Non Destructive Testers Limited (Guyana) Inc

PROJECT SUMMARY OUTLINE

APPROVAL TO OPERATE AND STORE INDUSTRIAL X-RAY AND GAMMA RAY EQUIPMENT AND CONSUMABLES

Rev. 02

DOCUMENT PREPARED BY : LUDMILA TACKOOR-ADDO

DATE : 2ND SEPTEMBER 2021

#394 CIPERO ROAD,
FRIENDSHIP VILLAGE,
SAN FERNANDO
TRINIDAD
TEL: 868-221-1658 / 653-8122
FAX: 868-652-5089
EMAIL:info@ndt.co.tt

50 BRICKDAM
STABROEK,
GEORGETOWN
GUYANA
TEL: 686-680-4759 / 221-1658
FAX: 868-652-5089
EMAIL: info@ndt.co.tt /
ludmila@ndt.co.tt / kirk@ndt.co.tt

Non Destructive Testers Limited (Guyana) Inc

HISTORY OF NDTL

Non Destructive Testers Limited (NDTL), Trinidad Operations was established in 1990 and incorporated three years after, to provide a range of inspection, testing and heat treatment services to the petroleum, petrochemical and other energy related upstream / downstream industries. At present, NDTL employs a staff of approximately one hundred (100) employees, which is inclusive of both permanent and weekly paid Technicians, that are utilized as service demands. The office is strategically located in San Fernando, South Trinidad.

In June of 2018, NDTL registered its operations in Guyana – Non Destructive Testers Limited (Guyana) Inc. with the intent of providing similar services.

Due to the growing needs of Guyana's Energy Sector, NDTL expects to increase its market share with the broad variety of its inspection services and also plans to build a strong market position in Guyana.

The company is led by a team of certified professionals who have spent the major part of their working lives in the practice of the technology which they offer to their clients. The Directors and Shareholders each have a minimum of thirty (30) years' experience in the non-destructive testing fields and combined with their qualifications they have provided an excellent foundation for this company.

MARKET FOCUS

The organization aims to offer its services at competitive prices to meet the demands of the growing sector.

NDTL (Guyana) Inc. wants to establish a large, local and loyal customer base, and therefore concentrates its business and marketing on both local and international clients, which will be the dominant target market. This will establish a healthy, consistent revenue base to ensure stability of the business and the organization understands that high visibility and competitive services are crucial to capture this segment of the market.

MISSION STATEMENT

To conduct all our company's operations in a manner that protects the safety and health of our employees, our customers, others involved in our operations, the environment and the general public.

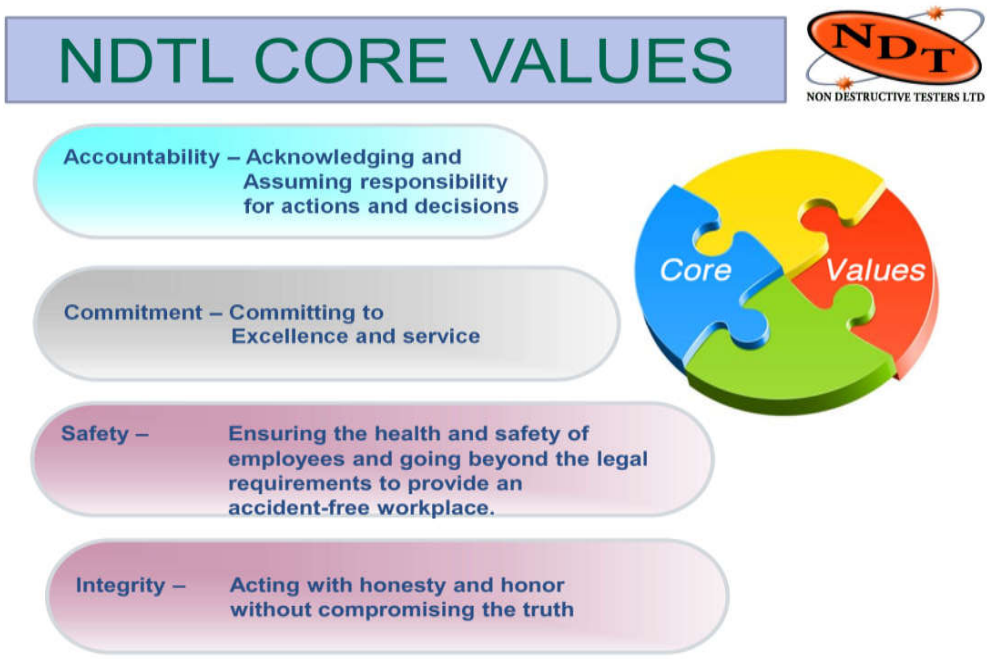
VISION STATEMENT

To be the provider of the highest quality of Non Destructive Examination Services to both the local and international industry by exceeding our clients expectations and creating productive relationships which will lead to mutual success in business endeavors.

KEYS TO SUCCESS

- Providing the highest quality and exceptional service
- Competitive pricing
- Implementation of a programme to provide training & eventual certification to suitable local candidates.

CORE VALUES



SERVICES PROVIDED

NDTL offers a broad range of services to cater to all of its customers.

The following is a list of the services currently provided by NDTL (both locations):

1. Conventional NDE Inspection Services

- Radiographic Inspection (Gamma Ray & X-Ray)
- Magnetic Particle Inspection
- Liquid Dye Penetrant Inspection
- Ultrasonic Thickness & Flaw Detection
- Close Visual Inspection (CVI)
- General Visual Inspection (GVI)
- Ferrite Testing
- Heat Treatment Services (Pre Heat/PWHT)
- Hardness Testing
- Vacuum Box Testing
- Holiday Detection (Low/High Voltage)
- Load Testing (CCU/Proof Load)
- Welding Procedure Qualification
- Quality Control/Quality Assurance Services

2. Advanced NDE Inspection Services

- Computerized Radiographic Testing (CRT)
- Phased Array Ultrasonic Testing (PAUT)
- Phased Array Corrosion Mapping
- Pulsed Eddy Current Testing (PEC)
- Qualitative Short Range (QSR)
- Time of Flight Detection (TOFD)
- Eddy Current Testing (ET)
- Guided Wave Ultrasonic Testing (GUL) (through NDT Partner)
- Infrared Thermographic Inspection (IR)
- Positive Material Identification (PMI)

SERVICES PROVIDED

3. Visual Aid Inspection Services

- Borescope Inspections
- Binocular Inspection
- Drone Inspection with IR capability (through NDT Partner)

4. American Petroleum Institute (API) License Inspections Services

- API 510 Pressure Vessel Inspection of Internal & External Pressure Vessels
- API 570 Piping Inspection on process piping, critical valves, PSVs
- API 653 Above Ground Storage Tank Inspections
- API 580 Risk Based Inspections-RBMI Asset Based Inspection

5. National Association of Corrosion Engineers (NACE) Inspections Services

- NACE CIP Level I,II,III Coating inspection services
- NACE-OCAT Inspectors for Offshore Corrosion Assessments
- NACE Basic Corrosion Inspectors
- QA/QC Inspection on Fabric Maintenance Projects
- Adhesion Testing and Consultancy Services.
- CP Inspection and Installation services (through NDT Partner)

6. American Welding Society (AWS) Inspections Services

- Provision of Certified Welding Inspectors
- QA/QC Inspection and verification on offshore and onshore Fabrication Projects
- WPS/ PQR Reviews and consultancy services

7. American Society Non Destructive Testing (ASNT)

- Provision of ASNT Level 3 Services
- ASNT Level 1 & II NDT Technicians
- Procedure and Documentation Reviews

SERVICES PROVIDED

8. Rope Access Services (IRATA)

- Provision of IRATA Level 3 Supervision Services
- Supply of IRATA Level 1& 2 ASNT NDE CRT/UT/PAUTMT/PT Inspectors
- Supply of IRATA Level 1& 2 API 510/570/653 Inspectors
- Supply of IRATA Level 1& 2 NACE Inspectors
- Supply of IRATA Level CWI Inspectors
- Rope Access Equipment Inspection
- Rope Access Training for Level 1/2/3.

9. Statutory Inspection & Certification (OSHA)

- Certification of Air Receivers/Vessels and lifting devices

10. RBMI Engineering Support & Focal Point FTE Inspectors

- Mechanical/Corrosion/Civil/Structural Engineers (through NDT Partner)
- RBMI Software Trained Inspectors
- Provision of QA/QC & Multi Skilled Inspectors to Turn Around Teams & Shutdown Teams
- Provision of API Multi Skilled Inspectors to assist Shell Engineers

11. In Development Services

- Failure Analysis Services
- Replica Testing Services

N.B: Continuing overtures to foreign entities into the specialized field of knowledge / plan of how to expand into the field of 'drill pipe' inspections.

DESCRIPTION OF SITE

NDTL will operate on a facility that has a total of 112,774 sq. ft. which is located at 1-2 Coverden, East Bank Demerara. The area is generally flat and has an existing building which will be used as office space and workshops for conducting inspections. Therefore, the site will not require any major infrastructure and utility development as well as no major earthworks and waterworks will be required prior to commencing the project. NDTL's storage facility is located at least 100ft away from the roadway and there are no immediate neighbours or residences. **Attachment # 1 includes an approved site plan which indicates the location of the existing structures, NDTL's location and the present land use.**

PROJECT DESIGN

NDTL has partnered with National Hardware (Guyana) Limited located at 28 Holmes Street, South Cummingsburg, Georgetown and has finalized a lease agreement for the property located at 1-2 Coverden, East Bank, Demerara, with the intention to set up offices and base of operation.

NDTL intends to apply for approval for of this property to operate and store Industrial X-Ray and Gamma Ray equipment, chemicals, consumables, additional radiographic equipment, magnetic particle and liquid dye penetrant equipment.

The following identifies some information on the equipment and consumables we intend to store for operational purposes:

1) Industrial x-ray equipment - Comet EVO 300D:
   Approval for – Import / Export / Store & Operate

2) Gamma ray equipment – Iridium 192:
   Approval for – Import / Export / Store & Operate

3) Chemicals / Consumables as follows:
   Approval for – Import / Export & Store the following:

   (a) Radiographic Examination:
   - AGFA G135 Part A & B Developer
   - AGFA G335 Part A & B Fixer

(b) Magnetic Particle Examination:
- MAGNAFLUX Prepared Bath - 7HF
- MAGNAFLUX - White Contrast Paint - WCP 2

PROJECT DESIGN (CONTINUED):

(c) Liquid Dye Penetrant Examination:

- MAGNAFLUX Cleaner – SKC-S
- MAGNAFLUX Penetrant – SKL-SP2
- MAGNAFLUX Developer – SKD-S2

N.B: Simultaneous to the application for licences and approvals listed above, the following licences and approval will also be requested:

a) PTCB – Import / Export / Storage and use of chemicals as listed above for Magnetic Particle and Liquid Dye Penetrant Examination.

b) EPA – Import / Export / Storage & Use of:
(i) Industrial X-Ray Equipment - Comet EVO 300D
(ii) Gamma Ray Equipment – Iridium 192

PROJECT SIZE

NDTL intends to establish a large, local and loyal customer base, and therefore concentrates its business and marketing on both local and international clients, which will be the dominant target market. High visibility and competitive services are critical to capture this segment of the market.

This project is currently in the planning phase and NDTL (Guyana) Inc. expects to raise 100% of its own capital and this provides the bulk of the current financing required.
NDTL (Guyana) Inc. anticipates sales of about $200,000.00 USD in the first year, and growth of approximately 5 – 10 % in the second and third year of the business.

Number of employees required will depend on demand for services and time required for completion however, for this initial phase, NDTL (Guyana) Inc. will be utilizing approximately five (5) employees.

PROJECT EXPLANATION

NDTL (Guyana) Inc. intends to provide our services to the oil and gas sector in Guyana on a continuous basis.

This method is widely used to examine for subsurface discontinuities (such as voids, porosity, inclusions and cracks, etc.) in castings and weldments in a wide range of materials, by using the technique of radiographic exposure and interpretation of radiographic film.

The source capsule and the pigtail is housed in a shielding device referred to as a exposure device or camera. NDTL utilizes 880 Delta / Sigma source projectors which are portable, relatively lightweight and compact industrial radiographic exposure devices.

Photograph #1 below shows an 880 Delta source projector.

Photograph # 1

Taking into consideration the risks involved with its operations, NDTL employs risk assessments and additional controls to ensure operations are completed in a safe manner and in the best interest of its customer, employees, the environment and the general public.

For this project, the organization ensures the following:

- Storage area constructed in accordance with international standards and double locked for additional security.
- Keys for storage are assigned to the HSEQ Manager who is also a Radiation Safety Officer.
- Logs track the movement of isotopes to and from jobsites.

It is important to note that radiographic examination operations are **NOT** conducted at the storage site. All operations are conducted at approved client sites / facilities and is done in accordance with approved examination procedures.

EXPECTED LIFETIME:

This project was expected to begin in March 2021 and continue until March 2023. This is the first phase of this project and will include approximately five (5) technical personnel as well as a Radiation Protection Supervisor / Radiation Safety Officer.

Initial project (s) when awarded may vary from five (5) – ten (10) years and as such, NDTL (Guyana) Inc. registered its business with the intent to provide its services to the energy sector in Guyana on a continuous basis. **The intent is to provide services for multiple projects.**

POTENTIAL EFFECTS ON THE ENVIRONMENT

NDTL ensures due diligence in all of its operations and pays particular attention to managing the mitigation of all / any environmental risks. The organization has implemented preventative maintenance programs for its equipment thus preventing any impact to land and soil from its operations. The organization understands that radiographic examination is ranked as high risk and as such, for radiographic inspection equipment, wipe test / leak test are performed on the isotopes to ensure that the integrity on the equipment and isotope is not compromised. Surveys are also done around the isotope storage areas to ensure the isotopes are properly secured.

Depleted isotopes are returned to the manufacturer for disposal according to manufacturer requirements (in accordance with applicable regulations and shipped in approved sealed containers).

Our activities do not generate any air emissions (i.e. particulate emission such as dust or pollutant gaseous emissions) thus causing any impact to air. Also, our operations do not generate any noise or vibrations.

Current operations in Trinidad poses no negative impacts to both ground and surface water. This has been tested and approved by the local Environmental Management Authority (EMA). Used film processing chemicals, go through a treatment process **(refer to Attachment # 4)** before being released to ensure that ground and surface water is not impacted.

Additionally, empty aerosol cans containing residue consumables are disposed of by an approved waste disposal supplier in Trinidad. If this service is not available in Guyana, NDTL proposes to stock the empty cans in designated bins and return to Trinidad on a bi-annual basis for disposal in accordance with NDTL's Waste Management Program and the approved waste disposal suppliers' process.

POTENTIAL EFFECTS ON THE ENVIRONMENT (Continued)

As per the MSDS attached **(Attachments # 2A - # 2D)** for the consumables used in our operations, the following tables provides a breakdown of the environmental impacts and the mitigation factors employed by NDTL.

Table # 1

CHEMICAL / CONSUMABLE	POTENTIAL ENVIRONMENTAL IMPACT (AS PER MSDS)	MITIGATION FACTORS
Iridium 192 Isotope	Iridium-192 does not occur in nature and is produced by neutron activation of iridium metal, usually in nuclear reactors. Since the used of iridium-192 are typically in sealed sources, release of iridium-192 to the environment would be expected to be minimal and human exposure to iridium-192 would be limited to its beta emission rather than to the element itself.	• Regular service and maintenance on exposure device / cameras used for radiographic examination. • Monitoring of isotope storage pit. • Only authorized personnel are allowed access. • Depleted isotopes are returned to manufacturer / supplier for proper disposal.
Radiographic Film Processing Consumables	Hazardous to the aquatic environment	• Depleted processing chemical is treated and disposed as per NDTL Waste Management Procedure and the requirements of the EMA. • See attachment # 4 for extraction from procedure and sample report from an approved provider showing toxicity measures and acceptance.

POTENTIAL EFFECTS ON THE ENVIRONMENT (Continued)

Table # 2

CHEMICAL / CONSUMABLE	POTENTIAL ENVIRONMENTAL IMPACT (AS PER MSDS)	MITIGATION FACTORS
Magnetic Particle Examination Consumables	Hazardous to the aquatic environment	• NDTL trained personnel immediately cordons off the contaminated area to prevent others from entering and follow the requirements of the organization's procedure for loss of containment and the attached MSDS (Attachment 2C). • Empty aerosol tins are segregated and disposed of by an approved waste disposal supplier in Trinidad. NDTL is in the process of sourcing the availability of approved suppliers in Guyana.
Liquid Dye Penetrant Examination Consumables	Hazardous to the aquatic environment	• NDTL trained personnel immediately cordons off the contaminated area to prevent others from entering and follow the requirements of the organization's procedure for loss of containment and the attached MSDS (Attachment 2D). • Empty aerosol tins are segregated and disposed of by an approved waste disposal supplier in Trinidad. NDTL is in the process of sourcing the availability of approved suppliers in Guyana.

PLAN TO MITIGATE RADIATION EXPOSURE TO PERSONNEL AND THE PUBLIC

NDTL in its effort to provide a safe workplace for its employees adopts its' implemented procedure as part of its safety policies to ensure protection of employees and the public from the hazards associated with Ionizing Radiation.

NDTL ensures provision of instruction, guidance and training for its employees as it relates to Radiation and the prevention of potential injuries associated with this subject. This includes training on the necessary personnel protective equipment (PPE) which is provided by the organization and maintained within the preventative maintenance program.

The organization also monitors dosimetry records for all radioactive technicians and maintains records of results. This is done by an approved third party provider.

Handling, storage and accidental release measures are controlled as per the requirements of the organizations **Radiation Safety and Emergency Response Program (LV-NDTL-07-PWP-HSE-#34) – See attachment # 3.**

The HSE management system includes procedures for managing risk associated with radiation examination as well as other areas of operations.

REQUIREMENTS FOR STORAGE OF EQUIPMENT & CONSUMABLES

As per the recommended guidelines of each associated MSDS, the following shall apply:

1) X-ray equipment – No specific requirements

2) Gamma ray equipment – Iridium 192 - Stored in a lead lined tool box designed in accordance with IAEA-TECDOC-1145 (Section 6.2).

REQUIREMENTS FOR STORAGE OF EQUIPMENT & CONSUMABLES (CONTINUED):

3) Chemicals / Consumables:

NDE Process	Chemical / Consumable	Type	Storage Requirements as per MSDS
Radiography	AGFA G135 Part A & B Developer	Liquid	Recommended storage temperature 10 ºC to 30 ºC
	AGFA G335 Part A & B Fixer	Liquid	Recommended storage temperature 10 ºC to 30 ºC
Magnetic Particle	Magnaflux - Prepared Bath - 7HF	Aerosol	Protect from sunlight and do not expose to temperatures exceeding 50 ºC. Recommended storage temperature 10 ºC to 30 ºC.
	Magnaflux - White Contrast Paint - WCP 2	Aerosol	Protect from sunlight and do not expose to temperatures exceeding 50 ºC. Recommended storage temperature 10 ºC to 30 ºC.
Liquid Dye Penetrant	Magnaflux - Cleaner - SKC-S	Aerosol	Protect from sunlight and do not expose to temperatures exceeding 50 ºC. Recommended storage temperature 10 ºC to 30 ºC.

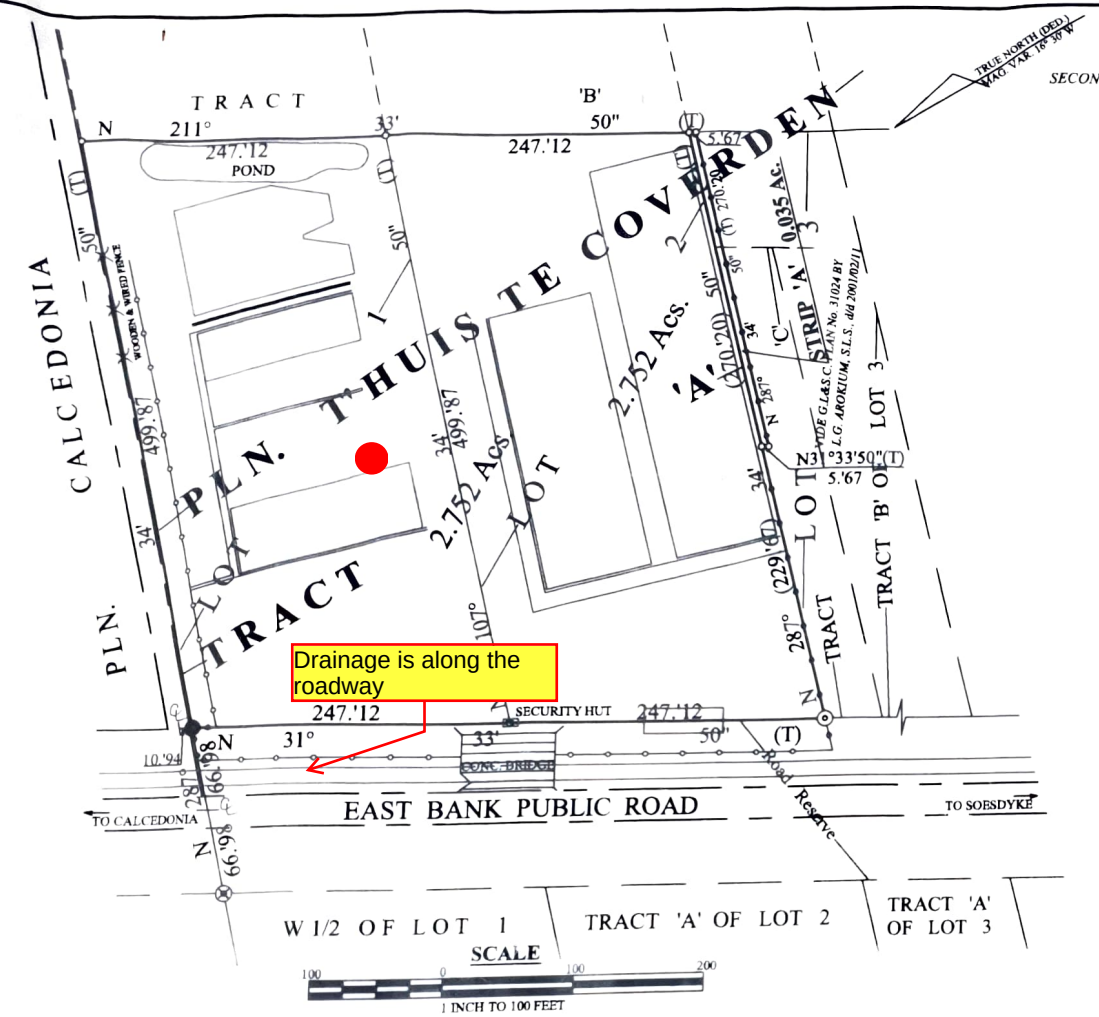
REQUIREMENTS FOR STORAGE OF EQUIPMENT & CONSUMABLES (CONTINUED):

3) Chemicals / Consumables (continued):

NDE Process	Chemical / Consumable	Type	Storage Requirements as per MSDS
Liquid Dye Penetrant	Magnaflux - Penetrant - SKL-SP2	Aerosol	Protect from sunlight and do not expose to temperatures exceeding 50 ºC. Recommended storage temperature 10 ºC to 30 ºC.
	Magnaflux - Developer - SKD-S2	Aerosol	Protect from sunlight and do not expose to temperatures exceeding 50 ºC. Recommended storage temperature 10 ºC to 30 ºC.

ATTACHMENT # 1

APPROVED SITE PLAN



PLAN

FIRSTLY: **TRACT 'A' BEING PORTIONS OF LOT 1 AND LOT 2**
SECONDLY: **STRIP 'A' BEING PORTIONS OF TRACT 'C' OF LOT 3 AND TRACT "B" OF LOT 3**
ALL BEING PORTIONS OF
PLN. T'HUIS TE COVERDEN
EAST OF THE EAST BANK PUBLIC ROAD
SITUATE ON
THE EAST BANK OF DEMERARA
IN THE COUNTY OF DEMERARA
GUYANA

SURVEYED AND PAALED OFF AT THE REQUEST OF
THE CHEIF EXECUTIVE OFFICER OF NICIL
BY

K.A. Chapman
KEITH A. CHAPMAN
SWORN LAND SURVEYOR

DATE: 14/10/2011

MEMORANDUM

1. NOTICE OF INTENDED WAS SERVED ON THE COMMISSIONER OF GUYANA LANDS AND SURVEYS COMMISSION, THE CHAIRMAN OF T'HUIS TE COVERDEN N.D.C., GERSHON BEN-AMIN, THE HEIRS PIERRE JACK, JAMES DOUGLAS, AZORE, ANTHONY OWENS ETAL, V. AKAI, SUKHRAM, WILLIAM SHRUTER AND IGNATIUS DAVIDSON.

2. THE SURVEY WAS COMMENCED ON 21/04/2011 STOPPED ON 28/05/2011. RECOMMENCED ON 26/09/2011 AND WAS COMPLETED ON 07/10/2011. INTERRUPTIONS IN THE FIELD DURING THE EXECUTION RESULTED IN THE DELAY.

3. MR. SOLOMON NOEL MOHAMED OBJECTED TO THE SURVEY WHILE I WAS IN THE PROCESS OF RELOCATING THE ROAD RESERVE ALONG PLN. CALCEDONIA AND T'HUIS DE COVERDEN TO RELOCATE THE BOUNDARIES OF LOTS 1 AND 2 ETC. FOR ACCURATE EXECUTION.

4. REFERENCE WAS MADE TO THE FOLLOWING G.L&S.C. PLANS:-
   (a) No.831 BY H. RAINSFORD, S.L.S., d/d 13/12/1841 ON WHICH THE SURVEY IS BASED.
   (b) No.10651 BY R. PREMSINGH, S.L.S., d/d 04/10/1962 FROM WHICH BEARINGS WERE DEDUCED.
   (c) No. 21074 BY H.A. HOWARD, S.L.S., d/d 2000/11/30 WHICH DESCRIBED TRACT 'A'. HOWEVER BEARINGS DEDUCED WERE ERRONEOUS AND INCONSISTENT.
   (d) No. 31024 BY L.G. AROKIUM, S.L.S., d/d 2001/02/11.

5. (a) THE E 1/2 OF LOT 1 AND LOT 2 ARE HELD BY B.G. CLAY PRODUCTS LTD. UNDER TRANSPORT No. 2480 OF 28/11/1960.
   (b) THE W 1/2 OF LOT 1 IS HELD BY V. AKAI UNDER TRANSPORT No. 1200 OF 1960/07/06.
   (c) THE NORTH PORTION OF LOT 3 IS HELD BY WILLIAM SHRUTER UNDER TRANSPORT No. 242 OF 1959/02/10.
   (d) TRACT 'A' OF LOT 2 AND TRACTS 'B' AND 'C' OF LOT 3 ARE HELD BY GERSHOM BENJAMIN VIDE TRANSPORT No. 1435 OF 2008.

6. IT WAS DIFFICULT TO ASCERTAIN THE POSITIONS DESCRIBED BY THE AFOREMENTIONED TRANSPORTS IN RELATION TO THE AREAS SURVEYED SINCE NO REFERENCE PLANS WERE CALLED OUT.

7. THE PURPOSE OF THE SURVEY IS TO REDEFINE THE BOUNDARIES OF TRACT 'A' AND TO PROVIDE ENGINEERING DETAILS OF EXISTING FEATURES, BUILDINGS AND INFRASTRUCTURES AND THE EXTENT OF OCCUPATION THEREIN.

8. (i) FOR ALL INTENT AND PURPOSES A CAREFUL ANALYSIS OF THE TERM THE E 1/2 OF LOT 1 AND 2 HELD BY
   B.G. CLAY PRODUCTS LTD. UNDER TRANSPORT No. 2480 OF 28/1/1960 SHOULD HAVE BEEN DESCRIBED AS THE EASTERN PORTION OF LOTS 1 AND 2.
   (ii) ALSO THE TERM W 1/2 OF LOT 1 HELD BY V. AKAI UNDER TRANSPORT No.1200 OF 1960/07/06 SHOULD HAVE BEEN DESCRIBED AS THE WESTERN PORTION OF LOT 1.

K.A. Chapman

LEGEND

- DENOTES CONC. MARK K.A.C. AND H.A.H. JUXTAPOSED
- DENOTES WOOD PAAL K.A.C.
- DENOTES CONC. MARK K.A.C.
- DENOTES OLD WOOD PAAL (FOUND) AND WOOD PAAL K.A.C. JUXTAPOSED
- DENOTES OLD WOOD PAAL
- DENOTES DRAIN
- DENOTES CONC. FENCE
- DENOTES BUILDINGS

GUYANA LANDS & SURVEYS COMMISSION
HEREBY CERTIFY THAT THIS IS A COPY OF ORIGINAL
PLAN NO. 51470
ON RECORD IN THIS OFFICE
2011-11-11
MANAGER SURVEYS DIVISION

SURVEYS DIVISION
2011-11-10
RECEIVED
2011/11/19 13
G. L. S. C.

TO BE A TRUE COPY OF THE ORIGINAL K.A. Chapman

01412

ATTACHMENT # 2 (A)

APPLICABLE MSDS – IRIDIUM 192

Material Safety Data Sheet
Iridium-192 (Ir-192)

Issue Date: November 2019

1.0 Chemical Product and Company Identification

1.1 **Material Identification:** Iridium-192 (Ir-192)

1.2 **Trade Names and Synonyms:**
Iridium-192 (Ir-192 Bulk (not special form)
Iridium-192 (Ir-192 Sealed sources (special form)

1.3 **Company Identification:**
Manufacturer:
QSA Global, Inc.
40 North Avenue
Burlington, MA 01803
Phone Number (781) 272-2000
Fax Number (781) 359-9191

2.0 Composition, Information or Ingredients:
Disks of metallic iridium in a stainless steel capsule.

3.0 Hazard Identification:
The ionizing radiation emitted from this material can only be detected by an appropriate beta/gamma detector. It cannot be experienced by human sensory systems. Acute exposure to ionizing radiation may result in acute radiation syndrome (ARS). Long term effects are increased risk for cancer and genetic effects.

4.0 First Aid Measures:
Remove from source of exposure or take other actions that minimize exposure. Acute exposure to ionizing radiation above applicable regulatory limits requires assessment by a medical professional familiar with radiation injuries.

5.0 Fire-Fighting Measures:

5.1 **Extinguishing Media:**
The capsules themselves are not flammable. Use media appropriate to surrounding fire.

5.2 **Special Firefighting Procedures:**
Fire fighters should wear positive pressure, self-contained breathing apparatus, full protective clothing, and alarming radiation monitoring devices. Survey for radioactive contamination in case of suspected capsule integrity failure.

6.0 Accidental Release Measures:
Do not approach spilled source(s) or material without appropriate radiation detection instruments. Secure the affected area from access except to save lives. Emergency operations should be conducted in accordance with site emergency plan and with responders spending the minimum possible time in the affected area.

7.0 Handling and Storage:
Possession of this material requires a radioisotope license both for the shipper and the consignee and handling must be performed as specified in the license.

7.1 **Handling:**
This material should never be handled directly, but through the use of remote handling tools. All appropriate radiation protection precautions should be utilized. Transport of this material must be in accordance with all applicable regulations.

7.2 **Storage:**
Store this material in an appropriate storage container made of a heavy dense metal such as lead or depleted uranium. Storage must be in accordance with applicable regulations.

8.0 Exposure Control and Personnel Protection:
Exposure to the radiation from this material may be mitigated by using remote handling tools, use of a shield, or by minimizing the time of exposure.

8.1 **Respiratory Protection:**
Respiratory protection is not necessary for normal operations with this material because the capsules are sealed. Should the integrity of the capsule be compromised, use an air-purifying respirator with P100 cartridge or equivalent.

8.2 **Protective Clothing:**
Protective clothing is used to prevent radioactive contamination of the skin and does not protect against ionizing radiation. Lead aprons or other lead impregnated materials may reduce exposure somewhat.

9.0 Chemical and Physical Properties:
Silver-white very hard metallic element.
Melting point: 2450°C. Boiling Point: ~4500°C. Sp.Gr. 22.65

Ir-192 is a beta and gamma emitter with the following main energies:

β	Energy KeV (% Yield)	γ	Energy KeV (% Yield)
	536 (41.33)		316.5079 (82.86)
	672 (47.82)		468.0715 (47.64)
	256 (5.528)		308.4569 (29.70)
			259.9583 (28.68)

10.0 Stability and Reactivity:
Ir-192 decays with a half-life of 73.83 days.

11.0 Toxicological Information:
The radiation toxicity from this material exceeds the chemical toxicity of the material for the purpose of mitigating human effects.

12.0 Ecological Information:
The effects of this material are expected to be limited in area and scope.

13.0 Disposal Considerations:
Dispose of in accordance with all applicable regulations in a facility licensed for radioactive material.

14.0 Transport Information:
Transport of this material must be in accordance with all applicable regulations. It must be shipped in approved containers (usually Type B, UN2916 or UN2917).

15.0 Regulatory Information:
This MSDS is not required in the United States under the OSHA Hazard Communication Standard, but is produced for such jurisdictions where it is required.

16.0 Other Information:
N/A

ATTACHMENT # 2 (B)

APPLICABLE MSDS – RADIOGRAPHIC FILM PROCESSING CONSUMABLES – G135-Part A (Developer)

SAFETY DATA SHEET

Classified in accordance 29 CFR 1910.1200

1. Identification

Product identifier: G135 PART A

Recommended restrictions

Recommended use: Photographic developer concentrate
Restrictions on use: Reserved for industrial and professional use.

Manufacturer/Importer/Distributor Information

Manufacturer

Agfa-Gevaert NV
Septestraat 27
2640 Mortsel
Belgium

Telephone: +32 3 4445501
Fax: +32 3 4445503
E-mail: electronic.sds@agfa.com

Distributor

Agfa Corporation
611 River Drive
Center 3
Elmwood Park, NJ 07407
U.S.A.

Telephone: 908-231-5261
Contact Person: M. Patrick
E-mail: nafta.productsafety@agfa.com

Emergency telephone number:

Transport Emergency	Non-transportation
Call CHEMTREC : +1 800 4249300	Health Emergency Phone : +1 303 6235716
International : +1 703 5273887	Agfa Information Phone : +1 201 4402500

2. Hazard(s) identification

Hazard Classification

Health Hazards

Serious Eye Damage/Eye Irritation	Category 1
Skin sensitizer	Category 1
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 2

Environmental Hazards

Acute hazards to the aquatic environment	Category 1

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement: Causes serious eye damage.
May cause an allergic skin reaction.
Suspected of causing genetic defects.
Suspected of causing cancer.

Precautionary Statements

Prevention: Wear protective gloves/protective clothing/eye protection/face protection. Avoid breathing dust/fume/gas/mist/vapors/spray. Contaminated work clothing should not be allowed out of the workplace. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required.

Response: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF ON SKIN: Wash with plenty of water/… If skin irritation or rash occurs: Get medical advice/attention. Immediately call a POISON CENTER/doctor. Specific treatment (see on this label). Wash contaminated clothing before reuse.

Storage: Store locked up.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Hazard(s) not otherwise classified (HNOC): None.

3. Composition/information on ingredients

Mixtures

Chemical Identity	CAS number	Content in percent (%)*
Potassium carbonate	584-08-7	5 - <10%
Hydroquinone	123-31-9	5 - <10%
Trisodium 2-(carboxylatomethyl(2-hydroxyethyl)amino)ethyliminodi(acetate)	139-89-9	1 - <5%
Potassium hydroxide	1310-58-3	0 - <0.1%
sodium hydroxide	1310-73-2	0 - <0.1%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Description of necessary first-aid measures

General information:	Get medical attention if symptoms occur.
Inhalation:	Call a physician or poison control center immediately. If breathing stops, provide artificial respiration. Move to fresh air. If breathing is difficult, give oxygen.
Skin Contact:	Call a physician or poison control center immediately. Destroy or thoroughly clean contaminated shoes. Immediately remove contaminated clothing and shoes and wash skin with soap and plenty of water. If skin irritation or an allergic skin reaction develops, get medical attention.
Eye contact:	Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately.
Ingestion:	Call a physician or poison control center immediately. Rinse mouth. Never give liquid to an unconscious person. Do not induce vomiting without advice from poison control center.
Personal Protection for First-aid Responders:	CAUTION! First aid personnel must be aware of own risk during rescue! See Section 8 of the SDS for Personal Protective Equipment.

Most important symptoms/effects, acute and delayed

Symptoms:	See section 11 of the SDS for additional information on health hazards.
Hazards:	See section 11 of the SDS for additional information on health hazards.

Indication of immediate medical attention and special treatment needed

Treatment:	Treat symptomatically.

5. Fire-fighting measures

General Fire Hazards: No unusual fire or explosion hazards noted.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media:	Extinguish with foam, carbon dioxide, dry powder or water fog.
Unsuitable extinguishing media:	Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical: During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: No data available.

Special protective equipment for fire-fighters:	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep unauthorized personnel away.
For emergency responders:	Warn everybody of potential hazards and evacuate if necessary. Use personal protective equipment.
For non-emergency personnel:	Use personal protective equipment.
Methods and material for containment and cleaning up:	Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Dike far ahead of larger spill for later recovery and disposal.
Environmental Precautions:	Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Handling

Technical measures (e.g. Local and general ventilation):	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Emergency showers and eye wash stations should be available.
Safe handling advice:	Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. Use personal protective equipment as required. Do not get in eyes. Wash hands thoroughly after handling. Do not get in eyes, on skin, on clothing. Avoid contact with eyes, skin, and clothing.
Contact avoidance measures:	Contact with incompatible materials.
Hygiene measures:	Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not get in eyes. Wash contaminated clothing before reuse. Do not get this material in contact with skin. Contaminated work clothing should not be allowed out of the workplace. Avoid contact with skin.

Storage

Safe storage conditions:	Store locked up.
Safe packaging materials:	Keep in original container.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	Type	Exposure Limit Values	Source

Hydroquinone	TWA	1 mg/m3	US. ACGIH Threshold Limit Values (03 2014)
	Ceil_Time	2 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	PEL	2 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	TWA	2 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
Potassium hydroxide	Ceiling	2 mg/m3	US. ACGIH Threshold Limit Values (03 2014)
	Ceiling	2 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	Ceil_Time	2 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2016)
sodium hydroxide	Ceiling	2 mg/m3	US. ACGIH Threshold Limit Values (03 2014)
	Ceil_Time	2 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	PEL	2 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	Ceiling	2 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)

Appropriate Engineering Controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Emergency showers and eye wash stations should be available.

Individual protection measures, such as personal protective equipment

General information:

Provide easy access to water supply and eye wash facilities. Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Follow training instructions when handling this material.

Eye/face protection:

Safety goggles

Skin Protection

Hand Protection:

Protective gloves should be used if there is a risk of direct contact or splash., Chemical resistant gloves required for prolonged or repeated contact., Butyl rubber., Glove thickness: > 0.35 mm, Break-through time: > 240 min, Risk of splashes:, Nitrile rubber., Nitrile gloves are recommended, but be aware that the liquid may penetrate the gloves. Frequent change is advisable., The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin and Body Protection:

Wear suitable protective clothing as protection against splashing or contamination.

Respiratory Protection:

Under normal conditions of use, respirator protection is not required. In case of inadequate ventilation, use respiratory protection. If respirators are used, OSHA requires compliance with its respiratory protection program (29 CFR 1910.134).

Hygiene measures:

Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not get in eyes. Wash contaminated clothing before reuse. Do not get this material in contact with skin. Contaminated work clothing should not be allowed out of the workplace. Avoid contact with skin.

9. Physical and chemical properties

Appearance	
Physical state:	liquid
Form:	liquid
Color:	Pale yellow
Odor:	Odorless
Odor Threshold:	No data available.
pH:	11.85 (25 °C)
Freezing point:	< 0 °C (DSC)
Boiling Point:	> 100 °C (DSC)
Flash Point:	> 100 °C
Evaporation Rate:	No data available.
Flammability (solid, gas):	Not flammable.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	23 hPa (20 °C) (DSC)
Vapor density (air=1):	No data available.
Density:	No data available.
Relative density:	1.302 (DSC)
Solubility(ies)	
Solubility in Water:	No data available.
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Self Ignition Temperature:	No data available.
Decomposition Temperature:	No data available.
Kinematic viscosity:	No data available.
Dynamic viscosity:	No data available.
Explosive properties:	No data available.
Oxidizing properties:	No data available.

Other information

VOC Content: 80.7 g/l ~6.2 % (calculated) VOC content excluding water

10. Stability and reactivity

Reactivity: Material is stable under normal conditions.

Chemical Stability: Material is stable under normal conditions.

Possibility of hazardous reactions: Not known.

Conditions to avoid: Avoid heat or contamination.

Incompatible Materials: None known.

Hazardous Decomposition Products: By heating and fire, harmful vapors/gases may be formed.

11. Toxicological information

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation: Inhalation is the primary route of exposure. In high concentrations, vapors, fumes or mists may irritate nose, throat and mucus membranes.

Skin Contact: May cause an allergic skin reaction. Moderately irritating to skin with prolonged exposure.

Eye contact: Causes serious eye damage.

Ingestion: May be ingested by accident. Ingestion may cause irritation and malaise.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product: ATEmix: 5,924.19 mg/kg

Dermal

Product: Not classified for acute toxicity based on available data.

Components:

Potassium carbonate	LD 50 (Rabbit): > 2,000 mg/kg
Hydroquinone	LD 50 (Rabbit): > 2,000 mg/kg

Inhalation

Product: Not classified for acute toxicity based on available data.

Components:

Potassium carbonate	LC 50 (Rat): > 4.96 mg/l
Trisodium 2-(carboxylatomethyl(2-hydroxyethyl)amino)ethyliminodi(acetate)	LC 50 (Rat): > 1,103 mg/m3

Repeated dose toxicity

Product: No data available.

Components:

Potassium carbonate	NOAEL (Rat(Male), Oral, 130 Weeks): 2,667 mg/kg Oral Read-across from supporting substance (structural analogue or surrogate), Key study NOAEL (Rat(Female), Oral, 130 Weeks): 3,331 mg/kg Oral Read-across from supporting substance (structural analogue or surrogate), Key study NOAEL (Rat(Female, Male), Inhalation): 0.4 mg/l Inhalation Experimental result, Supporting study
Trisodium 2-(carboxylatomethyl(2-hydroxyethyl)amino)ethyliminodi(acetate)	NOAEL (Rat(Male), Oral, 13 Weeks): >= 500 mg/kg Oral Read-across from supporting substance (structural analogue or surrogate), Key study

Skin Corrosion/Irritation

Product: No data available.

Components:

Hydroquinone	in vivo (Rabbit): Not irritant Experimental result, Weight of Evidence study
Potassium hydroxide	in vivo (Guinea pig): Corrosive Experimental result, Weight of Evidence study in vivo (Rabbit): Corrosive Experimental result, Weight of Evidence study

Serious Eye Damage/Eye Irritation

Product: No data available.

Respiratory or Skin Sensitization

Product: No data available.

Components:

Hydroquinone	Skin sensitization:, in vivo (Guinea pig): Sensitising
Potassium hydroxide	Skin sensitization:, in vivo (Guinea pig): Non sensitising

Carcinogenicity

Product: Suspected of causing cancer.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro

Product: No data available.

In vivo

Product: No data available.

Reproductive toxicity

Product: No data available.

Specific Target Organ Toxicity - Single Exposure

Product: No data available.

Specific Target Organ Toxicity - Repeated Exposure

Product: No data available.

Aspiration Hazard

Product: No data available.

Other effects: No data available.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: Not classified for acute toxicity based on available data.

Aquatic Invertebrates
Product: Not classified for acute toxicity based on available data.

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and Degradability

Biodegradation
Product: No data available.

Components:
Hydroquinone
86 % (14 d) Detected in water. Experimental result, Supporting study
>= 99.9 % Sediment Experimental result, Key study
70 % (14 d) Detected in water. Experimental result, Supporting study
100 % Detected in water. Experimental result, Supporting study
97.5 % (5 d) Detected in water. Experimental result, Key study

BOD/COD Ratio
Product: No data available.

Bioaccumulative potential
Bioconcentration Factor (BCF)
Product: No data available.

Partition Coefficient n-octanol / water (log Kow)
Product: No data available.

Mobility in soil: No data available.

Components:

Potassium carbonate	No data available.
Hydroquinone	No data available.
Trisodium 2-(carboxylatomethyl(2-hydroxyethyl)amino)ethyliminodi(acetate)	No data available.
Potassium hydroxide	No data available.
sodium hydroxide	No data available.

Other adverse effects: No data available.

13. Disposal considerations

General information: Waste disposal should be in accordance with existing federal, state and local environmental control laws.

Disposal methods: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Since emptied containers retain product residue, follow label warnings even after container is emptied.

Contaminated Packaging: Dispose in accordance with all applicable regulations.

US. RCRA Hazardous Waste Classification (40 CFR 261) If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste.

14. Transport information

DOT

UN Number	Not regulated.
UN Proper Shipping Name	Not regulated.
Transport Hazard Class(es)	Not regulated.
Packing Group	Not regulated.
Environmental Hazards	Not regulated.
Special precautions for user	Not regulated.

IATA

UN Number	Not regulated.
UN Proper Shipping Name	Not regulated.
Transport Hazard Class(es)	Not regulated.
Packing Group	Not regulated.
Environmental Hazards	Not regulated.
Special precautions for user	Not regulated.

IMDG

UN Number	Not regulated.
UN Proper Shipping Name	Not regulated.
Transport Hazard Class(es)	Not regulated.
Packing Group	Not regulated.
Environmental Hazards	Not regulated.
Special precautions for user	Not regulated.

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

None present or none present in regulated quantities.

US. Toxic Substances Control Act (TSCA) Section 5(a)(2) Final Significant New Use Rules (SNURs) (40 CFR 721, Subpt E)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

Chemical Identity	Reportable quantity
Potassium hydroxide	lbs. 1000
sodium hydroxide	lbs. 1000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate (Acute) Health Hazards
Delayed (Chronic) Health Hazard
Serious eye damage or eye irritation
Respiratory or Skin Sensitization
Germ Cell Mutagenicity
Carcinogenicity

SARA 302 Extremely Hazardous Substance

Chemical Identity	Reportable quantity	Threshold Planning Quantity
sodium hydroxide		

US. EPCRA (SARA Title III) Section 304 Extremely Hazardous Substances Reporting Quantities and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Hazardous Substances

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity
Potassium carbonate	10000 lbs
Hydroquinone	10000 lbs
Trisodium 2-(carboxylatomethyl(2-hydroxyethyl)amino)ethyliminodi(acetate)	10000 lbs
Potassium hydroxide	10000 lbs
sodium hydroxide	10000 lbs

SARA 313 (TRI Reporting)

Chemical Identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
Hydroquinone	lbs	lbs.

Clean Air Act (CAA) Section 111 SOCMI Intermediate or Final Volatile Organic Compounds (40 CFR 60.489):

None present.

Clean Air Act (CAA) Section 112, 1990 Amendments, Statutory Hazardous Air Pollutants:

None present.

Clean Air Act (CAA) Section 112(i) High-Risk Hazardous Air Pollutants (40 CFR 63.74):

None present.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

None present or none present in regulated quantities.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

Chemical Identity	Reportable quantity
Potassium hydroxide	Reportable quantity: 1,000 lbs.
sodium hydroxide	Reportable quantity: 1,000 lbs.

US State Regulations

US. California Proposition 65

No ingredient requiring a warning under CA Prop 65.

US. New Jersey Worker and Community Right-to-Know Act

No ingredient regulated by NJ Right-to-Know Law present.

US. Massachusetts RTK - Substance List

No ingredient regulated by MA Right-to-Know Law present.

US. Pennsylvania RTK - Hazardous Substances

No ingredient regulated by PA Right-to-Know Law present.

US. Rhode Island RTK

No ingredient regulated by RI Right-to-Know Law present.

US. Toxic Substances Control Act (TSCA)

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substance Control Act (U.S, EPA TSCA) 8(b) inventory.

16.Other information, including date of preparation or last revision

Issue Date:	06-05-2019
Revision Information:	No data available.
Version #:	1.0
Further Information:	This information is furnished without warranty, expressed or implied, and is believed to be accurate to the best knowledge of Agfa Corporation. The data on this SDS relates only to the specific material designated herein. Agfa Corporation assumes no legal responsibility for use or reliance upon these data.

ATTACHMENT # 2 (B)

APPLICABLE MSDS – RADIOGRAPHIC FILM PROCESSING CONSUMABLES – G135-Part B (Developer)

SAFETY DATA SHEET

Classified in accordance 29 CFR 1910.1200

1. Identification

Product identifier: G135 PART B

Recommended restrictions

Recommended use: Photographic developer concentrate
Restrictions on use: Reserved for industrial and professional use.

Manufacturer/Importer/Distributor Information

Manufacturer

Agfa-Gevaert NV
Septestraat 27
2640 Mortsel
Belgium

Telephone: +32 3 4445501
Fax: +32 3 4445503
E-mail: electronic.sds@agfa.com

Distributor

Agfa Corporation
611 River Drive
Center 3
Elmwood Park, NJ 07407
U.S.A.

Telephone: 908-231-5261
Contact Person: M. Patrick
E-mail: nafta.productsafety@agfa.com

Emergency telephone number:

Transport Emergency	Non-transportation
Call CHEMTREC : +1 800 4249300	Health Emergency Phone : +1 303 6235716
International : +1 703 5273887	Agfa Information Phone : +1 201 4402500

2. Hazard(s) identification

Hazard Classification

Health Hazards

Acute toxicity (Oral)	Category 4
Acute toxicity (Dermal)	Category 4
Skin Corrosion/Irritation	Category 1A
Serious Eye Damage/Eye Irritation	Category 1

Environmental Hazards

Chronic hazards to the aquatic environment	Category 3

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement: Harmful if swallowed or in contact with skin.
Causes severe skin burns and eye damage.
Harmful to aquatic life with long lasting effects.

Precautionary Statements

Prevention: Wear protective gloves/protective clothing/eye protection/face protection. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe dust/fume/gas/mist/vapors/spray. Avoid release to the environment.

Response: IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower]. IF SWALLOWED: Call a POISON CENTRE/doctor/… if you feel unwell. Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER/doctor. Specific treatment (see on this label). Wash contaminated clothing before reuse.

Storage: Store locked up.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Hazard(s) not otherwise classified (HNOC): None.

3. Composition/information on ingredients

Mixtures

Chemical Identity	CAS number	Content in percent (%)*
Acetic acid	64-19-7	50 - <100%
2,2' -oxybisethanol; diethylene glycol	111-46-6	25 - <50%
1-Phenyl-3-pyrazolidone	92-43-3	5 - <10%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Description of necessary first-aid measures

General information: Get medical attention if symptoms occur.

Inhalation: Move into fresh air and keep at rest. Get medical attention immediately. Show this safety data sheet to the doctor in attendance.

Skin Contact:	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention if symptoms occur. Wash contaminated clothing before reuse.
Eye contact:	Flush thoroughly with water for at least 15 minutes. Get medical assistance.
Ingestion:	Rinse mouth with plenty of water. Call a physician immediately. Show this safety data sheet to the doctor in attendance.
Personal Protection for First-aid Responders:	CAUTION! First aid personnel must be aware of own risk during rescue! See Section 8 of the SDS for Personal Protective Equipment.

Most important symptoms/effects, acute and delayed

Symptoms:	See section 11 of the SDS for additional information on health hazards.
Hazards:	See section 11 of the SDS for additional information on health hazards.

Indication of immediate medical attention and special treatment needed

Treatment:	Treat symptomatically.

5. Fire-fighting measures

General Fire Hazards:	No unusual fire or explosion hazards noted.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media:	Extinguish with foam, carbon dioxide, dry powder or water fog.
Unsuitable extinguishing media:	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical:	During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters

Special fire fighting procedures:	No data available.
Special protective equipment for fire-fighters:	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep unauthorized personnel away.
For emergency responders:	Warn everybody of potential hazards and evacuate if necessary. Use personal protective equipment.

For non-emergency personnel: Use personal protective equipment.

Methods and material for containment and cleaning up: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Dike far ahead of larger spill for later recovery and disposal.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid release to the environment.

7. Handling and storage

Handling

Technical measures (e.g. Local and general ventilation): Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Emergency showers and eye wash stations should be available.

Safe handling advice: Avoid contact with eyes, skin, and clothing. Wash hands thoroughly after handling. Do not taste or swallow. Do not get in eyes. Do not get in eyes, on skin, on clothing.

Contact avoidance measures: Contact with incompatible materials.

Hygiene measures: Employees should wash their hands and face before eating, drinking, or using tobacco products. Keep away from foodstuffs, drinks and tobacco.

Storage

Safe storage conditions: Store locked up.

Safe packaging materials: Keep in original container.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	Type	Exposure Limit Values		Source
Acetic acid	TWA	10 ppm		US. ACGIH Threshold Limit Values (03 2014)
	STEL	15 ppm		US. ACGIH Threshold Limit Values (03 2014)
	REL	10 ppm	25 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	STEL	15 ppm	37 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	PEL	10 ppm	25 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	TWA	10 ppm	25 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)

Appropriate Engineering Controls Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Emergency showers and eye wash stations should be available.

Individual protection measures, such as personal protective equipment

General information:	Educate and train employees in the safe use and handling of this product. Do not eat, drink or smoke when using the product. Eye wash facilities and emergency shower must be available when handling this product. Wash at the end of each work shift and before eating, smoking and using the toilet.
Eye/face protection:	Safety goggles
Skin Protection	
Hand Protection:	Protective gloves should be used if there is a risk of direct contact or splash., Chemical resistant gloves required for prolonged or repeated contact., Butyl rubber., Glove thickness: > 0.35 mm, Break-through time: > 240 min, Risk of splashes:, Nitrile rubber., Nitrile gloves are recommended, but be aware that the liquid may penetrate the gloves. Frequent change is advisable., The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.
Skin and Body Protection:	Wear suitable protective clothing as protection against splashing or contamination.
Respiratory Protection:	Under normal conditions of use, respirator protection is not required. In case of inadequate ventilation, use respiratory protection. If respirators are used, OSHA requires compliance with its respiratory protection program (29 CFR 1910.134).
Hygiene measures:	Employees should wash their hands and face before eating, drinking, or using tobacco products. Keep away from foodstuffs, drinks and tobacco.

9. Physical and chemical properties

Appearance	
Physical state:	liquid
Form:	liquid
Color:	Colorless
Odor:	Sour/acidic
Odor Threshold:	No data available.
pH:	0.7
Freezing point:	No data available.
Boiling Point:	No data available.
Flash Point:	No data available.
Evaporation Rate:	No data available.
Flammability (solid, gas):	Not flammable.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	not applicable
Vapor density (air=1):	aqueous solution
Density:	1.09 g/cm3
Relative density:	1.094 (DSC)
Solubility(ies)	
Solubility in Water:	completely soluble
Solubility (other):	completely soluble
Partition coefficient (n-octanol/water):	No data available.

Self Ignition Temperature:	No data available.
Decomposition Temperature:	No data available.
Kinematic viscosity:	No data available.
Dynamic viscosity:	No data available.
Explosive properties:	No data available.
Oxidizing properties:	No data available.

Other information

VOC Content:	950.5 g/l ~87.2 % (calculated) VOC content excluding water

10. Stability and reactivity

Reactivity:	Material is stable under normal conditions.
Chemical Stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Not known.
Conditions to avoid:	Avoid heat or contamination.
Incompatible Materials:	None known.
Hazardous Decomposition Products:	By heating and fire, harmful vapors/gases may be formed.

11. Toxicological information

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation:	Inhalation is the primary route of exposure. In high concentrations, vapors, fumes or mists may irritate nose, throat and mucus membranes.
Skin Contact:	Harmful in contact with skin. Causes severe skin burns.
Eye contact:	Causes serious eye damage.
Ingestion:	Harmful if swallowed.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product:	ATEmix: 1,557.63 mg/kg

Dermal

Product:	ATEmix: 1,717.99 mg/kg

Inhalation

Product:	Not classified for acute toxicity based on available data.

Components:

Acetic acid	LC 50 (Rat): 11.4 mg/l

Repeated dose toxicity

Product: No data available.

Components:

Acetic acid — NOAEL (Rat(Male), Oral, 8 Weeks): 290 mg/kg Oral Experimental result, Weight of Evidence study

Skin Corrosion/Irritation

Product: No data available.

Serious Eye Damage/Eye Irritation

Product: No data available.

Respiratory or Skin Sensitization

Product: No data available.

Components:

2,2' -oxybisethanol; diethylene glycol — Skin sensitization:, in vivo (Guinea pig): Non sensitising

Carcinogenicity

Product: No data available.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:

No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:

No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):

No carcinogenic components identified

Germ Cell Mutagenicity

In vitro

Product: No data available.

In vivo

Product: No data available.

Reproductive toxicity

Product: No data available.

Specific Target Organ Toxicity - Single Exposure

Product: No data available.

Specific Target Organ Toxicity - Repeated Exposure

Product: No data available.

Aspiration Hazard

Product: No data available.

Other effects: No data available.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish

Product: No data available.

Components:

Acetic acid	NOAEL (Cyprinodon variegatus, 96 h): 300.82 mg/l Experimental result, Supporting study LC 50 (Oncorhynchus mykiss, 96 h): > 1,000 mg/l Experimental result, Key study NOAEL (Oncorhynchus mykiss, 96 h): 1,000 mg/l Experimental result, Key study
2,2' -oxybisethanol; diethylene glycol	LC 50 (Pimephales promelas, 96 h): 75,200 mg/l Experimental result, Key study

Aquatic Invertebrates

Product: No data available.

Components:

Acetic acid	EC 50 (Daphnia magna, 48 h): > 300.82 mg/l Experimental result, Key study
2,2' -oxybisethanol; diethylene glycol	EC 50 (Daphnia magna, 24 h): > 10,000 mg/l Experimental result, Key study

Chronic hazards to the aquatic environment:

Fish

Product: No data available.

Aquatic Invertebrates

Product: No data available.

Toxicity to Aquatic Plants

Product: No data available.

Persistence and Degradability

Biodegradation

Product: No data available.

Components:

Acetic acid	96 % (20 d) Detected in water. Experimental result, Key study

2,2' -oxybisethanol; diethylene glycol	90 - 100 % (28 d) Detected in water. Experimental result, Weight of Evidence study 70 - 80 % (28 d) Detected in water. Experimental result, Weight of Evidence study 90 - 100 % (20 d) Detected in water. Read-across based on grouping of substances (category approach), Weight of Evidence study 90 - 100 % (28 d) Detected in water. Experimental result, Weight of Evidence study 25 - 92 % (28 d) Detected in water. Read-across based on grouping of substances (category approach), Weight of Evidence study

BOD/COD Ratio

Product: No data available.

Bioaccumulative potential

Bioconcentration Factor (BCF)

Product: No data available.

Components:

Acetic acid	Various, Bioconcentration Factor (BCF): 3.16 Aquatic sediment QSAR, Key study Various, Bioconcentration Factor (BCF): 0.95 Aquatic sediment QSAR, Key study
2,2' -oxybisethanol; diethylene glycol	Leuciscus idus, Bioconcentration Factor (BCF): 100 Aquatic sediment Experimental result, Key study

Partition Coefficient n-octanol / water (log Kow)

Product: Log Kow: No data available.

Mobility in soil: No data available.

Components:

Acetic acid	No data available.
2,2' -oxybisethanol; diethylene glycol	No data available.
1-Phenyl-3-pyrazolidone	No data available.

Other adverse effects: Harmful to aquatic life with long lasting effects.

13. Disposal considerations

General information: Waste disposal should be in accordance with existing federal, state and local environmental control laws.

Disposal methods: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Since emptied containers retain product residue, follow label warnings even after container is emptied.

Contaminated Packaging: Dispose in accordance with all applicable regulations.

US. RCRA Hazardous Waste Classification (40 CFR 261) If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal,

whether a material containing the product or derived from the product should be classified as a hazardous waste.

14. Transport information

DOT

UN Number	UN2790
UN Proper Shipping Name	Acetic acid solution
Transport Hazard Class(es)	
Class	8
Label(s)	8
Packing Group	II
Environmental Hazards	No
Special precautions for user	

IATA

UN Number	UN2790
Proper Shipping Name	Acetic acid solution
Transport Hazard Class(es)	
Class	8
Label(s)	8
Packing Group	II
Environmental Hazards	No
Special precautions for user	
Other information	
Passenger and cargo aircraft	Allowed.
Cargo aircraft only	Allowed.

IMDG

UN Number	UN2790
UN Proper Shipping Name	ACETIC ACID SOLUTION
Transport Hazard Class(es)	
Class	8
Label(s)	8
EmS No.	F-AS-B
Packing Group	II
Limited quantity	1.00L
Excepted quantity	E2
Environmental Hazards	No
Special precautions for user	

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

None present or none present in regulated quantities.

US. Toxic Substances Control Act (TSCA) Section 5(a)(2) Final Significant New Use Rules (SNURs) (40 CFR 721, Subpt E)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

Chemical Identity	Reportable quantity
Acetic acid	lbs. 5000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate (Acute) Health Hazards
Acute toxicity (any route of exposure)
Skin Corrosion or Irritation
Serious eye damage or eye irritation

SARA 302 Extremely Hazardous Substance

None present or none present in regulated quantities.

US. EPCRA (SARA Title III) Section 304 Extremely Hazardous Substances Reporting Quantities and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Hazardous Substances

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity
Acetic acid	10000 lbs
2,2' -oxybisethanol; diethylene glycol	10000 lbs
1-Phenyl-3-pyrazolidone	10000 lbs

SARA 313 (TRI Reporting)

None present or none present in regulated quantities.

Clean Air Act (CAA) Section 111 SOCMI Intermediate or Final Volatile Organic Compounds (40 CFR 60.489):

Chemical Identity
Acetic acid

Clean Air Act (CAA) Section 112, 1990 Amendments, Statutory Hazardous Air Pollutants:

None present.

Clean Air Act (CAA) Section 112(i) High-Risk Hazardous Air Pollutants (40 CFR 63.74):

None present.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

None present or none present in regulated quantities.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

Chemical Identity	Reportable quantity
Acetic acid	Reportable quantity: 5,000 lbs.

US State Regulations

US. California Proposition 65

No ingredient requiring a warning under CA Prop 65.

US. New Jersey Worker and Community Right-to-Know Act

Chemical Identity
Acetic acid

US. Massachusetts RTK - Substance List

Chemical Identity
Acetic acid

US. Pennsylvania RTK - Hazardous Substances

Chemical Identity
Acetic acid

US. Rhode Island RTK

Chemical Identity
Acetic acid
2,2' -oxybisethanol; diethylene glycol

US. Toxic Substances Control Act (TSCA)

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substance Control Act (U.S, EPA TSCA) 8(b) inventory.

16.Other information, including date of preparation or last revision

Issue Date:	06-05-2019
Revision Information:	No data available.
Version #:	1.0
Further Information:	This information is furnished without warranty, expressed or implied, and is believed to be accurate to the best knowledge of Agfa Corporation. The data on this SDS relates only to the specific material designated herein. Agfa Corporation assumes no legal responsibility for use or reliance upon these data.

ATTACHMENT # 2 (B)

APPLICABLE MSDS – RADIOGRAPHIC FILM PROCESSING CONSUMABLES – G135-Part C (Developer)

SAFETY DATA SHEET

Classified in accordance 29 CFR 1910.1200

1. Identification

Product identifier: G135 PART C

Recommended restrictions

Recommended use: Photographic developer concentrate
Restrictions on use: Reserved for industrial and professional use.

Manufacturer/Importer/Distributor Information

Manufacturer

Agfa-Gevaert NV
Septestraat 27
2640 Mortsel
Belgium

Telephone: +32 3 4445501
Fax: +32 3 4445503
E-mail: electronic.sds@agfa.com

Distributor

Agfa Corporation
611 River Drive
Center 3
Elmwood Park, NJ 07407
U.S.A.

Telephone: 908-231-5261
Contact Person: M. Patrick
E-mail: nafta.productsafety@agfa.com

Emergency telephone number:

Transport Emergency	Non-transportation
Call CHEMTREC : +1 800 4249300	Health Emergency Phone : +1 303 6235716
International : +1 703 5273887	Agfa Information Phone : +1 201 4402500

2. Hazard(s) identification

Hazard Classification

Not classified

Label Elements

Hazard Symbol:	No symbol
Signal Word:	No signal word.
Hazard Statement:	not applicable
Precautionary Statements	not applicable

Hazard(s) not otherwise classified (HNOC): None.

3. Composition/information on ingredients

Mixtures

Composition Comments: The components are not hazardous or are below required disclosure limits.

4. First-aid measures

Description of necessary first-aid measures

General information: Get medical attention if symptoms occur.

Inhalation: Move to fresh air.

Skin Contact: Remove contaminated clothing and wash the skin thoroughly with soap and water after work.

Eye contact: Rinse immediately with plenty of water.

Ingestion: Rinse mouth thoroughly.

Personal Protection for First-aid Responders: CAUTION! First aid personnel must be aware of own risk during rescue! See Section 8 of the SDS for Personal Protective Equipment.

Most important symptoms/effects, acute and delayed

Symptoms: See section 11 of the SDS for additional information on health hazards.

Hazards: See section 11 of the SDS for additional information on health hazards.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically.

5. Fire-fighting measures

General Fire Hazards: No unusual fire or explosion hazards noted.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Unsuitable extinguishing media: Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical: During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: No data available.

Special protective equipment for fire-fighters: Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	Use personal protective equipment. Put on protective equipment before entering danger area.
For emergency responders:	Warn everybody of potential hazards and evacuate if necessary. Use personal protective equipment.
For non-emergency personnel:	Use personal protective equipment.
Methods and material for containment and cleaning up:	Stop the flow of material, if this is without risk. Absorb with sand or other inert absorbent.
Environmental Precautions:	Avoid release to the environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water sources or sewer. Environmental manager must be informed of all major spillages.

7. Handling and storage

Handling

Technical measures (e.g. Local and general ventilation):	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Emergency showers and eye wash stations should be available.
Safe handling advice:	Provide adequate ventilation. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.
Contact avoidance measures:	Contact with incompatible materials.
Hygiene measures:	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

Storage

Safe storage conditions:	Store away from incompatible materials.
Safe packaging materials:	Keep in original container.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

None of the components have assigned exposure limits.

Appropriate Engineering Controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Emergency showers and eye wash stations should be available.

Individual protection measures, such as personal protective equipment

General information:	Use personal protective equipment as required. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment. Follow training instructions when handling this material.
Eye/face protection:	Safety goggles
Skin Protection	
Hand Protection:	Protective gloves should be used if there is a risk of direct contact or splash., Chemical resistant gloves required for prolonged or repeated contact., Butyl rubber., Glove thickness: > 0.35 mm, Break-through time: > 240 min, Risk of splashes:, Nitrile rubber., Nitrile gloves are recommended, but be aware that the liquid may penetrate the gloves. Frequent change is advisable., The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.
Skin and Body Protection:	Wear suitable protective clothing as protection against splashing or contamination.
Respiratory Protection:	Under normal conditions of use, respirator protection is not required. In case of inadequate ventilation, use respiratory protection. If respirators are used, OSHA requires compliance with its respiratory protection program (29 CFR 1910.134).
Hygiene measures:	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

9. Physical and chemical properties

Appearance	
Physical state:	liquid
Form:	liquid
Color:	Pale yellow
Odor:	Mild pungent
Odor Threshold:	No data available.
pH:	2.5 (25 °C)
Freezing point:	< 0 °C
Boiling Point:	> 100 °C
Flash Point:	> 93.33 °C Not combustible.
Evaporation Rate:	No data available.
Flammability (solid, gas):	Not flammable.
Explosive limit - upper (%):	Not applicable
Explosive limit - lower (%):	Not applicable

Vapor pressure:	23.00 hPa (20 °C)
Vapor density (air=1):	Not applicable
Density:	No data available.
Relative density:	1.2440 (20 °C)
Solubility(ies)	
Solubility in Water:	completely soluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Self Ignition Temperature:	No data available.
Decomposition Temperature:	No data available.
Kinematic viscosity:	No data available.
Dynamic viscosity:	No data available.
Explosive properties:	No data available.
Oxidizing properties:	No data available.

Other information

VOC Content:	0 g/l ~0 % VOC content excluding water
Minimum ignition temperature:	Not applicable

10. Stability and reactivity

Reactivity:	Material is stable under normal conditions.
Chemical Stability:	No data available.
Possibility of hazardous reactions:	Not known.
Conditions to avoid:	Avoid heat or contamination.
Incompatible Materials:	None known.
Hazardous Decomposition Products:	By heating and fire, harmful vapors/gases may be formed.

11. Toxicological information

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation:	Inhalation is the primary route of exposure. In high concentrations, vapors, fumes or mists may irritate nose, throat and mucus membranes.
Skin Contact:	Moderately irritating to skin with prolonged exposure.
Eye contact:	Eye contact is possible and should be avoided.
Ingestion:	May be ingested by accident. Ingestion may cause irritation and malaise.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product:	Not classified for acute toxicity based on available data.

Dermal

Product: Not classified for acute toxicity based on available data.

Inhalation
Product: Not classified for acute toxicity based on available data.

Repeated dose toxicity
Product: No data available.

Skin Corrosion/Irritation
Product: No data available.

Serious Eye Damage/Eye Irritation
Product: No data available.

Respiratory or Skin Sensitization
Product: No data available.

Carcinogenicity
Product: No data available.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro
Product: No data available.

In vivo
Product: No data available.

Reproductive toxicity
Product: No data available.

Specific Target Organ Toxicity - Single Exposure
Product: No data available.

Specific Target Organ Toxicity - Repeated Exposure
Product: No data available.

Aspiration Hazard
Product: No data available.

Other effects: No data available.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and Degradability

Biodegradation
Product: No data available.

BOD/COD Ratio
Product: No data available.

Bioaccumulative potential
Bioconcentration Factor (BCF)
Product: No data available.

Partition Coefficient n-octanol / water (log Kow)
Product: No data available.

Mobility in soil: No data available.

Other adverse effects: No data available.

13. Disposal considerations

General information: Waste disposal should be in accordance with existing federal, state and local environmental control laws.

Disposal methods: Wash before disposal. Dispose to controlled facilities.

Since emptied containers retain product residue, follow label warnings even after container is emptied.

Contaminated Packaging: Dispose in accordance with all applicable regulations.

US. RCRA Hazardous Waste Classification (40 CFR 261) If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste.

14. Transport information

DOT

UN Number	Not regulated.
UN Proper Shipping Name	Not regulated.
Transport Hazard Class(es)	Not regulated.
Packing Group	Not regulated.
Environmental Hazards	Not regulated.
Special precautions for user	Not regulated.

IATA

UN Number	Not regulated.
UN Proper Shipping Name	Not regulated.
Transport Hazard Class(es)	Not regulated.
Packing Group	Not regulated.
Environmental Hazards	Not regulated.
Special precautions for user	Not regulated.

IMDG

UN Number	Not regulated.
UN Proper Shipping Name	Not regulated.
Transport Hazard Class(es)	Not regulated.
Packing Group	Not regulated.
Environmental Hazards	Not regulated.
Special precautions for user	Not regulated.

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

None present or none present in regulated quantities.

US. Toxic Substances Control Act (TSCA) Section 5(a)(2) Final Significant New Use Rules (SNURs) (40 CFR 721, Subpt E)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

None present or none present in regulated quantities.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Not listed.

SARA 302 Extremely Hazardous Substance

None present or none present in regulated quantities.

US. EPCRA (SARA Title III) Section 304 Extremely Hazardous Substances Reporting Quantities and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Hazardous Substances

SARA 311/312 Hazardous Chemical

None present or none present in regulated quantities.

SARA 313 (TRI Reporting)

None present or none present in regulated quantities.

Clean Air Act (CAA) Section 111 SOCMI Intermediate or Final Volatile Organic Compounds (40 CFR 60.489):

None present.

Clean Air Act (CAA) Section 112, 1990 Amendments, Statutory Hazardous Air Pollutants:

None present.

Clean Air Act (CAA) Section 112(i) High-Risk Hazardous Air Pollutants (40 CFR 63.74):

None present.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

None present or none present in regulated quantities.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65

No ingredient requiring a warning under CA Prop 65.

US. New Jersey Worker and Community Right-to-Know Act

No ingredient regulated by NJ Right-to-Know Law present.

US. Massachusetts RTK - Substance List

No ingredient regulated by MA Right-to-Know Law present.

US. Pennsylvania RTK - Hazardous Substances

No ingredient regulated by PA Right-to-Know Law present.

US. Rhode Island RTK

No ingredient regulated by RI Right-to-Know Law present.

US. Toxic Substances Control Act (TSCA)

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substance Control Act (U.S, EPA TSCA) 8(b) inventory.

16.Other information, including date of preparation or last revision

Issue Date:	06-05-2019
Revision Information:	No data available.
Version #:	1.0

Further Information: This information is furnished without warranty, expressed or implied, and is believed to be accurate to the best knowledge of Agfa Corporation. The data on this SDS relates only to the specific material designated herein. Agfa Corporation assumes no legal responsibility for use or reliance upon these data.

ATTACHMENT # 2 (B)

APPLICABLE MSDS – RADIOGRAPHIC FILM PROCESSING CONSUMABLES – G335-Part A (Fixer)

SAFETY DATA SHEET

1. Identification

Product identifier: G335 PART A

Other means of identification
SDS number: 000001015844

Recommended use and restriction on use
Recommended use: photochemicals
Restrictions on use: Reserved for industrial and professional use.

Manufacturer/Importer/Supplier/Distributor Information

Manufacturer

Company Name:	Agfa-Gevaert NV
Address:	Septestraat 27 2640 Mortsel Belgium
Telephone:	+32 3 4445501
Fax:	+32 3 4445503
Contact Person:	
E-mail:	electronic.sds@agfa.com

Distributor

Company Name:	Agfa Corporation
Address:	611 River Drive Center 3 Elmwood Park, NJ 07407 U.S.A.
Telephone:	908-231-5261
Fax:	
Contact Person:	M. Patrick
E-mail:	nafta.productsafety@agfa.com

Emergency telephone number:

Transport Emergency	Non-transportation
Call CHEMTREC : +1 800 4249300	Health Emergency Phone : +1 303 6235716
International : +1 703 5273887	Agfa Information Phone : +1 201 4402500

2. Hazard(s) identification

Hazard Classification

Health Hazards

Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 1
Toxic to reproduction	Category 1B

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement:
Causes skin irritation.
Causes serious eye damage.
May damage fertility or the unborn child.

Precautionary Statements

Prevention: Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required.

Response: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF ON SKIN: Wash with plenty of water. If skin irritation occurs: Get medical advice/attention. Immediately call a POISON CENTER/doctor. Specific treatment (see on this label). Take off contaminated clothing.

Storage: Store locked up.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Mixtures

Chemical Identity	Common name and synonyms	CAS number	Content in percent (%)*
Acetic acid		64-19-7	3 - 7%
boric acid		10043-35-3	1 - 5%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical attention if symptoms occur.

Inhalation:	Move to fresh air.
Skin Contact:	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash contaminated clothing before reuse. Get medical attention.
Eye contact:	Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately.
Ingestion:	Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
Personal Protection for First-aid Responders:	CAUTION! First aid personnel must be aware of own risk during rescue! See Section 8 of the SDS for Personal Protective Equipment.

Most important symptoms/effects, acute and delayed

Symptoms:	See section 11 of the SDS for additional information on health hazards.
Hazards:	See section 11 of the SDS for additional information on health hazards.

Indication of immediate medical attention and special treatment needed

Treatment:	Skin and/or eye contact. Flush thoroughly with water for at least 15 minutes. Get medical assistance.

5. Fire-fighting measures

General Fire Hazards:	No unusual fire or explosion hazards noted.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media:	Extinguish with foam, carbon dioxide, dry powder or water fog.
Unsuitable extinguishing media:	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical:	During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters

Special fire fighting procedures:	No data available.
Special protective equipment for fire-fighters:	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep unauthorized personnel away.

Methods and material for containment and cleaning up: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling: Do not get in eyes. Wash hands thoroughly after handling. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. Use personal protective equipment as required. Avoid contact with skin.

Conditions for safe storage, including any incompatibilities: Store locked up.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	Type	Exposure Limit Values	Source
Acetic acid	TWA	10 ppm	US. ACGIH Threshold Limit Values (03 2014)
	STEL	15 ppm	US. ACGIH Threshold Limit Values (03 2014)
	REL	10 ppm 25 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	STEL	15 ppm 37 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	PEL	10 ppm 25 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	TWA	10 ppm 25 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
boric acid - Inhalable fraction.	STEL	6 mg/m3	US. ACGIH Threshold Limit Values (03 2014)
	TWA	2 mg/m3	US. ACGIH Threshold Limit Values (03 2014)

Appropriate Engineering Controls Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Emergency showers and eye wash stations should be available.

Individual protection measures, such as personal protective equipment

General information: Provide easy access to water supply and eye wash facilities. Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Follow training instructions when handling this material.

Eye/face protection: Safety goggles

Skin Protection

Hand Protection: Protective gloves should be used if there is a risk of direct contact or splash. Chemical resistant gloves required for prolonged or repeated contact. Butyl rubber. Glove thickness: > 0.35 mm Break-through time: > 240 min Risk of splashes: Nitrile rubber. Nitrile gloves are recommended, but be aware that the liquid may penetrate the gloves. Frequent change is advisable. The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Other: Wear suitable protective clothing as protection against splashing or contamination.

Respiratory Protection: Under normal conditions of use, respirator protection is not required. In case of inadequate ventilation, use respiratory protection. If respirators are used, OSHA requires compliance with its respiratory protection program (29 CFR 1910.134).

Hygiene measures: Do not get in eyes. Observe good industrial hygiene practices. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. Wash contaminated clothing before reuse. Avoid contact with skin. Wash hands before breaks and immediately after handling the product.

9. Physical and chemical properties

Appearance

Physical state:	liquid
Form:	liquid
Color:	Colourless.
Odor:	Slightly pungent smell
Odor threshold:	No data available.
pH:	5.4 (25 °C)
Melting point/freezing point:	< 0 °C
Initial boiling point and boiling range:	> 100 °C
Flash Point:	> 93.33 °C Not combustible.
Evaporation rate:	No data available.
Flammability (solid, gas):	Not flammable.

Upper/lower limit on flammability or explosive limits

Flammability limit - upper (%):

Flammability limit - lower (%):

Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	No data available.
Vapor density:	Not applicable
Relative density:	1.3430 (20 °C)
Solubility(ies)	
Solubility in water:	completely soluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

Other information

VOC:	40.3 g/l VOC content excluding water

10. Stability and reactivity

Reactivity:	Material is stable under normal conditions.
Chemical Stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Not known.
Conditions to avoid:	Avoid heat or contamination.
Incompatible Materials:	None known.
Hazardous Decomposition Products:	By heating and fire, harmful vapors/gases may be formed.

11. Toxicological information

Symptoms related to the physical, chemical and toxicological characteristics

Ingestion:	May be ingested by accident. Ingestion may cause irritation and malaise.
Inhalation:	Inhalation is the primary route of exposure. In high concentrations, vapors, fumes or mists may irritate nose, throat and mucus membranes.
Skin Contact:	Causes skin irritation.
Eye contact:	Causes serious eye damage.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product:	ATEmix: 3,466.96 mg/kg

Dermal

Product: ATEmix 3,291.62 mg/kg

Inhalation
Product: Not classified for acute toxicity based on available data.

Repeated dose toxicity
Product: No data available.

Specified substance(s):
Acetic acid — NOAEL (Rat(Male), Oral, 8 Weeks): 290 mg/kg Oral Experimental result, Weight of Evidence study

Skin Corrosion/Irritation
Product: No data available.

Serious Eye Damage/Eye Irritation
Product: No data available.

Respiratory or Skin Sensitization
Product: No data available.

Carcinogenicity
Product: No data available.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro
Product: No data available.

In vivo
Product: No data available.

Reproductive toxicity
Product: May damage fertility or the unborn child.

Specific Target Organ Toxicity - Single Exposure
Product: No data available.

Specific Target Organ Toxicity - Repeated Exposure
Product: No data available.

Target Organs

No data available.

Aspiration Hazard
Product: No data available.

Other effects: No data available.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Specified substance(s):

Acetic acid	NOAEL (Cyprinodon variegatus, 96 h): 300.82 mg/l Experimental result, Supporting study LC 50 (Oncorhynchus mykiss, 96 h): > 1,000 mg/l Experimental result, Key study NOAEL (Oncorhynchus mykiss, 96 h): 1,000 mg/l Experimental result, Key study
boric acid	LC 50 (Oncorhynchus kisutch, 96 h): 600 mg/l experimental result LC50 (Carassius auratus (goldfish), 72 h): 178 mg/l Based on available data, the classification criteria are not met.

Aquatic Invertebrates
Product: No data available.

Specified substance(s):

Acetic acid	EC 50 (Daphnia magna, 48 h): > 300.82 mg/l Experimental result, Key study

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and Degradability

Biodegradation
Product: No data available.

Specified substance(s):

Acetic acid	96 % (20 d) Detected in water. Experimental result, Key study

BOD/COD Ratio

Product: No data available.

Bioaccumulative potential

Bioconcentration Factor (BCF)

Product: No data available.

Specified substance(s):

Acetic acid	Various, Bioconcentration Factor (BCF): 3.16 Aquatic sediment QSAR, Key study Various, Bioconcentration Factor (BCF): 0.95 Aquatic sediment QSAR, Key study

Partition Coefficient n-octanol / water (log Kow)

Product: No data available.

Specified substance(s):

Acetic acid	Log Kow: -0.17

Mobility in soil: No data available.

Known or predicted distribution to environmental compartments

Acetic acid	No data available.
boric acid	No data available.

Known or predicted distribution to environmental compartments

Ammonium thiosulphate, Amonium thiosulphate	No data available.
Water	No data available.
Sodium sulphite	No data available.

Other adverse effects: No data available.

13. Disposal considerations

General information: Waste disposal should be in accordance with existing federal, state and local environmental control laws.

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws. Since emptied containers retain product residue, follow label warnings even after container is emptied.

Contaminated Packaging: Dispose in accordance with all applicable regulations.

US. RCRA Hazardous Waste Classification (40 CFR 261) If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste.

14. Transport information

DOT

UN Number	Not regulated.
UN Proper Shipping Name	Not regulated.
Transport Hazard Class(es)	Not regulated.
Packing Group	Not regulated.
Environmental Hazards	Not regulated.
Special precautions for user	Not regulated.

IMDG

UN Number	Not regulated.
UN Proper Shipping Name	Not regulated.
Transport Hazard Class(es)	Not regulated.
Packing Group	Not regulated.
Marine Pollutant	Not regulated.
Special precautions for user	Not regulated.

IATA

UN Number	Not regulated.
Proper Shipping Name	Not regulated.
Transport Hazard Class(es)	Not regulated.
Packing Group	Not regulated.
Environmental Hazards	Not regulated.
Special precautions for user	Not regulated.
Packing instruction (cargo aircraft)	Not regulated.
Packing instruction (passenger aircraft)	Not regulated.

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

None present or none present in regulated quantities.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Chemical Identity	OSHA hazard(s)

CERCLA Hazardous Substance List (40 CFR 302.4):

Chemical Identity	Reportable quantity
Acetic acid	lbs. 5000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate (Acute) Health Hazards
Delayed (Chronic) Health Hazard

SARA 302 Extremely Hazardous Substance

Chemical Identity	Reportable quantity	Threshold Planning Quantity

SARA 304 Emergency Release Notification

Chemical Identity	Reportable quantity
Acetic acid	lbs. 5000

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity

SARA 313 (TRI Reporting)

Chemical Identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
Ammonium thiosulphate, Amonium thiosulphate		

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

Chemical Identity	Reportable quantity
Acetic acid	Reportable quantity: 5,000 lbs.

Clean Air Act (CAA) Section 111 SOCMI Intermediate or Final Volatile Organic Compounds (40 CFR 60.489):

Chemical Identity
Acetic acid
Sodium acetate

Clean Air Act (CAA) Section 112, 1990 Amendments, Statutory Hazardous Air Pollutants:

None present.

Clean Air Act (CAA) Section 112(i) High-Risk Hazardous Air Pollutants (40 CFR 63.74):

None present.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65

No ingredient requiring a warning under CA Prop 65.

US. New Jersey Worker and Community Right-to-Know Act

Chemical Identity
Acetic acid
boric acid

US. Massachusetts RTK - Substance List

Chemical Identity
Ammonium thiosulphate, Amonium thiosulphate
Acetic acid

US. Pennsylvania RTK - Hazardous Substances

Chemical Identity
Ammonium thiosulphate, Amonium thiosulphate
Acetic acid

US. Rhode Island RTK

Chemical Identity
Acetic acid

US. Toxic Substances Control Act (TSCA)

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substance Control Act (U.S, EPA TSCA) 8(b) inventory.

16.Other information, including date of preparation or last revision

Issue Date:	12-18-2018
Revision Date:	No data available.
Version #:	1.2
Further Information:	This information is furnished without warranty, expressed or implied, and is believed to be accurate to the best knowledge of Agfa Corporation. The data on this SDS relates only to the specific material designated herein. Agfa Corporation assumes no legal responsibility for use or reliance upon these data.
Disclaimer:	This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

ATTACHMENT # 2 (B)

APPLICABLE MSDS – RADIOGRAPHIC FILM PROCESSING CONSUMABLES – G335-Part B (Fixer)

SAFETY DATA SHEET

Classified in accordance 29 CFR 1910.1200

1. Identification

Product identifier: G335 part B

Recommended restrictions

Recommended use: photochemicals
Restrictions on use: Reserved for industrial and professional use.

Manufacturer/Importer/Distributor Information

Manufacturer

Agfa-Gevaert NV
Septestraat 27
2640 Mortsel
Belgium

Telephone: +32 3 4445501
Fax: +32 3 4445503
E-mail: electronic.sds@agfa.com

Distributor

Agfa Corporation
611 River Drive
Center 3
Elmwood Park, NJ 07407
U.S.A.

Telephone: 908-231-5261
Contact Person: M. Patrick
E-mail: nafta.productsafety@agfa.com

Emergency telephone number:

Transport Emergency	Non-transportation
Chemtrec: +1 800 4249300	Health Emergency Phone: +1 303 6235716
International: +32 3 4442111	Agfa Information Phone: +1 201 4402500

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Corrosive to metal	Category 1

Health Hazards

Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 1

Environmental Hazards

Acute hazards to the aquatic environment	Category 3

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement: May be corrosive to metals.
Causes skin irritation.
Causes serious eye damage.
Harmful to aquatic life.

Precautionary Statements

Prevention: Keep only in original packaging. Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection. Avoid release to the environment.

Response: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF ON SKIN: Wash with plenty of water/… If skin irritation occurs: Get medical advice/attention. Immediately call a POISON CENTER/doctor. Take off contaminated clothing. Absorb spillage to prevent material damage.

Storage: Store in a corrosion-resistant container with a resistant inner liner.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Hazard(s) not otherwise classified (HNOC): None.

3. Composition/information on ingredients

Mixtures

Chemical Identity	CAS number	Content in percent (%)*
aluminium sulphate	10043-01-3	10 - <20%
Acetic acid	64-19-7	5 - <10%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Description of necessary first-aid measures

General information: Get medical attention if symptoms occur.

Inhalation: Move into fresh air and keep at rest. Get medical attention immediately. Show this safety data sheet to the doctor in attendance.

Skin Contact:	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash contaminated clothing before reuse. Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention if symptoms occur. Wash contaminated clothing before reuse.
Eye contact:	Flush thoroughly with water for at least 15 minutes. Get medical assistance. Flush thoroughly with water for at least 15 minutes. Get medical assistance.
Ingestion:	Rinse mouth with plenty of water. Call a physician immediately. Show this safety data sheet to the doctor in attendance.
Personal Protection for First-aid Responders:	CAUTION! First aid personnel must be aware of own risk during rescue! See Section 8 of the SDS for Personal Protective Equipment.

Most important symptoms/effects, acute and delayed

Symptoms:	See section 11 of the SDS for additional information on health hazards.
Hazards:	See section 11 of the SDS for additional information on health hazards.

Indication of immediate medical attention and special treatment needed

Treatment:	Treat symptomatically.

5. Fire-fighting measures

General Fire Hazards: No unusual fire or explosion hazards noted.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media:	Extinguish with foam, carbon dioxide, dry powder or water fog.
Unsuitable extinguishing media:	Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical: During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters

Special fire fighting procedures:	No data available.
Special protective equipment for fire-fighters:	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep unauthorized personnel away.
For emergency responders:	Warn everybody of potential hazards and evacuate if necessary. Use personal protective equipment.
For non-emergency personnel:	Use personal protective equipment.
Methods and material for containment and cleaning up:	Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Dike far ahead of larger spill for later recovery and disposal.
Environmental Precautions:	Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Handling

Technical measures (e.g. Local and general ventilation):	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Emergency showers and eye wash stations should be available.
Safe handling advice:	Do not get in eyes. Wash hands thoroughly after handling. Avoid contact with skin.
Contact avoidance measures:	Contact with incompatible materials.
Hygiene measures:	Employees should wash their hands and face before eating, drinking, or using tobacco products. Keep away from foodstuffs, drinks and tobacco.

Storage

Safe storage conditions:	Store in a corrosion-resistant container with a resistant inner liner.
Safe packaging materials:	Keep in original container.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	Type	Exposure Limit Values	Source
aluminium sulphate - Respirable fraction.	TWA	1 mg/m3	US. ACGIH Threshold Limit Values, as amended (03 2014)
aluminium sulphate - as Al	REL	2 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2010)
	TWA	2 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000), as amended (1989)
Acetic acid	TWA	10 ppm	US. ACGIH Threshold Limit Values, as amended (03 2014)
	STEL	15 ppm	US. ACGIH Threshold Limit Values, as amended (03 2014)
	REL	10 ppm 25 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2010)
	STEL	15 ppm 37 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2010)
	PEL	10 ppm 25 mg/m3	US. OSHA Table Z-1 Limits for Air

				Contaminants (29 CFR 1910.1000), as amended (02 2006)
	TWA	10 ppm	25 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000), as amended (1989)

Appropriate Engineering Controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Emergency showers and eye wash stations should be available.

Individual protection measures, such as personal protective equipment

General information:

Educate and train employees in the safe use and handling of this product. Do not eat, drink or smoke when using the product. Eye wash facilities and emergency shower must be available when handling this product. Wash at the end of each work shift and before eating, smoking and using the toilet.

Eye/face protection:

Safety goggles

Skin Protection

Hand Protection:

Protective gloves should be used if there is a risk of direct contact or splash., Chemical resistant gloves required for prolonged or repeated contact., Butyl rubber., Glove thickness: > 0.35 mm, Break-through time: > 240 min, Risk of splashes:, Nitrile rubber., Nitrile gloves are recommended, but be aware that the liquid may penetrate the gloves. Frequent change is advisable., The most suitable glove must be chosen in consultation with the gloves supplier, who can inform about the breakthrough time of the glove material.

Skin and Body Protection:

Wear suitable protective clothing as protection against splashing or contamination.

Respiratory Protection:

Under normal conditions of use, respirator protection is not required. In case of inadequate ventilation, use respiratory protection. If respirators are used, OSHA requires compliance with its respiratory protection program (29 CFR 1910.134).

Hygiene measures:

Employees should wash their hands and face before eating, drinking, or using tobacco products. Keep away from foodstuffs, drinks and tobacco.

9. Physical and chemical properties

Appearance

Physical state:	liquid
Form:	liquid
Color:	Colorless
Odor:	acetic acid odour
Odor Threshold:	No data available.
pH:	2.01 (25 °C)
Freezing point:	< 0 °C
Boiling Point:	> 100 °C
Flash Point:	> 93.33 °C Not combustible.
Evaporation Rate:	No data available.
Flammability (solid, gas):	Not flammable.
Explosive limit - upper (%):	No data available.

Explosive limit - lower (%):	No data available.
Vapor pressure:	No data available.
Vapor density (air=1):	No data available.
Density:	No data available.
Relative density:	1.12 (20 °C)
Solubility(ies)	
Solubility in Water:	completely soluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Self Ignition Temperature:	No data available.
Decomposition Temperature:	No data available.
Kinematic viscosity:	No data available.
Dynamic viscosity:	No data available.
Explosive properties:	No data available.
Oxidizing properties:	No data available.

Other information

VOC Content:	79.5 g/l ~7.1 % (calculated) VOC content excluding water
Metal Corrosion:	Corrosive to metal

10. Stability and reactivity

Reactivity: Material is stable under normal conditions.

Chemical Stability: Material is stable under normal conditions.

Possibility of hazardous reactions: Not known.

Conditions to avoid: Avoid heat or contamination.

Incompatible Materials: None known.

Hazardous Decomposition Products: By heating and fire, harmful vapors/gases may be formed.

11. Toxicological information

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation: Inhalation is the primary route of exposure. In high concentrations, vapors, fumes or mists may irritate nose, throat and mucus membranes.

Skin Contact: Causes severe skin burns. Causes skin irritation.

Eye contact: Eye contact is possible and should be avoided. Causes serious eye damage. Causes serious eye damage.

Ingestion: May be ingested by accident. Ingestion may cause irritation and malaise.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product: Not classified for acute toxicity based on available data.

Components:

aluminium sulphate	LD 50 (Rat): > 2,000 mg/kg

Dermal

Product: ATEmix: 14,929.58 mg/kg

Inhalation

Product: ATEmix: 49.02 mg/l

Repeated dose toxicity

Product: No data available.

Components:

aluminium sulphate	NOAEL : 2.45 mg/m3 Inhalation Read-across based on grouping of substances (category approach), Key study
Acetic acid	NOAEL (Rat(Male), Oral, 8 Weeks): 290 mg/kg Oral Experimental result, Weight of Evidence study

Skin Corrosion/Irritation

Product: No data available.

Serious Eye Damage/Eye Irritation

Product: No data available.

Components:

aluminium sulphate	Rabbit, 1 - 3 d: Category 2A

Respiratory or Skin Sensitization

Product: No data available.

Carcinogenicity

Product: No data available.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro

Product: No data available.

In vivo

Product: No data available.

Reproductive toxicity

Product: No data available.

Specific Target Organ Toxicity - Single Exposure
Product: No data available.

Specific Target Organ Toxicity - Repeated Exposure
Product: No data available.

Aspiration Hazard
Product: No data available.

Other effects: No data available.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Components:

aluminium sulphate	LC 50 (Danio rerio, 96 h): 9.4 mg/l interpreted
Acetic acid	NOAEL (Cyprinodon variegatus, 96 h): 300.82 mg/l Experimental result, Supporting study LC 50 (Oncorhynchus mykiss, 96 h): > 1,000 mg/l Experimental result, Key study NOAEL (Oncorhynchus mykiss, 96 h): 1,000 mg/l Experimental result, Key study

Aquatic Invertebrates
Product: No data available.

Components:

aluminium sulphate	EC 50 (48 h): > 200 mg/l experimental result
Acetic acid	EC 50 (Daphnia magna, 48 h): > 300.82 mg/l Experimental result, Key study

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Components:

aluminium sulphate	LC 50 (Salvelinus fontinalis, 10 d): 1.9 mg/l experimental result

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and Degradability

Biodegradation
Product: No data available.

Components:
Acetic acid: 96 % (20 d) Detected in water. Experimental result, Key study

BOD/COD Ratio
Product: No data available.

Bioaccumulative potential
Bioconcentration Factor (BCF)
Product: No data available.

Components:
Acetic acid: Various, Bioconcentration Factor (BCF): 3.16 Aquatic sediment QSAR, Key study
Various, Bioconcentration Factor (BCF): 0.95 Aquatic sediment QSAR, Key study

Partition Coefficient n-octanol / water (log Kow)
Product: No data available.

Components:
aluminium sulphate: Log Kow: Not applicable

Acetic acid: Log Kow: -0.17

Mobility in soil: No data available.

Components:
aluminium sulphate: No data available.
Acetic acid: No data available.

Other adverse effects: No data available.

13. Disposal considerations

General information: Waste disposal should be in accordance with existing federal, state and local environmental control laws.

Disposal methods: Discharge to sewer may require approval of permitting authority and may require pretreatment. Wash before disposal. Dispose to controlled facilities.

Recondition or dispose of empty container in accordance with governmental regulations. Since emptied containers retain product residue, follow label warnings even after container is emptied.

Contaminated Packaging: Dispose in accordance with all applicable regulations.

US. RCRA Hazardous Waste Classification (40 CFR 261) When discarded in its purchased form, this product meets the criteria of corrosivity, and should be managed as a hazardous waste (EPA Hazardous Waste Number D002).

14. Transport information

DOT

UN Number	UN3264
UN Proper Shipping Name	Corrosive liquid, acidic, inorganic, n.o.s.(Aluminium sulphate)
Transport Hazard Class(es)	
Class	8
Label(s)	8
Packing Group	III
Environmental Hazards	No
Special precautions for user	

IATA

UN Number	UN3264
Proper Shipping Name	Corrosive liquid, acidic, inorganic, n.o.s.(Aluminium sulphate)
Transport Hazard Class(es)	
Class	8
Label(s)	8
Packing Group	III
Limited quantity	1.00L
Excepted quantity	E1
Environmental Hazards	No
Special precautions for user	
Other information	
Passenger and cargo aircraft	Allowed.
Cargo aircraft only	Allowed.

IMDG

UN Number	UN3264
UN Proper Shipping Name	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.(Aluminium sulphate)
Transport Hazard Class(es)	
Class	8
Label(s)	8
EmS No.	F-AS-B
Packing Group	III
Limited quantity	5.00L
Excepted quantity	E1
Environmental Hazards	No
Special precautions for user	

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

None present or none present in regulated quantities.

US. Toxic Substances Control Act (TSCA) Section 5(a)(2) Final Significant New Use Rules (SNURs) (40 CFR 721, Subpt E)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

Chemical Identity	Reportable quantity
aluminium sulphate	lbs. 5000
Acetic acid	lbs. 5000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Reactive
Immediate (Acute) Health Hazards
Corrosive to metal
Skin Corrosion or Irritation
Serious eye damage or eye irritation

SARA 302 Extremely Hazardous Substance
None present or none present in regulated quantities.

US. EPCRA (SARA Title III) Section 304 Extremely Hazardous Substances Reporting Quantities and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Hazardous Substances

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity
aluminium sulphate	10000 lbs
Acetic acid	10000 lbs

SARA 313 (TRI Reporting)
None present or none present in regulated quantities.

Clean Air Act (CAA) Section 111 SOCMI Intermediate or Final Volatile Organic Compounds (40 CFR 60.489):

Chemical Identity
Acetic acid
Sodium acetate

Clean Air Act (CAA) Section 112, 1990 Amendments, Statutory Hazardous Air Pollutants:
None present.

Clean Air Act (CAA) Section 112(i) High-Risk Hazardous Air Pollutants (40 CFR 63.74):
None present.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)
None present or none present in regulated quantities.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

Chemical Identity	Reportable quantity
aluminium sulphate	Reportable quantity: 5,000 lbs.
Acetic acid	Reportable quantity: 5,000 lbs.

US State Regulations

US. California Proposition 65
No ingredient requiring a warning under CA Prop 65.

US. New Jersey Worker and Community Right-to-Know Act

Chemical Identity
aluminium sulphate
Acetic acid

US. Massachusetts RTK - Substance List

Chemical Identity
aluminium sulphate
Acetic acid

US. Pennsylvania RTK - Hazardous Substances

Chemical Identity
aluminium sulphate
Acetic acid

US. Rhode Island RTK

Chemical Identity
Acetic acid

US. Toxic Substances Control Act (TSCA)

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substance Control Act (U.S, EPA TSCA) 8(b) inventory.

16.Other information, including date of preparation or last revision

Issue Date:	10-04-2019
Revision Information:	No data available.
Version #:	1.4
Further Information:	This information is furnished without warranty, expressed or implied, and is believed to be accurate to the best knowledge of Agfa Corporation. The data on this SDS relates only to the specific material designated herein. Agfa Corporation assumes no legal responsibility for use or reliance upon these data.

ATTACHMENT # 2 (C)

APPLICABLE MSDS – MAGNETIC PARTICLE EXAMINATION CONSUMABLES – WCP2 (White Contrast Paint)

WCP-2 Aerosol

Prepared according to the Hazard Communication Standard (CFR29 1910.1200) HazCom 2012 and the Hazardous Products Regulations (HPR) WHMIS 2015

Date of issue: 03/18/2016 Revision date:02/23/2021 Version: 1.1

SECTION 1: IDENTIFICATION

1.1. PRODUCT IDENTIFIER

Product name : WCP-2 Aerosol

Product code : Not available

1.2. RELEVANT IDENTIFIED USES OF THE SUBSTANCE OR MIXTURE AND USES ADVISED AGAINST

Use of the substance/mixture : Non-Destructive Testing

1.3. DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET

Manufacturer

Magnaflux
155 Harlem Ave.
Glenview, IL 60025 - USA
T: 847-657-5300

Distributor

1.4. EMERGENCY TELEPHONE NUMBER

Emergency number : CHEMTREC 800-424-9300

SECTION 2: HAZARDS IDENTIFICATION

2.1. CLASSIFICATION OF THE SUBSTANCE OR MIXTURE

GHS classification

Flam. Aerosol 1

Compressed gas

Eye Irrit. 2A

STOT SE 3

2.2. LABEL ELEMENTS

GHS labeling

Hazard pictograms (GHS) :

GHS02 GHS04 GHS07

Signal word (GHS) : Danger

Hazard statements (GHS) : Extremely flammable aerosol. Contains gas under pressure; may explode if heated. Causes serious eye irritation. May cause drowsiness or dizziness.

Precautionary statements (GHS) : Keep away from heat/sparks/open flames/hot surfaces. -No smoking. Do not spray on an open flame or other ignition source. Pressurized container: Do not pierce or burn, even after use. Wash hands thoroughly after handling. Wear eye protection/face protection. Avoid breathing dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor if you feel unwell. Protect from sunlight. Do not expose to temperatures exceeding 50 °C/122 °F. Store in a well-ventilated place. Store locked up. Dispose of contents/container in accordance with local/regional/national/international Regulations.

2.3. OTHER HAZARDS

No additional information available.

2.4. UNKNOWN ACUTE TOXICITY (GHS)

Not applicable.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. SUBSTANCE

Not applicable.

3.2. MIXTURE

Name	Product identifier	%
Acetone	(CAS No) 67-64-1	65.56
Carbon dioxide	(CAS No) 124-38-9	9.10

SECTION 4: FIRST AID MEASURES

4.1. DESCRIPTION OF FIRST AID MEASURES

First-aid measures after inhalation : If inhaled, remove to fresh air and keep at rest in a position comfortable for breathing. Get medical advice/attention if you feel unwell.

First-aid measures after skin contact : If irritation occurs, flush skin with plenty of water. Get medical attention if irritation persists.

First-aid measures after eye contact : In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. If easy to do, remove contact lenses, if worn. If irritation persists, get medical attention.

First-aid measures after ingestion : If swallowed, do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical advice/attention if you feel unwell.

4.2. MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Symptoms/injuries after inhalation : May cause drowsiness or dizziness. May cause respiratory tract irritation.

Symptoms/injuries after skin contact : May cause skin irritation. Symptoms may include redness, drying, defatting and cracking of the skin.

Symptoms/injuries after eye contact : Causes serious eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with marked redness and swelling of the conjunctiva.

Symptoms/injuries after ingestion : May be harmful if swallowed. May cause stomach distress, nausea or vomiting.

4.3. INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED

Symptoms may not appear immediately. In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).

SECTION 5: FIREFIGHTING MEASURES

5.1. EXTINGUISHING MEDIA

Suitable extinguishing media : Water fog, foam, dry chemical, carbon dioxide.

Unsuitable extinguishing media : Do not use water jet.

5.2. SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

Fire hazard : Extremely flammable aerosol. Products of combustion may include, and are not limited to: oxides of carbon.

Explosion hazard : Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

5.3. ADVICE FOR FIREFIGHTERS

Firefighting instructions : Move containers away from the fire area if this can be done without risk. DO NOT fight fire when fire reaches explosives. Evacuate area.

Protection during firefighting : Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Use water spray to keep fire-exposed containers cool.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

General measures : Remove ignition sources. Use special care to avoid static electric charges. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

6.2. METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

For containment : Stop leak, if possible without risk. Move containers from spill area. Use only non-sparking tools. Use explosion-proof equipment. Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Do not flush to sewer or allow to enter waterways. Use appropriate Personal Protective Equipment (PPE).

Methods for cleaning up : Scoop up material and place in a disposal container. Provide ventilation.

6.3. REFERENCE TO OTHER SECTIONS

See section 8 for further information on protective clothing and equipment and section 13 for advice on waste disposal.

SECTION 7: HANDLING AND STORAGE

7.1. PRECAUTIONS FOR SAFE HANDLING

Additional hazards when processed : Hazardous waste due to potential risk of explosion. Pressurized container: Do not pierce or burn, even after use. Keep away from sources of ignition - No smoking.

Precautions for safe handling : Do not spray on an open flame or other ignition source. Use non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharge. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with skin and eyes. Do not swallow. Handle and open container with care. When using do not eat, drink or smoke. Use only outdoors or in a well-ventilated area.

Hygiene measures : Launder contaminated clothing before reuse. Wash hands before eating, drinking, or smoking.

7.2. CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Technical measures : Proper grounding procedures to avoid static electricity should be followed.

Storage conditions : Keep locked up and out of reach of children. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatibles. Do not expose to temperatures exceeding 50 °C/ 122 °F. Keep in fireproof place.

7.3. SPECIFIC END USE(S)

Not available.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. CONTROL PARAMETERS

Acetone (67-64-1)		
ACGIH	ACGIH TWA (mg/m³)	1188 mg/m³/8h
ACGIH	ACGIH TWA (ppm)	500 ppm/8h
ACGIH	ACGIH STEL (mg/m³)	1782 mg/m³/15min
ACGIH	ACGIH STEL (ppm)	750 ppm/15min
OSHA	OSHA PEL (TWA) (mg/m³)	2400 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	1000 ppm
USA - IDLH	US IDLH (ppm)	2500 ppm (10% LEL)
USA - NIOSH	NIOSH REL (TWA) (mg/m³)	590 mg/m³/10h
USA - NIOSH	NIOSH REL (TWA) (ppm)	250 ppm/10h

Carbon dioxide (124-38-9)		
ACGIH	ACGIH TWA (mg/m³)	9000 mg/m³/8h
ACGIH	ACGIH TWA (ppm)	5000 ppm/8h
ACGIH	ACGIH STEL (mg/m³)	54000 mg/m³/15min
ACGIH	ACGIH STEL (ppm)	30000 ppm/15min
OSHA	OSHA PEL (TWA) (mg/m³)	9000 mg/m³/8h
OSHA	OSHA PEL (TWA) (ppm)	5000 ppm/8h
USA - IDLH	US IDLH (ppm)	40000 ppm
USA - NIOSH	NIOSH REL (TWA) (mg/m³)	9000 mg/m³/10h
USA - NIOSH	NIOSH REL (TWA) (ppm)	5000 ppm/10h
USA - NIOSH	NIOSH REL (STEL) (mg/m³)	54000 mg/m³/15min
USA - NIOSH	NIOSH REL (STEL) (ppm)	30000 ppm/15min

8.2. EXPOSURE CONTROLS

Appropriate engineering controls : Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapor, etc.) below recommended exposure limits.

Hand protection : Wear chemically resistant protective gloves.

Eye protection : Safety glasses with side-shields.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Environmental exposure controls : Maintain levels below Community environmental protection thresholds.

Other information : Do not eat, smoke or drink where material is handled, processed or stored. Wash hands carefully before eating or smoking. Handle according to established industrial hygiene and safety practices.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

Physical state	:	Gas/Pressurized Liquid
Appearance	:	No data available
Color	:	White
Odor	:	Acetone
Odor threshold	:	No data available
pH	:	Neutral
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	Not applicable
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	Flammable
Explosion limits	:	No data available
Explosive properties	:	Pressurised container: May burst if heated
Oxidizing properties	:	No data available
Vapor pressure	:	No data available
Relative density	:	No data available
Relative vapor density at 20 °C	:	No data available
Solubility	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. OTHER INFORMATION

VOC content	:	626.07 g/l
VOC minus exempt solvents	:	1.13 g/l
Heat of combustion	:	8 888 Btu/lb

SECTION 10: STABILITY AND REACTIVITY

10.1. REACTIVITY

No dangerous reaction known under conditions of normal use.

10.2. CHEMICAL STABILITY

Extremely flammable aerosol. Contents under pressure. Container may explode if heated. Do not puncture. Do not burn. Extreme risk of explosion by shock, friction, fire or other sources of ignition.

10.3. POSSIBILITY OF HAZARDOUS REACTIONS

No dangerous reaction known under conditions of normal use.

10.4. CONDITIONS TO AVOID

Sources of ignition. Heat. Incompatible materials.

10.5. INCOMPATIBLE MATERIALS

Strong oxidizing agents.

10.6. HAZARDOUS DECOMPOSITION PRODUCTS

May include, and are not limited to: oxides of carbon.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. INFORMATION ON TOXICOLOGICAL EFFECTS

Acute toxicity	:	Not classified

WCP-2 Aerosol	
LD50 oral rat	> 2000 mg/kg
LD50 dermal rabbit	No data available
LC50 inhalation rat	> 5 mg/l/4h

Acetone (67-64-1)	
LD50 oral rat	5800 mg/kg
LC50 inhalation rat	76 mg/l/4h (female)
LC50 inhalation rat	132 mg/l/3h (male)

Skin corrosion/irritation : Based on available data, the classification criteria are not met.

Serious eye damage/irritation : Causes serious eye irritation.

Respiratory or skin sensitization : Based on available data, the classification criteria are not met.

Germ cell mutagenicity : Based on available data, the classification criteria are not met.

Carcinogenicity : Based on available data, the classification criteria are not met.

Reproductive toxicity : Based on available data, the classification criteria are not met.

Specific target organ toxicity (single exposure) : May cause drowsiness or dizziness.

Specific target organ toxicity (repeated exposure) : Based on available data, the classification criteria are not met.

Aspiration hazard : Based on available data, the classification criteria are not met.

Symptoms/injuries after inhalation : May cause drowsiness or dizziness. May cause respiratory tract irritation.

Symptoms/injuries after skin contact : May cause skin irritation. Symptoms may include redness, drying, defatting and cracking of the skin.

Symptoms/injuries after eye contact : Causes serious eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with marked redness and swelling of the conjunctiva.

Symptoms/injuries after ingestion : May be harmful if swallowed. May cause stomach distress, nausea or vomiting.

SECTION 12: ECOLOGICAL INFORMATION

12.1. TOXICITY

Ecology - general : May cause long-term adverse effects in the aquatic environment.

12.2. PERSISTENCE AND DEGRADABILITY

WCP-2 Aerosol	
Persistence and degradability	Not established.

12.3. BIOACCUMULATIVE POTENTIAL

WCP-2 Aerosol	
Bioaccumulative potential	Not established.

12.4. MOBILITY IN SOIL

No additional information available.

12.5. OTHER ADVERSE EFFECTS

Effect on the global warming : No known ecological damage caused by this product.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. WASTE TREATMENT METHODS

Waste disposal recommendations : This material must be disposed of in accordance with all local, state, provincial, and federal regulations. The generation of waste should be avoided or minimized wherever possible.

Additional information : Flammable vapors may accumulate in the container. Pressurized container: Do not pierce or burn, even after use.

SECTION 14: TRANSPORT INFORMATION

In accordance with DOT/TDG/IATA/IMDG

DOT Ground : Consumables, Limited Quantity

TDG : Consumables, Limited Quantity

IATA : UN 1950, Aerosols, Flammable, 2.1

IMDG : UN 1950, Aerosols, 2.1 (Limited Quantity)

ADDITIONAL INFORMATION

Other information : No supplementary information available.

Special transport precautions : Do not handle until all safety precautions have been read and understood.

SECTION 15: REGULATORY INFORMATION

15.1. FEDERAL REGULATIONS

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory.

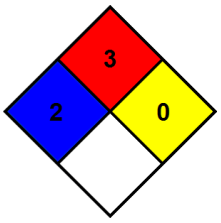
All components of this product are listed, or excluded from listing, on the Canadian DSL (Domestic Substances List) and NDSL (Non-Domestic Substances List) inventories.

Acetone (67-64-1)	
EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA

NFPA health hazard : 2

NFPA fire hazard : 3

NFPA reactivity : 0



15.3. US STATE REGULATIONS

WCP-2 Aerosol	
State or local regulations	This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

SECTION 16: OTHER INFORMATION

Date of issue : 03/18/2016

Revision date : 02/23/2021

Other information : None.

Disclaimer: We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind. The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for the user's own particular use.

ATTACHMENT # 2 (C)

APPLICABLE MSDS – MAGNETIC PARTICLE EXAMINATION CONSUMABLES – 7HF (Prepared Bath)

Safety Data Sheet

7HF Aerosol

Prepared according to the Hazard Communication Standard (CFR29 1910.1200) HazCom 2012 and the Hazardous Products Regulations (HPR) WHMIS 2015

Date of issue: 03/18/2016 Revision date: 02/23/2021 Version: 1.1

SECTION 1: IDENTIFICATION

1.1. PRODUCT IDENTIFIER

Product name : 7HF Aerosol

Product code : Not available

1.2. RELEVANT IDENTIFIED USES OF THE SUBSTANCE OR MIXTURE AND USES ADVISED AGAINST

Use of the substance/mixture : Non-Destructive Testing

1.3. DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET

Manufacturer

Magnaflux
155 Harlem Ave.
Glenview, IL 60025 - USA
T: 847-657-5300

Distributor

1.4. EMERGENCY TELEPHONE NUMBER

Emergency number : CHEMTREC 800-424-9300

SECTION 2: HAZARDS IDENTIFICATION

2.1. CLASSIFICATION OF THE SUBSTANCE OR MIXTURE

GHS classification

Flam. Aerosol 2

Liquefied gas

Asp. Tox. 1

Simple Asphy

2.2. LABEL ELEMENTS

GHS labelling

Hazard pictograms (GHS) :

GHS02 GHS04 GHS08

Signal word (GHS) : Danger

Hazard statements (GHS) : Flammable aerosol. Contains gas under pressure; may explode if heated. May be fatal if swallowed and enters airways. May displace oxygen and cause rapid suffocation.

Precautionary statements (GHS) : Keep away from heat/sparks/open flames/hot surfaces. -No smoking. Do not spray on an open flame or other ignition source. Pressurized container: Do not pierce or burn, even after use. If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. Protect from sunlight. Do not expose to temperatures exceeding 50 °C/122 °F. Store in a well-ventilated place. Store locked up. Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3. OTHER HAZARDS

No additional information available

2.4. UNKNOWN ACUTE TOXICITY (GHS)

Not applicable

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. SUBSTANCE

Not applicable

3.2. MIXTURE

Name	Product identifier	%
Petroleum distillates, hydrotreated light	(CAS No) 64742-47-8	81.70
Petroleum gases, liquefied, sweetened	(CAS No) 68476-86-8	17.00

SECTION 4: FIRST AID MEASURES

4.1. DESCRIPTION OF FIRST AID MEASURES

First-aid measures after inhalation : If inhaled, remove to fresh air and keep at rest in a position comfortable for breathing. Get medical advice/attention if you feel unwell.

First-aid measures after skin contact : If irritation occurs, flush skin with plenty of water. Get medical attention if irritation persists.

First-aid measures after eye contact : In case of contact, immediately flush eyes with plenty of water. If easy to do, remove contact lenses, if worn. Get medical attention if irritation occurs.

First-aid measures after ingestion : If swallowed, do NOT induce vomiting. Never give anything by mouth to an unconscious person. Immediately call a POISON CENTER or doctor/physician.

4.2. MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Symptoms/injuries after inhalation : May cause respiratory tract irritation. May displace oxygen and cause rapid suffocation. May cause cardiac arrhythmia.

Symptoms/injuries after skin contact : May cause skin irritation. Symptoms may include redness, drying, defatting and cracking of the skin.

Symptoms/injuries after eye contact : May cause eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with possible redness and swelling.

Symptoms/injuries after ingestion : May be harmful if swallowed. May cause stomach distress, nausea or vomiting. May be fatal if swallowed and enters airways. This product may be aspirated into the lungs and cause chemical pneumonitis.

4.3. INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED

Symptoms may not appear immediately. In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).

SECTION 5: FIREFIGHTING MEASURES

5.1. EXTINGUISHING MEDIA

Suitable extinguishing media : Water fog, foam, dry chemical, carbon dioxide.

Unsuitable extinguishing media : Do not use water jet.

5.2. SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

Fire hazard : Flammable aerosol. Products of combustion may include, and are not limited to: oxides of carbon, oxides of nitrogen, oxides of sulfur.

Explosion hazard : Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

5.3. ADVICE FOR FIREFIGHTERS

Firefighting instructions : DO NOT fight fire when fire reaches explosives. Evacuate area.

Protection during firefighting : Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Use water spray to keep fire-exposed containers cool.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

General measures : Remove-ignition sources. Use special care to avoid static electric charges. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

6.2. METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

For containment : Stop leak, if possible without risk. Move containers from spill area. Use only non-sparking tools. Use explosion-proof equipment. Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Do not flush to sewer or allow to enter waterways. Use appropriate Personal Protective Equipment (PPE).

Methods for cleaning up : Scoop up material and place in a disposal container. Provide ventilation.

6.3. REFERENCE TO OTHER SECTIONS

See section 8 for further information on protective clothing and equipment and section 13 for advice on waste disposal.

SECTION 7: HANDLING AND STORAGE

7.1. PRECAUTIONS FOR SAFE HANDLING

Additional hazards when processed : Keep away from sources of ignition - No smoking. Hazardous waste due to potential risk of explosion. Pressurized container: Do not pierce or burn, even after use.

Precautions for safe handling : Do not spray on an open flame or other ignition source. Use non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharge. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with skin and eyes. Do not swallow. Handle and open container with care. When using do not eat, drink or smoke.

Hygiene measures : Launder contaminated clothing before reuse. Wash hands before eating, drinking, or smoking.

7.2. CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Technical measures : Proper grounding procedures to avoid static electricity should be followed.

Storage conditions : Keep locked up and out of reach of children. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatibles. Do not expose to temperatures exceeding 50 °C/ 122 °F. Keep in fireproof place.

7.3. SPECIFIC END USE(S)

Not available.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. CONTROL PARAMETERS

Petroleum distillates, hydrotreated light (64742-47-8)		
ACGIH	ACGIH RCP-TWA (mg/m³)	1200 mg/m³ (143 ppm) (total hydrocarbons; supplier exposure limits)
OSHA	Not applicable	

Petroleum gases, liquefied, sweetened (68476-86-8)		
ACGIH	ACGIH STEL (ppm)	1000 ppm
OSHA	OSHA PEL (TWA) (ppm)	1000 ppm

8.2. EXPOSURE CONTROLS

Appropriate engineering controls : Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapor, etc.) below recommended exposure limits.

Hand protection : Wear chemically resistant protective gloves.

Eye protection : Safety glasses with side-shields.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Environmental exposure controls : Maintain levels below Community environmental protection thresholds.

Other information : Do not eat, smoke or drink where material is handled, processed or stored. Wash hands carefully before eating or smoking. Handle according to established industrial hygiene and safety practices.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

Physical state : Gas/Pressurized Liquid

Appearance : Oily

Color : Black

Odor : Mild oily

Odor threshold : No data available

pH : Neutral

Melting point : No data available

Freezing point : No data available

Boiling point : No data available

Flash point : Not applicable

Relative evaporation rate (butylacetate=1) : No data available

Flammability (solid, gas) : Flammable

Explosive limits : No data available

Explosive properties : Pressurised container: May burst if heated.

Oxidising properties : No data available

Vapor pressure : No data available

Relative density	:	No data available
Relative vapour density at 20 °C	:	No data available
Solubility	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. OTHER INFORMATION

VOC content	:	326.22 g/l
Heat of combustion	:	14 586 Btu/lb

SECTION 10: STABILITY AND REACTIVITY

10.1. REACTIVITY

No dangerous reaction known under conditions of normal use.

10.2. CHEMICAL STABILITY

Flammable aerosol. Contents under pressure. Container may explode if heated. Do not puncture. Do not burn. Extreme risk of explosion by shock, friction, fire or other sources of ignition.

10.3. POSSIBILITY OF HAZARDOUS REACTIONS

No dangerous reaction known under conditions of normal use.

10.4. CONDITIONS TO AVOID

Sources of ignition. Heat. Incompatible materials.

10.5. INCOMPATIBLE MATERIALS

Strong oxidizing agents.

10.6. HAZARDOUS DECOMPOSITION PRODUCTS

May include, and are not limited to: oxides of carbon, oxides of nitrogen, oxides of sulfur.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. INFORMATION ON TOXICOLOGICAL EFFECTS

Acute toxicity : Not classified.

7HF Aerosol	
LD50 oral rat	> 2000 mg/kg
LD50 dermal rabbit	> 2000 mg/kg
LC50 inhalation rat	> 5 mg/l/4h

Petroleum distillates, hydrotreated light (64742-47-8)	
LD50 oral rat	> 5000 mg/kg
LD50 dermal rabbit	> 5000 mg/kg
LC50 inhalation rat	> 5000 mg/m^3/4h

Skin corrosion/irritation	:	Based on available data, the classification criteria are not met.
Serious eye damage/irritation	:	Based on available data, the classification criteria are not met.
Respiratory or skin sensitisation	:	Based on available data, the classification criteria are not met.
Germ cell mutagenicity	:	Based on available data, the classification criteria are not met.
Carcinogenicity	:	Based on available data, the classification criteria are not met.
Reproductive toxicity	:	Based on available data, the classification criteria are not met.
Specific target organ toxicity (single exposure)	:	Based on available data, the classification criteria are not met.
Specific target organ toxicity (repeated exposure)	:	Based on available data, the classification criteria are not met.
Aspiration hazard	:	May be fatal if swallowed and enters airways.
Symptoms/injuries after inhalation	:	May cause respiratory tract irritation. May displace oxygen and cause rapid suffocation. May cause cardiac arrhythmia.

Symptoms/injuries after skin contact : May cause skin irritation. Symptoms may include redness, drying, defatting and cracking of the skin.

Symptoms/injuries after eye contact : May cause eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with possible redness and swelling.

Symptoms/injuries after ingestion : May be harmful if swallowed. May cause stomach distress, nausea or vomiting. May be fatal if swallowed and enters airways. This product may be aspirated into the lungs and cause chemical pneumonitis.

SECTION 12: ECOLOGICAL INFORMATION

12.1. TOXICITY

Ecology - general : May cause long-term adverse effects in the aquatic environment.

12.2. PERSISTENCE AND DEGRADABILITY

7HF Aerosol	
Persistence and degradability	Not established.

12.3. BIOACCUMULATIVE POTENTIAL

7HF Aerosol	
Bioaccumulative potential	Not established.

12.4. MOBILITY IN SOIL

No additional information available

12.5. OTHER ADVERSE EFFECTS

Effect on the global warming : No known ecological damage caused by this product.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. WASTE TREATMENT METHODS

Waste disposal recommendations : This material must be disposed of in accordance with all local, state, provincial, and federal regulations. The generation of waste should be avoided or minimized wherever possible.

Additional information : Pressurized container: Do not pierce or burn, even after use. Flammable vapours may accumulate in the container.

SECTION 14: TRANSPORT INFORMATION

In accordance with DOT/TDG/IATA/IMDG

DOT Ground : Consumables, Limited Quantity

TDG : Consumables, Limited Quantity

IATA : UN 1950, Aerosols, Flammable, 2.1

IMDG : UN 1950, Aerosols, 2.1 (Limited Quantity)

ADDITIONAL INFORMATION

Other information : No supplementary information available.

Special transport precautions : Do not handle until all safety precautions have been read and understood.

SECTION 15: REGULATORY INFORMATION

15.1. FEDERAL REGULATIONS

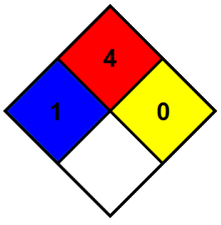
All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory.

All components of this product are listed, or excluded from listing, on the Canadian DSL (Domestic Substances List) and NDSL (Non-Domestic Substances List) inventories.

NFPA health hazard : 1

NFPA fire hazard : 4

NFPA reactivity : 0



15.2. US STATE REGULATIONS

7HF Aerosol	
State or local regulations	This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

SECTION 16: OTHER INFORMATION

Date of issue : 03/18/2016
Revision date : 02/23/2021
Other information : None.

Disclaimer: We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind. The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for the user's own particular use.

ATTACHMENT # 2 (C)

APPLICABLE MSDS – MAGNETIC PARTICLE EXAMINATION CONSUMABLES – 14AM (Fluorescent Prepared Bath)

14AM Aerosol

Prepared according to the Hazard Communication Standard (CFR29 1910.1200) HazCom 2012 and the Hazardous Products Regulations (HPR) WHMIS 2015

Date of issue: 03/11/2016 Revision date: 03/11/2016 Version: 1.0

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. PRODUCT IDENTIFIER

Product name : 14AM Aerosol

Product code : Not available

1.2. RELEVANT IDENTIFIED USES OF THE SUBSTANCE OR MIXTURE AND USES ADVISED AGAINST

Use of the substance/mixture : Non-Destructive Testing

1.3. DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET

Manufacturer

Magnaflux
155 Harlem Ave.
Glenview, IL 60025 - USA
T: 847-657-5300

Distributor

1.4. EMERGENCY TELEPHONE NUMBER

Emergency number : CHEMTREC 800-424-9300

SECTION 2: HAZARDS IDENTIFICATION

2.1. CLASSIFICATION OF THE SUBSTANCE OR MIXTURE

GHS classification

Flam. Aerosol 2

Liquefied gas

Asp. Tox. 1

Simple Asphy

2.2. LABEL ELEMENTS

GHS labelling

Hazard pictograms (GHS) :

GHS02 GHS04 GHS08

Signal word (GHS) : Danger

Hazard statements (GHS) : Flammable aerosol. Contains gas under pressure; may explode if heated. May be fatal if swallowed and enters airways. May displace oxygen and cause rapid suffocation.

Precautionary statements (GHS) : Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Do not spray on an open flame or other ignition source. Pressurized container: Do not pierce or burn, even after use. If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. Protect from sunlight. Do not expose to temperatures exceeding 50 °C/122 °F. Store in a well-ventilated place. Store locked up. Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3. OTHER HAZARDS

No additional information available

2.4. UNKNOWN ACUTE TOXICITY (GHS)

Not applicable

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. SUBSTANCE

Not applicable

3.2. MIXTURE

Name	Product identifier	%
White mineral oil, petroleum	(CAS No) 8042-47-5	79.68
Petroleum gases, liquefied, sweetened	(CAS No) 68476-86-8	20.10

SECTION 4: FIRST AID MEASURES

4.1. DESCRIPTION OF FIRST AID MEASURES

First-aid measures after inhalation : If inhaled, remove to fresh air and keep at rest in a position comfortable for breathing. Get medical advice/attention if you feel unwell.

First-aid measures after skin contact : If irritation occurs, flush skin with plenty of water. Get medical attention if irritation persists.

First-aid measures after eye contact : In case of contact, immediately flush eyes with plenty of water. If easy to do, remove contact lenses, if worn. Get medical attention if irritation occurs.

First-aid measures after ingestion : IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting.

4.2. MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Symptoms/injuries after inhalation : May cause respiratory tract irritation. May displace oxygen and cause rapid suffocation. May cause cardiac arrhythmia.

Symptoms/injuries after skin contact : May cause skin irritation. Symptoms may include redness, drying, defatting and cracking of the skin.

Symptoms/injuries after eye contact : May cause eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with possible redness and swelling.

Symptoms/injuries after ingestion : May be harmful if swallowed. May cause stomach distress, nausea or vomiting. May be fatal if swallowed and enters airways. This product may be aspirated into the lungs and cause chemical pneumonitis.

4.3. INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED

Symptoms may not appear immediately. In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).

SECTION 5: FIREFIGHTING MEASURES

5.1. EXTINGUISHING MEDIA

Suitable extinguishing media : Water fog. Water spray. Foam. Carbon dioxide. Dry chemical.

Unsuitable extinguishing media : Do not use water jet.

5.2. SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

Fire hazard : Flammable aerosol. Products of combustion may include, and are not limited to: oxides of carbon, oxides of nitrogen and acrolein.

Explosion hazard : Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

5.3. ADVICE FOR FIREFIGHTERS

Firefighting instructions : DO NOT fight fire when fire reaches explosives. Evacuate area.

Protection during firefighting : Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Use water spray to keep fire-exposed containers cool.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

General measures : Remove ignition sources. Use special care to avoid static electric charges. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

6.2. METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

For containment : Stop leak, if possible without risk. Move containers from spill area. Use only non-sparking tools. Use explosion-proof equipment. Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Do not flush to sewer or allow to enter waterways. Use appropriate Personal Protective Equipment (PPE).

Methods for cleaning up : Scoop up material and place in a disposal container. Provide ventilation.

6.3. REFERENCE TO OTHER SECTIONS

See section 8 for further information on protective clothing and equipment and section 13 for advice on waste disposal.

SECTION 7: HANDLING AND STORAGE

7.1. PRECAUTIONS FOR SAFE HANDLING

Additional hazards when processed : Keep away from sources of ignition - No smoking. Hazardous waste due to potential risk of explosion. Pressurized container: Do not pierce or burn, even after use.

Precautions for safe handling : Do not spray on an open flame or other ignition source. Use non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharge. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with skin and eyes. Do not swallow. Handle and open container with care. When using do not eat, drink or smoke.

Hygiene measures : Launder contaminated clothing before reuse. Wash hands before eating, drinking, or smoking.

7.2. CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Technical measures : Proper grounding procedures to avoid static electricity should be followed.

Storage conditions : Keep locked up and out of reach of children. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatibles. Do not expose to temperatures exceeding 50 °C/ 122 °F. Keep in fireproof place.

7.3. SPECIFIC END USE(S)

Not available.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. CONTROL PARAMETERS

White mineral oil, petroleum (8042-47-5)		
ACGIH	ACGIH TWA (mg/m3)	5 mg/m^3 (oil mist)
ACGIH	ACGIH STEL (mg/m^3)	10 mg/m^3 (oil mist)
OSHA	Not applicable	

Petroleum gases, liquefied, sweetened (68476-86-8)		
ACGIH	ACGIH STEL (ppm)	1000 ppm
OSHA	OSHA PEL (TWA) (ppm)	1000 ppm

8.2. EXPOSURE CONTROLS

Appropriate engineering controls : Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapor, etc.) below recommended exposure limits.

Hand protection : Wear chemically resistant protective gloves.

Eye protection : Safety glasses with side-shields.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Environmental exposure controls : Maintain levels below Community environmental protection thresholds.

Other information : Do not eat, smoke or drink where material is handled, processed or stored. Wash hands carefully before eating or smoking. Handle according to established industrial hygiene and safety practices.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

Physical state : Gas/Pressurized Liquid

Appearance : Oily

Colour : Brown

Odour : Mild petroleum odour

Odour threshold : No data available

pH : No data available

Melting point : No data available

Freezing point : No data available

Boiling point : No data available

Flash point : Not applicable

Relative evaporation rate (butylacetate=1) : No data available

Flammability (solid, gas)	: Flammable
Explosive limits	: No data available
Explosive properties	: Pressurised container: May burst if heated.
Oxidising properties	: No data available
Vapour pressure	: No data available
Relative density	: No data available
Relative vapour density at 20 °C	: No data available
Solubility	: No data available
Partition coefficient: n-octanol/water	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available

9.2. OTHER INFORMATION

VOC content	: 349.61 g/l
Heat of combustion	: 14,586 Btu/lb

SECTION 10: STABILITY AND REACTIVITY

10.1. REACTIVITY

No dangerous reaction known under conditions of normal use.

10.2. CHEMICAL STABILITY

Flammable aerosol. Contents under pressure. Container may explode if heated. Do not puncture. Do not burn. Extreme risk of explosion by shock, friction, fire or other sources of ignition.

10.3. POSSIBILITY OF HAZARDOUS REACTIONS

No dangerous reaction known under conditions of normal use.

10.4. CONDITIONS TO AVOID

Sources of ignition. Heat. Incompatible materials.

10.5. INCOMPATIBLE MATERIALS

Strong oxidizing agents. Acids.

10.6. HAZARDOUS DECOMPOSITION PRODUCTS

May include, and are not limited to: oxides of carbon, oxides of nitrogen and acrolein.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. INFORMATION ON TOXICOLOGICAL EFFECTS

Acute toxicity : Not classified.

14AM Aerosol	
LD50 oral rat	> 2000 mg/kg
LD50 dermal rabbit	> 2000 mg/kg
LC50 inhalation rat	> 5 mg/l/4h

White mineral oil, petroleum (8042-47-5)	
LD50 oral rat	> 5000 mg/kg

Skin corrosion/irritation	: Based on available data, the classification criteria are not met.
Serious eye damage/irritation	: Based on available data, the classification criteria are not met.
Respiratory or skin sensitisation	: Based on available data, the classification criteria are not met.
Germ cell mutagenicity	: Based on available data, the classification criteria are not met.
Carcinogenicity	: Based on available data, the classification criteria are not met.
Reproductive toxicity	: Based on available data, the classification criteria are not met
Specific target organ toxicity (single exposure)	: Based on available data, the classification criteria are not met.
Specific target organ toxicity (repeated exposure)	: Based on available data, the classification criteria are not met.

Aspiration hazard	:	May be fatal if swallowed and enters airways.
Symptoms/injuries after inhalation	:	May cause respiratory tract irritation. May displace oxygen and cause rapid suffocation. May cause cardiac arrhythmia.
Symptoms/injuries after skin contact	:	May cause skin irritation. Symptoms may include redness, drying, defatting and cracking of the skin.
Symptoms/injuries after eye contact	:	May cause eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with possible redness and swelling.
Symptoms/injuries after ingestion	:	May be harmful if swallowed. May cause stomach distress, nausea or vomiting. May be fatal if swallowed and enters airways. This product may be aspirated into the lungs and cause chemical pneumonitis.

SECTION 12: ECOLOGICAL INFORMATION

12.1. TOXICITY

Ecology - general : May cause long-term adverse effects in the aquatic environment.

12.2. PERSISTENCE AND DEGRADABILITY

14AM Aerosol	
Persistence and degradability	Not established.

12.3. BIOACCUMULATIVE POTENTIAL

14AM Aerosol	
Bioaccumulative potential	Not established.

12.4. MOBILITY IN SOIL

No additional information available

12.5. OTHER ADVERSE EFFECTS

Effect on the global warming : No known ecological damage caused by this product.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. WASTE TREATMENT METHODS

Waste disposal recommendations : This material must be disposed of in accordance with all local, state, provincial, and federal regulations. The generation of waste should be avoided or minimized wherever possible.

Additional information : Pressurized container: Do not pierce or burn, even after use. Flammable vapours may accumulate in the container.

SECTION 14: TRANSPORT INFORMATION

In accordance with DOT/TDG/IATA/IMDG

DOT Ground : Consumables, Limited Quantity

TDG : Consumables, Limited Quantity

IATA : UN 1950, Aerosols, Flammable, 2.1

IMDG : UN 1950, Aerosols, 2.1 (Limited Quantity)

ADDITIONAL INFORMATION

Other information : No supplementary information available.

Special transport precautions : Do not handle until all safety precautions have been read and understood.

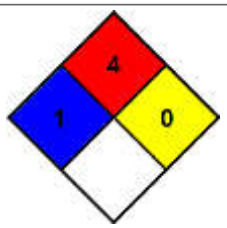
SECTION 15: REGULATORY INFORMATION

15.1. FEDERAL REGULATIONS

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory.

All components of this product are listed, or excluded from listing, on the Canadian DSL (Domestic Substances List) and NDSL (Non-Domestic Substances List) inventories.

NFPA health hazard	: 1
NFPA fire hazard	: 4
NFPA reactivity	: 0



15.2. US STATE REGULATIONS

14AM Aerosol	
State or local regulations	This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm

SECTION 16: OTHER INFORMATION

Date of issue	: 03/11/2016
Revision date	: 03/11/2016
Other information	: None.

Disclaimer: We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind. The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for the user's own particular use.

ATTACHMENT # 2 (D)

APPLICABLE MSDS – LIQUID DYE PENETRANT EXAMINATION CONSUMABLES – SKC-S (Cleaner)

Prepared according to the Hazard Communication Standard (CFR29 1910.1200) HazCom 2012 and the Hazardous Products Regulations (HPR) WHMIS 2015

Date of issue: 03/11/2016 Revision date: 08/23/2017 Supersedes: 07/27/2017 Version: 3.0

SECTION 1: IDENTIFICATION

1.1. IDENTIFICATION

Product form : Mixture

Product name : SKC-S Aerosol

1.2. RELEVANT IDENTIFIED USES OF THE SUBSTANCE OR MIXTURE AND USES ADVISED AGAINST

Recommended use : Non-Destructive Testing.

1.3. DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET

Manufacturer
Magnaflux
155 Harlem Ave.
Glenview, IL 60025 - USA
T 847-657-5300

Distributor

1.4. EMERGENCY TELEPHONE NUMBER

Emergency number : CHEMTREC 800-424-9300

SECTION 2: HAZARD IDENTIFICATION

2.1. CLASSIFICATION OF THE SUBSTANCE OR MIXTURE

GHS classification

Flam. Aerosol 1
Press. Gas (Comp.)
Skin Irrit. 2
STOT SE 3
Asp. Tox. 1

2.2. LABEL ELEMENTS

GHS labelling

Hazard pictograms (GHS) :

GHS02 GHS04 GHS07 GHS08

Signal word (GHS) : Danger

Hazard statements (GHS) : Extremely flammable aerosol. Contains gas under pressure; may explode if heated. May be fatal if swallowed and enters airways. Causes skin irritation. May cause drowsiness or dizziness.

Precautionary statements (GHS) : Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Do not spray on an open flame or other ignition source. Pressurized container: Do not pierce or burn, even after use. Avoid breathing dust/fume/gas/mist/vapours/spray. Wash hands, forearms and face thoroughly after handling. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection. If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. If on skin: Wash with plenty of water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor if you feel unwell. Store in a well-ventilated place. Store locked up. Protect from sunlight. Do not expose to temperatures exceeding 50 °C/122 °F. Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation.

2.3. OTHER HAZARDS

No additional information available

2.4. UNKNOWN ACUTE TOXICITY

Not applicable

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. SUBSTANCES

Not applicable

3.2. MIXTURES

Name	Product identifier	%
Naphtha, petroleum, hydrotreated light	(CAS-No.) 64742-49-0	96.40
Carbon dioxide	(CAS-No.) 124-38-9	3.60

SECTION 4: FIRST AID MEASURES

4.1. DESCRIPTION OF FIRST AID MEASURES

First-aid measures after inhalation : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a POISON CENTER or doctor/physician if you feel unwell.

First-aid measures after skin contact : In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Call a physician if irritation develops and persists.

First-aid measures after eye contact : IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

First-aid measures after ingestion : IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting. Never give anything by mouth to an unconscious person.

4.2. MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Symptoms/effects after inhalation : May cause irritation to the respiratory tract. May cause drowsiness or dizziness.

Symptoms/effects after skin contact : Causes skin irritation. Symptoms may include redness, edema, drying, defatting and cracking of the skin.

Symptoms/effects after eye contact : May cause eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with possible redness and swelling.

Symptoms/effects after ingestion : May be fatal if swallowed and enters airways. This product may be aspirated into the lungs and cause chemical pneumonitis. May cause stomach distress, nausea or vomiting.

4.3. INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED

Symptoms may not appear immediately. In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).

SECTION 5: FIREFIGHTING MEASURES

5.1. EXTINGUISHING MEDIA

Suitable extinguishing media : Dry chemical. Carbon dioxide. Water fog. Foam.

Unsuitable extinguishing media : Do not use water jet.

5.2. SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

Fire hazard : Extremely flammable aerosol. Products of combustion may include, and are not limited to: oxides of carbon.

Explosion hazard : Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

Reactivity : No dangerous reaction known under conditions of normal use.

5.3. ADVICE FOR FIREFIGHTERS

Firefighting instructions : Move containers away from the fire area if this can be done without risk. DO NOT fight fire when fire reaches explosives. Evacuate area.

Protection during firefighting : Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Use water spray to keep fire-exposed containers cool.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

General measures : Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Remove ignition sources. Use special care to avoid static electric charges. Use only non-sparking tools. Avoid breathing vapour or mist.

6.1.1. FOR NON-EMERGENCY PERSONNEL

No additional information available

6.1.2. FOR EMERGENCY RESPONDERS

No additional information available

6.2. ENVIRONMENTAL PRECAUTIONS

Do not allow to enter into surface water or drains. Prevent entry to sewers and public waters.

6.3. METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

For containment : Stop leak without risks if possible. Dilute with water. Absorb and/or contain spill with inert material (sand, vermiculite or other appropriate material), then place in suitable container. Do not flush into surface water or sewer system. Wear recommended personal protective equipment. Use explosion-proof equipment.

Methods for cleaning up : Scoop up material and place in a disposal container. Provide ventilation.

6.4. REFERENCE TO OTHER SECTIONS

For further information refer to section 8: "Exposure controls/personal protection"

SECTION 7: HANDLING AND STORAGE

7.1. PRECAUTIONS FOR SAFE HANDLING

Additional hazards when processed : Hazardous waste due to potential risk of explosion. Pressurized container: Do not pierce or burn, even after use.

Precautions for safe handling : Keep away from sources of ignition - No smoking. Do not spray on an open flame or other ignition source. Do not pierce or burn, even after use. Use non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharge. Avoid breathing vapour or mist. Avoid contact with skin and eyes. Do not swallow. When using do not eat, drink or smoke. Use only outdoors or in a well-ventilated area.

Hygiene measures : Launder contaminated clothing before reuse. Wash hands before eating, drinking, or smoking.

7.2. CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Technical measures : Proper grounding procedures to avoid static electricity should be followed.

Storage conditions : Keep locked up and out of reach of children. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatibles. Do not expose to temperatures exceeding 50 °C/ 122 °F.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. CONTROL PARAMETERS

Naphtha, petroleum, hydrotreated light (64742-49-0)		
ACGIH	ACGIH TWA	247 ppm/8h

Carbon dioxide (124-38-9)		
ACGIH	ACGIH TWA (ppm)	5000 ppm
ACGIH	ACGIH STEL (ppm)	30000 ppm
OSHA	OSHA PEL (TWA) (mg/m³)	9000 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	5000 ppm
IDLH	US IDLH (ppm)	40000 ppm
NIOSH	NIOSH REL (TWA) (mg/m³)	9000 mg/m³
NIOSH	NIOSH REL (TWA) (ppm)	5000 ppm
NIOSH	NIOSH REL (STEL) (mg/m³)	54000 mg/m³
NIOSH	NIOSH REL (STEL) (ppm)	30000 ppm

8.2. EXPOSURE CONTROLS

Appropriate engineering controls : Ensure good ventilation of the work station. Use explosion-proof ventilation equipment.

Hand protection : Wear suitable gloves resistant to chemical penetration.

Eye protection : Safety glasses or goggles are recommended when using product.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Environmental exposure controls : Avoid release to the environment.

Other information : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

Physical state	:	Gas/Pressurized Liquid
Appearance	:	Clear
Colour	:	Colourless
Odour	:	Hydrocarbon
Odour threshold	:	No data available
pH	:	Not applicable
Melting point	:	No data available
Freezing point	:	Not applicable
Boiling point	:	No data available
Flash point	:	No data available
Relative evaporation rate (butylacetate=1)	:	No data available
Flammability (solid, gas)	:	Extremely flammable aerosol
Vapour pressure	:	No data available
Relative vapour density at 20 °C	:	No data available
Relative density	:	No data available
Solubility	:	No data available
Partition coefficient n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosive limits	:	No data available
Explosive properties	:	Pressurised container: May burst if heated.
Oxidising properties	:	No data available

9.2. OTHER INFORMATION

VOC content	:	745.77 g/l
Heat of combustion	:	39.14 kJ/g

SECTION 10: STABILITY AND REACTIVITY

10.1. REACTIVITY

No dangerous reaction known under conditions of normal use.

10.2. CHEMICAL STABILITY

Extremely flammable aerosol. Contents under pressure. Container may explode if heated. Do not puncture. Do not burn. Extreme risk of explosion by shock, friction, fire or other sources of ignition.

10.3. POSSIBILITY OF HAZARDOUS REACTIONS

No dangerous reaction known under conditions of normal use.

10.4. CONDITIONS TO AVOID

Sources of ignition. Heat. Incompatible materials. Direct sunlight.

10.5. INCOMPATIBLE MATERIALS

Oxidizing agents.

10.6. HAZARDOUS DECOMPOSITION PRODUCTS

May include, and are not limited to: oxides of carbon.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. INFORMATION ON TOXICOLOGICAL EFFECTS

Acute toxicity (oral)	:	Not classified.
Acute toxicity (dermal)	:	Not classified.
Acute toxicity (inhalation)	:	Not classified.

Naphtha, petroleum, hydrotreated light (64742-49-0)	
LD50 oral rat	> 5000 mg/kg
LD50 dermal rabbit	> 3160 mg/kg
LC50 inhalation rat	73680 ppm/4h

Skin corrosion/irritation : Causes skin irritation.
pH: Not applicable

Serious eye damage/irritation : Not classified.
pH: Not applicable

Respiratory or skin sensitisation : Not classified.

Germ cell mutagenicity : Not classified.

Carcinogenicity : Not classified.

Reproductive toxicity : Not classified.

STOT-single exposure : May cause drowsiness or dizziness.

STOT-repeated exposure : Not classified.

Aspiration hazard : May be fatal if swallowed and enters airways.

SKC-S Aerosol	
Vaporizer	Aerosol

Symptoms/effects after inhalation : May cause irritation to the respiratory tract. May cause drowsiness or dizziness.

Symptoms/effects after skin contact : Causes skin irritation. Symptoms may include redness, edema, drying, defatting and cracking of the skin.

Symptoms/effects after eye contact : May cause eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with possible redness and swelling.

Symptoms/effects after ingestion : May be fatal if swallowed and enters airways. This product may be aspirated into the lungs and cause chemical pneumonitis. May cause stomach distress, nausea or vomiting.

SECTION 12: ECOLOGICAL INFORMATION

12.1. TOXICITY

Ecology - general : May cause long-term adverse effects in the aquatic environment.

12.2. PERSISTENCE AND DEGRADABILITY

SKC-S Aerosol	
Persistence and degradability	Not established.

12.3. BIOACCUMULATIVE POTENTIAL

SKC-S Aerosol	
Bioaccumulative potential	Not established.

Carbon dioxide (124-38-9)	
BCF fish 1	(no bioaccumulation)

12.4. MOBILITY IN SOIL

No additional information available

12.5. OTHER ADVERSE EFFECTS

Effect on the global warming : No known effects from this product.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. WASTE TREATMENT METHODS

Product/Packaging disposal recommendations : Dispose in a safe manner in accordance with local/national regulations.

Additional information : Flammable vapours may accumulate in the container. Pressurized container: Do not pierce or burn, even after use.

SECTION 14: TRANSPORT INFORMATION

In accordance with DOT/TDG/IATA/IMDG

DOT	:	Consumables, Limited Quantity
Transportation of Dangerous Goods	:	Consumables, Limited Quantity
IATA	:	UN1950, Aerosols Flammable, 2.1
IMDG	:	UN1950, Aerosols, 2.1 (Limited Quantity)

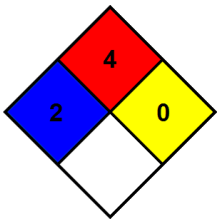
SECTION 15: REGULATORY INFORMATION

15.1. FEDERAL REGULATIONS

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory.

All components of this product are listed, or excluded from listing, on the Canadian DSL (Domestic Substances List) and NDSL (Non-Domestic Substances List) inventories.

NFPA health hazard	:	2
NFPA fire hazard	:	4
NFPA reactivity	:	0



15.2. INTERNATIONAL REGULATIONS

No additional information available

15.3. US STATE REGULATIONS

California Proposition 65 - This product contains, or may contain, trace quantities of a substance(s) known to the state of California to cause cancer, developmental and/or reproductive harm

Carbon dioxide (124-38-9)
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: OTHER INFORMATION

Revision date	:	08/23/2017
Other information	:	None.
Prepared by	:	Nexreg Compliance Inc. www.Nexreg.com

NEXREG

SDS HazCom 2012 - WHMIS 2015 (Nexreg_MAGNAFLUX)

Disclaimer: We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind. The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for the user's own particular use.

ATTACHMENT # 2 (D)

APPLICABLE MSDS – LIQUID DYE PENETRANT EXAMINATION CONSUMABLES – SKD-S2 (Developer)

SKD-S2 Aerosol

Prepared according to the Hazard Communication Standard (CFR29 1910.1200) HazCom 2012 and the Hazardous Products Regulations (HPR) WHMIS

2015 Date of issue: 03/18/2016 Revision date: 02/23/2021 Version: 1.2

SECTION 1: IDENTIFICATION

1.1. PRODUCT IDENTIFIER

Product name : SKD-S2 Aerosol

Product code : Not available

1.2. RELEVANT IDENTIFIED USES OF THE SUBSTANCE OR MIXTURE AND USES ADVISED AGAINST

Use of the substance/mixture : Non-Destructive Testing

1.3. DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET

Manufacturer

Magnaflux
155 Harlem Ave.
Glenview, IL 60025 - USA
T: 847-657-5300

Distributor

1.4. EMERGENCY TELEPHONE NUMBER

Emergency number : CHEMTREC 800-424-9300

SECTION 2: HAZARDS IDENTIFICATION

2.1. CLASSIFICATION OF THE SUBSTANCE OR MIXTURE

GHS classification

Flam. Aerosol 1

Liquefied gas

Eye Irrit. 2A

STOT SE 3

Simple Asphy

2.2. LABEL ELEMENTS

GHS labeling

Hazard pictograms (GHS) :

GHS02 GHS04 GHS07

Signal word (GHS) : Danger

Hazard statements (GHS) : Extremely flammable aerosol. Contains gas under pressure; may explode if heated. Causes serious eye irritation. May cause drowsiness or dizziness. May displace oxygen and cause rapid suffocation.

Precautionary statements (GHS) : Keep away from heat/sparks/open flames/hot surfaces. -No smoking. Do not spray on an open flame or other ignition source. Pressurized container: Do not pierce or burn, even after use. Wash hands thoroughly after handling. Wear eye protection/face protection. Avoid breathing dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor if you feel unwell. Protect from sunlight. Do not expose to temperatures exceeding 50 °C/122 °F. Store in a well-ventilated place. Store locked up. Dispose of contents/container in accordance with local/regional/national/international Regulations.

2.3. OTHER HAZARDS

No additional information available.

2.4. UNKNOWN ACUTE TOXICITY (GHS)

Not applicable.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. SUBSTANCE

Not applicable.

3.2. MIXTURE

Name	Product identifier	%
Isopropyl alcohol	(CAS No) 67-63-0	45.17
Petroleum gases, liquefied, sweetened	(CAS No) 68476-86-8	29.73
Acetone	(CAS No) 67-64-1	14.43

SECTION 4: FIRST AID MEASURES

4.1. DESCRIPTION OF FIRST AID MEASURES

First-aid measures after inhalation : If inhaled, remove to fresh air and keep at rest in a position comfortable for breathing. Get medical advice/attention if you feel unwell.

First-aid measures after skin contact : If irritation occurs, flush skin with plenty of water. Get medical attention if irritation persists.

First-aid measures after eye contact : In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. If easy to do, remove contact lenses, if worn. If irritation persists, get medical attention.

First-aid measures after ingestion : If swallowed, do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical advice/attention if you feel unwell.

4.2. MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Symptoms/injuries after inhalation : May cause drowsiness or dizziness. May cause respiratory tract irritation. May displace oxygen and cause rapid suffocation. May cause cardiac arrhythmia.

Symptoms/injuries after skin contact : May cause skin irritation. Symptoms may include redness, drying, defatting and cracking of the skin.

Symptoms/injuries after eye contact : Causes serious eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with marked redness and swelling of the conjunctiva.

Symptoms/injuries after ingestion : May be harmful if swallowed. May cause stomach distress, nausea or vomiting.

4.3. INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED

Symptoms may not appear immediately. In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).

SECTION 5: FIREFIGHTING MEASURES

5.1. EXTINGUISHING MEDIA

Suitable extinguishing media : Water fog, foam, dry chemical, carbon dioxide.

Unsuitable extinguishing media : Do not use water jet.

5.2. SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

Fire hazard : Extremely flammable aerosol. Products of combustion may include, and are not limited to: oxides of carbon, oxides of nitrogen, oxides of sulfur.

Explosion hazard : Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

5.3. ADVICE FOR FIREFIGHTERS

Firefighting instructions : Move containers away from the fire area if this can be done without risk. DO NOT fight fire when fire reaches explosives. Evacuate area.

Protection during firefighting : Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Use water spray to keep fire-exposed containers cool.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

General measures : Remove ignition sources. Use special care to avoid static electric charges. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

6.2. METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

For containment : Stop leak, if possible without risk. Move containers from spill area. Use only non-sparking tools. Use explosion-proof equipment. Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Do not flush to sewer or allow to enter waterways. Use appropriate Personal Protective Equipment (PPE).

Methods for cleaning up : Scoop up material and place in a disposal container. Provide ventilation.

6.3. REFERENCE TO OTHER SECTIONS

See section 8 for further information on protective clothing and equipment and section 13 for advice on waste disposal.

SECTION 7: HANDLING AND STORAGE

7.1. PRECAUTIONS FOR SAFE HANDLING

Additional hazards when processed : Hazardous waste due to potential risk of explosion. Pressurized container: Do not pierce or burn, even after use. Keep away from sources of ignition - No smoking.

Precautions for safe handling : Do not spray on an open flame or other ignition source. Use non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharge. Avoid breathing dust/fume/gas/ mist/vapors/spray. Avoid contact with skin and eyes. Do not swallow. Handle and open container with care. When using do not eat, drink or smoke. Use only outdoors or in a well-ventilated area.

Hygiene measures : Launder contaminated clothing before reuse. Wash hands before eating, drinking, or smoking.

7.2. CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Technical measures : Proper grounding procedures to avoid static electricity should be followed.

Storage conditions : Keep locked up and out of reach of children. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatibles. Do not expose to temperatures exceeding 50 °C/ 122 °F. Keep in fireproof place.

7.3. SPECIFIC END USE(S)

Not available.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. CONTROL PARAMETERS

Isopropyl alcohol (67-63-0)		
ACGIH	ACGIH TWA (ppm)	200 ppm
ACGIH	ACGIH STEL (ppm)	400 ppm
OSHA	OSHA PEL (TWA) (mg/m³)	980 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	400 ppm
USA - IDLH	US IDLH (ppm)	2000 ppm (10% LEL)
USA - NIOSH	NIOSH REL (TWA) (mg/m³)	980 mg/m³
USA - NIOSH	NIOSH REL (TWA) (ppm)	400 ppm
USA - NIOSH	NIOSH REL (STEL) (mg/m³)	1225 mg/m³
USA - NIOSH	NIOSH REL (STEL) (ppm)	500 ppm

Petroleum gases, liquefied, sweetened (68476-86-8)		
ACGIH	ACGIH STEL (ppm)	1000 ppm
OSHA	OSHA PEL (TWA) (ppm)	1000 ppm

Acetone (67-64-1)		
ACGIH	ACGIH TWA (mg/m³)	1188 mg/m³/8h
ACGIH	ACGIH TWA (ppm)	500 ppm/8h
ACGIH	ACGIH STEL (mg/m³)	1782 mg/m³/15min
ACGIH	ACGIH STEL (ppm)	750 ppm/15min
OSHA	OSHA PEL (TWA) (mg/m³)	2400 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	1000 ppm
USA - IDLH	US IDLH (ppm)	2500 ppm (10% LEL)
USA - NIOSH	NIOSH REL (TWA) (mg/m³)	590 mg/m³/10h
USA - NIOSH	NIOSH REL (TWA) (ppm)	250 ppm/10h

8.2. EXPOSURE CONTROLS

Appropriate engineering controls : Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapor, etc.) below recommended exposure limits.

Hand protection : Wear chemically resistant protective gloves.

Eye protection : Safety glasses with side-shields.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Environmental exposure controls : Maintain levels below Community environmental protection thresholds.

Other information : Do not eat, smoke or drink where material is handled, processed or stored. Wash hands carefully before eating or smoking. Handle according to established industrial hygiene and safety practices.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

Physical state	:	Gas/Pressurized Liquid
Appearance	:	No data available.
Color	:	White
Odor	:	Alcohol
Odor threshold	:	No data available
pH	:	Neutral
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	Not applicable
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	Flammable
Explosion limits	:	No data available
Explosive properties	:	Pressurised container: May burst if heated.
Oxidizing properties	:	No data available
Vapor pressure	:	No data available
Relative density	:	No data available
Relative vapor density at 20 °C	:	No data available
Solubility	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. OTHER INFORMATION

VOC content	:	765.06 g/l
VOC minus exempt solvents	:	655.18 g/l
Heat of combustion	:	13 285 Btu/lb

SECTION 10: STABILITY AND REACTIVITY

10.1. REACTIVITY

No dangerous reaction known under conditions of normal use.

10.2. CHEMICAL STABILITY

Extremely flammable aerosol. Contents under pressure. Container may explode if heated. Do not puncture. Do not burn. Extreme risk of explosion by shock, friction, fire or other sources of ignition.

10.3. POSSIBILITY OF HAZARDOUS REACTIONS

No dangerous reaction known under conditions of normal use.

10.4. CONDITIONS TO AVOID

Sources of ignition. Heat. Incompatible materials.

10.5. INCOMPATIBLE MATERIALS

Strong oxidizing agents, aldehydes, halogenated hydrocarbons, halogens, strong acids.

10.6. HAZARDOUS DECOMPOSITION PRODUCTS

May include, and are not limited to: oxides of carbon, oxides of nitrogen, oxides of sulfur.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. INFORMATION ON TOXICOLOGICAL EFFECTS

Acute toxicity : Not classified

SKD-S2 Aerosol	
LD50 oral rat	> 2000 mg/kg
LD50 dermal rabbit	> 2000 mg/kg
LC50 inhalation rat	> 5 mg/l/4h

Isopropyl alcohol (67-63-0)	
LD50 oral rat	5840 mg/kg
LD50 dermal rabbit	> 12800 mg/kg
LC50 inhalation rat	> 10000 ppm/6h

Acetone (67-64-1)	
LD50 oral rat	5800 mg/kg
LC50 inhalation rat	76 mg/l/4h (female)
LC50 inhalation rat	132 mg/l/3h (male)

Skin corrosion/irritation : Based on available data, the classification criteria are not met.

Serious eye damage/irritation : Causes serious eye irritation.

Respiratory or skin sensitization : Based on available data, the classification criteria are not met.

Germ cell mutagenicity : Based on available data, the classification criteria are not met.

Carcinogenicity : Based on available data, the classification criteria are not met.

Isopropyl alcohol (67-63-0)	
IARC group	3 - Not classifiable

Reproductive toxicity : Based on available data, the classification criteria are not met.

Specific target organ toxicity (single exposure) : May cause drowsiness or dizziness.

Specific target organ toxicity (repeated exposure) : Based on available data, the classification criteria are not met.

Aspiration hazard : Based on available data, the classification criteria are not met.

Symptoms/injuries after inhalation : May cause drowsiness or dizziness. May cause respiratory tract irritation. May displace oxygen and cause rapid suffocation. May cause cardiac arrhythmia.

Symptoms/injuries after skin contact : May cause skin irritation. Symptoms may include redness, drying, defatting and cracking of the skin.

Symptoms/injuries after eye contact : Causes serious eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with marked redness and swelling of the conjunctiva.

Symptoms/injuries after ingestion : May be harmful if swallowed. May cause stomach distress, nausea or vomiting.

SECTION 12: ECOLOGICAL INFORMATION

12.1. TOXICITY

Ecology - general : May cause long-term adverse effects in the aquatic environment.

12.2. PERSISTENCE AND DEGRADABILITY

SKD-S2 Aerosol	
Persistence and degradability	Not established.

12.3. BIOACCUMULATIVE POTENTIAL

SKD-S2 Aerosol	
Bioaccumulative potential	Not established.

12.4. MOBILITY IN SOIL

No additional information available.

12.5. OTHER ADVERSE EFFECTS

Effect on the global warming : No known ecological damage caused by this product.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. WASTE TREATMENT METHODS

Waste disposal recommendations : This material must be disposed of in accordance with all local, state, provincial, and federal regulations. The generation of waste should be avoided or minimized wherever possible.

Additional information : Flammable vapors may accumulate in the container. Pressurized container: Do not pierce or burn, even after use.

SECTION 14: TRANSPORT INFORMATION

In accordance with DOT/TDG/IATA/IMDG

DOT Ground : Consumables, Limited Quantity

TDG : Consumables, Limited Quantity

IATA : UN 1950, Aerosols, Flammable, 2.1

IMDG : UN 1950, Aerosols, 2.1 (Limited Quantity)

ADDITIONAL INFORMATION

Other information : No supplementary information available.

Special transport precautions : Do not handle until all safety precautions have been read and understood.

SECTION 15: REGULATORY INFORMATION

15.1. FEDERAL REGULATIONS

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory.

All components of this product are listed, or excluded from listing, on the Canadian DSL (Domestic Substances List) and NDSL (Non-Domestic Substances List) inventories except:

Chlorite-group minerals	CAS No 1318-59-8

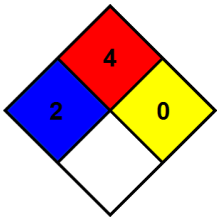
Isopropyl alcohol (67-63-0)	
Subject to reporting requirements of United States SARA Section 313	
EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA
SARA Section 313 - Emission Reporting	1.0 %

Acetone (67-64-1)	
EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA

NFPA health hazard : 2

NFPA fire hazard : 4

NFPA reactivity : 0



15.3. US STATE REGULATIONS

SKD-S2 Aerosol	
State or local regulations	This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm

SECTION 16: OTHER INFORMATION

Date of issue : 03/18/2016

Revision date : 02/23/2021

Other information : None.

Disclaimer: We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind. The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for the user's own particular use.

ATTACHMENT # 2 (D)

APPLICABLE MSDS – LIQUID DYE PENETRANT EXAMINATION CONSUMABLES – SKL-SP2 (Solvent Removable Penetrant)

SKL-SP2 Aerosol

Prepared according to the Hazard Communication Standard (CFR29 1910.1200) HazCom 2012 and the Hazardous Products Regulations (HPR) WHMIS 2015

Date of issue: 03/11/2016 Revision date: 11/14/2016 Version: 1.1

SECTION 1: IDENTIFICATION

1.1. PRODUCT IDENTIFIER

Product name : SKL-SP2 Aerosol

Product code : Not available

1.2. RELEVANT IDENTIFIED USES OF THE SUBSTANCE OR MIXTURE AND USES ADVISED AGAINST

Use of the substance/mixture : Non-Destructive Testing

1.3. DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET

Manufacturer

Magnaflux
155 Harlem Ave.
Glenview, IL 60025 - USA
T: 847-657-5300

Distributor

1.4. EMERGENCY TELEPHONE NUMBER

Emergency number : CHEMTREC 800-424-9300

SECTION 2: HAZARDS IDENTIFICATION

2.1. CLASSIFICATION OF THE SUBSTANCE OR MIXTURE

GHS classification

Flam. Aerosol 2

Liquefied gas

Asp. Tox. 1

Simple Asphy

2.2. LABEL ELEMENTS

GHS labelling

Hazard pictograms (GHS) :

GHS02 GHS04 GHS08

Signal word (GHS) : Danger

Hazard statements (GHS) : Flammable aerosol. Contains gas under pressure; may explode if heated. May be fatal if swallowed and enters airways. May displace oxygen and cause rapid suffocation.

Precautionary statements (GHS) : Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Do not spray on an open flame or other ignition source. Pressurized container: Do not pierce or burn, even after use. If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. Protect from sunlight. Do not expose to temperatures exceeding 50 °C/122 °F. Store in a well-ventilated place. Store locked up. Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3. OTHER HAZARDS

No additional information available.

2.4. UNKNOWN ACUTE TOXICITY (GHS)

Not applicable.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. SUBSTANCE

Not applicable.

3.2. MIXTURE

Name	Product identifier	%
Petroleum gases, liquefied, sweetened	(CAS No) 68476-86-8	54.00
Petroleum distillates, hydrotreated light	(CAS No) 64742-47-8	33.67
Distillates, petroleum, hydrotreated light naphthenic	(CAS No) 64742-53-6	3.58

SECTION 4: FIRST AID MEASURES

4.1. DESCRIPTION OF FIRST AID MEASURES

First-aid measures after inhalation : If inhaled, remove to fresh air and keep at rest in a position comfortable for breathing. Get medical advice/attention if you feel unwell.

First-aid measures after skin contact : If irritation occurs, flush skin with plenty of water. Get medical attention if irritation persists.

First-aid measures after eye contact : In case of contact, immediately flush eyes with plenty of water. If easy to do, remove contact lenses, if worn. Get medical attention if irritation occurs.

First-aid measures after ingestion : IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting.

4.2. MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Symptoms/injuries after inhalation : May cause respiratory tract irritation. May displace oxygen and cause rapid suffocation. May cause cardiac arrhythmia.

Symptoms/injuries after skin contact : May cause skin irritation. Symptoms may include redness, drying, defatting and cracking of the skin.

Symptoms/injuries after eye contact : May cause eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with possible redness and swelling.

Symptoms/injuries after ingestion : May be harmful if swallowed. May cause stomach distress, nausea or vomiting. May be fatal if swallowed and enters airways. This product may be aspirated into the lungs and cause chemical pneumonitis.

4.3. INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED

Symptoms may not appear immediately. In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).

SECTION 5: FIREFIGHTING MEASURES

5.1. EXTINGUISHING MEDIA

Suitable extinguishing media : Water fog. Water spray. Foam. Carbon dioxide. Dry chemical.

Unsuitable extinguishing media : Do not use water jet.

5.2. SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

Fire hazard : Flammable aerosol. Products of combustion may include, and are not limited to: oxides of carbon, oxides of nitrogen and oxides of sulfur.

Explosion hazard : Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

5.3. ADVICE FOR FIREFIGHTERS

Firefighting instructions : DO NOT fight fire when fire reaches explosives. Evacuate area.

Protection during firefighting : Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Use water spray to keep fire-exposed containers cool.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

General measures : Remove ignition sources. Use special care to avoid static electric charges. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

6.2. METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

For containment : Stop leak, if possible without risk. Move containers from spill area. Use only non-sparking tools. Use explosion-proof equipment. Contain and/or absorb spill with inert material (e.g. sand, vermiculite), then place in a suitable container. Do not flush to sewer or allow to enter waterways. Use appropriate Personal Protective Equipment (PPE).

Methods for cleaning up : Scoop up material and place in a disposal container. Provide ventilation.

6.3. REFERENCE TO OTHER SECTIONS

See section 8 for further information on protective clothing and equipment and section 13 for advice on waste disposal.

SECTION 7: HANDLING AND STORAGE

7.1. PRECAUTIONS FOR SAFE HANDLING

Additional hazards when processed : Keep away from sources of ignition - No smoking. Hazardous waste due to potential risk of explosion. Pressurized container: Do not pierce or burn, even after use.

Precautions for safe handling : Do not spray on an open flame or other ignition source. Use non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharge. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with skin and eyes. Do not swallow. Handle and open container with care. When using do not eat, drink or smoke.

Hygiene measures : Launder contaminated clothing before reuse. Wash hands before eating, drinking, or smoking.

7.2. CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Technical measures : Proper grounding procedures to avoid static electricity should be followed.

Storage conditions : Keep locked up and out of reach of children. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatibles. Do not expose to temperatures exceeding 50 °C/ 122 °F. Keep in fireproof place.

7.3. SPECIFIC END USE(S)

Not available.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. CONTROL PARAMETERS

Petroleum gases, liquefied, sweetened (68476-86-8)		
ACGIH	ACGIH STEL (ppm)	1000 ppm
OSHA	OSHA PEL (TWA) (ppm)	1000 ppm

Petroleum distillates, hydrotreated light (64742-47-8)		
ACGIH	ACGIH RCP-TWA (mg/m³)	1200 mg/m³ (143 ppm) (total hydrocarbons; supplier exposure limits)
OSHA	Not applicable	

Distillates, petroleum, hydrotreated light naphthenic (64742-53-6)	
ACGIH	Not applicable
OSHA	Not applicable

8.2. EXPOSURE CONTROLS

Appropriate engineering controls : Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapor, etc.) below recommended exposure limits.

Hand protection : Wear chemically resistant protective gloves.

Eye protection : Safety glasses with side-shields.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Environmental exposure controls : Maintain levels below Community environmental protection thresholds.

Other information : Do not eat, smoke or drink where material is handled, processed or stored. Wash hands carefully before eating or smoking. Handle according to established industrial hygiene and safety practices.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

Physical state : Gas/Pressurized Liquid

Appearance : Oily

Colour : Dark red

Odour : Mild oily

Odour threshold : No data available

pH : Neutral

Melting point : No data available

Freezing point : No data available

Boiling point	:	No data available
Flash point	:	Not applicable
Relative evaporation rate (butylacetate=1)	:	No data available
Flammability (solid, gas)	:	Flammable
Explosive limits	:	No data available
Explosive properties	:	Pressurised container: May burst if heated.
Oxidising properties	:	No data available
Vapour pressure	:	No data available
Relative density	:	No data available
Relative vapour density at 20 °C	:	No data available
Solubility	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. OTHER INFORMATION

VOC content	:	506.81 g/l
Heat of combustion	:	17,455 Btu/lb

SECTION 10: STABILITY AND REACTIVITY

10.1. REACTIVITY

No dangerous reaction known under conditions of normal use.

10.2. CHEMICAL STABILITY

Flammable aerosol. Contents under pressure. Container may explode if heated. Do not puncture. Do not burn. Extreme risk of explosion by shock, friction, fire or other sources of ignition.

10.3. POSSIBILITY OF HAZARDOUS REACTIONS

No dangerous reaction known under conditions of normal use.

10.4. CONDITIONS TO AVOID

Sources of ignition. Heat. Incompatible materials.

10.5. INCOMPATIBLE MATERIALS

Strong oxidizing agents.

10.6. HAZARDOUS DECOMPOSITION PRODUCTS

May include, and are not limited to: oxides of carbon, oxides of nitrogen and oxides of sulfur.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. INFORMATION ON TOXICOLOGICAL EFFECTS

Acute toxicity : Not classified.

SKL-SP2 Aerosol	
LD50 oral rat	> 2000 mg/kg
LD50 dermal rabbit	> 2000 mg/kg
LC50 inhalation rat	> 5 mg/l/4h

Petroleum distillates, hydrotreated light (64742-47-8)	
LD50 oral rat	> 5000 mg/kg
LD50 dermal rabbit	> 5000 mg/kg
LC50 inhalation rat	> 5000 mg/m^3/4h

Skin corrosion/irritation	:	Based on available data, the classification criteria are not met.
Serious eye damage/irritation	:	Based on available data, the classification criteria are not met.
Respiratory or skin sensitisation	:	Based on available data, the classification criteria are not met.

Germ cell mutagenicity	:	Based on available data, the classification criteria are not met.
Carcinogenicity	:	Based on available data, the classification criteria are not met.
Reproductive toxicity	:	Based on available data, the classification criteria are not met.
Specific target organ toxicity (single exposure)	:	Based on available data, the classification criteria are not met.
Specific target organ toxicity (repeated exposure)	:	Based on available data, the classification criteria are not met.
Aspiration hazard	:	May be fatal if swallowed and enters airways.
Symptoms/injuries after inhalation	:	May cause respiratory tract irritation. May displace oxygen and cause rapid suffocation. May cause cardiac arrhythmia.
Symptoms/injuries after skin contact	:	May cause skin irritation. Symptoms may include redness, drying, defatting and cracking of the skin.
Symptoms/injuries after eye contact	:	May cause eye irritation. Symptoms may include discomfort or pain, excess blinking and tear production, with possible redness and swelling.
Symptoms/injuries after ingestion	:	May be harmful if swallowed. May cause stomach distress, nausea or vomiting. May be fatal if swallowed and enters airways. This product may be aspirated into the lungs and cause chemical pneumonitis.

SECTION 12: ECOLOGICAL INFORMATION

12.1. TOXICITY

Ecology - general : May cause long-term adverse effects in the aquatic environment.

12.2. PERSISTENCE AND DEGRADABILITY

SKL-SP2 Aerosol	
Persistence and degradability	Not established.

12.3. BIOACCUMULATIVE POTENTIAL

SKL-SP2 Aerosol	
Bioaccumulative potential	Not established.

12.4. MOBILITY IN SOIL

No additional information available

12.5. OTHER ADVERSE EFFECTS

Effect on the global warming : No known ecological damage caused by this product.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. WASTE TREATMENT METHODS

Waste disposal recommendations	:	This material must be disposed of in accordance with all local, state, provincial, and federal regulations. The generation of waste should be avoided or minimized wherever possible.
Additional information	:	Pressurized container: Do not pierce or burn, even after use. Flammable vapours may accumulate in the container.

SECTION 14: TRANSPORT INFORMATION

In accordance with DOT/TDG/IATA/IMDG

DOT Ground	:	Consumables, Limited Quantity
TDG	:	Consumables, Limited Quantity
IATA	:	UN 1950, Aerosols, Flammable, 2.1
IMDG	:	UN 1950, Aerosols, 2.1 (Limited Quantity)

ADDITIONAL INFORMATION

Other information	:	No supplementary information available.
Special transport precautions	:	Do not handle until all safety precautions have been read and understood.

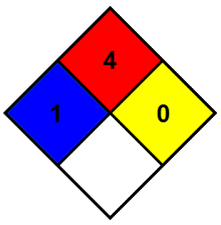
SECTION 15: REGULATORY INFORMATION

15.1. FEDERAL REGULATIONS

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory.

All components of this product are listed, or excluded from listing, on the Canadian DSL (Domestic Substances List) and NDSL (Non-Domestic Substances List) inventories.

NFPA health hazard	: 1
NFPA fire hazard	: 4
NFPA reactivity	: 0



15.2. US STATE REGULATIONS

SKL-SP2 Aerosol	
State or local regulations	This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

SECTION 16: OTHER INFORMATION

Date of issue	: 03/11/2016
Revision date	: 11/14/2016
Version	: 1.1
Other information	: None.

Disclaimer: We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind. The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for the user's own particular use.

ATTACHMENT # 3

NDTL RADIATION SAFETY & EMERGENCY RESPONSE PROGRAM

(LV-NDTL-07-PWP-HSE-#34)

NON DESTRUCTIVE TESTERS LTD

Radiation Safety and Emergency Program For Guyana Operations

LV-NDTL-07-PWP-HSE-#34

CONTROLLED COPY

#394 CIPERO ROAD, ST. JOHN'S VILLAGE
SAN FERNANDO
TRINIDAD, WEST INDIES
TEL: (868) 221-1658, 221-1720 Fax: (868) 652-5089
E-Mail: info@ndt.co.tt or qa@ndt.co.tt

Revision No.	Revision Date	Purpose	List of Updated/Modified sections if any
0	-	Original Document	-

NON DESTRUCTIVE TESTERS LIMITED
RADIATION SAFETY & EMERGENCY PROGRAM

APPROVED BY:	Neal Tackoor	Ludmila Tackoor-Addo
POSITION:	CEO	Managing Director
SIGNATURE:	*Neal Tackoor*	*Ludmila Tackoor-Addo*

DOCUMENT NUMBER: LV-NDTL-07-PWP-HSE-#34

REVISION NUMBER: 0

ORIGNAL ISSUE DATE: 22nd February 2021

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1.0 POLICY STATEMENT

Non-Destructive Testers Ltd (NDTL) in its effort to provide a safe workplace for its employees will adopt the following procedures as part of its safety policies to ensure protection of employees from the hazards associated with Ionizing Radiation for it Guyana Operations.

NDTL will provide instruction, guidance and training for employees of as it relates to Radiation and the prevention of potential injuries associated with this subject.

Managing Director

22-02-2021
Date

2.0 INTRODUCTION

This section of the manual is prepared for the use of personnel who are involved with Radiographic Procedures. Failure by personnel to follow the recommended procedures as stated here will be considered sufficient reason to terminate employment immediately.

The procedures set forth in this manual, are designated to safeguard those engaged in radiography, as well as the general public against exposure to ionizing radiation.

It should always be remembered that the five normal senses of sight, taste, hearing, smell and touch are unable to detect even extremely dangerous radiation levels.

The only means of detecting radiation is with specialized protective devices which are mentioned in section 2.12 of this document.

2.1 EFFECTS OF EXPOSURE TO RADIATION

The effects of radiation on the human body can be described as follows:

- The actual destruction of the body cells which will cause death if enough body cells are destroyed.
- The highly increased possibility of contracting leukemia.
- The genetic effects where mutations may occur among the children or grandchildren of a person whose reproductive organs have been exposed to radiation.

Radiation is always damaging to the body cells and tissue, therefore it must be remembered that Ionizing Radiation is destructive and must be carefully and properly handled.

2.2 MEDICAL EFFECTS OF EXPOSURE TO IONIZING RADIATION

Dose Range – 0 to 100 Rem

There are usually no immediate or delayed symptoms such as nausea, vomiting, hair loss, etc. in this exposure range. Certain very special blood tests may reveal blood changes at the 50 to 100 Rem range. No therapy is required, other than reassurance that there will be no permanent harm.

Dose Range – 100 to 200 Rem

When and individual receives a dose in this range, clinical observation will be required. A dose of more than 100 Rem will probably produce nausea or vomiting in about 5% of these cases and it will occur about 3 to 4 hours after receiving the dose.
Blood tests will reveal moderate loss of white blood cells and continuing blood tests on a regular basis will be required.
A period of several weeks of convalescence will probably be required; however, no deaths are expected in this range.

Dose Range – 200 to 1000 Rem

In this range, every person exposed to this dose will become nauseous and begin vomiting within two hours.
There will be severe blood changes, which may produce bleeding under the skin and internally.
Hair loss will occur with a dose of approximately 300 Rem.
The **Mid-Lethal Dose** (or Median Lethal Dose) is generally believed to be within this range.
Normally considered to be about 400 to 500 Rem. This is the dose which will cause death to approximately half of the individuals exposed to this dose.
The incidence of death in this range varies from 0 to 100% depending on the dose received.
Those individuals who survive this dose will require medical attention, blood transfusions, antibiotics and a convalescent period of up to 12 months. Bone marrow transplants are considered effective at the higher limits of this range.

Dose Range – 1000 to 5000 Rem

Doses in this range are considered fatal and the cause of death is a combination of severe blood and marrow damage, disturbance of the electrolyte balance, damage to the central nervous system and the circulatory system.
In this range, death will occur in from 2 days to 2 weeks depending on the dose received.

2.3 MEDICAL SURVEILLANCE

All NDTL employees conducting radiographic examination works are medically evaluated bi-annually. This is done via fit for work medical and a blood count test. The HR Manager is provided with a copy of the results which is kept on file for a period of 20 – 25 years. Additionally, all employee film badges are returned to the manufacturer / supplier for verification and trending of exposure. Where a badge may indicate that an employee may have been exposed to amounts exceeding the allowable limit, the provider immediately notifies NDTL via email and that employee is sent to do follow up blood count tests to confirm information received from the manufacturer / supplier. Only when the results confirm no exposure, is the employee is allowed to continue work.

2.4 IONIZATION

Ionization is a process whereby the passage of radiation through a material causes changes in the makeup of the atom by forcing electrons out of their orbits around the nucleus. This causes the formation of electrically charged particles (the electron which is forced out of orbit is negative and the remainder of the atom is positive) called negative ions and positive ions. It is this process of breaking up of atoms which causes harmful effects in human tissue. This is also the process which makes it possible for radiation detection instruments to measure the intensity of radiation fields.

2.5 TRAINING OF THE RADIOGRAPHER

Proper attitude and understanding of the radiographic process by the operator are essential to the safe performance of radiography.
This understanding is more necessary now than before as newer machines are capable of higher and higher radiation output, where some machines are capable of delivering a potentially lethal dose of radiation to the body in a few seconds.
That is why certain aspects of radiographic inspection are essential, which include time spent, exposed to radiation, distance from exposed source, method of shielding and protective measures taken.
These measures are taken because any person within the course of this type of work, business or occupation is likely to receive a dose of ionizing radiation in excess of those limits specified for the general public.
Before any on the job training begins, a certain amount of knowledge pertaining to radiation safety, safety equipment and radiography equipment will be required.

Certification and training for all NDTL ASNT LI and LII technicians includes a combination of classroom and practical training of at least 40 hours. Additionally, RPS (Radiation Protection Supervisor), RPA (Radiation Protection Advisor) and RSO (Radiation Safety Officer) training is provided for Supervisors to be able to deal with an emergency in an efficient and safe manner.

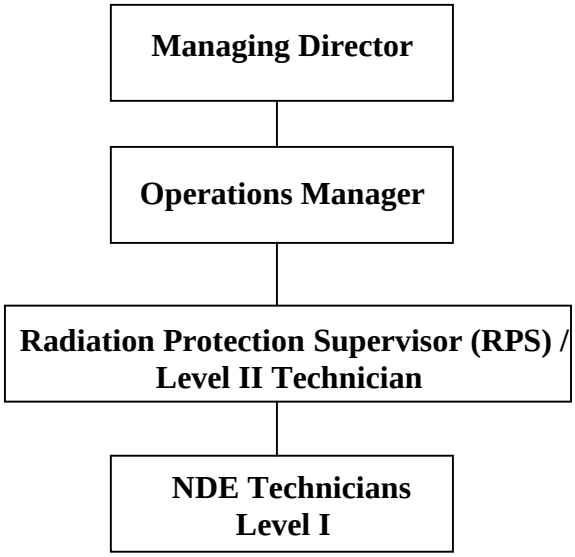
2.5 TRAINING OF THE RADIOGRAPHER – CONTINUED:

Table 1 extracted from NDTL's Company Written Practice provides information on the hours of training and experience required for ASNT Level I and LII Technician.

Table 1 – Extracted from Company Written Practice

Examination Method	Level	Training Hours Required	Minimum Required Work Experience in Method (Hours)	Total Hours in NDT
Liquid Penetrant Inspection	I II	4 8	70 140	130 270
Magnetic Particle Inspection	I II	12 8	70 210	130 400
Radiographic Inspection	I II	40 40	210 630	400 1200
Computed Radiography	I II	40 40	210 630	400 1200
Ultrasonic Inspection	I II Ltd II	40 8 (Formal Training) 40	210 40 (Minimum) 630	400 1200

2.6 MANAGEMENT STRUCTURE



2.6.1 CREW MAKEUP

The crew shall consist of a minimum of three men. This can be:

- One qualified radiographer.
- A qualified RPS /RT Level II.
- A Radiographer Assistant/designated Barrier watches.
- The trainee cannot operate the controls of the exposure device nor make required surveys unless he is under the **direct, personal** supervision of the trainer.

2.6.2 RESPONSIBILITIES

LEVEL II RADIOGRAPHER / RPS:

The radiographer performing the examination will be qualified in accordance with SNT-TC-1A Level II. He must also have experience in interpretation of radiographs. Details of each Radiographer shall be provided to the client prior to the start of field examination.

He shall also be trained as the Radiation Protection Supervisor (RPS) and has a key role in ensuring that all rules for site safety during radiography are complied with in full. He must be directly involved in the work playing a close supervisory role at site level.

Specifically he is responsible for the following:-

1. Prior to packaging for any jobsite, the radiographic examination equipment shall be checked at NDTL's office. This shall be performed by the technician together with the Audit Manager and Stores Personnel.
2. Check all radiographers carry personal dosimeters (TLD's)
3. Check proper monitoring is carried out.
4. Co-ordinate with other site personnel
5. Invoke contingency plans in the event of an emergency.

LEVEL I RADIOGRAPHIC ASSISTANT:

A Level I Radiographic Assistant shall know the practical aspects of the radiographic method, the importance of following procedures exactly and be able to perform operational type examinations using procedures and techniques or other written instructions specified by his radiographic ASNT Level II Crew Leader.

They shall be proficient in operating the radiographic equipment and instruments including performing operations in accordance with specific instructions from the ASNT Level II Crew Leader while under his direct supervision.

They shall also assist the Level II / RPS during emergency situations.

2.7 SAFETY MEASURES TO BE PERFORMED

It is imperative that no operation take place without careful planning and safety considerations. The following shall be adhered:

2.7.1 SETTING UP

The following list of equipment must be on hand on all jobs:

- Survey Meter.
- TLD Badge (Film Badge) worn by each person on the job.
- Approximately 200 ft. of rope. / radiation tape (where applicable)
- Minimum of six (6) radiation signs.
- Collimator
- Dosimeter (optional)
- Flashing Lights
- **Lead Apron**
- **Tongs**
- **Emergency Retrieval Container**
- **Lead shots / Lead bags**

Note: Items in **"RED"** are the emergency retrieval equipment.

1. The first step is to establish a barrier extending to a distance from the source at which the dose rate does not exceed 0.75 mR/h
2. Demarcation barriers must be erected at this distance with warning notices and flashing amber lights strategically placed at all possible points of entry.
3. Check that no unauthorized persons remain in the area.
4. It is advised that wherever possible a beam collimator and local shielding will be used as this considerable reduces the radiation intensity.
5. Do not unlock the exposure container until set up is complete and the area is evacuated.
6. The perimeter of the roped off area must be checked with a survey meter each time the source on shielding is moved to be sure radiation levels do not exceed 0.75mR/h.

2.7.2 CONTROLLING RESTRICTED AREAS

- When the initial barrier is set up, a new controlled area perimeter distance can be established.
- In this new perimeter distance signs and barriers must be erected. These signs must be placed where personnel are likely to walk through.
- In some instances a job must be accomplished in a certain time frame, such as lunch and coffee breaks (windows). It is imperative that all Simultaneous Operations (SIMOPS) understand that if radiation tape and signs are still in place when they return from the break, they do not enter the work area.
- There may also occur instances where the area to be worked in is impossible to rope off (such as in plants and refinery hi-lines). In this case the ground below will be roped off and surveyed by the barrier watch during exposure.
- The barrier watch will be located on catwalks above and below in a safe area and will be instructed to stop anyone from entering into an area where they may be exposed.
- In the area around the demarcation barriers, a constant vigilance must be maintained during exposures to ensure that no unauthorized person approaches or crosses the perimeter of the controlled area.
- Prior to each exposure the controlled area must be checked to ensure no unauthorized person has encroached.

2.7.3 SOURCE SECURITY

- Personnel must at all times be conscious of source security.
- No unauthorized handling of radiographic equipment is allowed.
- When on the job always replace the safety plug and lock the exposure container when not in use.
- An exposure container must never be left unattended, even with the safety plug in the exposure container locked.
- If a job is completed or there is a break in the work, return the exposure container to the specific RT Tool Box in the vehicle and lock it up.
- When not in use on any job the source shall be stored and locked securely in the designated storage bunker in the main operations site / facility. Only authorized Radiographic Technicians shall have access to this area.
- The facility shall be protected and monitored 24hrs by a reliable security provider.

2.7.4 INVENTORY

- A total of six (6) Ir-192 Radioactive Sources will be utilized per annum for this project. At any given time no more than two (2) radioactive sources will be stored on site for use.

- Each day the company shall account for all isotopes (sources of radiation) through a recorded inventory (log book located in isotope storage area and verification on NDTL Daily Job Log).

2.8 MAINTENANCE

2.8.1 RADIOGRAPHIC EQUIPMENT, INSPECTION & MAINTENANCE

All radiographic equipment must be kept in perfect working condition, to do this, maintenance and inspection program must be followed:

- Never take equipment on a job without first checking it over.
- Check source tubes for cuts or crimps.
- Check cables to be sure they are working freely.
- Check the safety plugs for security
- Check the exposure container for proper labels and signs.
- Check connectors on both the source tube and control cables to make sure they are properly secured.
- Always keep the exposure container as clean as possible.

2.8.2 QUARTERLY INSPECTION AND MAINTENANCE

- Once each calendar quarter, the company must make a physical inspection of exposure containers and equipment and record the results of these inspections and the maintenance performed. This inspection includes exposure container and equipment and a survey of guide tubes and controls for contamination.

2.8.3 LEAK TESTS

- The company must perform a test on each source at least once every 6 months to determine if more than **.005 micro Ci** of removable contamination is present. If the test reveals the presence of contamination, the contaminated equipment must be removed from service and decontaminated, repaired or replaced by a facility licensed to do so.

2.9 TRANSPORTATION OF RADIOACTIVE SOURCES

- The vehicles shall be conspicuously marked with radiation warning signs, clean and legible at all times.

- NDTL ensures that all vehicles transporting radioactive isotopes are equipped with a lockable metal box designed for transportation of sealed sources. This box must be located as far back as possible from the occupants during the road trip, in compliance with 49 CFR CH. 1: 177,870g and 49 CFR CH. 1: 173,448a. The certified NDTL technician ensures that the camera is locked and is placed in the vehicles' box. This box is locked to ensure that no unauthorized person will access the equipment. The camera must be stored only in the cargo compartment of the vehicle and must never be stored in any other compartment of the vehicle that is occupied by individuals. (49 CFR CH. 1: 177g)

- The exposure container shall be marked with the warning symbol and Serial Number. The date and strength of the isotope is available on the current decay chart for the respective source within the exposure container.

- Only certified ASNT Level I or Level II Technicians shall travel in vehicles transporting sealed radioactive isotopes. At all times, it is essential that a competent Level II RT / RPS Technician is present during transportation and storage. After ensuring that pre-cautions listed above are taken, the vehicle would leave NDTL's storage area and proceed to the relevant jobsite.

2.9 TRANSPORTATION OF RADIOACTIVE SOURCES (CONTINUED):

- For vehicles transporting sealed radioactive sources, the dose rate shall not exceed:

(a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:

(i) The vehicle is equipped with an enclosure that, during routine conditions of transport, prevents the access of unauthorized persons.

(ii) Provisions are made to secure the package so that its position within the enclosure remains fixed in the vehicle during routine conditions of transport.

(b) 2 mSv/h at any point on the outer surfaces of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle.

(c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, if the load is transported in an open vehicle, at any point, 2m from the vertical planes projected from the outer edges of the vehicle.

Upon arrival to the Clients' site, the crew obtains the relevant work permit and only then proceeds to remove the radioactive isotope from the vehicle's secured metal box and perform the required radiographic examination.

To return the radioactive isotope to NDTL's storage area, steps above are reversed as applicable.

2.10 STORAGE AND HANDLING:

(a) The sealed source should be packaged in such a way that the package integrity can be assured during the entire storage time;

(b) In the storage container, the sources are packaged in a lead lined box which has appropriate shielding properties when the box is placed within a lidded steel container. The box has a capacity of 75 mL and could be used to store several sources.

NDTL will maintain an information sheet detailing which sources are contained in the container at all times.

(c) Each camera (exposure container) shall be marked with the ionizing radiation symbol, “radioactive”, and an Identification Tag shall be attached.

(d) The storage facility is properly designed and licensed by the relevant regulatory body. The general guidelines for safe storage will include the following:

(i) Location of the on-site store should be remote from working places or other areas regularly attended by personnel or public;

(ii) Transfer of sources to and from the storage area should be facilitated by proper manual lifting techniques.

(iii) The loading capacity of the floor must be taken into consideration when planning the storage of isotopes.

(iv) Physical barriers to intrusion, surveillance, high security lock, alarm system or any combination of these should be provided as appropriate. The physical protection measures are viewed as a whole, taking into account the combined effect of individual precautions.

(v) The storage area should be properly marked with a symbol of ionizing radiation (trefoil) and the words “radioactive” & “authorized personnel only”.

(vi) The storage area should be large enough to permit the sources to be stored in an orderly manner in order to be visually identified by the authorized personnel.

(vii) Radioactive sources being stored shall be adequately ID’ d

(viii) Shielding should be provided to ensure that the dose rate at any accessible place within or outside the storage area does not exceed the applicable value prescribed by any regulatory body.

(ix) Appropriate ventilation should be provided in storage areas.

2.11 MANAGEMENT OF PUBLIC EXPOSURE:

NDTL has implemented monitoring programmes to ensure that public exposure due to sources under its responsibility are adequately assessed and that the assessment is sufficient to verify and demonstrate compliance with regulatory bodies. This includes monitoring of the following, as appropriate:

(i) Leak tests conducted semiannually on all exposure devices to ensure non-contamination. Records of the results are maintained and kept on file.

(ii) All depleted sources shall be returned to NDTL's main office in Trinidad for change out. During change out of depleted isotopes, the operation shall be conducted within the confines of the storage area which is specifically designed with barrier protection – (6" concrete wall, lead lined and includes storage pits for isotopes with steel covers for additional protection)

During transportation of isotopes from NDTL's storage area to client facility, the following controls are adhered to:

(i) Decay Charts for isotope (s) in transit are given to the ASNT Level II technician
(ii) Crew Leaders are trained to manage contingencies in a safe and efficient manner when / if they arise.
(iii) Isotopes are transported in tool boxes that are designed for transportation of such, adequately secured and inaccessible to unauthorized personnel.
(iv) Vehicle transporting isotopes are not left unattended at any time.
(v) Additional controls for public protection may also include the use of Fire and Police Services where necessary.

During operations on site, the following controls are adhered to:

(i) Perimeter distance is calculated.
(ii) Signs and barriers are erected.
(iii) Employee assigned as barrier watch to ensure no access to unauthorized personnel.
(iv) Constant monitoring of area
(v) Operations are scheduled at times with little or no SIMOPS
(vi) For all Radiographic Examination to be performed on Off Shore Installations, a maximum curie strength as per allowed by Client's procedure would be used.

2.12 SAFETY EQUIPMENT REQUIRED FOR MANAGEMENT OF EXPOSURE:

2.12.1 SURVEY METER

The survey meter is a delicate instrument and should be treated with care at all times. It can prevent unnecessary exposure of the radiographer only when in proper working condition and if used correctly.

Before use, the survey meter should be checked to ensure:

- There are no physical defects.
- Batteries are not weak.
- The survey meter is in proper working condition.

All survey meters will be sent out for calibration once a year to ensure accurate readings. The survey meter registers the radiation level to which it is exposed and shows this level in roentgens or mill roentgens.

- The survey meter shall be used for the following purposes:
- To check the exposure container at the storage vault before preceding to a job, in order to verify that the exposure container contains a source in the shielded position, and to show that the survey meter is working.
- Used on the job site to check the hazardous area and to be sure no hazardous area is left unmarked.
- To set it near the exposure container and in full view of the operator to indicate movements of the source, and that it has been returned into a safe position.
- Used at the completion of a job before and after equipment is wrapped up to ensure the source is there and in a safe position.
- Spare batteries must be kept on hand at all times. When the batteries are replaced in the survey meter the spare batteries are to be replaced as soon as possible.
- A survey meter shall be calibrated every six months and calibrated for the isotope it will be used for, i.e. Iridium 192.

2.12.2 T.L.D. BADGES

- The Thermo Luminescent Dosimeter (TLD) must be sent to the radiation dosimetry division (TLD Supplier) for processing before any dose measurements are known.
- T.L.D. badges are to be worn when personnel are traveling in a mobile radiography unit and when radiography is being carried out.
- They are to be worn on a part of the clothing not likely to be removed.
- The T.L.D. badge must be changed every four weeks (returned to the supplier)
- Report loss immediately to QHSE Coordinator.

2.12.3 POCKET DOSIMETER

- Pocket dosimeters give an immediate reading of dose received up to 500 mill roentgens; however they are extremely sensitive and are easily knocked out of calibration by the slightest jerk. As a result of this N.D.T. Ltd. has made it an optional piece of equipment for our employees.
- The dosimeter is to be zeroed prior to beginning each job and checked frequently.

2.12.4 ROPE

- ¼" yellow nylon rope will be used / yellow label radiation caution tape (where applicable)
- At least 200ft of rope / radiation caution tape will accompany each operation.

2.13 RETURN OF DEPLETED ISOTOPES

As per Manufacturer / Supplier requirements, all depleted isotopes purchased must be returned to the manufacturer/supplier for disposal. Evidence of this will be kept by NDTL and shall include a copy of the disposal certificate received from the manufacturer/supplier.

To be able to return these depleted isotopes, the manufacturer/supplier is notified that an isotope will be required via a purchase order (as the depleted isotope will need to be replaced). When this isotope is shipped from the manufacturer/supplier, it will be sent in a dual chamber container so as to accommodate return of the depleted isotope. A leak test of the container is conducted by NDTL upon receipt and sent to the manufacturer/supplier for verification prior to its return. Once returned from the manufacturer/supplier, indicating less than <0.005 micro curie, preparations are made to are made to ship the depleted isotope to the manufacturer/supplier.

2.14 WASTE MANAGEMENT OF PROCESSING CHEMICALS

For the disposal for depleted processing chemicals, NDTL is proposing either of the following:

1) Returning the depleted chemicals to Trinidad for processing and disposal or

2) Setting up a processing area in Guyana (similar to Trinidad operations) as per approved guidelines by the Environmental Management Authority of Trinidad & Tobago to ensure that the following parameters are met before disposing of the waste water into the environment.
   i) Temperature - ≤ 35° C
   ii) Dissolved Oxygen – > 4 $mg.L^{-1}$
   iii) pH LEVEL– 6-9
   iv) Chemical Oxygen Demand · ≤ 250 $mg.L^{-1}$
   v) Total Suspended Solids - ≤ 50 $mg.L^{-1}$

The following are the steps for treatment of depleted chemicals:

a. ***Film Processing Chemicals:***

Depleted processing chemical (Fixer & Developer) collected from NDTL's Darkroom processors shall be returned in chemical containers and stored at the facility.

The following process will be used to prepare the chemicals for disposal:

- The Fixer is placed in the silver recovery unit which filters the chemical for twenty four (24) hours to remove the silver content of the liquid.
- The Fixer is then filtered using the REPACK Cartridge before entering the storage tank for disposal.
- One Gallon of Fixer and One Gallon of Developer is then mixed together and diluted with 248 gallons of water within the storage tank.
- Oxygen is also pumped into the diluted solution for a period of twenty four (24) hours.
- Once the chemical meets the requirements of the EMA, it can then be released into the environment through natural water ways (eg. drains).

3.0 MONITORING AND REVIEW

NDTL shall ensure that adequate resources are provided to conduct audits of this radiation safety program. These will be done during internal audits of the HSE MS and records kept on file. The QHSE Manager shall be responsible for ensuring that internal audits are planned and conducted as per “LII-11-01-Monitoring, Audit and Review Procedure”.

4.0 CONTINGENCY PLANS TO BE INVOKED IN THE EVENT OF AN EMERGENCY

4.1 GENERAL EMERGENCY

These plans are laid down to enable the site Radiation Protection Supervisor to deal with an emergency in an efficient and safe manner as much as possible.

Whilst it is the responsibility of the RPS named in the local rules to act in the first instance to render the situation safe, help is available should he find the contingency complicated and the plan impossible or impractical to carry out.

Contact Telephone Numbers:

Mr. Neal Tackoor	**868-653-0275 (office)** **868-653-1839 (home)** **868-678-1418 (cell)**
Mrs. Ludmila Tackoor-Addo	**868-653-0275 (office)** **868-653-1839 (home)** **868-680-4759 (cell)**
Mr. Wayne Thomas	**868-653-0275 (office)** **868-657-3671 (home)** **868-685-7079 (cell)**

RADIATION PROTECTION SUPERVISORS (RPS):

Devanand Baldeo	**868-681-2502 (Mobile)**
Videsh Basdeo	**868-221-1658 (Office)** **868-656-3147 (Home)** **868-737-4662 / 397-7583 (Mobile)**
David Rambarran	**868-760-8088 (Mobile)**
Adrian Maharaj	**868-657-8289 (Home)** **868-681-3079 (Mobile)**
Jairam Ralphsammy	**868-497-7358 (Mobile)**
Revain Baksh	**868-649-2726 (Home)** **868-704-4937 (Mobile)**
Imran Khan	**868-655-7452 (Home)** **868-744-5970 (Mobile)**
Andrew Samai	**868-657-0384 (Home)** **868-748-6601 (Mobile)**
Bharrat Jerrybandan	**868-496-1589 (Mobile)**
Christopher Putkoo	**868-716-4200 (Mobile)**
Rajesh Juman	**868-312-8873 (Mobile)**

RADIATION PROTECTION SUPERVISORS (RPA):

Sunil Walay	**868-221-1658 (Office)** **868-686-0745 (Mobile)**
Wayne Thomas	**868-221-1658 (Office)** **868-685-7079 (Mobile)**

RADIATION SAFETY OFFICERS (RSO):

Kirk Thomas	**868-221-1658 (Office)** **868-475-5146 (Mobile**
Marlon John	**868-221-1658 (Office)** **868-358-5086 (Mobile**

4.2 Plan A - Unauthorized Person/s Discovered in Controlled Area During Exposure.

1. Terminate the exposure immediately.
2. Request the name, address and employer of the person suspected being overexposed.
3. Make a detailed sketch of the exposure setup, showing location and direction of radiation beam, position of exposed person, type and thickness of local shielding, (if any) e.g. brickwork or pipe racks, location of controlled area perimeter barriers and in particular warning signs and lights, measurements of all relevant distances.
4. Determined by the interview, the length of time the person had been in this position inside the controlled area.
5. In consultation with the company RPS, investigate and assess extent of the exposure to which the person may have subjected.
6. If exposure is in excess of the relevant limit the suspected person and his RPS must be informed immediately.

N.B. During any of the following source recovery operations always remember never handle a sealed source directly with the hands.

4.3 Plan B (i) - Sealed Source Holder Assembly Becoming Detached From Wind-Out Drive Cable / Control Cable during Exposure

- Check that all barriers, warning signs and lights remain in place and the barrier dose rate remains below 7.5uSv/h.
- Inform the site engineer or manager of the situation, advising of the need to maintain strict observance of the controlled area by all personnel, until the emergency is resolved.
- Pause for the appraisal of the situation before action.
- Assess the practicality of the plan in the light of any unforeseen complications. Calculate the stay time at the working distance for a maximum permitted dose of 5mSv. (See Appendix 2)
- Personnel involved in retrieval shall not to exceed the calculated stay time. If retrieval is not practical within the calculated stay time rotate personnel
- Ensure that a quartz fiber dosimeter is worn throughout retrieval operation in addition to the TLD, to confirm that the dose rate received is not in excess of that estimated, i.e.5mSv.
- Drive cable / Control cable should be fully extended to push the detached sealed source capsule to the end of the guide tube / source tube into the collimator.
- Attenuate the radiation by placing bags of lead shot over the sealed source capsule, checking its effectiveness with the survey meter.
- Check the effectiveness of the attenuation with a survey meter.
- Retract the drive cable / control cable.
- Disconnect the guide tube / source tube from the exposure container.
- Working quickly but carefully, with long handling tongs at arm's length, working up to a maximum stay time only, remove the guide tube / source tube from beneath the lead shot / lead bags. Attempt Gravitational removal of the sealed source capsule by manipulation of the guide tube / source tube with the tongs.
- Once removal has been effected, attenuate the sealed source capsule with lead shots / lead bags leaving the drive cable / control cable connection socket uncovered.
- Re-connect the drive cable and sealed source capsule, taking care not to disturb the lead shot / lead bag shielding the sealed source capsule.
- Remove the lead shot / lead bag and retire to the drive cable / control cable, wind in to fully retract the sealed source capsule into the exposure container.
- Check with the survey meter to ensure proper retraction then check the storage plug, disconnect drive cable / control cable form the sealed source capsule and lock the exposure container.
- If unsuccessful in retracting the sealed source capsule into the exposure container, place the sealed source capsule into the emergency retrieval container using the tongs for return to base (NDTL Facility)
- Inform site engineer or manager that emergency is over.
- Liaise with the company RPS / HSE to assess estimated extent of dose and possible urgent TLD analysis.

N.B. **Exposure Container and drive cable / control cable must not be reused until faults investigated and cleared by manufacturer**.

4.3 Plan B (ii) - Sealed Source Holder Assembly Becoming Detached From Wind-Out Drive Cable / Control cable during Exposure (On Heights via Rope Access using 20ft Source Tube)

- Check that all barriers, warning signs and lights remain in place and the barrier dose rate remains below 7.5uSv/h.
- Inform the site engineer or manager of the situation, advising of the need to maintain strict observance of the controlled area by all personnel, until the emergency is resolved.
- Pause for the appraisal of the situation before action.
- Assess the practicality of the plan in the light of any unforeseen complications. Calculate the stay time at the working distance for a maximum permitted dose of 5mSv. (See Appendix 2)
- Personnel involved in retrieval shall not exceed the calculated stay time. If retrieval is not practical within the calculated stay time rotate personnel.
- Ensure that a quartz fiber dosimeter is worn throughout retrieval operation in addition to the TLD, to confirm that the dose rate received is not in excess of that estimated, i.e.5mSv.
- Drive cable / Control cable should be fully extended to push the detached sealed source capsule to the end of the guide tube / source tube into the collimator.
- Place lead shots / lead bags on guide tube / source tube in front of exposure container to attenuate the radiation exposure when the sealed source capsule returns for reconnection. (1 bag of lead will reduce dose rate from Ir 192 by approx. 80%)
- Retract the drive cable / control cable.
- Tug on rope rigged to guide tube / source tube to detach from profile jig. Once detached from the jig, keep guide tube / source tube suspended vertically. This will allow the detached sealed source capsule to return to the guide tube / source tube end connected to the exposure container via gravitational flow.
- Check the effectiveness of the attenuation with a survey meter and readjust lead shots / lead bags to ensure effective shielding.
- Disconnect guide tube / source tube from exposure container and reattach the sealed source capsule to the drive cable / control cable while maintaining shielding from the lead shot / lead bag.
- Retract the sealed source capsule into the exposure container using the drive cable / control cable.
- Check with the monitor to ensure proper retraction then check the storage plug, disconnect drive cable / control cable and lock the exposure container.
- If unsuccessful in retracting the sealed source capsule into the exposure container, place the sealed source capsule into the emergency retrieval container using the tongs.
- Demobilize radiographic equipment and return to base (NDTL Facility)
- Inform site engineer or manager that emergency is over.
- Liaise with the company RPS / HSE to assess estimated extent of dose and possible urgent TLD analysis.

N.B. **Exposure Container and drive cable / control cable must not be reused until faults investigated and cleared by manufacturer**.

4.4 Plan C (i) - Sealed Source Becomes Jammed During Exposure and Will Not Retract Into Its Container, Most Likely Due to Jammed Mechanism or Damaged Guide Tube / Source Tube

- Check that all barriers, warning signs and lights remain in place and the barrier dose rate remains below 7.5uSv/h.
- Inform the site engineer or manager of the situation, advising of the need to maintain strict observance of the controlled area by all personnel, until the emergency is resolved.
- First attempt to dislodge the sealed source capsule by firm backwards and forwards movement of the drive cable / control cable unit handle. If successful, demobilize the equipment and eliminate cause of fault before reuse.
- If unsuccessful, retire to the barrier.
- Pause for appraisal of the situation before further action. Assess the practicality of the plan in the light of any unforeseen complications.
- Calculate the stay time at the working distance for a maximum permitted dose of 5mSv.
- Personnel involved in retrieval shall not to exceed the calculated stay time. If retrieval is not practical within the calculated stay time rotate personnel
- Ensure that a quartz fiber dosimeter is worn throughout retrieval to ensure that dose is not in excess of that estimate i.e. 5mSv.
- Using a survey meter, locate the position of the sealed source capsule in the guide tube / source tube.
- Attenuate the radiation by placing bags of lead shot over the sealed source capsule, checking its effectiveness with the survey meter.
- Return to the barrier and re-appraise the situation. Checks the doses received on the dosimeter and assess the practicality of the plan for complete source recovery within the remainder of the calculated stay time.

If the sealed source capsule will not retract past a visible buckle or kink in the guide tube:

- Fully extend the drive cable / control cable to position the sealed source capsule at the end of the guide tube / source tube into the collimator.
- Attenuate the radiation with lead shot / lead bags and check its effectiveness with the survey meter.
- Attempt to straighten out or repair the damage using pliers or a hammer, retire and try again to retract, if successful lock and demobilize the equipment.
- Inform site engineer or manager that emergency is over.
- Liaise with RPS / HSE to assess extent of dose and possible urgent TLD analysis.

4.4 Plan C (i) - Sealed Source Becomes Jammed During Exposure and Will Not Retract Into Its Container, Most Likely Due to Jammed Mechanism or Damaged Guide Tube / Source Tube (Continued):

- If unsuccessful, retract the sealed source capsule as far as possible without using excessive force, check its position with the survey meter and attenuate the radiation with lead shot / lead bags.
- Using the cable cutters, cut the guide tube / source tube as close to the collimator end stopper as possible, retire to the drive cable / control cable and extend the cable to wind the sealed source capsule completely out of the open guide tube / source tube.
- Using long handling tongs carefully insert the sealed source capsule into the emergency retrieval container, disconnect the sealed source capsule from the drive cable / control cable and secure the emergency container for return to base (NDTL Facility)
- Inform site engineer or manager that emergency is over.
- Liaise with RPS / HSE to assess extent of dose and possible urgent TLD analysis.

<u>If the source will not retract due to jammed mechanisms:</u>

- Check for the position of the sealed source capsule in the guide tube / source tube using the survey meter and ensure attenuation of radiation with the lead shot / lead bags.
- Disconnect the guide tube / source tube from the exposure container to expose a discrete length of the drive cable / control cable.
- Remove guide tube / source tube using tongs to expose drive cable / control cable and sealed source capsule and attenuate source with lead shots / lead bags.
- Proceed to disconnect sealed source capsule from drive cable / control cable and place into the emergency retrieval container for return to base (NDTL Facility)

- Inform site engineer or manager that emergency is over.
- Liaise with RPS to assess extent of dose and possible urgent TLD analysis.

N.B. During recovery operations involving cutting tools, care must be taken not to damage the sealed source capsule.

4.4 Plan C (ii) - Sealed Source Becomes Jammed Out During Exposure and Will Not Retract Into Its Container, Most Likely Due to Jammed Mechanism or Damaged Guide Tube / Source Tube (On Heights via Rope Access)

- Check that all barriers, warning signs and lights remain in place and the barrier dose rate remains below 7.5uSv/h.
- Inform the site engineer or manager of the situation, advising of the need to maintain strict observance of the controlled area by all personnel, until the emergency is resolved.
- First attempt to dislodge the seal source capsule by firm backwards and forwards movement of the drive cable / control cable unit handle. If successful, demobilize the equipment and eliminate cause of fault before reuse.
- If unsuccessful, retire to the barrier.
- Pause for appraisal of the situation before further action. Assess the practicality of the plan in the light of any unforeseen complications.
- Calculate the stay time at the working distance for a maximum permitted dose of 5mSv.
- Personnel involved in retrieval shall not to exceed the calculated stay time. If retrieval is not practical within the calculated stay time rotate personnel
- Ensure that a quartz fiber dosimeter is worn throughout retrieval to ensure that dose is not in excess of that estimate i.e. 5mSv.
- Tug on rope rigged to guide tube / source tube to detach from profile jig. Once detached lower guide tube / source tube to the ground using the rope as the control device.
- Using a survey meter. Locate the position of the sealed source capsule in the guide tube / source tube.
- Attenuate the radiation by placing bags of lead shot over the sealed source capsule, checking its effectiveness with the survey meter.
- Return to the barrier and re-appraise the situation. Checks the doses received on the dosimeter and assess the practicality of the plan for complete source recovery within the remainder of the calculated stay time.

If the sealed source capsule will not retract past a visible buckle or kink in the guide tube:

- Fully extend the drive cable / control cable to position the sealed source capsule at the end of the guide tube / source tube into the collimator.
- Attenuate the radiation with lead shot / lead bags and check its effectiveness with the survey meter.
- Attempt to straighten out or repair the damage using pliers or a hammer, retire and try again to retract, if successful lock and demobilize the equipment.

4.4 Plan C (ii) - Sealed Source Becomes Jammed Out During Exposure and Will Not Retract Into Its Container, Most Likely Due to Jammed Mechanism or Damaged Guide Tube (On Heights via Rope Access) (Continued):

- Inform site engineer or manager that emergency is over.
- Liaise with RPS / HSE to assess extent of dose and possible urgent TLD analysis.
- If unsuccessful, retract the sealed source capsule as far as possible without using excessive force, check its position with the survey meter and attenuate the radiation with lead shot / lead bags
- Using the cable cutters, cut the guide tube / source tube as close to the collimator end stopper as possible, retire to the drive cable / control cable and extend the cable to wind the sealed source capsule completely out of the open guide tube / source tube.
- Using long handling tongs carefully insert the sealed source capsule into the emergency retrieval container, disconnect the sealed source capsule from the drive cable / control cable and secure the emergency container for return to base (NDTL Facility)
- Inform site engineer or manager that emergency is over.
- Liaise with RPS / HSE to assess extent of dose and possible urgent TLD analysis.

<u>If the source will not retract due to jammed mechanisms:</u>

- Check for the position of the sealed source capsule in the guide tube / source tube using the survey meter and ensure attenuation of radiation with the lead shot / lead bags.
- Disconnect the guide tube / source tube from the exposure container to expose a discrete length of the drive cable / control cable.
- Remove guide tube / source tube using tongs to expose drive cable / control cable and sealed source capsule and attenuate source with lead shots / lead bags.
- Proceed to disconnect sealed source capsule from drive cable / control cable and place into the emergency retrieval container for return to base (NDTL Facility)
- Inform site engineer or manager that emergency is over.
- Liaise with RPS to assess extent of dose and possible urgent TLD analysis.

N.B. During recovery operations involving cutting tools, care must be taken not to damage the sealed source capsule.

4.5 Plan D - Accident or Incident Involving the Possible Fracture of a Sealed Source Capsule and Leakage of Radioactive Contaminants.

- All personnel to evacuate controlled area immediately.
- Check and maintain barriers, signs and lights.
- Inform site manager of the situation advising of the need to maintain strict observance of the controlled area by all personnel until the emergency is resolved.
- Because of the danger of airborne contamination, no attempt should be made to approach the source, expert assistance is required and the immediate advice of the RPS must be sought.
- Do not eat, drink or smoke. Wash your hands and hand to avoid mouth contact. Try to keep all involved persons together in a limited area to avoid possible unnecessary spread of contaminating radioactive material.
- Maintain barrier supervision until the proper expert arrives to deal with the situation, and then act under his instructions.
- When the emergency is resolved liaise with the RPS concerning urgent medical examination and dose assessment.

N.B. In the event the accident involves trapped or injured persons then the rescue of those persons takes precedence over all other actions.

4.6 Plan E - Road Accident Involving a Vehicle Carrying Radioactive Material.

- Exposure and transportation containers are normally designed to withstand severe accident conditions, including fire. It must however, be assumed that the container is damaged and the source is exposed until it can be positively established otherwise.
- Monitor the container to establish any increase in the written transport index (dose rate at 1 meter.)
- If the dose rate is not in excess of the transport index, it can be assumed that the container has withstood the impact; nevertheless, it must be withdrawn from use for full examinations and clearance by the manufacturer.
- If the dose rate is in excess of the transport index then it must be assumed that the shielding is damaged and possible leakage of radioactive contents has occurred.
- The area must be immediately evacuated and barred off at the 7.5uSv/h distance, with appropriate warning signs and lights.
- Maintain barrier supervision until the proper expert arrives to deal with the situation and then act under his instructions.
- When the emergency is resolved, liaise with the RPS concerning urgent medical examination and dose assessment.

N. B. In the event the accident involves trapped or injured persons, then the rescue of those persons take precedence over all other actions

4.7 Plan F - Incident or Accident Involving a Radioactive Substance in Intense Fire.

4.7.1 Exposure containers of the type normally used would comply with Type B requirements and should be capable of withstanding intense fire without damage. It must however be accepted that the possibility of damage does exist and action must be taken accordingly.

4.7.2 Rewind source, if possible remove container from vicinity of the fire.

4.7.3 Attempt to extinguish the fire using available fire fighting equipment. If this proves impossible then call the fire brigade (and police if the public are involved.)

4.7.4 On the assumption that the container may be damaged, a controlled area must be established and barred off, with warning signs and lights. The barriers should as a matter of urgency, be first erected at an estimated safe distance at which the dose rate from the unshielded source would not exceed 7.5uSv/h.

4.7.5 The controlled area must be evacuated and the barriers supervised to prevent unauthorized access.

4.7.6 When the fire brigade arrives, the senior officer must be immediately informed of the potential radiation hazard.

4.7.7 Maintain barrier supervision whilst the fire is being extinguished or act as instructed by the police if they are involved. All possible assistance must be given to the fire services throughout.

4.7.8 When the fire is extinguished the container must be thoroughly inspected, including careful monitoring for any signs of damage or leakage. Should no damage or leakage be apparent, the container must be withdrawn from use for examination by the manufacturer.

4.7.9 Should the container show signs of excessive dose rate it must be assumed possible leakage of contents has taken place, retire to the barriers and seek urgent assistance from the RPS.

4.7.10 Maintain the barriers until the RPS has arrived and then act under his instruction

4.7.11 When the emergency is over, liaise with the RPS concerning urgent medical treatment and dose assessment.

4.8 Plan G - Missing or Stolen Source.

If a Radioactive Source is missing, an immediate search using whatever radiation detection equipment that is available is conducted. If the source is not found within 1 hour, employeed MUST inform the RPS and Company Management. The supplier, police and local regulatory bodies must also be informed. If a vehicle containing a source is missing, the police and senior RPS must be immediately informed.

Appendix 1

To calculate 7.5uSv/h barrier distance use the following formula:

$$\text{Barrier Distance (In meters)} = \left(\frac{\text{activity (GBq)} \times \text{output (uSv/h/GBq)}}{\text{max. Permissible dose rate (7.5uSv/h)}} \right)$$

N.B. Output:

Ir 192	=	130 uSv/h/GBq
Co 60	=	351 uSv/h/GBq
Yb 169	=	34 uSv/h/GBq
TM170	=	1.2 uSv/h/GBq
Cs 137	=	94.5 uSv/h/GBq

e.g. **(1)** Barrier Distance from an unshielded 185 GBq Co 60:

$$= \frac{185 \times 351}{7.5} = 8658 = 93 \text{ meters}$$

e.g. **(2)** Barrier Distance from unshielded 1850 GBq Ir 192:

$$= \frac{1850 \times 130}{7.5} = 32066 = 179 \text{ meters}$$

Appendix 2

To calculate the maximum stay time at a known distance, first determine the dose rate.

e.g ***10 ci Ir 192 at 1 ft. = 10 x 5.2 = 52 R/hr at 1ft / 520mSv/hr at 1ft***

If the working distance is not 1ft, then use the inverse square law to calculate the dose rate at the correct distance.

To calculate maximum stay time for 10 ci IR 192 at 1ft. incorporate dose rate and maximum permitted dose (5mSv) into the following formula:

$$\text{Stay Time at 1ft} = \frac{\text{Maximum Permitted Dose}}{\text{Dose Rate at Working Distance (mSv/h)}}$$

$$= \frac{5\text{mSv}}{520\text{mSv/hr}}$$

$$= 0.0096\ \text{hr}$$

➡ ***35 seconds.***

To calculate maximum stay time for 10 ci IR 192 at 3ft.

$$\frac{I_1}{I_2} = \frac{D_2^{\,2}}{D_1^{\,2}}$$

$$I_2 = \frac{D_1^{\,2} \times I_1}{D_2^{\,2}}$$

$$= \frac{1^2 \times 520\text{mSv/hr}}{3^2}$$

$$= 57.78\ \text{mSv/hr}$$ - ***Intensity at 3ft.***

Then incorporate dose rate and maximum permitted dose (5mSv) into the following formula:

$$\text{Stay Time at 3ft} = \frac{\text{Maximum Permitted Dose}}{\text{Dose Rate at Working Distance (mSv/h)}}$$

$$= \frac{5\text{mSv}}{57.78\text{mSv/hr}}$$

$$= 0.0865\ \text{hrs}$$

➡ ***5mins 12 seconds.***

Appendix 3- Conversion Table for SI Units:

Old Units			SI Units
1 REM	=	0.01Sv or 10mSv	to convert REM
100 REM	=	1 Sv	to Sv divide
5 REM	=	0.05 Sv or 50mSv	by 100
0.75 mREM	=	0.0075mSv or 7.5uSv	
1 Ci	=	37 x 10 Bq or 37 GBq	to convert Ci
0.027Ci or 27 mCi	=	1 GBq	to GBq
27pCi or 0.027 nCi	=	1 Bq	multiply by 37

Table of Prefixes:

Kilo (K)	=	1,000	or	10^{3}
Mega (M)	=	1,000,000	or	10^{6}
giga (G)	=	1,000,000,000	or	10^{9}
tera (T)	=	1,000,000,000,000	or	10^{12}
milli (m)	=	$\frac{1}{1,000}$	or	10^{-3}
micro (µ)	=	$\frac{1}{1,000,000}$	or	10^{-6}
nano (n)	=	$\frac{1}{1,000,000,000}$	or	10^{-9}
Pico (p)	=	$\frac{1}{1,000,000,000,000}$	or	10^{-12}

ATTACHMENT # 4

EXTRACTION FROM NDTL WASTE MANAGEMENT PROCEDURE

&

SAMPLE REPORT FROM APPROVED WASTE DISPOSAL PROVIDER

9.0 COLLECTION, TRANSPORTATION AND DISPOSAL OF WASTE (CONT'D)

9.9 Special or Hazardous Waste:

a. ***Spent or depleted isotopes:***

Spent or depleted Isotopes will be kept in the isotope pit until they can be shipped back to the manufacturer for proper disposal. Once an Isotope has been depleted, an order is placed for a new isotope from the supplier. This new isotope would be contained in a special transport container when shipped from the supplier.

This container would then be used to transport the depleted isotope back to the supplier for disposal. Transportation is done by the company's shipping agents.

Refer to procedure LIV-NDTL-06-RT-07 for Replacing & Returning of Depleted Radioactive Isotope

b. ***Film Processing Chemicals:***

Depleted processing chemical (Fixer & Developer) is collected from NDTL's Darkroom processors at set intervals. Chemicals from offshore sites will be returned in the portable Darkrooms in approved chemical containers and stored at the facility.

The following process will be used to prepare the chemicals for disposal:

- The Fixer is placed in the silver recovery unit which filters the chemical for twenty four (24) hours to remove the silver content of the liquid.
- The Fixer is then filtered using the REPACK Cartridge before entering the storage tank for disposal.
- One Gallon of Fixer and One Gallon of Developer is then mixed together and diluted with 248 gallons of water within the storage tank.
- Oxygen is also pumped into the diluted solution for a period of twenty four (24) hours.
- A sample will be taken annually by an approved and certified Laboratory to ensure that the chemical for disposal meet the requirements of the Environment Management Authority (EMA). Parameters for testing will include Temperature, Dissolved Oxygen, pH, Chemical Oxygen Demand and Total Suspended Solids as per EMA Permissible Level for inland surface water.
- Once the chemical meets the requirements of the EMA, it can then be released into the environment through natural water ways (eg. drains).

9.0 COLLECTION, TRANSPORTATION AND DISPOSAL OF WASTE (CONT'D)

Special or Hazardous Waste (Cont'd):

c. ***Used and damaged Film:***

Used and damaged film would be stored in NDTL's Darkroom in a designated container. Once the container is full the relevant supplier will be contacted and the film will be packaged and sent for recycling.

KaizenLAB
Analytical Division of Kaizen Environmental Services (Trinidad) Ltd.

Unit 8 Rajkumar Street,
Mission Road, Freeport.
Email: kaizenlab@kaizen-tt.com
Tel: (868) 299-0009
Fax: (868) 673-6774

ANALYSIS DATA REPORT

Customer:	Non Destructive Testers Limited	**Customer Contact:**	Mr. Kirk Thomas
Customer's Address:	Cipero Road, St. John Village, San Fernando.		
Client Project #:	19-146	**Lab File #:**	427430
Item(s) Analyzed:	Liquid Sample		
Date of Sampling:	25-Oct-19	**Sampling Location:**	San Fernando
Sampling Condition:	Sunny Conditions	**Sampled By:**	KLAB Staff - A. Manshoor
Sampling Plan Used:	Following Sampling Instructions Detailed in Standard Operating Procedure KLABSOP017 - Water Sampling		
Date of Receipt:	25-Oct-19	**Date of Testing:**	25-Oct-19 to 29-Oct-19
Report Date:	7-Nov-19		

ANALYSIS RESULTS

Parameter Name	Method Used*	Units	Results	EMA Permissible Level for Inland Surface Water
			427430-1, Film Processing Chemical	
pH	SMEWW 4500 - H^+B	pH units	7.47	6-9
Temperature	SMEWW 2550 B	°C	26.8	35
Dissolved Oxygen	SMEWW 4500 - O G	$mg.L^{-1}$	5.55	>4
Total Suspended Solids (TSS)	SMEWW 2540 D	$mg.L^{-1}$	5.75	50
Chemical Oxygen Demand (COD)	SMEWW 5220 D	$mg.L^{-1}$	223	250

** Detailed Test Methodologies and QA/QC data available upon request.*

Discussion: None

Comments: The results in this test report relate only to the items tested.

Report Authorized by:

Meera Missire – Laboratory Manager