• EmS number: Not dangerous goods
Maritime transport in bulk according to IMO instruments	• Not relevant

15. REGULATORY INFORMATION

Safety, health and environmental regulations/ legislation specific for the substance or mixture	• Information regarding relevant EU safety, health and environmental provisions • ISOPA, the European Diisocyanate & Polyol Producers Association has elaborated a Guideline document for the safe treatment of MDI containing products. The Guidelines have been built into this data sheet.
Chemical safety assessment	• In accordance with REACH chemical safety assessment (CSA) has not been carried out for the product. However, the results from the CSA for 4,4'-MDI were transposed into this SDS.

16. OTHER INFORMATION

The information given corresponds with our actual knowledge and experience. This information is meant to describe our product in view of possible safety requirements. Classification of the mixture is based on the classification of components.

Indication of changes	• This is the modified version of the first edition of the datasheet.
Abbreviations and acronyms	
BCF	Bioconcentration factor
BMGV	Biological monitoring guidance value
bw	bodyweight
CAS No.	Chemical Abstracts Service number
CLP	Regulation on classification, labelling and packaging
DIN	Deutsches Institut für Normung (German Institute for Standardization)
DNEL	Derived no effect level
dw	dry weight
EC No.	EINECS and ELINCS number
EC_{10}	Concentration at which 10% of the organisms tested exhibit a statistically significant effect of the chemical
EC_{50}	Half maximal effective concentration
EEC	European Economic Community

16. OTHER INFORMATION (CONTINUED)

EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of Notified Chemical Substances
EPA	Environmental Protection Agency, USA
ErC_{50}	EC_{50} based on growth rate
EU	European Union
LC_{50}	Lethal concentration, 50%
LD_{50}	Median lethal dose
LLNA	Local lymph node assay
LOAEC	Lowest Observed Adverse Effect Concentration
NOAEC	No Observed Adverse Effect Concentration
NOAEL	No Observed Adverse Effect Level
NOEC	No Observed Effect Concentration
OECD	Organization for Economic Cooperation and Development
PBT	Persistent, Bioaccumulative and Toxic
PEC	Predicted Environmental Concentration
PMDI	Polymeric MDI (CAS: 9016-87-9)
PNEC	Predicted No Effect Concentration
REACH	The Registration, Evaluation, Authorisation and Restriction of Chemicals
SDS	Safety Data Sheet
TWA	Time-weighted average
vPvB	Very Persistent and Very Bioaccumulative
WEL	Workplace exposure limit
Key literature references and sources for data	• Safety data sheets, received from the raw materials suppliers.
Full text of abbreviations	
H-Phrases	
H302	Harmful if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure: respiratory system, inhalation.
H412	Harmful to aquatic life with long-lasting effects.
P-Phrases	
P260	Do not breathe dust/fume/gas/mist/vapors/spray.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P284	Wear respiratory protection.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.

16. OTHER INFORMATION (CONTINUED)

P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P308+P313	If exposed: Call a POISON CENTER or doctor/physician.
Hazard classes	
Acute Tox.	Acute toxicity
Aquatic Chronic	Hazardous to the aquatic environment, chronic
Carc.	Carcinogenicity
Eye Irrit.	Serious eye irritation
Resp. Sens.	Respiratory sensitization
Skin Irrit.	Skin irritation
Skin Sens.	Skin sensitization
STOT RE	Specific target organ toxicity – repeated exposure
STOT SE	Specific target organ toxicity – single exposure
Disclaimer	• The information provided in this Safety Data Sheet is correct to the best of our knowledge information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification, The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
Issue Date	• Not available.
This Data Sheet Contains	• Product and Company Identification: Synonyms changes from the previous Physical & Chemical Properties: Multiple Properties version in section(s): Transport Information: Material Transportation Information Regulatory Information.

United Point Repair Specification

Specification for the Sectional Repair of Pipelines with Cured-In-Place Pipe

1.0 INTENT

It is the intent of the specification to provide for the rehabilitation of gravity flow sewers by the installation of a resin impregnated fiberglass point repair into the existing pipe using an inflatable element and air pressure. Curing of the resin impregnated fiberglass point repair shall be accomplished at ambient temperature and shall result in a hard, impermeable, corrosion resistant pipe-within-a-pipe.

2.0 GENERAL

2.1 DESIGN

Wall thickness calculations for the sectional repair shall be made in accordance with ASTM F1216, Appendix X1. The design of the sectional repair shall take into consideration the type of deterioration or damage to the existing host pipe, as well as hydrostatic, soil and live loads and meet the following design criteria:

- Initial flexural modulus = 1,375,000 psi
- Initial flexural strength = 27,500 psi
- Design factor of safety = 2.0

2.3 GENERAL PROCEDURES

The installation of the sectional repair shall be defined as the rehabilitation of an existing pipe by the installation of a composite material tube (silicate resin-impregnated fiberglass), which is first formed into an overlapping tube from a flat sheet and then pulled, pushed or both into the sewer host pipe. After insertion, the tube shall be inflated using air pressure and then cured at ambient temperature until the composite material tube is a hard, impermeable pipe. The repair shall extend a minimum of one foot past either end of the defect.

3. APPLICATION

This process is applicable for sectional pipe repairs 3-in to 72-in (80mm to 1828mm) in diameter and 2-ft to 10-ft (0.6m to 3.0m) in length. Longer repairs may be accomplished by installing multiple repairs end to end with a minimum 1-in to 2-in overlap of material where the repairs are joined.

4. REFERENCED SPECIFICATIONS

- ASTM F1216, “Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube”
- ASTM D790, “Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulation Materials”
- ASTM D638, Standard Test Method for Tensile Properties of Plastics

CIPP INITIAL STRUCTURAL PROPERTIES

Property	Test Method	Min./ASTM	United Point Repair
Flexural Strength	ASTM D790	4,500 psi	27,500 psi
Flexural Modulus	ASTM D790	250,000 psi	1,345,000 psi
Tensile Strength	ASTM D638	3,000 psi	24,500 psi

**The values in the table above are for field inspection. The purchaser should consult the manufacturer for the long-term structural properties.*

- NASSCO Pipeline Assessment Certification Program (PACP), Lateral Assessment Certification Program (LACP)

5. MATERIALS

5.1 LINER

The liner utilized shall be fabricated from a two-sided fiberglass mat, comprised of a chopped strand fiberglass on one side, knitted biaxial woven fiberglass on the reverse side.

5.2 RESIN

The resin utilized shall be an ambient cure, two-part silicate resin system mixed at a 2:1 ratio by volume (Part B: Part A). Acceptable products shall be United Point Repair Summer, Winter and Turbo repair resin.

6. PREPARATORY PROCEDURES

The following procedures shall be adhered to unless otherwise approved.

6.1 SAFETY

Safety precautions shall be in strict accordance with all applicable OSHA standards. All requirements for traffic control and confined space entry will be observed.

6.2 FLOW CONTROL

Flexible Point Repair Packers/Carriers may or may not be equipped with a "Flow Through". The flow of sewage around the section of sewer pipe under repair shall be maintained. If needed, a suitable bypass shall be constructed by installing a plug in the sewer line at a point upstream of the pipe under repair and pumping the sewage to a point in the same sewer line downstream of that section. The pump and by pass lines shall be of adequate capacity and size to handle the flow of sewage and prevent any back flow of sewage into homes connected to the sewer line.

6.3 CLEANING

Cleaning of the sewer pipe shall be carried out immediately before TV inspection.

6.4 TV INSPECTION

TV inspection of the sewer pipe shall be carried out immediately before insertion of the point repair, to ensure that the sewer is clean and that the pipe conditions have not changed.

7. INSTALLATION PROCEDURES

The process of installing a sectional pipe repair involves the following steps:

7.1 CCTV

7.1.1 Measure pipe diameter.

7.1.2 Determine position and size of the defect.

7.1.3 Place the eye of the camera at the center of the area to be repaired.

7.1.4 Mark the CCTV cable with tape to indicate the distance from the entrance of the host pipe to the center of the defect.

7.1.5 Stretch the CCTV cable w/ camera above ground.

7.1.6 Connect the flexible adapter to the packer/carrier along with the push rods/air hose. Lay alongside of the cctv cable/camera.

7.1.7 Mark the push rods/air hose and safety pullback cable/rope/strap with the corresponding measurement for the position of the defect.

7.2 CLEAN

7.2.1 Clean the pipe using a high pressure water jet and, if necessary, mechanical means.

7.2.2 Remove any roots, dirt or debris that might affect the installation.

7.3 PULL-IN-PLACE / PULL ASSIST METHOD (IF NEEDED)

7.3.1 If packer needs to be pulled into position, insert a pull rope from the upstream to downstream manhole.

7.4 CALCULATE LENGTH OF POINT REPAIR

7.4.1 Calculate the length of the point repair, adding sufficient length to allow to extend 1 foot into the undamaged host pipe at each end of the repair.

7.5 CALCULATE THE AMOUNT OF MATERIAL REQUIRED TO MAKE THE POINT REPAIR

7.5.1 Calculate the amount of fiberglass material required for the point repair per ASTM F1216, Appendix X1 and as recommended by the manufacturer (United Felts).

7.5.2 Calculate the amount of resin required to wet out the fiberglass as recommended by the manufacturer (United Felts).

7.6 WET OUT THE POINT REPAIR

7.6.1 Lay out the fiberglass material on a clean sheet of plastic with the woven side up.

7.6.2 Mix the two-part silicate resin in accordance with manufacturer's instructions.

7.6.3 Apply resin to the fiberglass material and fold or layer as necessary in accordance with manufacturer's instructions.

7.7 ROLL WET OUT FIBERGLASS ONTO THE CARRIER/PACKER

7.7.1 Install and secure protective sleeve around the packer.

7.7.2 Roll the wet out fiberglass around the packer with chopped mat side against the carrier/packer and pipe.

7.7.3 Secure the wet out fiberglass to the packer with binding wire/zip ties spaced in accordance with manufacturer's instructions.

7.8 INSERT CARRIER/PACKER WITH POINT REPAIR INTO THE SEWER LINE

7.8.1 Insert the packer into the host pipe and center the area of the defect on the repair.

7.9 INFLATE THE CARRIER/PACKER

7.9.1 Slowly inflate the packer to necessary air pressure as determined by pre inflation testing and in accordance with manufacturer's instructions.

7.10 CURE THE POINT REPAIR

7.10.1 Allow the point repair to cure for the recommended amount of time in accordance with manufacturer's instructions.

7.11 DEFLATE AND REMOVE PACKER

7.12 POST TV

7.12.1 Using CCTV examine the point repair and determine that it is properly installed and free of any defects.

7.12.2 Perform and record a final video inspection per NASSCO.

8. FINISH

The finished repair shall be as smooth as commercially feasible, with a smooth transition from the host pipe to the repair pipe on either end. The repair shall overlap beyond the defect by a minimum of six inches onto sound pipe at either end.

9. CLEANUP

After all work has been completed, the contractor will clean up the project area. The contractor will dispose of any excess material and debris in a safe manner.

10. FINAL ACCEPTANCE

In addition to any specific acceptance criteria specified in the contract, the following standards should be met:

10.1 FINISH

The finished pipe should be continuous over the length of the defect plus two feet and be free as practical from significant defects.

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Installation Manual

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UNITED POINT REPAIR

INSTALLATION GUIDE

Please read this document completely before beginning repair.

UNITED POINT REPAIR

www.unitedfelts.com/pointrepair

REV. 05-31-2024

Repair Package Contents

1. Resin and Hardener
2. Spatula(s)
3. Packer/Carrier Protective Covering (2)
4. Cable Ties and/or Wire Ties
5. Plastic Working Mat
6. Gloves
7. Fiberglass Mat
8. Tape

Equipment and Tools

1. Point Repair Packer/Carrier
2. Flexible Adapter
3. Regulator
4. Push Rods
5. Pull Cable
6. Air Compressor
7. Inspection Camera
8. Measuring Tape
9. Wire Cutters
10. Pipe Cleaning Equipment

Installation Instructions 3” Through 12” Diameter

1. INSPECT THE PIPE AND REPAIR AREA. Using a CCTV camera, inspect the area leading up to and at the repair site.

2. CLEAN AND REMOVE ALL DEBRIS FROM THE PIPE. All sharp edges or objects should be removed to avoid damage to the packer/carrier.

3. VISUALLY INSPECT THE PIPE A SECOND TIME TO VERIFY IT IS READY TO PROCEED WITH THE REPAIR. As you are doing this, measure to determine the location of the repair using your inspection camera. Once the head of the camera is in the center of the area in need of repair, mark the camera cable with a piece of tape at the opening of the pipe where the camera was inserted.

4. TEST SAFETY REGULATOR. Connect the supplied air safety regulator equipped with a 45 psi blow-off valve. This ensures proper air flow through the regulator, push rods/air hose to inflate the packer/carrier.

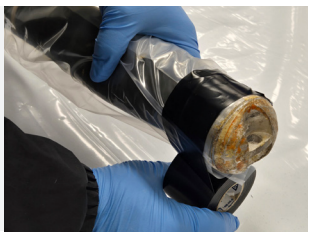
5. INFLATE THE PACKER/CARRIER IN A TEST PIPE THE SAME DIAMETER AS THE REPAIR TO BE COMPLETED. Note the minimum psi required to inflate the packer/carrier to the dimensions needed for the repair. Due to the nature of the packer/carrier, the psi may fluctuate based on age, temperature, and condition. Maintain the inflation for five minutes, check all connections for possible leaks or restricted air flow, then deflate using your regulator. This test is required prior to each use.

6. ASSEMBLE THE FLEXIBLE ADAPTER AND PUSH RODS TO THE LENGTH NEEDED FOR THE REPAIR. Tape each joint before and after the connection collars to prevent potential disconnection and for gliding across offset or open joints during installation. At this point, mark the push rods at the correct length for the repair determined during Step 3.

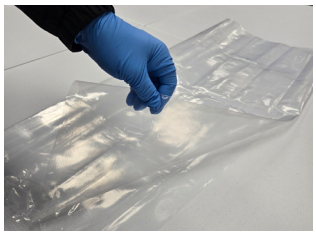


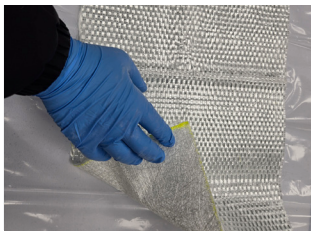
7. ENSURE THE REPAIR CAN BE ACCESSED BY PERFORMING A TEST RUN. Cover the packer/carrier with one of the two protective covering pieces provided with the point repair. Secure with tape at each end. Attach push rods and pull cable. Push the packer/carrier to the location of the repair. At this time, do not inflate. Pull the packer/carrier back out of the pipe, remove the protective covering and discard.

8. COVER THE PACKER/CARRIER WITH THE SECOND PROTECTIVE COVER. Fold over additional plastic in an "S" formation, and tape in place. It is important to ensure there is enough contact area for the tape to adhere to the packer/carrier without restricting the inflation. To avoid air buildup during the repair, two small slits should be cut into the covering at both ends. Put on two pairs of gloves, leaving the outer glove shorter on the wrist for easy removal later.

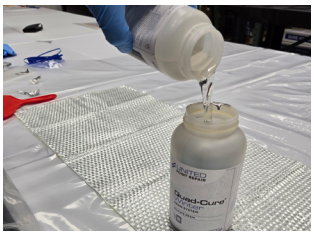
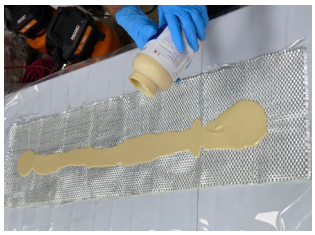
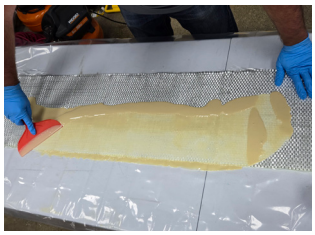
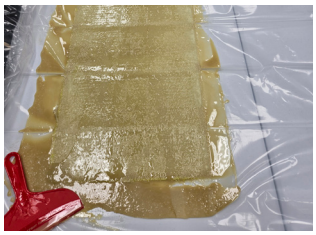




9. PREPARE YOUR WORK SURFACE ON A FLAT AREA. Secure it in place, lay out all repair materials, and ensure you have any necessary tools within easy reach. Uncover the fiberglass mat and lay it out on the work surface with the woven side up.

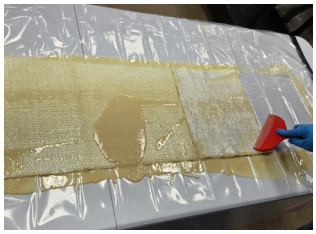
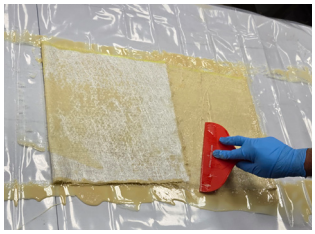




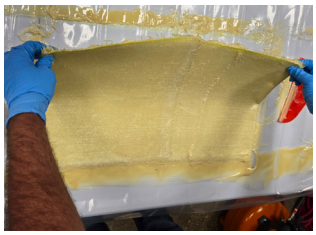
10. MIX RESIN AND WET OUT. First, put on both pairs of gloves, leaving the outer glove shorter on the wrist for easy removal later. Mix part A and part B and shake thoroughly for a minimum of 60 seconds. Write the mixing time on the box. This signifies the start of your working time/pot life and curing time. Pour just over half the resin mixture onto the fiberglass mat. With the woven (shiny) side up, use spatula(s) provided to evenly spread the resin and saturate the fiberglass.

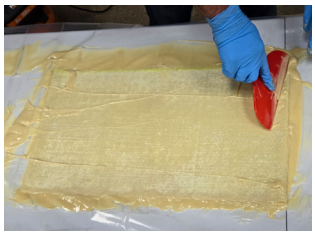
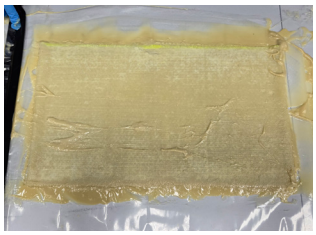





11. PICK UP ONE SIDE OF THE SATURATED FIBERGLASS MAT AND FOLD IT IN TO THE CENTER. Use some of the remaining resin to saturate that folded section. Once that is saturated, fold the other side to the middle and overlap by 1-inch. Use a little more resin if needed to fully saturate this section.

12. FLIP THE MAT OVER, TO WET OUT OTHER SIDE. Grab the corners away from you, carefully lifting up to flip the mat over. You should now see the chopped strand side. Use all of the remaining resin to totally saturate the entire fiberglass mat, visually assuring there are no dry/white spot. Press firmly with the spreading spatula along the folded edges and discard onto the plastic. Fold both sides of the plastic to within 2-inches of the fiberglass.

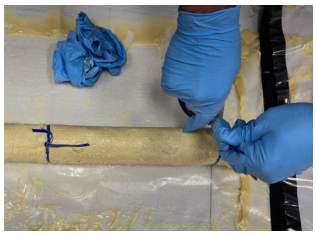


13. CENTER THE PACKER/CARRIER ON THE FIBERGLASS. Roll the fiberglass mat tightly onto the packer/carrier and secure with provided **cable ties or *blue wire ties.

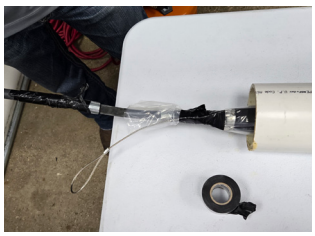
a. **Cable ties should be used for repairs using a flow through packer/carrier.
b. *Blue wire ties should be used for 3” to 6” repairs using a non-flow through packer/carrier.
c. Position ties around the packer/carrier’s nose, the back end and then in the center. Cut off the excess tails.




14. ATTACH THE FLEXIBLE ADAPTER, PUSH RODS, AND PULL CABLE. Connect the flexible adapter to the push rod and attach the safety pull cable. Tape over the connection and where the pull cable is attached (helps eliminate getting caught in an open or offset joint). Position the packer/carrier at the repair location. Using the air regulator, slowly inflate the packer/carrier. The packer/carrier should be completely packed out at the predetermined psi from step five.





15. LEAVE THE PACKER/CARRIER IN PLACE FOR THE TIME DETERMINED ON THE CURING CHART. Deflate the packer/carrier and remove by pushing forward, then pulling back on attached pull cable. If the packer/carrier does not remove freely, re-inflate and let sit for another 15 minutes. It is safe to release the packer/carrier after the resin has cured enough to be tack-free.

16. INSPECT THE REPAIR WITH A SEWER CAMERA. Always confirm the repair was completed successfully.

17. CLEAN-UP. All United Point Repair waste can be regularly disposed of. Always follow owner's guidelines, procedures and protocols.

United Point Repair Silicate Resin Curing Guidelines

QUAD-CURE® SUMMER

AMBIENT TEMP.	WORKING MINUTES	CURE MINUTES
55°F	32 - 35	210 - 240
64°F	32 - 35	180 - 240
73°F	30 - 32	180 - 210
82°F	20 - 23	180 - 210
91°F	14 - 16	150 - 210

QUAD-CURE® WINTER

AMBIENT TEMP.	WORKING MINUTES	CURE MINUTES
33°F	20 - 22	100 - 120
55°F	18 - 20	90 - 110
67°F	16 - 19	75 - 100
73°F	15 - 17	60 - 70

QUAD-CURE® TURBO

AMBIENT TEMP.	WORKING MINUTES	CURE MINUTES
40°F	9 - 10	55 - 60
50°F	8 - 9	45 - 50
59°F	7 - 8	35 - 40
68°F	6 - 7	25 - 30

WORK TIME: Amount of time installer has to install a repair before resin starts to set.
CURE TIME: Amount of time it takes for the resin to cure once part A & B have been mixed together.
NOTE: Resin cure time will vary depending on environmental factors such as Temperature, Humidity, Hydrostatic Pressure and Thermal Wicking due to Cold Water Infiltration.

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Scan for Safety Data Sheets and Technical Data Sheets

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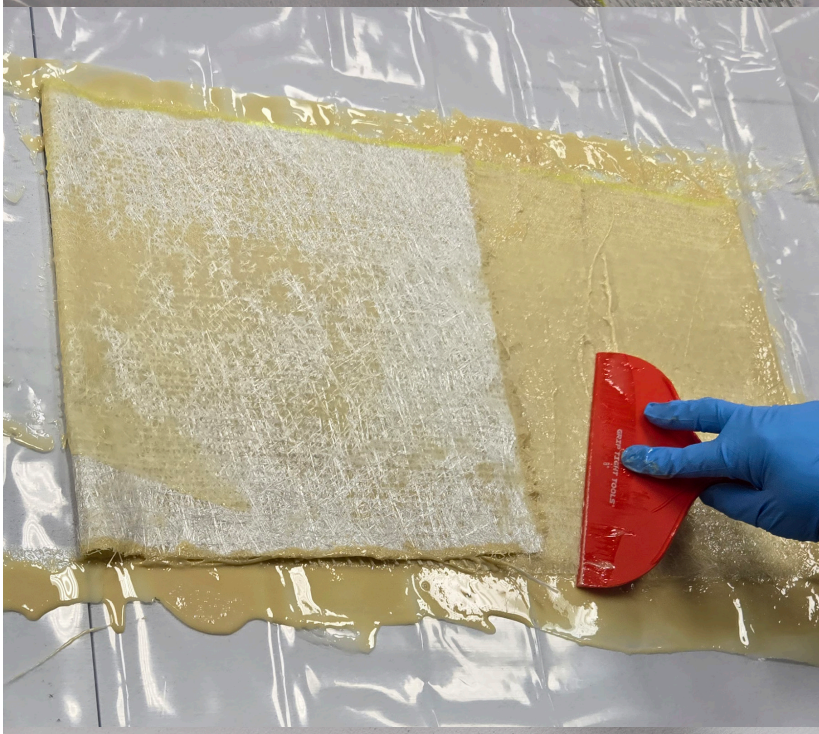

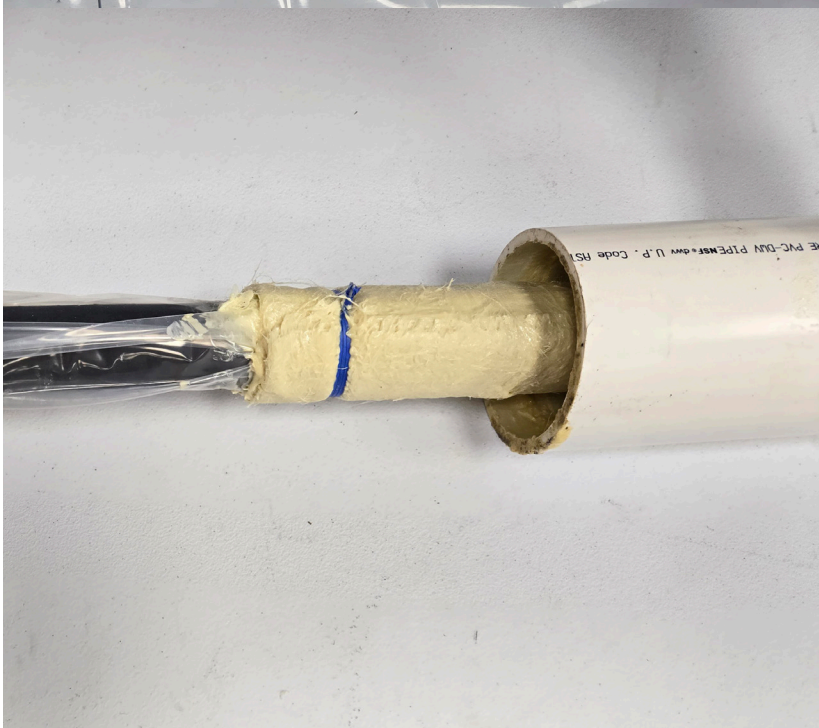

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