

SAFETY DATA SHEET



According to Regulation (EC) No 1907/2006, Annex II, as amended.

COMMISSION REGULATION (EU) 2015/830 of 28 May 2015.

Version: 1.01

Revision Date: First issue, 14.08.2019

Print Date: 17.12.2019

1 Company and Product Identification

1.1 Product Identifiers

Product Name Graphene Enhanced Thermal Prepreg
Product Number GA-THM – 001 / 002
Note: UN code does not apply

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified Uses Composite tooling and components

1.3 Details of the supplier of the safety data sheet

Company Haydale Limited
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1.4 Emergency telephone number

Emergency # +44 (0)1269 842946 Mon – Fri between 09:00 – 16:00 hours

2 Hazards Identification

Classification (EC 1272/2008)

Physical and Chemical Hazards	Not classified	
Human health	Skin Sens. 1B	- H317
	Skin Irrit. 2	- H315
	Eye Irrit. 2	- H319
Environment	Aquatic Chronic 2	- H411
	Aquatic Chronic 3	- H412

Classification (1999/45/EEC) R43
N; R51/53

The Full Text for all R-Phrases and Hazard Statements are Displayed in Section 16.

Human health	May cause sensitisation by skin contact.
Environment	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

2.2. Label elements (Pictogram)

Label in Accordance With (EC) No. 1272/2008



Signal Word	Warning	
Additional Label Description	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. TETRAGLYCIDYL METHYLENEDIANILINE BOUND IN CARBON FIBRE WEAVE MATRIX	
Hazard Statements	H315	Causes skin irritation
	H317	May cause an allergic skin reaction
	H319	Causes serious eye irritation
	H411	Toxic to aquatic life with long lasting effects
	H412	Harmful to aquatic life with long lasting effects
Precautionary Statements	P273	Avoid release to the environment.
	P280	Wear protective gloves/protective clothing/eye protection/face protection.
	P302+P352	IF ON SKIN: Wash with plenty of water.
	P333+P313	If skin irritation or rash occurs: Get medical advice/ attention.
	P337+P313	If eye irritation persists: Get medical advice/ attention.
	P501	Dispose of contents/ container in accordance with national regulations.
Contains	Epoxy formaldehyde phenol novolac resin	
Supplementary Precautionary Statements	P233	Keep container tightly closed.
	P272	Contaminated work clothing should not be allowed out of the workplace.
	P264	Wash contaminated skin thoroughly after handling.
	P302+352	IF ON SKIN: Wash with plenty of soap and water.
	P303+361+353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
	P304+340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
	P305+P351 +P358	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
	P312	Call a POISON CENTRE or doctor/physician if you feel unwell.
	P332+313	If skin irritation occurs: Get medical advice/attention.
	P333+313	If skin irritation or rash occurs: Get medical advice/attention.
	P362	Take off contaminated clothing and wash before reuse.
	P363	Wash contaminated clothing before reuse.
	P403+235	Store in a well-ventilated place. Keep cool.
	P501	Dispose of contents/container in accordance with local regulations

3 Composition and Information on Ingredients

Mixtures

Reaction product: 4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline];		60 – 90 %
CAS-No.: 28768-32-3	EC No.: 249-204-3	
Classification (EC 1272/2008) Skin Sens. 1 - H317	Classification (67/548/EEC) R43	

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Aquatic Chronic 2. - H411	N; R51/53
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Graphite (in the form of graphene)		1 – 40 %
CAS-No.: 7782-42-5	EC No.: 231-955-3	
Classification (EC 1272/2008) Not Classified, Substance with a workplace exposure limit, see Section 8		

Epoxy phenol novolac resin		30 – 60 %
CAS-No.: 28064-14-4	EC No.: 608-164-0	
Classification (EC 1272/2008) Skin Irrit. 2 – H315 Eye Irrit. 2 – H319 Skin Sens. 1 – H317 Aquatic Chronic 2 – H411		

See Section 16 for the full text of the R- phrases declared above.
See Section 16 for the full text of the H statements declared above.

Composition Comments

Resin and graphene mixture impregnated to textile weave

4 First Aid Measures

4.1 Description of first aid measures

General Information	Contaminated disposable PPE must go to hazardous waste after use. Wash contaminated workwear and/or clothing before reuse. Seek medical attention if symptoms persist or any discomfort continues. Take this Safety Data Sheet to show the medical personnel.
Skin Contact	It is important to remove the substance from the skin immediately. Remove contamination with soap and plenty of water or recognised skin cleansing agent. Immediately remove contaminated PPE and/or clothing. Seek medical attention if symptoms are severe or persist after washing. In the event of any sensitisation symptoms developing, ensure further exposure is avoided.
Inhalation	Move affected person to fresh air and keep warm and at rest in a position comfortable for breathing. Loosen tight clothing such as collar, tie or belt. Get medical attention if symptoms are severe or persist.
Eye Contact	Do not rub eye. Remove any contact lenses and open eyelids wide apart. Rinse with water. Get medical attention if any discomfort continues. Make sure to remove any contact lenses from the eyes before rinsing. Promptly wash eyes with plenty of water while lifting the eye lids. Get medical attention promptly if symptoms occur after washing. Get medical attention if any discomfort continues.
Ingestion	Rinse mouth thoroughly with water. Keep person under observation. Get medical advice/attention if you feel unwell. Do not induce vomiting unless under the direction of medical personnel.
Protection of First Aiders	First aid personnel should wear appropriate protective equipment during any rescue.

4.2 Most important symptoms and effects, both acute and delayed

General information	The severity of the symptoms described will vary dependent on the concentration and the length or duration of exposure.
Inhalation	No specific symptoms known.

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Ingestion	May cause sensitisation or allergic reactions in sensitive individuals. May cause irritation.
Skin contact	May cause skin sensitisation or allergic reactions in sensitive individuals. Redness. Irritating to skin.
Eye contact	Irritating to eyes.

4.3 Indication of any immediate medical attention and special treatment needed

Notes for the doctor Treat symptomatically. May cause sensitisation or allergic reactions in sensitive individuals.

5 Firefighting Measures

5.1 Extinguishing media

Fire Hazards	The product is not flammable. Burning may produce irritation, toxic and obnoxious fumes. Extinguish with alcohol-resistant foam, carbon dioxide, dry powder or water fog. Use fire-extinguishing media suitable for the surrounding fire.
Extinguishing Media	Fire can be extinguished using: Foam, carbon dioxide or dry powder. Dry chemicals, sand, dolomite etc. Do not use water jet as an extinguisher as this will spread the fire.
Firefighting Instructions	If trained and competent to do so; Use pressurised air mask if product is involved in a fire. Cool containers exposed to flames with water continuously until well after the fire is out. Keep run-off water out of sewers and water sources. Protective equipment for fire-fighters, self-contained breathing apparatus and full protective clothing must be worn in case of fire.

5.2 Special hazards arising from the substance or mixture

Specific hazards	None known.
Hazardous combustion products	Thermal decomposition or combustion products may include the following substances: Harmful gases or vapours.

5.3 Advice for firefighters

Protective actions during Firefighting	Avoid breathing fire gases or vapours. Evacuate area. Cool containers exposed to heat with water spray and remove them from the fire area if it can be done without risk. Cool containers exposed to flames continuously with water until well after the fire is out. Avoid discharge to the aquatic environment. Control run-off water by containing and keeping it out of sewers and watercourses. If risk of water pollution occurs, notify appropriate authorities.
Special protective Equipment for firefighters	Wear positive-pressure self-contained breathing apparatus (SCBA) and appropriate protective clothing. Firefighter's clothing conforming to European standard EN469 (including helmets, protective boots and gloves) will provide a basic level of protection for chemical incidents.

6 Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions	Wear protective clothing as described in Section 8 of this safety data sheet. No action shall be taken without appropriate training or involving any personal risk. Do not touch or walk into spilled material. Avoid contact with skin and eyes.
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6.2 Environmental precautions

Environmental precautions	Avoid discharge into drains or watercourses or onto the ground. Avoid discharge to the aquatic environment.
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6.3 Methods and material for containment and cleaning up

Methods for cleaning up Wear protective clothing as described in Section 8 of this safety data sheet. Clear up spills immediately and dispose of waste safely. Collect spillage with a shovel and broom, or similar and reuse, if possible. Collect and place in suitable waste disposal containers and seal securely. Flush contaminated area with plenty of water. Wash thoroughly after dealing with a spillage. Dangerous for the environment. Do not empty into drains. For waste disposal, see Section 13.

6.4 Reference to other sections

Reference to other sections

For additional information on personal protection, see Section 8.

For additional information on health hazards, see Section 11.

For additional information on ecological hazards, see Section 12.

For additional information on waste disposal, see Section 13.

7 Handling and Storage

7.1 Precautions for safe handling

Usage precautions Read and follow manufacturer's recommendations. Wear protective clothing as described in Section 8 of this safety data sheet. Keep away from food, drink and animal feeding stuffs. Keep container tightly sealed when not in use. Avoid discharge to the aquatic environment. Do not handle until all safety precautions have been read and understood. Do not handle broken packages without protective equipment. Do not reuse empty containers.

Advice on general occupational hygiene Wash promptly if skin becomes contaminated. Take off contaminated clothing. Wash contaminated clothing before reuse.

7.2 Conditions for safe storage, including any incompatibilities

Storage precautions Store away from incompatible materials (see Section 10). Keep only in the original container. Keep container tightly closed, in a cool, well ventilated place. Keep containers upright. Protect containers from damage.

Storage class Miscellaneous hazardous material storage.

7.3 Specific end use(s)

Specific end use(s) The identified uses for this product are detailed in Section 1.2.

8 Exposure Controls and Personal Protection

Derived effect levels

Product/ingredient name	Type	Exposure	Value	Population	Effects
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	DNEL	Long Term Dermal	0.5 mg/kg bw/day	Workers	Systemic

Predicted effect concentrations

Product/ingredient name	Type	Compartment Detail	Value	Method Detail
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	PNEC	Fresh water	0.0047 mg/l	Assessment Factors
	PNEC	Marine	0.00047 mg/l	Assessment Factors
	PNEC	PNEC intermittent	0.047 mg/l	Assessment Factors
	PNEC	Fresh water sediment	0.0172 mg/kg	Equilibrium Partitioning
	PNEC	Marine water sediment	0.00172 mg/kg	Equilibrium Partitioning
	PNEC	Soil	0.0115 mg/kg	Equilibrium Partitioning
	PNEC	Sewage treatment plant	1000 mg/l	Assessment Factors

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Product/ingredient name	Type	Compartment Detail	Value	Method Detail
Graphite	WEL	Inhalable dust	10 mg/m ³	Long term (UK)
	WEL	Respirable dust	4 mg/m ³	Long term (UK)
	DNEL	inhalational	1.2 mg/m ³	Industry, long term, local effects
	DNEL	Inhalational	0.3 mg/m ³	Consumer, long term, local effects
	DNEL	Oral (bw/day)	813 mg/kg	Consumer, long term, systemic effects

8.1 Control parameters

Ingredient comments No exposure limits known for ingredient(s).

8.2 Exposure controls

Protective equipment



Engineering controls Provide adequate ventilation. Observe any occupational exposure limits for the product or ingredients, where applicable.

Eye/face protection Wear tight-fitting, chemical splash goggles or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Hand protection Wear protective gloves. The most suitable glove should be chosen in consultation with the glove supplier/manufacturer, who can provide information about the breakthrough time of the glove material. To protect hands from chemicals, gloves should comply with European Standard EN374.

Butyl rubber, EVAL; Long term (BTT >480 min)
Neoprene, Nitrile Rubber; Short term/ splash (10 min < BTT < 480 min)

Considering the data specified by the glove manufacturer, check during use that the gloves are retaining their protective properties and change them as soon as any deterioration is detected. Frequent changes are recommended.

Other skin and body protection May cause skin sensitisation or allergic reactions in sensitive individuals. Wear appropriate clothing to prevent repeated or prolonged skin contact.

Hygiene measures Wash after use and before eating, smoking and using the toilet. Do not eat, drink or smoke when using this product.

Respiratory protection Ensure all respiratory protective equipment is suitable for its intended use and is obtained from a reputable supplier and 'CE' marked. Check that the respirator fits tightly and the filter is changed regularly. Gas and combination filter cartridges should comply with European Standard EN14387. Full face mask respirators with replaceable filter cartridges should comply with European Standard EN136. Half mask and quarter mask respirators with replaceable filter cartridges should comply with European Standard EN140.

Environment exposure controls Keep container tightly sealed when not in use. Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

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9 Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance	Fibrous solid.
Colour	Amber or Black.
Odour	Almost odourless.
Melting point	No information available.
Flash point	No information available.
Flammability (solid, gas)	No specific test data are available.
Vapour pressure	No information available.
Bulk density	~ 1210 kg/m ³
Solubility(ies)	No specific test data are available.
Decomposition	Temperature No information available.
Comments	Information declared as "Not available" or "Not applicable" is not considered to be relevant to the implementation of the proper control measures.

9.2 Other information

Other information No other information available.

10 Stability and Reactivity

10.1 Reactivity

Reactivity See the other subsections of this section for further details.

10.2 Chemical stability

Stability Stable at normal ambient temperatures and when used as recommended. Stable under the prescribed storage conditions.

10.3 Possibility of hazardous reactions

Possibility of hazardous reactions No potentially hazardous reactions known.

10.4 Conditions to avoid

Conditions to avoid There are no known conditions that are likely to result in a hazardous situation.

10.5 Incompatible materials

Materials to avoid No specific material or group of materials is likely to react with the product to produce a hazardous situation.

10.6 Hazardous decomposition products

Hazardous Decomposition Products Does not decompose when used and stored as recommended. Thermal decomposition or combustion products may include carbon dioxide, carbon monoxide and nitrogen oxides.

11 Toxicological Information

Acute Toxicity Data

Product/ingredient name	Test	Result	Route	Species
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	LC0 Inhalation Vapour	>30 mg/m ³	4 Hrs	Rat
	LD50 Dermal	>3000 mg/kg		Rabbit
	LD50 Oral	>5000 mg/kg		Mouse
Graphite (bound in epoxy resin)	LD50 Oral	>2000 mg/kg		Rat
	LC50 inhalation	2000 mg/m ³	4 hrs	Rat

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Irritation/Corrosion

Product/ingredient name	Test	Species	Route	Result
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	OECD 404 Acute Dermal Irritation/ Corrosion	Rabbit	Skin	Mild Irritant
	Unknown guidelines	Rabbit	Eyes	Mild Irritant
Graphite (bound in epoxy resin)	OECD 404 Acute Dermal Irritation/ Corrosion	Rabbit	Skin	No Skin irritation
	OECD 405 Acute Eye Irritation/ Corrosion	Rabbit	Eyes	No eye irritation

Sensitiser

Product/ingredient name	Test	Species	Route	Result
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	OECD 406 Skin Sensitisation	Guinea Pig	Skin	Sensitising

Mutagenicity

Product/ingredient name	Test	Result
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	OECD 471 Bacterial Reverse Mutation Test	Positive
	OECD 476 In Vitro Mammalian Cell Gene Mutation Test	Positive
	OECD 474 Mammalian Erythrocyte Micronucleus Test	Negative
	Spermatogonial Chromosome Aberration Test	Negative

Teratogenicity

Product/ingredient name	Test	Species	Result
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	OECD 414 Prenatal Development Toxicity Study	Rat	90 mg/kg NOAEL

Potential acute health effects:

Inhalation	Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure
Ingestion	No known significant effects or critical hazards
Skin contact	May cause an allergic skin reaction
Eye contact	No known significant effects or critical hazards

Potential chronic health effects

Product/ingredient name	Test	Target Organ	Result
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	OECD 408 Repeated Dose 90-Day Oral Toxicity Study in Rodents	-	50 mg/kg/d NOAEL

12 Ecological Information**Toxicity**

Product/ingredient name	Test (Species)	Value	Comment
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	EC50 (algae)	>11 mg/l	72 hr
	EC50 (daphnia)	4.7 mg/l	48 hr
	IC50 (bacteria)	>10000 mg/l	24 hr
	LC50 (fish)	6-8 mg/l	96 hr
	EC10 (algae)	2.4 mg/l	72 hr

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Product/ingredient name	Test (Species)	Value	Comment
Graphite (bound in epoxy resin)	LC50 (fish)	100 mg/l	96 hr
	NOEC (fish)	100 mg/l	4 day
	EC50 (aquatic invertebrates)	100 mg/l	48 hr
	EC50 (aquatic algae)	100 mg/l	72 hr

Product/ingredient name	Test	Period	Result
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	OECD 301B Ready Biodegradability – CO2 Evolution Test	29 days	9-10 %

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	Fresh water days	-	-

Product/ingredient name	LogPow	BCF	Potential
4,4'-Methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	2.12	-	-

Ecotoxicity The product contains a substance which is harmful to aquatic organisms and which may cause long-term adverse effects in the aquatic environment.

12.1 Toxicity

Toxicity Aquatic Chronic 3 - H412 Harmful to aquatic life with long lasting effects.

12.2 Persistence and degradability

Persistence and degradability The degradability of the product is not known.

12.3 Bioaccumulative potential

Bioaccumulative potential No data available on bioaccumulation.

12.4 Mobility in soil

Mobility No data available.

12.5 Results of PBT and vPvB assessment

PBT and vPvB results No data available.

12.6 Other adverse effects

Other adverse effects None known.

13 Disposal Considerations

13.1 Waste treatment methods

General information

The generation of waste should be minimised or avoided wherever possible. Reuse or recycle products wherever possible. This material and its container must be disposed of in a safe way. When handling waste, the safety precautions applying to handling of the product should be considered. Care should be taken when handling emptied containers that have not been thoroughly cleaned or rinsed out. Empty containers or liners may retain some product residues and hence be potentially hazardous.

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Disposal methods

Do not empty into drains. Dispose of surplus products and those that cannot be recycled via a licensed waste disposal contractor. Waste, residues, empty containers, discarded work clothes and contaminated cleaning materials should be collected in designated containers, labelled with their contents. Incineration or landfill should only be considered when recycling is not feasible.

14 Transport Information

General

The product is not covered by international regulations on the transport of dangerous goods (IMDG, IATA, ADR/RID).

14.1 UN number

Not applicable.

14.2 UN proper shipping name

Not applicable.

14.3 Transport hazard class(es)

No transport warning sign required.

14.4 Packing group

Not applicable.

14.5 Environmental hazards

Environmentally hazardous substance/marine pollutant
No.

14.6 Special precautions for user

Not applicable.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code

Transport in bulk according to Annex II of MARPOL 73/78 And the IBC Code
Not applicable.

15 Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations Health and Safety at Work etc. Act 1974 (as amended).

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment

Regulations 2009 (SI 2009 No. 1348) (as amended) ["CDG 2009"].

EH40/2005 Workplace exposure limits.

EU legislation Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 of the Registration, Evaluation, Authorisation (and Restriction) of Chemicals (REACH) (as amended).

COMMISSION REGULATION (EU) 2015/830 of 28 May 2015.

Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (as amended).

15.2 Chemical safety assessment

No chemical safety assessment has been carried out.

Inventories

EU - EINECS/ELINCS

None of the ingredients are listed or exempt.

16 Other Information

Abbreviations and acronyms used in the safety data sheet

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road.

ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways.

RID: European Agreement concerning the International Carriage of Dangerous Goods by Rail.

IATA: International Air Transport Association.

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ICAO-TI: Technical Instructions for the Safe Transport of Dangerous Goods by Air.
IMDG: International Maritime Dangerous Goods.
CAS: Chemical Abstracts Service.
ATE: Acute Toxicity Estimate.
LC₅₀: Lethal Concentration to 50% of a test population.
LD₅₀: Lethal Dose to 50% of a test population (Median Lethal Dose).
EC₅₀: 50% of maximal Effective Concentration.
PBT: Persistent, Bioaccumulative and Toxic substance.
vPvB: Very Persistent and Very Bioaccumulative.

Classification abbreviations and acronyms

Eye Irrit. = Eye irritation
Skin Irrit. = Skin irritation
Skin Sens. = Skin sensitisation
Aquatic Chronic = Hazardous to the aquatic environment (chronic)

Risk Phrases in Full

R43 May cause sensitisation by skin contact.
R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Hazard Statements In Full

H317 May cause an allergic skin reaction.
H411 Toxic to aquatic life with long lasting effects.

General information

Only trained personnel should use this material.

Classification procedures according to Regulation (EC) 1272/2008

Skin Irrit. 2 - H315: Eye Irrit. 2 - H319: Skin Sens. 1 - H317: : Calculation method.
Aquatic Chronic 3 - H412: : Calculation method.

Training advice

Only trained personnel should use this material.

Additional Information

Further information on this product can be found on the Haydale website.

Revision Number

1.00

Revision Date

First issue, 14/08/2019

Issued by

HSEQ Manager

SDS Number

GA-THM

SDS Status

Approved

The content supplied in this safety data sheet ("Information") supersedes all previous versions supplied

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