UVA PROJECT

RISK ANALYSIS REPORT

1. Introduction

The Risk Analysis and Assessment is an instrument created and used to typify, analyze, assess and establish controls for possible problems or risks in the different productive activities that usually cause work accidents, sickness and/or damage to work materials. The research about the technology used in the Multi-Tool KIT UVA, regarding the use of LEDs as sources of ultraviolet light emission for the curing of adhesives, 3D printing and the construction of printed circuit board (PCBs) were the main basis and references for searching information for the elaboration of this paper.

Together with the development of the design and manufacturing project of the UVA Multi-Tool Kit, we have created this document containing the safety aspects in the Manufacturing, Assembling and Using processes of this tool. This means that security has been considered a critical and fundamental aspect of the project since its inception.

Chapter 2 defines the scope of this Risk Analysis and Assessment in order to have a reference framework for what this paper should contain, in order to ensure that all relevant aspects were covered. Chapter3 includes the General and Specific Objectives proposed to create a work plan that facilitates achieving the goals indicated in said objectives. Chapter 4 contains the definitions and terminologies specific to the area of Security. Chapter 5 graphically describes the Methodology used in this document for the realization of the Analysis and Risk Assessment and then in Chapter 6, this Methodology is implemented using the corresponding formats for each of the Project processes. Finally, Chapter 7 briefly establishes this paper's Conclusions..

In this way, the goal is to have a tool that offers security to the operator and the manufacturer or assembler, since its inception. Obviously, the exogenous risks arising from the inappropriate use and handling of the Multi-Tool Kit UVA are beyond this premise. However, we attempt to control these cases by using relevant measures that are able of nullify or mitigate such risks if duly observed or taken into consideration.

2. SCOPE

The Risk Analysis and Assessment developed in this document is mainly applicable to the Manufacturing, Assembly and Use processes of the UVA Multi-Tool Kit; and to the environment where these activities will be carried out, although this document also contains important information that was used in the design process, such as criteria and reference parameters to achieve a highly safe final product.

3. OBJECTIVES OF RISK ANALYSIS AND ASSESSMENT

a. General Objective

Provide the methodology to identify health and safety risks for the worker and environmental aspects, analyze them, weigh them, and establish the corresponding control measures.

Identify the risks in the design, manufacturing, assembly and use processes of the UVA Multi-Tool Kit, in order to establish:

- feedback to fine-tune design criteria,
- risk analysis and assessment procedures, and
- hazard control measures

b. Specific Objectives

- Analyze, from a conceptual point of view, the components of the Multi-Tool KIT UVA to know its main features and functions.

- Evaluate, based on the available documentation, the Multi-Tool Kit depending on each of the activities carried out in the manufacturing, assembly and use processes.

- Determine control measures that prevent or mitigate work accidents with the UVA Multi-Tool Kit to ensure the creation of a highly functional and safe device, since the Design phase.

4. DEFINITIONS:

INCIDENT: an unplanned, undesired event that adversely affects completion of a task.

ACCIDENT: an unwanted, unforeseen event that interrupts or interferes with the normal development of an activity and causes one or more of the following consequences: personal injury, material damage, and/or economic losses.

RISK ANALYSIS: Involves a systematic workplace examination to identify hazards, assess the severity and likelihood of injuries, and implement control measures to reduce risks.

RISK: Is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard.

RISK FACTOR: A condition, behavior or other factor that increases risk

HAZARD: Is any source of potential damage, harm or adverse health effects on something or someone

SEVERITY: the most likely consequence of a particular hazard ocurrence

LIKELIHOOD: A weighted factor based on a subjective analysis of the probability that a given threat is capable of exploiting a given vulnerability

RISK ASSESSMENT: Process of assessing the risk arising from a hazard taking into account the adequacy of existing controls and deciding whether the risk is acceptable or not.

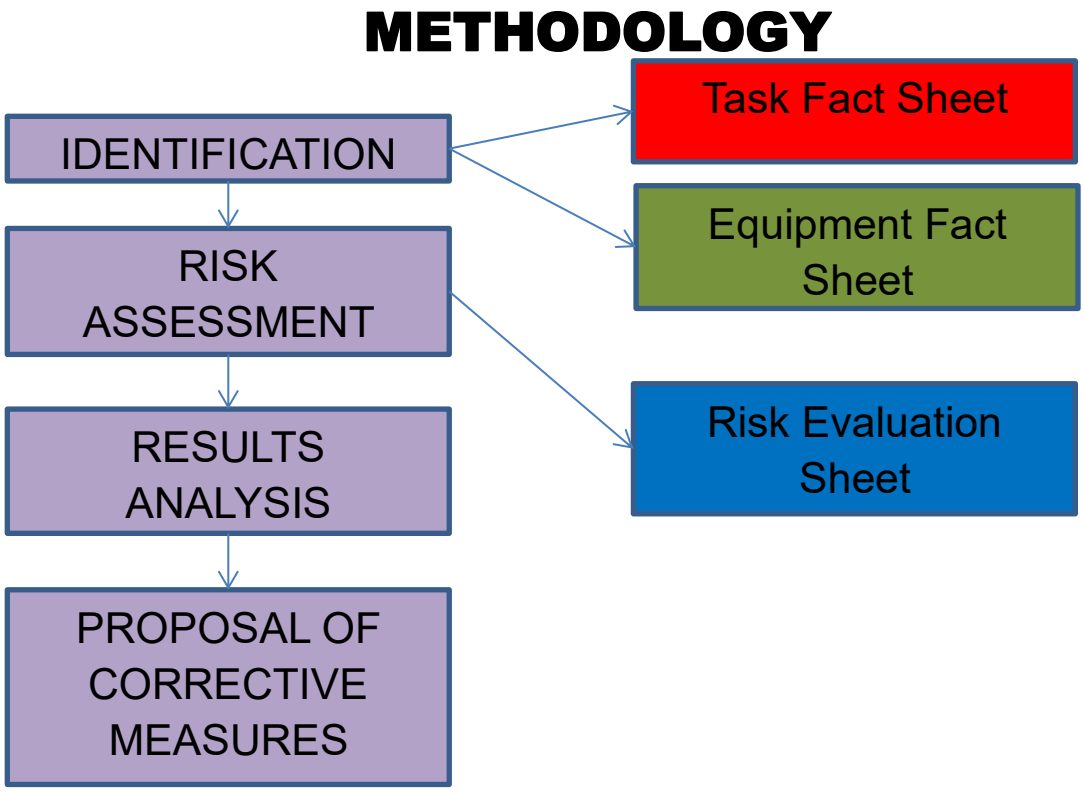
SENSITIZING AGENT: Drugs or products that produce adverse effects or enhance photo sensibilization in the individual.

SENSITIZING EFFECT: Photosensitizing reactions caused by a sensitizing agent.

PERSONAL PROTECTION EQUIPMENT: Where the nature of the risk factor is such that it can be removed or controlled at its source of origin, or in the media that propagates it. The required personal protective equipment must be provided to workers according to the type and magnitude of those factors and according to the current standard.

5. METHODOLOGY

In accordance with the objectives set, the Risk Identification and Assessment Methodology used was as follows:



5.a.- RISK ANALYSIS AND ASSESSMENT PROCEDURE

The following activities were performed to identify and review information about the risks likely to occur in the workplace:

- A documentary research about the technology used and the equipment necessary to carry out this project, as well as the revision of international safety regulations to determine the risks that could occur from the development activities of the Multi-Tool Kit UVA and its causes.

- Grouping similar risk factors and identifying trends in reported damages, diseases and hazards.
- Determination of the severity and probability of incidents that could result of each identified hazard and the use of this information to prioritize corrective actions.

5.b.- CRITERIA OF RISK ANALYSIS AND EVALUATION

To ensure the proper functioning of the UVA Multi-Tool Kit, Risk Analysis was taken into account from 2 perspectives. From the point of view of the processes, and from the point of view of the components. The processes of this project are as mentioned below:

- Design
- Manufacturing and Assembly
- Use

In this order, good results were achieved to establish criteria from the Design, that lead to the elimination or mitigation of possible risks to the end user of the Multi-Tool UVA Kit.

On the other hand, the Multi-Tool Kit UVA consists mainly of 2 elements that have been analyzed and evaluated in terms of risk - individually and together. We are referring to:

- The Battery Pack
- The UVA Flashlight

In the Analysis and Risk Assessment of the Design process, the recommendations and suggestions of international bodies were reviewed, as well as the best practices in security to eliminate or mitigate risks or hazards in the final product.

In the Manufacturing, Assembly and Use phases are risk analysis tables based on the sub-processes or activities that correspond to each process. Shown here are the hazards of the operators who manufacture and assemble and/or end users of the tool, the possible damages that might be caused, and the recommendations that must be taken into account to mitigate or eliminate incidents or accidents to persons or property.

PRELIMINARY RISK LIST

For each activity, **routine or non-routine**, health hazards, safety hazards, environmental aspects, and their respective impact on the work plan are identified.

In identifying hazards, the analysis of the following should be considered:

- ☞ Fall from the same/different level
- ☞ Contact with hot objects
- ☞ Contact with fire
- ☞ Contact with electricity
- ☞ Contact with sharp objects
- ☞ Projection of Fragments or Particles
- ☞ Contact with chemicals
- ☞ Hit with or by object or tool
- ☞ Hit against objects or equipment
- ☞ Clash against moving elements
- ☞ Collision against fixed objects or structures
- ☞ Entrapment by moving object
- ☞ Entrapment between moving or fixed objects and movement
- ☞ Glare
- ☞ Eye strain
- ☞ Physical Fatigue
- ☞ Dust exposure
- ☞ Exposure to gases and/or fumes
- ☞ Exposure to dews and/or mists
- ☞ Exposure to metal fumes
- ☞ Exposure to ultraviolet radiation
- ☞ Exposure to cold or heat
- ☞ Noise exposure
- ☞ Exposure to vibrations
- ☞ Exposure to abnormal pressures
- ☞ Over-stress by manual material handling
- ☞ Sudden motion overstraining
- ☞ Fire
- ☞ Explosion
- ☞ Run over
- ☞ Food poisoning
- ☞ Spills
- ☞ Emissions

RISK MEASUREMENT OR ASSESSMENT

The risk, once identified, is quantified in terms of Likelyhood and Severity, using two matrices:

1) Occurrence Probability Matrix (Table No.1)

2) Risk Severity Matrix (Table No.2)

Tabla No.1. - LIKELIHOOD

CATEGORY	Value	Description
Very Likely	5	Risk whose probability of occurrence tends to 100%
Likely	4	Risk whose probability is estimated to be between 75% to 95%
Possible	3	Risk whose probability is estimated to be between 51% to 74%
Unlikely	2	Risk whose probability is estimated to be between 26% to 50%
Highly Unlikely	1	Risk whose probability is estimated to be between 1% to 25%

Tabla No.2. - SEVERITY

Category	Value	Security	Environment
Fatality	5	Threat to Life; Total and/or Permanent Disability	Extreme, extensive, and irreversible damage
Major	4	Partial Disability. Serious Injury	Severe, extensive, and reversible damage in the long run
Moderate	3	Damage or Disease. Serious Injury	Serious, reversible damage for the duration of the process.
Minor	2	Medical Treatment or First Aid. Superficial Injury	Reversible damage in a short period of time
Insignificant	1	Not noticeable/No Impact	Very minimal damage

Calculation of Criticism or Risk Priority Number (RPN)

The Risk Criticality is a parameter that defines the importance of a hazard and allows its classification in a hierarchical form to focus control efforts. Risk Criticality **(RPN)** is a value that is calculated based firstly on the allocation of numeric values to set a measurement parameter of the variables: **Probability** (in table No. 1) and **Severity** (in table No. 2), and then perform a calculation using the following formula:

RPN = P x S

Being:

P - **Probability** (numeric value assigned in table No. 1)

S - **Severity (**numeric value assigned in table No. 2)

RPN - **Criticality or Risk Priority Number**

RPN		SEVERITY				
		1	2	3	4	5
LIKELIHOOD	1	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	20
	5	5	10	15	20	25

FATALITY	**STOP**
MAJOR	**URGENT ACTION**
MODERATE	**ACTION**
MINOR	**MONITOR**
INSIGNIFICANT	**NO ACTION**

VALUATION

Risk	RPN	Action Required
Trivial	1-3	No specific action is required.

Tolerable	4-6	Preventive action does not need to be improved, however the most cost-effective or upgradeable solutions that do not place a significant economic burden should be considered. Periodic checks are required to ensure that the efficiency of control measures is maintained.
Moderate	7-10	Efforts must be made to reduce risk, determining accurate investments. Measures to minimise risk should be implemented over a given period. When moderate risk is associated with extremely harmful consequences, further action will be needed to establish the likelihood of damage more accurately as a basis for determining the need for improvement of control measures.
Important	11-15	Work should not be started until the risk has been minimized. Resources considered to control risk may be required. When the risk corresponds to work being performed, the problem should be fixed at a time less than moderate risks.
Untolerable	16-25	You should not start or continue the work until the risk is minimized. If it is not possible to minimize it, even limited resources, work should be prohibited.

6. RISK IDENTIFICATION, ANALYSIS, EVALUATION and CONTROL

PROCESS: Manufacturing

Hazard Identification: Exposure to Ultraviolet Radiation A, Contact with hot objects,Contact with fire, Contact with electricity, Contact with sharp objects, Contact with chemicals, Beaten with or by object or tool, Hit against objects or equipment, Shock against moving elements, Shock against objects or fixed structures, Trapping by moving object, Exposure to dust, Exposure to gases and/or fumes, Exposure to noise, Exposure to vibrations, Fire.

Process Description:
Arrangement, Preparation and Assembly of each of the electronic elements and Printing of the plastic/mechanical elements that constitute the two main parts of the Multi-Tool UVA Kit, Electronics and Chassis.

Who may be affected by this work:

- Workers/Users/UV Radiation Operators
- Other workers who share the workspace
- Visitors

PROCESS: MANUFACTURING							
Activity	**Materials & Equipments**	**Hazard and/or Risk Factor**	**Risk**	**P**	**S**	**RPN**	**Control Measures**
PCB: Unpacking the components and PCB's	Scissors	Contact with Sharp Objects	Cuts, Punches and Punctures	1	1	1	Tools in good using condition. Protect edges and tips when not in use.
PCB: PCB's Preparation: Cleaning and Placing Soldering Paste	PCB's Isopropyl Alcohol Alcohol Balls Soldering Paste	Exposure to Lead contained in the paste/resin for welding. Exposure to gases and/or fumes of melted metal. Contact with chemicals (alcohol for cleaning PCBs)	Irritation in skin, mucous membranes and/or eyes. Asthma Fire Vomiting, nausea in case of accidental ingestion	1	2	2	Wear gloves, respiratory protection mask, protective googles. Ventilated Area Remove leftover flux from PCB In the event of an accident, move the person to a ventilated area, wash with plenty of water and seek medical assistance if necessary. Use chemical powder to extinguish. No Water Review weld paste data sheet
PCB: Placing the components in PCB's	Electronic Components PCB's Needle-nose pliers	Contact with Sharp Objects	Wounds, Blows and Punctures	1	1	1	Tools in good condition
PCB: Reflow of Printed Circuits Board (PCB's)	Reflow Oven PCB's	Contact with Electricity. Contact with Hot Objects, Exposure to Smoke and Fumes. Trapped Body Parts. Fire	Electric Shock Burns Hits Wounds Asphyxia Fire	1	3	3	Equipment only to be used by suitably instructed persons. Do not leave the machine running unattended. Restricted Access Area. Oven should not be opened until the cooling process has completed. Always use handle to open or close drawer. Do not touch any elements inside machine. Ensure hot extract system is functioning
PCB: Welding PCB's Wiring	Soldering iron Tin Copper Cables	Contact with Electricity. Contact with Hot Objects, Exposure to Smoke and Fumes	Electric Shock, Burns to hand/ fingers/other body parts. Fire. Inhalation of smoke/fumes Solder flux spit to eyes Cuts, nips, and pinches to hands or fingers Falls, Blows	1	2	2	Use tweezers/pliers or a vice to hold work piece where possible. Always assume that the soldering iron is hot and place back in its holder when not being used. Switch the iron off when it is not in use and replace in holder. First aid box available locally for treatment of minor burns. First aiders contact details listed

							Wear protective glasses when soldering. Avoid working close to face
3D Printing: Connecting to PowerSupply	3D printer AC Connection Cable	Contact with Electricity	Electric Shock	1	2	2	The 3D printer is for indoor use only. Do not expose the printer to rain or snow. Always keep the printer in a dry environment at a minimum distance of 30cm from other objects. Always place the printer on a stable place, where it cannot fall or tip over. Never connect the printer to a different power supply. Place the power cord so you cannot stumble on it or step on it, or otherwise expose it to any potential damage. Also, make sure that the power cord is not mechanically or otherwise damaged. If so, stop using the damaged power cord immediately, and replace it. When you disconnect the power cord from the socket, pull the plug rather than the cord to reduce the risk of damage to the plug or to the AC outlet. Do not touch the nozzle or heatbed when the printer is printing or warming up. Note that the temperature of the nozzle is over 210°C(410°F), heatbed can reach over 100°C(212°F). Temperatures above 40°C(104°F) can cause harm to the human body. Do not reach inside theprinter while it is still in operation. An injury may be caused by its moving parts. Prevent children from unsupervised access to the printer even when the printer is not printing. Do not leave the printer unattended while it is still on. Plastic is being melted during printing which produces odors. Set up the printer in a well-ventilated place. Clear signage to indicate risks. Allow 30 minutes after printing to allow the printer to cool before removing 3D print. Avoid making contact with any components of the printing chamber.
3D Printing: Filament Reel Mounting	3D printer Filament Reel	Hit by equipment Entrapment	Hits Wounds	1	1	1	
3D Printing: Start, Process and End of Printing	3D printer	Mobile Item Shock, Contact with Hot Objects, Trapping by Moving Object Dusts, Fumes, Gases and Nanoparticles, Volatile Resins, Polymers	Hits Wounds Inhalation of Smoke, Fumes and Nanoparticles Burn Fire	1	2	2	
3D Printing: Removal of the printed part	3D printer	Contact with Sharp or Sharp and Hot Objects. Hit with or by equipment	Burn Hits Wounds	1	1	1	
3D Printing: Finishing the 3D Prints	3D printer Spatula Knife	Contact with Sharp or Sharp Objects. Hit with or by object or tool	Wounds Hits Burn	1	2	2	

							Any burns should be irrigated immediately with copius amounts of cold running water. Lab Coat, gloves and eye protection should be use when printing also when finishing the 3D prints. Care should be taken when using sharp tools. Sharps should be disposed of in a sharps bin. A first aid box must be available in the area

PROCESS: UVA Multi-Tool Kit Assembly

Identification of Risk Factors: Contact with sharp or sharp objects, hit with or by object or tool, Contact with Chemicals, Fire, Explosion, Overload, Exposure to Non-Ionizing Radiotions UVA.

Process Description: Assemble the UVA Multi-Tool Kit by assembling the previously printed chassis and placing the PCB's, the battery compartment and finally closing the chassis. Perform the Operational Tests.

Who may be affected by this work:

- Workers/Users/UV Radiation Operators
- Other workers who share the workspace
- Visitors

PROCESS: ASSEMBLY							
Activity	**Materials & Equipments**	**Hazard and/or Risk Factor**	**Risk**	**P**	**S**	**RPN**	**Control Measures**
Place the batteries in the Battery Case	Battery Case Lithium Batteries 18650	Contact with sharp or sharp objects Hit with or by object. Contact with Chemicals Technical battery defect Bad storage Mechanical battery damage Overheating Electrical overload during charging and unloading.	Wounds Hits Explosion Fire Burns Chemical Leak Damage to the environment Spontaneous Combustion	1	3	3	Meet Manufacturer's Specifications Avoid short circuits from battery terminals Protect against mechanical damage Do not expose to temperatures below -5°C or above 60°C Correct storage: 2.5m away from combustible materials and in ventilated, cool, and dry places. Immediately remove damaged batteries Dispose only in places intended for this purpose. Use specific chargers for this type of battery

							Allow to cool to room temperature before recharging
Placing PCBs	PCB's Chassis	Contact with sharp or sharp objects Hit with or by object	Wounds Hits	1	1	1	
Printed Chassis Assembly	Chassis	Contact with sharp or sharp objects Hit with or by object.	Wounds Hits	1	1	1	
Place the Battery Case on top of the Chassis	Battery Case Chassis	Contact with sharp or sharp objects Hit with or by object	Wounds Hits	1	1	1	
Performance Test: Placing Resin or Adhesive	Resin or Adhesive	Contact with Chemical Substances, Inhalation of irritating organic fumes	Skin and mucous membrane irritation (ocular and respiratory): Asphyxiation, sore throat, dermatitis, allergy. By accidental ingestion: irritation of the digestive tract, nausea, vomiting. Fire Environmental pollution	1	2	2	Check manufacturer's instructions. Wear protective gloves, protective clothing, eye protection. Dispose of waste according to official legislation Keep the container tightly closed in a cool, ventilated place. Do not store together with flammable or explosive substances Do not consume, food, drink, or smoke during use. Do not perform spark-producing activities, open flame such as matches, lighters when handling the adhesive. Seek medical attention if required Avoiding release to the environment
Performance Test: UVA Radiation Application	Multi-Tool Kit UVA	Exposure to Non-Ionizing Radiation UVA Chassis Damage, Maintenance Activities and/or Inappropriate Use	Eye Conditions: Photokeratitis/Photoconjuntivitis Photochemical Cataract Photochemical Retina Skin Conditions: Erythema Aging Pigmentation Photosensitive Reactions	1 1	4 4	4 4	Report risks and instruct on proper management. Use Personal Protective Equipment Using lenses or facial screen with UVA filters Wear long sleeves during flashlight operation Avoid staff with sensitizing factors, such as systematic and/or topical medications that may produce phototoxicity or photoallergy in interaction with radiation. Decrease surfaces or elements that could generate a reflection of incident radiation.

							Placing barriers, screens or curtains between the issuing source and potentially exposed persons Avoid pregnant and underage women in the workplace. Do not leave the flashlight unsupervised Use only in dry environments Do not touch the light-emitting source when the flashlight is on and/or hot Keep out of reach of children and people without training. Do not look directly at the light source of the flashlight in operation or aim directly at the eyes of people, pets or living organisms. Controlling exposure time Signal

PROCESS: Using and Managing the UVA Multi-Tool Kit

Identification of Risk Factors: Contact with Sharp Objects, Hit with or by Object or Tool, Contact with Electricity Source, Contact with Chemicals: Lithium Battery, Battery Drilling, Fire, Explosion, Overload, Exposure to UVA Radiation

Description of the Work Process: Using personal protective equipment, the flashlight is pointed with the LEDs in the direction of the object to be irradiated, the arm is extended so that the head of the flashlight is 7cm away from the said object. Press the power button to turn the flashlight on and press the same button again when you want to turn off the flashlight. To use it again you must wait for the flashlight to cooldown.

Who may be affected by this work:

- Workers/Users/UV Radiation Operators
- Other workers who share the workspace
- Visitors

PROCESS: MULTI-TOOL KIT UVA USE & HANDLING							
Activity	**Materials & Equipments**	**Hazard and/or Risk Factor**	**Risk**	**P**	**S**	**RPN**	**Control Measures**

Docking the Lantern	Battery Chassis and Leds	Contact with sharp or sharp objects Hit with or by object	Wounds Hits	1	1	1	
Recharge and Place Batteries	Lithium Battery Charger 18650 Battery Case	Contact with Electricity Contact with sharp or sharp objects Hit with or by object. Contact with Chemicals Technical battery defect Bad storage Mechanical battery damage Overheating Electrical overload during charging and unloading.	Electric Shock Burns Chemical Leak Pollution Spontaneous Combustion Fire	1	3	3	Meet Manufacturer's Specifications Place the power cord so you cannot stumble on it or step on it, or otherwise expose it to any potential damage. Also, make sure that the power cord is not mechanically or otherwise damaged. If so, stop using the damaged power cord immediately and replace it. When you disconnect the power cord from the socket, pull the plug rather than the cord to reduce the risk of damage to the plug or to the AC outlet. Avoid short circuits from battery terminals Protect against mechanical damage Do not expose to temperatures below -5°C or above 60°C Correct storage: 2.5m away from combustible materials and in ventilated, cool, and dry places. Immediately remove damaged batteries Dispose only in places intended for this purpose. Use specific chargers for this type of battery Allow to cool to room temperature before recharging
Placing Resin or Adhesive	Resin or Adhesive	Contact with Chemicals, Inhalation of irritating organic fumes	Skin and mucous membrane irritation (ocular and respiratory): Asphyxiation, sore throat, dermatitis, allergy. By accidental ingestion: irritation of the digestive tract, nausea, vomiting. Fire Environmental pollution	1	1	1	Check the Manufacturer's instructions. Wear protective gloves, protective clothing, eye protection. Dispose of waste according to official legislation Keep the container tightly closed in a cool, ventilated place. Do not store together with flammable or explosive substances

							Do not consume food, drink, or smoke during use. Do not perform spark-producing activities, open flame such as matches, lighters when handling the adhesive. Seek medical attention if required Avoid release to the environment. Do not pour resin residue into drain systems. Use absorbent rags to clean up spills
UVA Radiation Application	Multi-Tool Kit UVA	Exposure to UVA Radiation	Eye Conditions: Photokeratitis/Pho-toconjuntivitis Photochemical Cataract Photochemical Retina	1	4	4	Report risks and instruct on proper management. Use Personal Protective Equipment Wearing lenses or facial screen with UVA filters Avoid staff with sensitizing factors, such as systematic and/or topical medications that may produce phototoxicity or photoallergies in interaction with radiation. Decrease surfaces or elements that could generate a reflection of incident radiation. Placing barriers, screens or curtains between the issuing source and potentially exposed persons Avoid pregnant and underage women in the workplace. Keep out of reach of children and people without training. Do not look directly at the light source of the flashlight in operation or aim directly at the eyes of people, pets or living organisms. Controlling exposure time Signal
			Skin Conditions: Erythema Aging Pigmentation Photosensitive Reactions	1	4	4	
UVA Maintenanc e	UVA Isopropyl Alcohol Cotton						Only use isopropyl alcohol for cleaning. Do not use water or rinse UVA

							Remove the batteries before cleaning the UVA

7.- CONCLUSIONS:

Identifying and valuating the risks in each UVA design and manufacturing process made it possible to establish preventive measures necessary to minimize the dangers to workers, the environment, and goods. However, it is concluded that, because of the magnitude of its severity, special attention needs to be paid to UV radiation exposure risk.

After verification tests, the UVA Multi-Tool Kit Irradiance (E) value reached 100mW/cm2, according to the preliminary engineering design.

The safety exposure time of the flashlight - which operates in the range UV-A with a wavelength of 365nm to 370nm - is up to a maximum of 1 an a half hours per day, staying within the safe ranges of use, i.e. it does not pose a risk to the worker as long as it is used safely and reasonably, and it is activated at a distance of 7cm from the UV light source to the irradiated object. Nevertheless, in the risk analysis of the UVA Multi-Tool Kit use and management, the appropriate suggestions for control measures were provided.

8.- REFERENCES

- **ICNIRP** (International Comission on Non-Ionizing Radiation Protection)
  www.icnirp.de
- **OSHA** (Occupational Safety and Health Administration)
  www.osha.com
- **ACGIH** (American Conference of Governmental Industrial Hygienists)
  www.acgih.org
- **INSHT** (NationalInstitute of Safety and Hygiene at Work
  www.insht.es
- **CIE** l'Eclairage (Internatonal Lighting Commission))
  www.cie.co.at
- **WHO** (World Health Organization)
  www.who.int
- **NIOSH** (National Institute for Occupational Safety and Health)
  www.cdc.gov/niosh/index.htm

- **ISO** (International Organization for Standardization) www.iso.org
- **IRPA** (International Radiation Protection Association) www.irpa.net
- **IEC** (International Electrotechnical Commission) www.iec.ch