POLITECNICO DI TORINO

Faculty of Engineering

M.Sc. Building Engineering – Green Building

Emergency management and Risk assessment in the Aerospace sector: an operational model for workplace safety

Student: Stefano Castelli

Tutor: Prof. Alberto Lauria

Co-tutor: Prof. Roberto Vancetti

Co-tutor: Prof.ssa Mariapaola Vozzola

Co-tutor: Arch. Cristina Griglione

A.Y. 2024-2025

Alla mia famiglia:

a mia mamma, per esserci sempre stata, con il suo amore incondizionato e i suoi preziosi consigli nei momenti più difficili,
a mio papà, che con il suo sostegno e la sua disponibilità mi è sempre stato vicino,
a mia nonna Pina, sempre pronta a portare gioia e allegria nella mia vita,
a mia nonna Claudia, per avermi sempre ascoltato e per i tuoi buonissimi pranzi,
a mio nonno Bruno, per tutti i tuoi insegnamenti, le storie e i bellissimi venerdì pomeriggio di gioco insieme,
a mio nonno Nicasio, per il tuo supporto e la tua pazienza con me,
ai miei zii Giusy e Tony, per le bellissime serate passate insieme,
alle mie splendide cugine, Giulia e Sofia, le sorelle che non ho mai avuto e a cui voglio più bene che a me stesso.

A voi, senza i quali tutto questo non sarebbe stato lo stesso.

INDEX

Abstract

Safety in the workplace is an indispensable element for the protection of workers' health and for the smooth running of production activities. Effective safety management not only prevents accidents and occupational illnesses, but also ensures operational continuity, protecting both personnel and production facilities. In highly specialised environments such as the aerospace sector, where activities involve processes of high technological and operational complexity, risk assessment and emergency planning assume a particularly crucial role. This thesis aims to outline emergency management procedures starting from the risk assessment carried out, applying the principles of occupational safety to a model aerospace company specialising in the production of nano and microsatellites. The work is divided into four macro-sections: a first part dedicated to the general principles of safety and the definition of the key figures responsible for managing company safety; a second section focusing on the applicable legal and regulatory references; a third part focusing on the analysis of the specific risks of the aerospace sector, distinguished by work environment, equipment and work activities; and finally a concluding section that sets out the emergency procedures designed to mitigate the impacts of critical situations.

The idea of dealing with this particular field of study stems from an internship experience during my second year of my master's degree, in the field of occupational safety, during which I had the opportunity to work alongside the figure of the HSE manager (Health, Safety and Environment Manager) within an aerospace company. This path allowed me to closely observe the issues related to safety management in a production context characterised by high-precision machining, the handling of sensitive materials, the use of hazardous substances and the presence of specific risk environments, thus providing the basis for the development of this thesis. Through the adoption of risk assessment methodologies and a detailed analysis of possible emergencies, the work intends to offer a reference model for companies in the aerospace sector, capable of integrating and updating prevention and response strategies.

A distinctive aspect of this study is the focus on the management of emergencies in particular environments, where the traditional hierarchy of immediate exodus in emergency conditions is modified. In particular, the clean room requires an unconventional approach, given its inherent complexity and the specific activities performed within it. In addition to analysing standard emergency procedures, this thesis explores the operational measures dedicated to such critical environments. The approach adopted aims not only to reduce risks and improve responsiveness in the event of an emergency, but also to promote an integrated and conscious safety culture, in line with best practices and current regulations. The proposed operational model is configured as a tool that can be replicated and adapted to similar contexts, providing concrete support to the design and management of safety in aerospace companies and contributing to the definition of effective and customised emergency procedures.

1. Theoretical basis

1.1. Occupational safety

Safety at work is a pivotal element in the management of production and work activities, playing a crucial role in protecting the health and well-being of workers. It not only contributes to preserving the physical and psychological integrity of people but also has a significant impact on the business continuity of companies and the overall sustainability of economic activities. In an increasingly complex and interconnected world of work, ensuring a safe environment is not only a practical necessity, but also a moral and strategic imperative. Safety at work is therefore an integrated and systematic set of rules, procedures and practices, aimed at preventing accidents, occupational diseases and protecting the integrity of the environment in which production activities take place.

The primary objective of occupational safety is to create an intrinsically safe working environment, where risks are minimised through the adoption of effective preventive and protective measures. Prevention means, in fact, the set of necessary provisions or measures, established considering the specific nature of the work, the experience gained and the techniques available, aimed at avoiding or reducing occupational risks. These measures should not be understood as mere bureaucratic compliance, but rather as an integral part of the organisational culture. Safety at work encompasses all stages of the production process and involves all levels of the organisation, from top management down to the operators in the field. This holistic approach to safety requires constant risk analysis and assessment, considering the specificities of each work activity and the environmental conditions in which it takes place. Risk analysis is the starting point for developing strategies to prevent accidents and reduce exposure to potential hazards. This phase requires special attention to technical and organisational aspects, but also to the training and information of workers, so that they are fully aware of the risks and know how to deal with them.

Another key aspect of occupational safety is legislation, which at national and international level has codified the importance of ensuring safe and healthy working

conditions. Occupational safety regulations impose strict standards and specific obligations on companies, regardless of the sector in which they operate. These standards not only define minimum safety requirements but also promote the adoption of innovative practices and advanced technologies for accident prevention. Protection refers to a set of necessary provisions and measures, also drawn up considering the particular nature of the work, experience and technology, with the aim of minimising the effects associated with accidental events. Occupational safety laws reflect a growing awareness of the importance of protecting not only workers, but also the surrounding environment and company assets. Regulatory compliance is therefore an essential prerequisite for any organisation, but it should not be seen as the end goal. On the contrary, companies should go beyond minimum legal requirements by developing proactive safety policies that promote continuous improvement of working conditions. The promotion of a safety culture is essential to ensure that workplace safety policies and practices are effectively implemented and sustained over time. A strong safety culture is based on the active participation of all members of the organisation, from management to workers. This culture must be rooted in the knowledge that safety is a shared responsibility and that everyone has a role to play in preventing accidents. Continuous training is a key element in this process, as it enables workers to acquire the knowledge and skills needed to deal with risks effectively. In addition, a well-established safety culture helps to improve worker morale and strengthen a sense of belonging to the organisation, creating a more harmonious and productive working environment. Another essential component of workplace safety concerns the management of emergencies, defined as critical situations or unforeseen events involving a possible risk to people and property. Managing emergencies requires specific preparation and the adoption of well-structured emergency plans to respond quickly and effectively to damaging events, minimising the impact on people, facilities and the environment. Investment in occupational safety therefore goes beyond mere regulatory compliance and is closely linked to corporate strategy and long-term objectives. Ensuring safety at work means investing in the future of the organisation, reducing the costs associated with occupational accidents and illnesses and improving productivity through a

safer and more motivating working environment. Furthermore, an effective safety system can have a positive impact on a company's reputation, strengthening the trust of customers, business partners and the community at large. The promotion of a safety culture that integrates prevention, protection and emergency management is therefore key to building a future in which safety at work and environmental protection are key elements for the sustainable growth of organisations and society. Finally, it is important to emphasise that occupational safety is not a static objective, but a dynamic process that requires constant commitment and a continuous review of the practices and policies adopted. In a rapidly evolving world of technological, economic and social change, organisations must be prepared to adapt and continuously improve their safety measures. Only in this way will it be possible to ensure a safe and sustainable working environment that protects the lives of workers and contributes to the well-being of society.

In the aerospace industry, occupational safety takes on an even more critical and complex dimension due to the highly specialised and high-risk nature of this sector. Operations and activities related to the design, construction and maintenance of spacecraft and aircraft require strict control of risks and safety measures, given the extreme conditions and potential consequences of accidents. Operations in this sector include, for example, the handling of high-tech materials, the use of complex tools and machinery, and high-pressure and high-temperature testing, all of which present significant risks, so every stage of a spacecraft's life cycle, from design to production, testing and maintenance, must be handled with the utmost attention to safety. In aerospace:

- prevention involves the adoption of strict protocols to identify and mitigate the specific risks associated with different phases of work. This may include the implementation of detailed procedures for handling hazardous materials, such as propellants and sensitive electronic components, as well as ongoing staff training to ensure that everyone is up to date on the latest best practices and safety standards. Prevention also requires careful planning and rigorous verification of production processes and testing protocols to avoid errors that could compromise the safety of the entire project;

- protection involves taking measures designed to limit the effects of accidents and unforeseen events while minimising damage to people and property. This includes the design and implementation of advanced safety systems, such as personal protective equipment (PPE) specific to work in high-tech environments, and control and monitoring systems that can detect and respond quickly to any anomaly. Protection procedures must be supported by well-defined contingency plans, including specific emergency scenarios and rapid response measures to deal with critical situations, such as system failures or incidents during testing;
- emergency management is a crucial aspect in the aerospace industry, where emergencies can have serious consequences not only for the safety of workers, but also for the success of missions and the safety of the public. Companies in the industry must develop and regularly test emergency plans that include detailed procedures for dealing with unforeseen events, such as fires, explosions or accidents during launch tests. These plans must include training of personnel and running emergency simulations to ensure that everyone is prepared to handle critical situations promptly and effectively.

However, in a cutting-edge industry such as aerospace, it is important to remember that the integration of advanced technologies provides a great deal of help in managing safety; the use of monitoring and predictive analysis tools can help identify potential risks before they become real problems, enabling timely and targeted interventions, and technologies such as virtual simulation and data analysis can help improve vehicle and system design, reducing the risk of failure and improving overall safety.

1.2. Safety roles

In the context of occupational safety management, particularly when it comes to an emergency situation, it is of paramount importance to understand the professionals who work to ensure that company regulations and practices are applied and maintained. These professionals, who have well-defined roles within the organisation, are responsible for ensuring that all work activities take place in a safe environment, minimising risks and promoting the health of workers. Their

collaboration is crucial in creating and sustaining a working environment that is not only compliant with applicable laws, but also proactive in preventing occupational accidents and illnesses. The main figures in occupational safety are the employer (DdL), Prevention and Protection Service Manager (RSPP), the workers' safety representative (RLS), the Occupational Health Physician, the Emergency Response Officer (RGE), the supervisors, the fire-fighting and evacuation officers, the first aid officers, the reception and communications officer, the maintenance and facilities officers, the night watchman and the workers.

1.2.1. Employer

The Employer is the person primarily responsible for protecting the safety and health of workers and has the legal and moral responsibility for ensuring that the working environment is safe for all employees. In the field of safety at work, he has several powers that enable him to exercise effective control over safety conditions within the company:

1. Governing power: the right of the employer to give direct orders to his subordinates and to demand that these directives be obeyed. Within this power is also included the “power of expenditure”;
2. organisational power: the power that entitles the employer to intervene in his company's production factors (workforce, facilities, markets, products and/or services); this includes the possibility of establishing internal rules and procedures for risk management, the use of work equipment, and access to company premises;
3. power of control: this consists in the possibility for the employer to check, within the limits of the law, that the employee complies with the obligations of diligence and loyalty; it can carry out periodic checks and inspections to ensure that workers follow safety procedures, and that personal protective equipment (PPE) is used correctly;
4. disciplinary power: this consists in the possibility for the employer to define aspects relating to the conduct of its employees and, in the event of violations by the latter of their obligations of loyalty and diligence, to impose on them, in compliance with the procedures provided for by law, sanctions of various kinds,

either by maintaining the employment relationship (through reprimands, fines and suspension from work and pay), or by terminating the relationship (dismissal for justified subjective reason or for just cause).

All the above-mentioned powers may be delegated by the employer to his employees, whose instructions the employees subordinate to them are obliged to obey. There are, however, two obligations of the employer that cannot be delegated, which are:

1. the appointment of the RSPP;
2. the drafting of the risk assesment document (DVR).

Although he/she does not have a direct function in emergencies, the employer is responsible for periodically monitoring, either directly or through appointed personnel, that the facility is in possession of all the tools and procedures useful for containing the effects. At the end of the emergency, he alone may authorise re-entry into the company premises, having consulted the emergency manager, the fire-fighting officers and the workers' representatives. As far as emergency procedures are concerned, he approves the document and requests any changes or additions to it from the HSE. He entrusts those responsible with the adoption of the planned measures. The employer does not reside directly within the institute and all management and decision-making powers, even during the emergency phases, are delegated to the person in charge, who also plays the role of emergency manager.

1.2.2. Prevention and Protection Service Manager (RSPP)

The Prevention and Protection Service Manager (RSPP) plays a crucial role in companies regarding safety at work. He or she is the figure in charge of coordinating the implementation of risk prevention and protection measures, ensuring that the working environment complies with current regulations and that risks to workers' health and safety are minimised. The RSPP works closely with the employer, managers and workers to identify the hazards present, assess the associated risks and propose effective solutions. In addition, the RSPP is responsible for drawing up the Risk Assessment Document and promoting a safety

culture within the organisation by training and informing staff. This role may be performed by:

- a worker from the company in question, designated by the employer, provided he or she has the appropriate skills, specific training and the necessary certifications to perform these functions (internal RSPP);
- an external professional, working as a consultant or freelancer specialised in occupational safety. This option is often used by companies that do not have adequately trained internal staff or that prefer to rely on an expert with specific experience in the field (external RSPP);
- by the employer himself (provided he has completed the mandatory training courses required by law), if the company in question is a small or medium-sized enterprise, which does not belong to high-risk categories (such as construction, chemical, etc.);

In the field of emergency management, similarly to the employer, the RSPP oversees the activity in the preventive phase, concerning the organisation of the emergency team and the preparation of the procedures to be implemented. He oversees preparing the emergency and evacuation plan and periodically checks its compliance. In the event of an emergency, he may be called upon to support the protection activities by providing any additional indications and, once the emergency is over, he will be consulted by the emergency manager and the employer to verify whether to resume the activity and any evaluations to be made in order to make a decision. The RSPP is trained in accordance with specific standards.

1.2.3. Workers' safety representative (RLS)

The Workers' Safety Representative (RLS) is a key figure in the occupational safety management system, whose main role is to represent workers in matters concerning health and safety at work. The RLS has the task of collaborating with the employer, the person in charge of the Prevention and Protection Service, and other company figures to ensure that working conditions are safe and comply with the regulations in force. Its functions include participating in risk assessment, promoting preventive

measures, and supervising the application of safety provisions. In addition, the RLS has the right to receive appropriate training, access the workplace to verify the application of safety measures, and consult the Risk Assessment Document. This role can be held by any worker within the company, although its election is not a legislative obligation to be fulfilled, so its presence is not one of the mandatory roles provided for by law; however, its presence ensures that workers have an authoritative and informed voice in company decisions that affect their safety, thus contributing to a safer working environment and the promotion of a shared safety culture.

In the management of emergencies, like the employer and the RSPP, the RLS performs his function mainly in the preventive phase, as he is consulted on the organisation of the emergency team and the preparation of the procedures to be implemented. He is responsible for ensuring that the content of the emergency and evacuation plan is appropriate to the working conditions. Once the emergency is over, he will be consulted on the measures taken and to be taken in order to avoid the recurrence of the emergency situation and whether or not to resume the activity and any evaluations to be made in order to decide.

1.2.4. Occupational Health Physician

The Occupational Health Physician is an essential figure in the occupational safety management system, in charge of protecting the health of workers through health surveillance activities. This professional, specialised in occupational medicine, has the task of assessing the suitability of employees for their assigned tasks, identifying any health risks arising from the working environment. The Occupational Health Physician carries out periodic medical examinations, both preventive and specific, to monitor the state of health of workers and detect any work-related pathologies at an early stage. Furthermore, he collaborates with the employer and the Prevention and Protection Service Manager in assessing the risks and defining the preventive and protective measures, also participating in the drafting and updating of the DVR and providing indications on any limitations or adjustments necessary to protect the health of workers.

Following an emergency situation, the Occupational Health Physician is involved in assessing the causes of the accident and investigating its health consequences, helping to review and update emergency procedures and safety protocols to prevent future similar situations. In summary, the Occupational Health Physician is key to ensuring an effective and timely response to emergencies, minimising risks to workers' health and improving the company's preparedness for possible future incidents.

1.2.5. Emergency Response Officer (RGE)

The person in charge of emergency management is the one who decides on the actions necessary to protect the safety and health of workers, giving consent for the evacuation of premises when it is no longer possible to mitigate the emergency. He is in charge of:

- assess the nature, extent and evolution of the event and make commensurate decisions;
- giving orders and coordinating the emergency management personnel (the fire and evacuation officers and first aid officers);
- order the activation of the alarm device;
- order, if necessary, the total or partial evacuation of buildings;
- supervise and monitor the conduct of evacuation operations;
- coordinating emergency response measures;
- coordinating attendance verification operations at the collection point;
- lift the state of alert once the emergency situation has ceased, formally notifying the employer, the RLS and the RSPP;

In preparation for evacuation drills, the RGE must also attend an emergency management refresher course, together with those assigned to specific tasks. Within a company, this role is filled by a worker appointed by the employer by means of an official appointment which, as in the case of fire and first aid officers, cannot be refused except for justified reasons.

1.2.6. Supervisor

The supervisor is a key figure in the management of safety at work, responsible for supervising the implementation of health and safety provisions by workers. He is appointed by the employer and must be a worker in the company who has an in-depth knowledge of the operational context and safety procedures, as he has the task of supervising and checking that work activities are carried out in compliance with safety regulations and procedures. Among his main responsibilities is the obligation to verify the correct use of equipment and personal protective equipment (PPE) by workers, reporting any anomalies or non-compliant behaviour. He must also intervene promptly to correct any risk situations, taking the necessary measures to ensure safety, and inform his hierarchical superiors of any problems or critical issues. In addition to these operational functions, the supervisor contributes to training and informing workers, making them aware of the importance of adopting safe behaviour. For a worker to be able to fulfil this role, in addition to experience in the field, he or she must be adequately trained and attend regular refresher courses so that he or she is always aware of regulations and best practices.

In the event of an emergency, the persons in charge coordinate their workers, informing them of the emergency in progress and the behaviour to be adopted in order to minimise the risks to the workers themselves. The persons in charge assist the workers under their responsibility by coordinating the activities useful for securing their positions and the evacuation procedures. In addition, during evacuation tests, they are asked to coordinate the evacuation methods and to complete a questionnaire on the correct way to carry out the test. In particular, they are asked to carry out, at the assembly point, the roll-call of people and give feedback to the RGE.

1.2.7. Fire-fighting and evacuation officer

The fire and evacuation officer is an essential figure within a company for managing fire-related emergencies and ensuring the safety of workers during critical situations. These workers are responsible for the material management of fire-fighting and evacuation operations and are appointed by the employer by means of an official communication and, except for justified reasons, this appointment cannot

be refused. Whenever possible, they intervene directly on the fire in order to extinguish it or reduce its effects or implement the necessary procedures for extinguishing it and reducing the possibility of its spreading. In the event of evacuation, they supervise the smooth progress of the evacuation, helping any persons in difficulty to reach the safe points; they then go to the assembly points to check the presence of all persons, informing the person in charge of emergency management. The training of the aforementioned workers, according to the regulations of Ministerial Decree 02/09/21, must be related to the type of activity of the company for which they perform this role (Level 1, Level 2, Level 3) by means of a compulsory fire-fighting course.

1.2.8. First-aid officer

The First Aid Officer is a key figure in the management of health emergencies in the workplace, in charge of providing first aid in the event of injury or illness to employees. These officers intervene in the event of a serious accident or exposure to chemical agents to assess the condition of the injured person, implement first aid measures and alert the medical staff. In the event of evacuation of premises, they work alongside the fire-fighting officers to assist people in evacuating, in particular any injured persons or persons with disabilities. These workers have been trained in accordance with the provisions of Article 3 of Ministerial Decree No. 388 of 15 July 2003, which stipulates that the workers in charge of this role must undergo specific training (theoretical and practical) for the implementation of internal first aid measures and the activation of first aid interventions. The duration and contents of these courses vary according to the classification of the company or production unit (Group A, B and C), carried out on the basis of the number of employees, the production sector and risk factors; specifically:

- for Group A companies or production units, the minimum duration of the course is 16 hours;
- for Group B and C companies or production units, the minimum duration of courses is 12 hours;

They also attend a refresher meeting during evacuation drills, focusing on behaviour in the event of an emergency and the procedures to be implemented. As in the case of fire and evacuation officers, their appointment is made by the employer and cannot be refused except for justified reasons.

1.2.9. Worker

The worker has a central role in occupational safety, being not only the recipient of protective measures, but also an active player in maintaining a safe working environment. Every worker is obliged to comply with the safety rules established by the company, correctly using the personal protective equipment (PPE) provided, and following the operating procedures indicated to prevent accidents and injuries. It is essential that the worker participates in safety training and information, becoming aware of the specific risks associated with his or her activity and how to avoid them. Furthermore, the worker is obliged to promptly report to his or her superior any hazardous conditions, equipment malfunctions or situations that may compromise safety.

During an emergency situation, the worker is obliged to immediately report it to those in charge of fire-fighting; if the worker does not remember their names, he/she shall report it to his/her supervisor or, in his/her absence, report the emergency situation, thus making him/herself available to provide the necessary assistance. Workers must assist the people in the facility, in particular customers and outsiders, by showing them the escape routes and checking for the presence of people in the different areas of the facility. Workers have been trained in accordance with the State-Regions Agreement of 21/12/2011, where they have been instructed on the procedures to which they are entitled. In addition, during evacuation tests, they are asked to simulate the identification of an emergency situation and the alerting of the internal fire-fighting team in order to verify their effectiveness and knowledge and to receive any doubts about it.

1.2.10. Other security roles

The following professionals are not necessarily present in all organisations, but when they are part of the corporate structure, they play an active and decisive role

in the management of emergency situations. Their presence and involvement contribute significantly to the creation of a safe working environment, as they bring specialist skills that are essential to ensure a timely and effective response in the event of an accident or unforeseen event.

Reception and communications officer

The receptionist receives any reports of emergency situations and alerts the RGE. After that, he/she refrains from carrying out any other actions, but makes him/herself available to his/her supervisor to take action to signal for help. In the event of being asked to call for help, he/she does so by following the call-out procedure annexed to this document. The aforementioned workers have been trained in accordance with the State-Regions Agreement of 21/12/2011, where the procedures to which they are entitled have been indicated. In addition, during evacuation drills, they attend a refresher meeting focusing on behaviour in the event of an emergency and the procedures to be implemented. In particular, they are asked to simulate a rescue call in order to verify their effectiveness and knowledge and to receive any doubts about it.

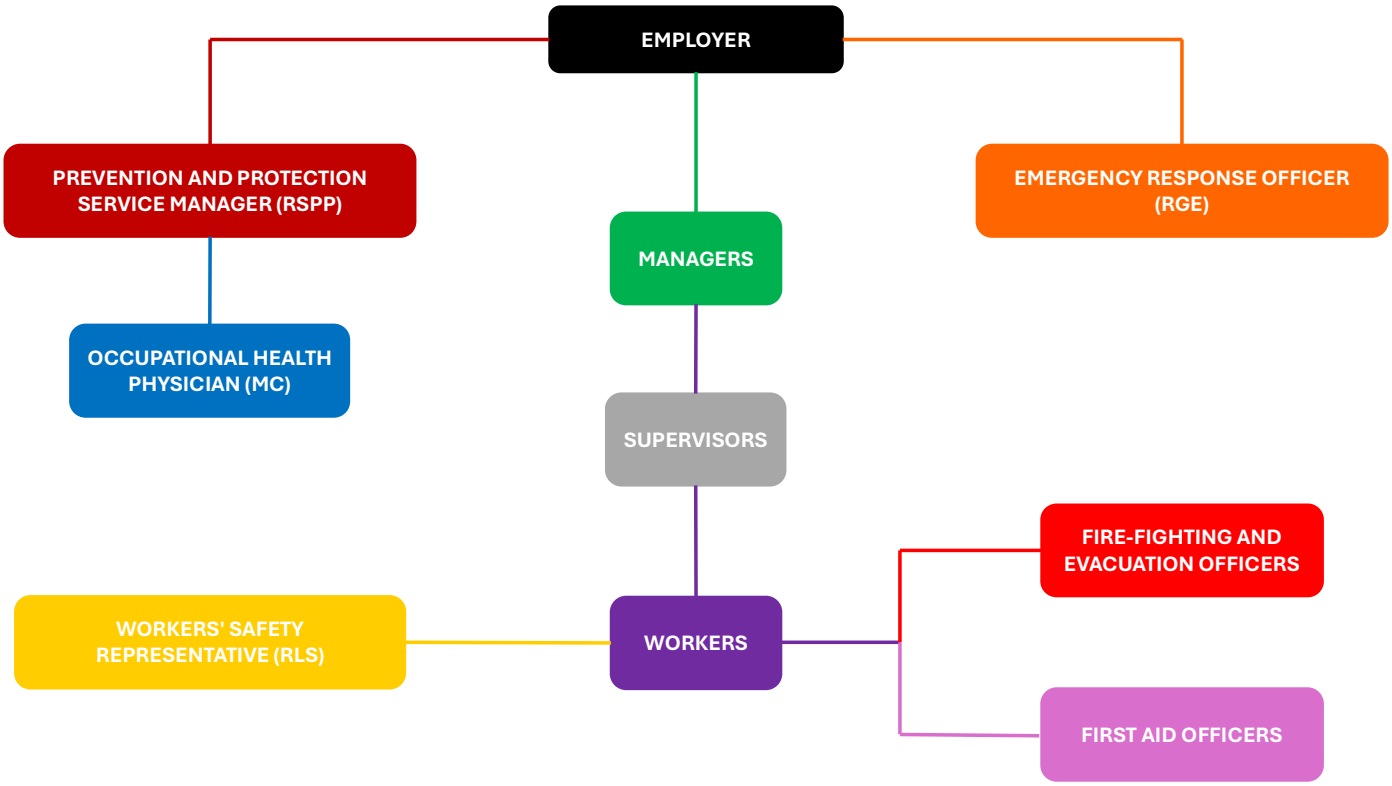
Maintenance and facilities officers

The plant maintenance and management officer is the person in charge of intervening on the plant in the event of an emergency in order to implement a series of actions to mitigate the consequences of the emergency and facilitate rescue operations. In the preventive phase, he assists the RSPP in identifying and defining the emergency procedures to be adopted and the practical methods of execution. In the emergency phase, he may carry out the mitigation procedures directly or be assisted by personnel he deems suitable, providing them with the necessary information and, if appropriate, handing over copies of the procedures to be implemented, and supervising the results. The aforementioned workers have been trained in accordance with the State-Regions Agreement of 21/12/2011, where the procedures to which they are entitled have been indicated to them. In addition, during evacuation drills, they attend a refresher meeting focusing on emergency behaviour and the procedures to be implemented. In particular, they are asked to

simulate the execution of the emergency procedures set out in the following plan, such as the disconnection of utilities, etc.

Night watchman

The night watchman supervises the facility during the night, checking access and any anomalies. The same, in the event of an emergency, can intervene directly on the emergency or report it to the night manned reception for the activation of the necessary procedures. The aforementioned workers have been trained as fire-fighting officers in accordance with the provisions of Ministerial Decree 02/09/21. In addition, during evacuation drills, they attend a refresher meeting focusing on behaviour in the event of an emergency and the procedures to be implemented. In particular, they are asked to simulate an emergency report with the consequent relationship with reception.



security organization chart

1.3. The Risk Assessment Document

The Risk Assessment Document (DVR) defines the organisation put in place by the employer to monitor and ensure the effectiveness and efficiency of measures aimed at preventing risks to workers' health. Its drafting requires a thorough and systematic analysis of all potential hazards that may threaten the physical and psychological safety of employees, identifying specific preventive and corrective measures to minimise the risks present during the performance of work activities. The process of drafting the DVR follows a planned periodic review method and adopts an approach based on continuous improvement, ensuring constant adaptation to changing working conditions.

The main objective of the Risk Assessment Document is to identify and assess the risks associated with work activities and to define the necessary preventive and protective measures. This process goes beyond the mere prevention of accidents and occupational diseases, contributing significantly to the improvement of working conditions and the promotion of workers' health. Risk assessment is an articulated process that goes through several stages, each of which is essential to ensure the effectiveness of the safety measures adopted:

1. identification of the hazards present in the work environment. This step requires a detailed analysis of the workplace (place where a work activity is carried out), the work activity (activity carried out by the worker) and the equipment used. Hazards may arise from various factors, including physical, chemical, biological, ergonomic and psychosocial hazards;
2. preliminary assessment of the risks present in the company with the participation of all company departments concerned and with the consultation of workers or their representatives. The risk is calculated by applying the formula:

   RISK = EXPOSURE X PROBABILITY OF OCCURRENCE X DAMAGE

where:

- damage: negative effect resulting from a given series of events;
- probability of occurrence: an estimate of the frequency with which a given event can be expected to occur in the future;
- exposure: the time for which those performing a specific task perform that specific activity, thus exposing themselves to that risk.

Livello	Descrizione
Low **Green zone R=1-4**	The risk is very low, although not completely eliminated, and it is not expected to worsen in the future to such an extent that its level will increase. No further prevention or protection measures are therefore necessary.
Medium **Yellow zone R=5-9** **or** **R=4 and P=4 or D=4**	The risk is under control but it is legitimate to think that it could increase in the future, leading to even serious risks. It is necessary to identify control measures aimed at maintaining the current state. If possible, it is advisable to identify prevention and protection measures to be taken.
High **Red zone R=10-16**	In this case, it is necessary to take technical measures to reduce the risk to a lower level. Pending the implementation of the aforementioned measures, it is necessary to take buffer measures.

Table 1 - Risk levels

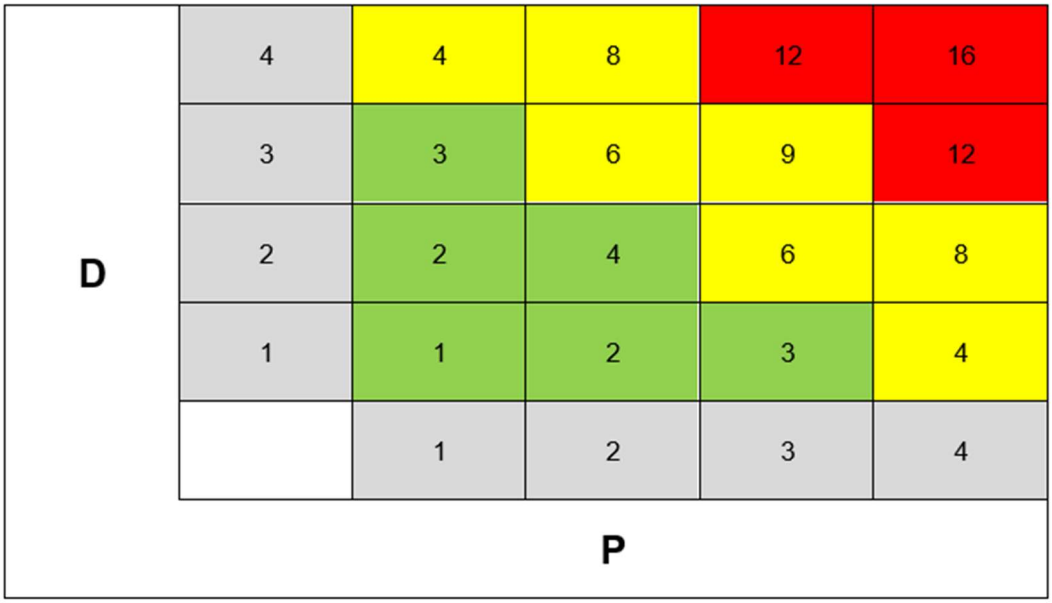


Figure 1 - Risk matrix

3. planning of the measures to be implemented in order to achieve an improvement in the level of security, including the data necessary to identify the resources required to implement the measures, the responsibilities and the timeframes for carrying them out. Actions are identified so that they are appropriate, achievable and congruent with the organisation's commitments;
4. implementation of the planned actions through the commitment of the necessary corporate functions. Commitments are implemented in accordance with a precise order of priorities, with defined times and deadlines and by allocating the necessary economic, technical and organisational resources;
5. monitoring the effectiveness of the actions taken on the safety levels obtained. This monitoring is carried out by the employer periodically, at least once a year, verifying that the interventions have actually been carried out and that they have brought the required results. This verification is recorded on the registration form attached to this document;
6. review of the organisation whereby the employer repeats the risk assessment and restarts the process.

As mentioned above, it is of paramount importance that the DVR is updated periodically whenever the following occur:

- change of employer;
- changes in the organisation of work (new company organisation chart, new locations in which to carry out the activity and in the case of a branch office);
- addition of new equipment;
- significant accidents at work;
- hiring of new staff;
- results of health surveillance showing the need to update the risk assessment.

In order to improve the effectiveness of the Risk Assessment Document (DVR), it is essential to ensure adequate training. Training is an essential tool to make workers aware of the risks present in the work environment and to ensure that prevention measures are correctly applied Workers must be informed about the risks present in their work environment and the prevention measures adopted. Training must be continuous and specific to the needs of each department, so that each sector of the organisation receives instructions adapted to its own operational peculiarities. Furthermore, the active participation of workers in risk assessment can provide valuable information and help to improve the safety measures adopted. Such participation, in fact, fosters the creation of a safety culture within the company, increasing workers' involvement in prevention practices and making them more aware of their role in ensuring a safe working environment.

In the Italian regulatory context, the DVR constitutes a non-delegable obligation for the employer, who is required not only to draw it up, but also to keep it updated according to changes in the company organisation, the introduction of new technologies or any accidents. The periodic review of the DVR, in fact, is a crucial aspect that makes it possible to guarantee the constant adaptation of safety and prevention measures, with a view to continuous improvement. In this sense, the DVR is not a static document, but a dynamic tool that evolves with the evolution of the company and of working conditions.

1.4. The Emergency and Evacuation Plan

The emergency and evacuation plan (PEE) is a strategic document that contains the technical and organisational measures and related behavioural instructions prepared by the organisation to deal with an emergency situation. It outlines the procedures to be followed in the event of unforeseen events, such as fire, earthquake, flooding or other emergencies, and establishes how to evacuate occupants from buildings or areas at risk. For the document to be effective, it must include a risk assessment, the identification of escape routes, the designation of responsible personnel and the establishment of clear communication procedures. In addition, it is essential that the document is periodically updated and tested through practical exercises to ensure that all individuals involved are prepared to deal with emergency situations in a rapid and co-ordinated manner; it must be checked and updated whenever:

- emergency tests carried out have revealed situations that were not adequately managed;
- emergency events occur from which deficiencies in the management of such events have emerged; and
- substantial changes occur to the premises, work processes and company organization;
- reports are made by interested parties such as workers, control bodies, etc.

The drafting of the emergency and evacuation plan is carried out by the employer, assisted by the Prevention and Protection Service Manager (RSPP) and by the emergency workers who, on the basis of the structure, type of activity, work shifts, the possible presence of external persons and the composition of the emergency team, draws up a document that is perfectly suited to the work reality being assessed. Pursuant to Legislative Decree 81/08 (Safety Consolidation Act), the employer is required to:

- organise the necessary relations with the public services responsible for first aid, rescue, fire-fighting and emergency management;
- appoint the workers in charge in advance (the appointment, unless for a justified reason, cannot be refused by the worker);

- inform all workers who may be exposed to serious and immediate danger of the measures prepared and the behaviour to be adopted;
- plans interventions, takes measures and gives instructions so that workers, in the event of serious and immediate danger, can cease their activity and move to safety, leaving the workplace immediately;
- take the necessary measures so that any worker, in the event of serious and immediate danger and in the impossibility of contacting the competent hierarchical superior, can take appropriate measures to avoid the consequences of that danger (taking into account his knowledge and the technical means available).

In accordance with Legislative Decree 81/08, art. 43 and Ministerial Decree 02/09/2021, Annex II, the preparation of the EEP is mandatory for all production activities (factories, offices, plants, public administration, etc.) that are occupied by 10 or more employees, for workplaces open to the public, characterised by the simultaneous presence of more than 50 people, regardless of the number of workers and in all those activities that are subject to 'Fire Prevention', pursuant to Presidential Decree 151/2011 (schools, theatres, healthcare facilities, etc.). According to Article 55, paragraph 5, letter a of the Safety Consolidation Act, failure to draw up this document provides for the employer to be punished with suspension of the work activity (which cannot be reinstated until the EEP is drawn up correctly), a fine ranging from a minimum of 1,200 to a maximum of 5,200 euro or with arrest from two to four months.

The PEE is therefore conceived as an operational tool, an annex to the risk assessment document (DVR), through which the operations to be carried out for the correct management of emergencies are studied and planned in order to allow all the occupants of a building to leave the building in safety. In summary, it must contain:

- characteristics of the premises and escape route;
- fire detection and alarm system;
- number of people present, indicating their location;

- workers exposed to particular risks;
- number of persons in charge of monitoring procedures and assisting in any emergencies;
- level of training and information provided to those in charge;
- specific measures for assisting disabled persons;
- arrangements for requesting the intervention of the fire brigade;
- evacuation plans showing escape routes, safe areas, the location of fire-fighting equipment and means and the assembly point.

2. Standards and regulation

The management of safety in the workplace in Italy is regulated by a complex regulatory system, consisting of laws and decrees that establish obligations for the identification, assessment and mitigation of risks, as well as for the preparation of appropriate emergency measures. The risk assessment document (DVR) represents a fundamental tool for ensuring the safety of workers and the protection of the working environment, as it allows the identification of the specific dangers present in a company and the definition of the most suitable preventive and protective measures. On the basis of the risk analysis carried out in the DVR, it is possible to draw up emergency procedures, including the emergency and evacuation plan (PEE), which defines the actions to be taken to manage critical situations such as fires, spills of hazardous substances or other unforeseen events

The regulatory framework of reference for risk assessment and emergency management is mainly constituted by Legislative Decree 81/2008, which regulates health and safety in the workplace, imposing the obligation on the employer to draw up and periodically update the DVR and to adopt emergency measures appropriate to the company context. The following regulatory references are analysed and utilised within this thesis project:

- D. Lgs. 9 aprile 2008, n. 81;
- D.M. 1, 2, 3 settembre 2021;
- UNI ISO 45001:2018 punto 8.2.

2.1. D. Lgs. 9 aprile 2008, n. 81 - Consolidation Act on Safety in the Workplace

The main regulatory reference on this subject is Legislative Decree 81/2008, which constitutes the legal basis on which the entire system of prevention and protection in the workplace rests. This decree, also known as the 'Consolidation Act on Safety in the Workplace', through specific articles, imposes on the employer the obligation to take all necessary measures to deal with emergency situations, guaranteeing the

safety of workers and minimising the risks associated with unforeseen events such as fires, earthquakes or leaks of hazardous substances.

The decree consists of 306 articles, divided into 13 titles and 51 annexes, and regulates four main interventions:

- general protective measures;
- risk assessment;
- health surveillance;
- safety roles (RSPP and RLS).

The 13 titles of the decree are:

- - Title I - Common Principles;
- - Title II - Workplaces;
- - Title III - Use of work equipment and personal protective equipment;
- - Title IV - Temporary or mobile construction sites;
- - Title V - Occupational health and safety signs;
- - Title VI - Manual handling of loads;
- - Title VII - Display screen equipment;
- - Title VIII - Physical agents;
- - Title IX - Dangerous substances;
- - Title X - Exposure to biological agents;
- - Title XI - Protection from explosive atmospheres;
- - Title XII - Provisions on criminal matters and criminal procedure;
- - Title XIII - Final provisions.

Within the decree, the risk assessment document (DVR) is mainly governed by Article 17, which states that the employer cannot delegate the assessment of all risks present in the company, an obligation that is among his non-derogable responsibilities:

Article 17 - Employer's non-delegable obligations

"Il datore di lavoro ha l'obbligo di:

a) *La valutazione di tutti i rischi con la conseguente elaborazione del documento di cui all'articolo 28."* - The employer is obliged to the assessment of all risks with the consequent drawing up of the document referred to in Article 28.

Article 28 also specifies the criteria that the DVR must meet, defining the risks to be assessed, including those related to emergencies:

Article 28 - Subject of risk assessment

"La valutazione di cui all'articolo 17, comma 1, lettera a), deve riguardare tutti i rischi per la sicurezza e la salute dei lavoratori, ivi compresi quelli riguardanti gruppi di lavoratori esposti a rischi particolari, tra cui quelli derivanti da esposizione ad agenti chimici, fisici e biologici, da stress lavoro-correlato, secondo i contenuti dell'accordo europeo dell'8 ottobre 2004, e quelli riguardanti le lavoratrici in stato di gravidanza." - The assessment referred to in Article 17(1)(a) must cover all risks to the safety and health of workers, including those concerning groups of workers exposed to particular risks, including those arising from exposure to chemical, physical and biological agents, work-related stress, according to the contents of the European Agreement of 8 October 2004, and those concerning pregnant workers.

This risk analysis is fundamental for the subsequent preparation of emergency procedures, which must be based on the specific operating conditions of the company.

The Occupational Safety Consolidation Act also provides the main regulatory basis for the drafting of the Emergency and Evacuation Plan (EEP). In particular, Article 18 establishes the employer's obligation to prepare a detailed plan for emergency management, with the responsibility for taking all necessary measures to protect workers:

Article 18 - Obligations of the employer and manager

"Il datore di lavoro, nell'affidare i compiti ai lavoratori, deve tenere conto delle capacità e delle condizioni degli stessi in rapporto alla loro salute e alla sicurezza. Inoltre, egli deve:

t) *adottare le misure necessarie ai fini della prevenzione incendi e dell'evacuazione dei luoghi di lavoro, nonché per il caso di pericolo grave e immediato, secondo le disposizioni di cui all'articolo 43."* - The employer, when assigning tasks to workers, must take account of their abilities and conditions in relation to their health and safety.

In addition, he must:

(t) take the necessary measures for fire prevention and evacuation of workplaces, as well as for the case of serious and immediate danger, in accordance with the provisions of Article 43

This obligation is further elaborated in Article 43, which requires the employer to organise an emergency management structure appropriate to the company's needs:

Article 43 - General Protection Measures

The employer:

- - organises relations with the public services responsible for first aid, rescue, fire-fighting and emergency management;
- - designates in advance the workers in charge of implementing emergency measures;
- - informs all workers who may be exposed to serious and immediate dangers about the risks and the procedures to be implemented;
- - take the necessary measures so that workers can suspend their activities in the event of serious and immediate danger.

Furthermore, Article 46 of the decree regulates fire prevention, emphasising the importance of planning and taking specific measures:

Article 46 - Fire Prevention

1. *"Ai fini della prevenzione incendi nei luoghi di lavoro il datore di lavoro adotta le necessarie misure organizzative e gestionali secondo le disposizioni di cui al presente decreto e nel rispetto della normativa vigente."* - For the purpose of fire prevention in workplaces, the employer shall take the necessary organisational and management measures in accordance with the provisions of this decree and in compliance with the regulations in force.

This article emphasises the importance of a systematic and organic approach to fire risk management, requiring the adoption of all the necessary preventive measures to avoid its occurrence. It also requires the preparation of well-defined and tested evacuation plans, based on the characteristics of the building and the company's activities.

Emergency plans must provide for:

- - safe and clearly marked escape routes;
- - assembly points outside the building, located at an adequate safe distance;
- - effective alarm systems capable of alerting staff in a timely manner in the event of danger.

Finally, to ensure effective management of emergencies, the employer must ensure the training of designated emergency workers, as required by Article 43. This training must include theoretical lessons, practical simulations and evacuation tests, in order to ensure an immediate and coordinated response to any emergency.

2.2. D.M. 1, 2, 3 settembre 2021 - Coordinated text on fire safety in the workplace

The Ministerial Decree of 10 March 1998 has been the main regulatory reference for fire safety in the workplace for more than twenty years, providing general criteria for the assessment of fire risk and the preparation of the relevant prevention, protection and emergency measures. However, as technologies, prevention

methods and European regulations have evolved, it has become necessary to substantially revise and update these provisions. To this end, in September 2021, three new ministerial decrees were issued that replaced the Ministerial Decree of 10 March 1998 in its entirety, reformulating the regulatory framework of fire safety in the workplace.

The three decrees are:

1. DM 1 September 2021 - 'Control Decree', general criteria for the control and maintenance of installations, equipment and other fire safety systems;
2. DM 2 September 2021 - 'GSA Decree', criteria for the management of workplaces in operation and in emergency and characteristics of the specific fire prevention and protection service
3. DM 3 September 2021 - 'Minicode Decree', general criteria for the design, implementation and operation of fire safety for workplaces.

These three decrees constitute an integrated system to ensure a more effective and up-to-date approach to fire risk prevention and management in the workplace and have a significant impact on the management of safety in the workplace, reinforcing the provisions of the Risk Assessment Document (DVR) and the Emergency and Evacuation Plan (PEE), making them more effective and up-to-date tools for the protection of workers.

2.2.1. DM 1 September 2021 – "Control Decree"

The Ministerial Decree of 1 September 2021, also known as the 'Control Decree', is a key piece in the new regulatory framework on fire safety in the workplace. This decree focuses on the maintenance, control and periodic verification of fire safety devices and systems, with the aim of ensuring that they are always efficient and ready for use in the event of an emergency. One of the main innovations introduced by the decree is the obligation to entrust these operations to qualified maintenance technicians, who must have certified and up-to-date skills. In addition, the decree stipulates the establishment of an inspection register, where all maintenance and

inspection operations carried out must be recorded, thus ensuring traceability and continuous monitoring of the state of fire-fighting systems.

The decree is divided into six articles, each of which regulates specific aspects relating to the maintenance and inspection of fire safety systems in workplaces, and two annexes.

- Article 1 - *Definitions:*
  This article defines the key concepts of maintenance and inspection of fire safety systems. In particular, maintenance concerns the operations necessary to keep systems and equipment efficient, while the qualified maintenance technician is the professional who, according to Annex II, must possess specific technical-professional requirements. Furthermore, the decree introduces the concept of qualification, which formally certifies the possession of the required skills. In order to ensure the functionality of the equipment, periodic inspections are established, i.e. scheduled inspections according to the regulatory or technical provisions of the manufacturers. Finally, the decree also regulates surveillance, which consists of visual checks between periodic inspections to ascertain the accessibility and integrity of the equipment. This activity can be carried out by workers present at the workplace, provided they have received appropriate training.
- Article 2 - *Scope:*
  the Article establishes, in implementation of Article 46 of Legislative Decree 81/2008, the general criteria for the inspection and maintenance of fire safety installations, equipment and systems, thus ensuring their proper functioning and the effectiveness of preventive measures.
- Article 3 - *Checks and maintenance of fire-fighting systems and equipment:*
  states that all fire-fighting equipment (fire extinguishers, detection systems, fire doors, etc.) must undergo periodic checks and maintenance in accordance with the technical standards in force (UNI and European standards).
- Article 4 - *Qualification of maintenance technicians:*
  The article stipulates that maintenance and inspections of fire safety systems must only be carried out by qualified maintenance technicians. Furthermore, it

defines that the qualification of these professionals is regulated in Annex II of the decree, which specifies their requirements. Finally, it clarifies that the qualification obtained is valid throughout the national territory, guaranteeing uniformity in the criteria of competence and qualification.

- Article 5 - *Repeals:*

  This article states that, with the entry into force of the decree, Article 3(1)(e), Article 4 and Annex VI of 10 March 1998 are repealed, thus eliminating the previous provisions and replacing them with the new fire safety regulations.

- Article 6 - *Entry into force:*

  this article establishes the entry into force of the decree and specifies that the provisions relating to the qualification of maintenance technicians, provided for in Article 4, will enter into force on 25 September 2023.

- Annex I:

  Establishes criteria for the maintenance and inspection of fire safety systems and equipment. It defines the technical characteristics of the safety systems, the operating requirements and the methods of intervention to ensure their efficiency. The employer is obliged to prepare an inspection register, in which the periodic inspections and maintenance work on installations, equipment and safety systems must be recorded, following the deadlines established by national and international regulations or user manuals. The register must be constantly updated and available to the control bodies. The parameters for periodic checks and the frequency of interventions are also defined, as well as the conditions that require extraordinary maintenance.

  - Annex II:

  describes the technical-professional requirements necessary for the qualification of maintenance technicians for fire safety systems. This annex specifies the criteria for the training, work experience and certifications that a technician must possess in order to be able to work in a qualified manner in the sector. It emphasises the need for continuous updating of skills to ensure that professionals are always able to carry out maintenance and control work in compliance with current regulations.

From a practical point of view, the Control Decree has a direct impact on company safety management, as it ensures that the necessary tools for fire prevention and response are always operational. This aspect has a strong link with the Emergency and Evacuation Plan (PEE), as the proper maintenance of fire-fighting equipment is an essential element in ensuring the effectiveness of evacuation and emergency management procedures. A functioning detection system, ready-to-use fire extinguishers and efficient extinguishing systems can make the difference between a timely management of the emergency and an escalation of the risk to workers.

2.2.2. DM 2 September 2021 – "GSA Decree"

The Ministerial Decree of 2 September 2021, also known as the GSA (Fire Safety Management) Decree, is structured to provide comprehensive guidance on the management of fire safety in workplaces, with a focus on prevention and protection from fire-related risks. It consists of eight articles and five annexes covering key aspects such as fire risk assessment, design and management of fire protection measures, and training of emergency management personnel.

- Article 1 - *Scope of application:*
  The first article of the decree states that the criteria defined are applicable for the management of fire safety during both the operational and emergency phases, in accordance with the provisions of Article 46 of Legislative Decree 81/2008. The decree applies to all activities that take place in workplaces, as defined by the same Legislative Decree 81/2008. However, for activities at temporary or mobile construction sites and for those regulated by Legislative Decree 105/2015, the provisions of the decree only apply to specific articles, namely Articles 4, 5 and 6, limited to fire safety requirements.
- Article 2 - *Management of fire safety in operation and in emergencies:*
  the article stipulates that the employer must adopt fire safety management measures both in operation and in an emergency, based on the risk factors present in his activity, following the criteria set out in Annexes I and II. Furthermore, the employer is required to prepare an emergency plan in workplaces where at least ten workers are employed, in places open to the public with more than fifty people present or in workplaces included in Annex I of

Presidential Decree 151/2011. The emergency plan must contain the fire safety management measures and the list of workers in charge of implementing these measures, including those for firefighting and emergency management. However, for workplaces that do not fall within these cases, it is not compulsory to draw up an emergency plan, but it is still necessary to adopt organisational measures to be reported in the Risk Assessment Document (DVR) or in a document based on the standardised procedures of Legislative Decree 81/2008.

- Article 3 - Worker information and training

This article states that the employer is responsible for providing workers with adequate information and training on fire risks, following the criteria defined in Annex I. These criteria must be adapted to the specific fire risk factors present in the work activity, thus ensuring targeted preparation in line with the needs of the company context.

- Article 4 - *Designation of fire-fighting officers:*

  This article stipulates that, after the fire risk assessment and based on the fire safety management measures, including the emergency plan, the employer must designate the workers responsible for implementing fire prevention, fire fighting and emergency management measures. These workers, referred to as 'fire-fighters', must be designated according to Article 18(1)(b) of Legislative Decree 81/2008, or the employer himself, in the cases provided for in Article 34 of the same decree. In addition, the designated workers must attend training and refresher courses, as provided for in Article 5 of the decree.

- Article 5 - *Training and refresher courses for fire prevention, firefighting and emergency response officers:*

  the article establishes that, in accordance with Article 37, paragraph 9, of Legislative Decree 81/2008, the employer must ensure the training of fire-fighting officers, following what is indicated in Annex III of the decree. Employees working in the activities described in Annex IV must obtain a certificate of technical suitability, as provided for in Article 3 of Legislative Decree No. 512 of 1 October 1996. If the employer deems it necessary, he may also acquire this certificate through the procedures established by the same decree-law. As regards Ministry of Defence personnel, they can fulfil their

training and technical aptitude obligations through specific training and tests at the institutes of their own administration. In addition, the employees must attend refresher courses every five years, as indicated in Annex III, and these courses may be held by the Fire Brigade or by public or private entities, provided they have qualified teachers. Finally, courses may also be organised directly by the employer or with the help of qualified workers from the company, provided that they meet the requirements set out in Article 6.

- Article 6 - *Requirements for trainers:*
  The Article defines the requirements for teachers of fire-fighting training courses, distinguishing between teachers for the theoretical and practical part. Teachers must have a secondary school diploma and meet specific requirements, such as documented experience or training courses recognised by the National Fire Service. For the practical part, experience or a type C training course is required. Teachers must update every five years and provide documentation proving the requirements, if requested by the supervisory bodies.
- Article 7 - *Transitory and final provisions:*
  this article states that courses already scheduled according to Annex IX of the 10 March 1998 decree are valid if they are carried out within six months of the entry into force of the new decree. Furthermore, the refresher training of fire-fighting officers must take place every five years, and if more than five years have passed, refresher training is mandatory within twelve months. Finally, the decree repeals some articles of the 1998 decree as of its entry into force.
- Article 8 - *Entry into force:*
  the Article establishes the entry into force of the Decree.
- Annex I - *Management of fire safety in operation:*
  stipulates that the employer must provide workers with training on fire risks, prevention measures, escape routes and evacuation procedures, updating it when there are changes in the workplace. In small places, information may be limited to signs. Training must be accessible to all workers and also provided to contractors and maintenance workers. Workers must participate in annual fire drills, which include walking the escape routes and identifying alarms and

equipment. The drills must be documented and repeated if necessary to solve problems that have arisen or following significant changes.

- Annex II - *Fire Safety Management in Emergencies:*
  states that the employer must draw up an emergency plan providing for actions in the event of fire, evacuation procedures, contact with the fire brigade and measures to assist persons with special needs. The plan must be up-to-date and must identify an adequate number of fire-fighting personnel. It must include details such as escape routes, location of persons and safety measures, as well as floor plans. In workplaces with more than one owner, the plans must be coordinated. For activities with fewer than 10 workers and more than 50 persons, simplified measures may be adopted.
- Annex III - *Fire prevention and emergency management training and refresher courses for fire prevention officers*:
  states that workers in charge of fire prevention and emergency management must receive specific training, with refresher courses based on the risk of the activities. The training can also be carried out in FAD mode, using multimedia tools. The courses are divided into three levels: level 3 covers high-risk activities (e.g. nuclear plants, hospitals), level 2 medium-risk activities (e.g. construction sites, plants with flammable substances), and level 1 low-risk activities. Each level has specific contents and duration.
- Annex IV - *Technical suitability of fire-fighting officers:*
  lists the workplaces where workers in charge of fire prevention, firefighting and emergency management measures must obtain a certificate of technical competence. These places include explosive establishments and factories, thermal power stations, nuclear power plants, storage facilities for combustible materials, and commercial activities with large areas. In addition, places such as airports, railway stations, schools, hospitals, hotels with more than 100 beds, tourist facilities with more than 400 people, and underground tunnel construction sites are mentioned. Finally, reference is made to waste storage and treatment facilities.
- Annex V - *Training and refresher courses for fire-fighting course instructors:*

states that the training course for teachers lasts at least 60 hours, divided into 10 modules, with 16 hours of practical part. At the end, there is a final examination to obtain the authorisation to teach the theoretical and practical modules. There are partial licences for the theoretical and practical modules, which can be obtained through type B and C courses and the corresponding final examination. Each module includes learning tests, except the first, introductory one. Attendance is compulsory, and whoever exceeds 10 per cent absences cannot take the exam, with the missing hours being made up. Teachers must update every five years with courses of at least 16 hours, 4 of which practical, which may also include distance learning and innovative methodologies.

The GSA Decree is closely linked to the risk assessment document (DVR) and emergency plan (PEE) for the provisions related to fire risk management and the need to include these risks within company plans. Indeed, fire risk assessment is a crucial aspect of the DVR, since the employer must identify, assess and prevent fire-related risks. Furthermore, the PEE becomes the practical tool for managing fire-related emergencies, establishing operational procedures for evacuation and crisis management. Therefore, the GSA Decree supports and supplements the provisions of the DVR and the PEE, providing a regulatory framework that guarantees fire safety in the workplace.

2.2.3. DM September 3, 2021 - "Minicode Decree"

The Minicode decree defines the general criteria for the design, implementation and operation of fire safety in workplaces, it is structured in five articles and an annex.

- Article 1 - *Subject matter and scope:*
  This article establishes the general criteria for preventing and limiting the consequences of fires, as well as operational fire safety measures applicable to workplaces defined by D.Lgs. 81/2008, excluding temporary or mobile sites.
- Article 2 - *Fire risk assessment:*
  The article provides that the fire risk assessment, integrated in the document provided for by art. 17 of D.Lgs. 81/2008, should follow the criteria indicated in art. 3 and be consistent with the explosion risk assessment, where necessary.

- Article 3 - *Criteria for the design, implementation and operation of fire safety:*
  This article defines the technical rules for the design, implementation and operation of fire safety. For low-risk sites, the criteria are specified in Annex I of the decree; while for other places reference is made to the decree of the Minister of the Interior of 8 August 2015, which can also be adopted for those at low risk.
- Article 4 - *Transitional and final provisions:*
  The article states that for workplaces existing at the time of entry into force, the adaptation to the new provisions shall be carried out in accordance with art. 29 of D.Lgs. 81/2008, and provides for the repeal of the Decree of the Minister of the Interior of 10 March 1998.
- Article 5 - *Entry into force:*
  This article establishes the entry into force of the decree.
- Annex I - *General criteria for the design, implementation and operation of fire safety in workplaces with a low risk of fire:*
  The Annex sets out simplified criteria for fire risk assessment and prevention, protection and management measures in low-risk workplaces. In particular, such places shall be defined on the basis of specific crowding limits, surface area, number of floors and absence of hazardous materials or substances in significant quantities. The terms and symbols of the ministerial decree of 3 August 2015 are used and it is specified that the risk assessment must include the identification of hazards, the description of the environment, the counting of occupants and the analysis of possible consequences, in order to identify mitigation measures. Next, the text sets out the fire strategy, which includes compartmentalization measures to limit the spread of fire and the definition of a safe exodus system, with specific requirements for exit routes, signage and lighting. In addition, criteria are defined for fire control, including installation and positioning of fire extinguishers, and for detection and alarm, with specific functions to be fulfilled. Finally, the document addresses smoke and heat control, fire management to facilitate access of rescue vehicles and safety of technological and service installations, which must be implemented and maintained to ensure emergency management.

The "Minicode" is a fundamental technical and normative reference for fire safety in workplaces. In particular, during the drafting of the Risk Assessment Document (RPR), its indications allow to identify and analyze precisely the fire hazards, providing the technical framework necessary to identify the most appropriate preventive and protective measures. Similarly, the Emergency and Evacuation Plan (PEE) is based on the principles set out in the decree, defining the operational and organizational modalities essential to ensure an effective management of the emergency, from the compartmentalization of rooms to the provision of safe routes for exodus, as well as the installation and maintenance of detection and alarm systems. Consequently, the "Mini Code Decree" creates an effective and coherent synergy between the DVR and the PEE, fully integrating preventive measures with rapid emergency response procedures.

2.3. UNI ISO 45001:2018 – Occupational health and safety management system

UNI ISO 45001:2018 is an international standard that defines the requirements for a health and safety management system (SSL, OH&S in English). It represents a significant step forward compared to the previous BS OHSAS 18001:2007, introducing an integrated and risk-based approach that places emphasis on accident prevention, the active participation of workers and continuous improvement of safety performance.

The objective of the standard is to provide a structured framework that enables organisations to systematically identify hazards, assess the risks associated with their activities and establish appropriate control measures. UNI ISO 45001 is based on the "High Level Structure", a structure common to the main ISO standards (such as ISO 9001 and ISO 14001), which facilitates the integration of the various management systems into a single coordinated model. In this way, organizations can not only optimize their operational performance but also ensure safer and healthier working environments.

There are two crucial aspects to the basic requirements of the standard:

1. risk assessment, which results in a structured document identifying and analysing hazards and risks in the work environment;
2. the preparation of an Emergency and Evacuation Plan (PEE), which establishes operational procedures for dealing with crisis situations, ensuring a coordinated and timely response to protect the health and safety of workers.

In the context of UNI ISO 45001:2018, the risk assessment document is essential to ensure that each hazard is properly identified and that risks are managed through preventive and corrective measures. In particular, the standard addresses this issue in point 6.1 "Actions to address risks and opportunities" (Actions to address risks and opportunities), within subsection 6.6.1, which reads:

6.1.1 General:
"The organization, in its planning process(es), shall determine and assess the risks and opportunities that are relevant to the intended outcomes of the OH&S management system associated with changes in the organization, its processes or the OH&S management system. In the case of planned changes, permanent or temporary, this assessment shall be undertaken before the change is implemented."

This quotation highlights the obligation for the organisation to identify in a clear and documented way all risks and opportunities, thus creating a solid basis on which to develop prevention and control strategies. The risk assessment document therefore not only serves as an operational guide for day-to-day security management but is also a key element in the process of continuous improvement of the SSL management system.

Emergency preparedness and response are equally essential for health and safety protection in the workplace. The UNI ISO 45001:2018 standard addresses this aspect in point 8.2 "Emergency preparedness and response", which establishes:

8.2 Emergency preparedness and response:

"The organization shall establish, implement, and maintain process[es) needed to prepare for and respond to potential emergency situations."

This requirement requires organizations to develop and maintain an Emergency and Evacuation Plan (PEE) that is properly documented and integrated with risk assessment processes. The PEE must clearly define:

- the actions to be taken in case of emergency;
- the roles and responsibilities of personnel (including security officers and evacuation coordinators);
- evacuation routes and collection points;
- how to test the effectiveness of the plan periodically, through exercises and simulations.

The objective is to ensure an immediate and coordinated response that minimises the impact of any accident or critical situation, thus protecting workers' lives and the integrity of the working environment.

The standard also emphasizes the importance of training staff to ensure a timely and effective response in an emergency. Unlike the reactive approach of BS OHSAS 18001, ISO 45001 promotes proactive management, encouraging organizations to constantly review and improve their emergency strategies based on experience and risk analysis.

3. Case study analysis and risk assessment

The case study analysed in this chapter concerns a generic model of company operating in the aerospace sector, located on the outskirts of Turin and specialising in the design and production of micro and nano-satellites intended mainly for Earth observation photogrammetry operations. Thanks to their small size and high technological efficiency, these devices find application in numerous fields, including environmental monitoring, climate change analysis and natural resource management.

One of the company's distinguishing features is the adoption of the so-called 'all-in-house concept', an innovative approach that provides for the in-house management of all the stages necessary to build a satellite, guaranteeing direct control over every step in the production chain. From initial conception and design, through development, assembly and component integration, to validation testing and preparation for launch, every activity is carried out in-house. This model makes it possible to optimise schedules, reduce production costs and improve the quality of the final product, ensuring high operational efficiency and constant monitoring of safety conditions at work.

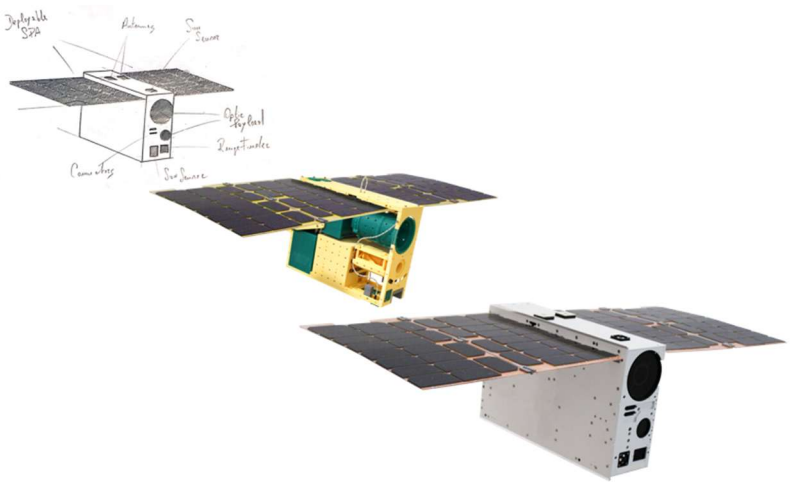


Figure 2 - All-in-house concept representation

Thanks to this production strategy, the company is able to respond quickly to market needs, customising solutions according to customer requirements and ensuring high standards of technology and reliability. However, the concentration of all production activities at a single site also brings with it significant challenges in terms of safety management, making careful risk assessment and implementation of effective emergency procedures essential to prevent accidents and ensure the protection of personnel and infrastructure.

For this reason, the company is divided into a number of highly specialised environments, each with its own characteristics and specific levels of risk, ranging from research and development laboratories to space mission control centres. The production process begins in the research and development laboratories, where engineers, scientists and technicians work on the design and innovation of satellite components, developing new technologies and improving the performance of existing systems. Here, the working environment is characterised by the use of advanced instrumentation, simulation software and experimental activities, which require careful management of IT security and protection of sensitive data, as well as the protection of operators exposed to potential risks related to the use of chemicals or high-precision equipment.

Subsequently, the developed prototypes and components are transferred to test laboratories, where they undergo rigorous testing to ensure their durability, reliability and conformity to aerospace standards. Tests are conducted in these environments, ranging from the analysis of electrical properties of circuits to tests of mechanical resistance, electromagnetic compatibility and response to space conditions.

A crucial stage of production takes place within the clean room, a highly controlled working environment designed to minimise the presence of contaminating particles in the air. Here, components from the laboratories are assembled with the utmost precision to ensure the integrity of the satellite and its operability in space. The clean rooms are divided into different classification levels based on the purity of the air, which is monitored through advanced filtration and pressurisation systems. The need to maintain strict environmental conditions requires operators to wear

special sterile clothing and follow strict access and material handling procedures, reducing the risk of contamination that could compromise the operation of the satellite systems. Once assembled, the complete satellite undergoes extreme environmental tests to simulate launch and operational conditions in space. Among the most critical tests are vibration tests, conducted using special machines known as shakers, which reproduce the mechanical stresses to which the satellite will be subjected during launch of the carrier rocket. In addition, inside the thermo-vacuum chambers, the satellite is exposed to extreme variations in temperature and pressure conditions close to the space vacuum, allowing its strength and functionality to be verified under real operating conditions.

The production cycle is completed with the Mission Control Centre (MCC), a strategic facility within which space systems, including operational satellites and payloads destined for the International Space Station, are managed and monitored. The MCC operators supervise the operation of the satellites, analyse the transmitted data and coordinate any orbital manoeuvres to correct trajectories or modify operational set-ups. Although the working environment is purely technical and characterised by the management of advanced software and computer systems, security also plays a key role here, with particular attention to the protection of critical infrastructures, the management of emergencies linked to technical failures or computer attacks, and the protection of the health of the operators involved in long shifts.

The adoption of the all-in-house concept allows direct control over each production step and greater responsiveness in solving technical problems, but it brings challenges in safety management. The coexistence of environments with different levels of risk requires a structured approach to hazard assessment and specific emergency procedures. It is therefore essential to implement targeted prevention measures, develop detailed emergency plans and ensure ongoing training to minimise risks and ensure a safe and efficient working environment.

3.1. Site Description

The company is spread over two floors, each designed to meet specific operational and administrative needs. The structure guarantees a functional organisation, with optimised spaces for production, research, management and logistical support activities.

Ground floor

The ground floor is organised into five main departments: production, laboratories, plant management technical area, warehouse and canteen; the first floor houses the administrative offices of the business. Each department is designed to efficiently respond to the operational needs of the company, with specially configured rooms and specific equipment to support the activities that take place there.

Below is a description of the various departments that make up the ground floor of the company.

1. Production department: area dedicated to the assembly and management of satellites, equipped with:
    - clean room: a working area (also called 'integration room') used for satellite assembly, designed to meet high standards of cleanliness, with an internal warehouse for rapid access to the necessary materials;
    - control room: an environment dedicated to monitoring and coordinating clean room operations;
    - changing rooms and decontamination units: two changing rooms equipped with decontamination areas to allow dressing and controlled access to the clean room;
    - MV/LV cabin: technical room for the management and distribution of medium and low voltage;
    - technical room: space intended for the maintenance and management of the department's technical installations;
    - prototyping room: area equipped for the development of prototypes;
    - infirmary and waiting room: facility dedicated to first aid, accessible to all personnel.

2. Laboratory department: includes specialised laboratories for the different stages of research and development of satellites and their components:
    - mechanical workshop: space for precision machining of mechanical components;
    - research and development (R&D) laboratory: equipped with a small warehouse for specific materials and a dedicated technical room;
    - electronics laboratory: includes a protected area for testing lithium batteries, ensuring safe and precise conditions;
    - thermal laboratory: a room where the disassembled satellite is analysed and tested in all its components before assembly in a clean room;
    - CED (Data Processing Centre) room: server room for the management and control of company data;
    - technical room: supports the operational infrastructure of the laboratories.

3. Facility management department: intended for business management activities, it includes:
    - individual offices: five individual offices designed for managerial activities;
    - open space office: shared area for collaborative and dynamic activities;
    - meeting room: space equipped for meetings and presentations;
    - relaxation room: an area dedicated to the comfort and well-being of employees;
    - office archive: organised storage for company documents;
    - printer room: support point for printing and copying activities.

4. Canteen department: equipped with:
    - kitchen: equipped for preparing meals for staff;
    - dining room: a welcoming and functional area for the consumption of meals.
5. Warehouse department: structured department for logistics management, consisting of:

- goods unloading area: for receiving and initial storage of supplies;
- goods loading area: for the dispatch and distribution of products;
- goods acceptance area: space dedicated to the control and registration of incoming supplies;
- office: administrative support for logistics operations;
- relaxation room: comfort area for warehouse personnel;
- technical room: dedicated to the management of logistics facilities.

The ground floor also includes toilets, a master control centre for central management of the control systems and the UPS room.

First floor

The first floor of the building is entirely dedicated to administrative and strategic activities. This level is divided into four main wings, each designed to accommodate specific operational functions and ensure seamless integration between departments.

Below is a description of the various departments that make up the first floor of the company.

- Management Wing: housing the management, legal and human resources departments, with space for strategic meetings and a company archive.
- Technical Wing: dedicated to research and development, with offices for mechanics, electronics and design, each with an adjoining meeting room.
- Flight Operations Wing: includes the Mission Control Centre (MCC) and the flight operations coordination office, with a meeting room for operational briefings.
- Meeting Wing: equipped spaces for meetings, presentations and workshops, promoting sharing and planning.

External structures

Outside the building there is a room dedicated to housing the generator sets, devices that guarantee operational continuity in the event of emergencies.

3.2. Jobs description

The jobs performed by the company's personnel are described below, highlighting the distinctive skills of each role. Work is organised in three shifts to ensure operational continuity. The morning shift runs from 6 a.m. to 2 p.m., the afternoon shift from 2 p.m. to 10 p.m. and the night shift from 10 p.m. to 6 a.m.

The following table shows the list of jobs within the company and the job code associated with them.

Job	Job Code
Clean Room Operators	01
General technicians	02
Research and Development Technicians	03
Facility technicians	04
Mechanical operators	05
Electronic technicians	06
Mechanical technicians	07
Small maintenance workers	08
Warehouse/logistics workers	09
Administrative clerks	10
Kitchen workers	11
Delivery and transfer clerk	12

Table 2 - Job list and codes

3.2.1. Clean Room Operators

Clean Room operators work in controlled environments to ensure product purity and precision in satellite assembly processes. They use highly specialised machinery and equipment, both manual and automated, to handle operations requiring the utmost care in handling delicate or contamination-sensitive materials. To ensure cleanliness standards, they wear specific sterile clothing (gowns, gloves, masks) and constantly sanitise equipment and work surfaces. Throughout the assembly process, functional tests are carried out with machines such as shakers and T-VACs, which simulate open space conditions to verify the satellite's responses. Activities also include manual handling of loads in compliance with safety regulations, with the support of lifting equipment such as hydraulic goats, overhead cranes and satellite manipulators. The assembly process is accompanied by dimensional tests and inspections, both bench and instrumental, using CMMs in the metrology room. Some operations may take place in external facilities, again in the context of product assembly, integration and testing. For operational needs, operators may be involved in missions or transfers, both nationally and internationally, and in extraordinary activities, including night shifts.

3.2.2. General technicians

Highly specialised technicians who are mainly involved in programming, using personal computers and peripherals connected within the offices. Thanks to their expertise, they have access to the plant's laboratories to supervise and support technical activities. They are involved in activities of an intellectual nature at customers, suppliers or companies both nationally and internationally, and due to operational needs, these figures may be involved in 'Missions' having to adjust their normal work shifts to different time slots, even at night.

3.2.3. Research and Development Technicians

Research and development (R&D) engineers are highly qualified professionals working in company departments dedicated to innovation, the improvement of existing products and services and the development of new technologies. They carry out feasibility studies for missions and services in line with the company's core

business and prototyping activities for enabling technologies, such as software, hardware and satellite subsystems (on-board computers, PCDUs, battery packs, radio antennas, general structure and control and attitude systems). These activities mainly take place in dedicated laboratories, which are accessible with prior authorisation, including the integration chamber. Here, technicians work with video terminals, electronic instrumentation, fume hoods, blowing processes, electrolytic welding and power tools. They may also handle chemicals and perform specific tests. In some cases, it is necessary to involve external workers specialised in testing the response of products to ionic or radioactive exposure.

3.2.4. Facility technicians

The facility technician carries out and supervises technical activities within the facility, also dealing with management and coordination with third-party companies, including budget management. He may carry out surveys, inspections and verifications at customer sites. His work is carried out both in the office, using video terminals and manual or electrical equipment, and at the customer's premises, where, using specific tools, he performs management, verification and control activities.

3.2.5. Mechanical operators

The person in this position is responsible for milling, machine tooling and the management of NC tools and programs on the machine, as well as the control of machining operations, including turning operations on CNC or manual machines. Tasks include the handling of raw material and workpieces by means of dedicated plastic boxes, transpallets and manual lifting systems (goats). Machining operations on conventional machines and the use of electrical equipment such as radial drills, power tools, grinders and sawing/grinding machines may be required, as well as limited bench fixing and deburring operations. During work activities, access to elevated points using fixed or portable ladders is possible, as well as occasional contact with chemicals such as oils, greases and emulsion liquids.

3.2.6. Electronic technicians

Technicians involved in manual or automated in-line design and assembly of electronic components, with mechanical and electrical prototyping, including testing of general purpose or power electronic systems (e.g. lithium batteries). These activities involve the integration of small cells (8 g each) in a controlled environment. Low-power radiative systems (radio waves for telecommunications and radar) are used. The use of tin soldering on a bench, with activated carbon aspirators, is possible. Soldering is concluded by placing the component in a heating oven to accelerate drying. Operations are carried out with manual or electrical equipment, while handling is limited to loads <15 kg, with the aid of lifting and transport systems.

3.2.7. Mechanical technicians

Their job is to support complex processes of assembly, integration and testing of mechanical, structural and electromechanical components, in close collaboration with engineers and specialised technicians. They deal with the assembly of mechanical and electronic components for pre-flight, flight and prototypes, integrating different parts into a functional system and ensuring that they interact correctly. They also carry out acceptance tests to verify the functioning of the assembled and integrated components. Tasks are performed using personal computers and related peripherals in specially equipped rooms. These tasks also extend to external laboratories and suppliers during the various stages of the process, up to transport and integration at the launch site. The handling of components is done manually for weights of less than 15 kg, or through the use of lifting systems.

3.2.8. Small maintenance workers

The person in this position is responsible for carrying out checks, routine maintenance and cleaning of machinery, structures and facilities. Activities are performed mainly with hand tools such as hammers, screwdrivers and the like, with the occasional use of power tools, usually battery-powered. Access to elevated positions is by means of portable ladders. He may also occasionally handle special

equipment (nitrogen, compressed air, etc.), carrying out checks and monitoring inside technical rooms (not confined spaces). The work of suppliers on site also falls under his supervision. He may be involved in internal handling activities and the use of lifting equipment, such as overhead cranes, forklifts and pallet trucks.

3.2.9. Warehouse/logistics workers

The person in this position is responsible for loading and unloading material from trucks arriving from suppliers or departing to customers. These activities are performed using front-end forklift trucks and electric pallet trucks, ensuring efficient and safe handling of goods. Once the pallets containing incoming products have been unloaded, the quantity and patterns received are carefully checked, comparing them with the delivery note and purchase order. The results of the check are recorded in the company's information system to guarantee the traceability of the materials. Next, the products are labelled with stickers generated by printers connected to personal computers. Once this stage is completed, the material is ready to be transferred to the warehouse worker, who ensures proper storage in the assigned areas. This job involves both clerical activities, related to data management and document verification, and goods handling operations, requiring precision, attention to detail and the ability to use lifting equipment.

3.2.10. Administrative clerks

Administrative clerks play a key role in ensuring the proper functioning of the management, accounting and organisational activities of a company or organisation. Their work is essential for the daily support of operations and the management of documentation and resources.

3.2.11. Kitchen workers

Kitchen workers are professionals who support the staff in various culinary activities and in the management of the work space. They are mainly involved in the preparation of ingredients, which includes cleaning, cutting, peeling and weighing food, contributing to the complete preparation of dishes. Another of their duties is the cleaning of kitchen utensils and equipment, such as crockery, pots and pans, ensuring that each tool is sanitised and properly stored. Kitchen workers are

also responsible for the maintenance of the working environment, taking care of the tidiness and cleanliness of worktops, floors and equipment, to maintain a safe and hygienic environment. They also manage food stocks, checking supplies, assisting in the storage of goods and maintaining order in the pantry. They may also deal with the direct purchase of raw materials from supermarkets or suppliers, using company or personal vehicles. The handling of loads is done manually or with the aid of trolleys, within the limits of the regulations. In the administrative area, kitchen staff support the preparation of the menu, following nutritional or company guidelines, and are responsible for expense reporting and managing the purchase of raw materials and materials needed for the business. Finally, they are responsible for the disposal of waste, correctly managing waste collection and ensuring that the work area remains clean and in compliance with current regulations. Kitchen workers are able to work in teams, paying particular attention to hygiene and food safety.

3.2.12. Delivery and transfer clerk

The person in this position is responsible for the transport and delivery of goods and merchandise using company vehicles, such as vans or cars, on time and in an agreed manner. This role is typical in sectors such as logistics, distribution, retail and delivery of consumer goods. Activities are organised through the use of computer equipment, such as video terminals.

3.3. Risk assessment

Risk assessment is a fundamental activity to ensure the safety and protection of workers within a company operating in the aerospace sector, where complex processes and cutting-edge technologies require a rigorous approach to managing critical issues. The purpose of this section is to illustrate the methodological logic adopted to carry out the risk assessment, highlighting the operational phases that characterise this analytical and preventive process. In the first phase, a detailed description of the company departments is carried out, with particular attention to the specific functions performed and the list of equipment used in each environment.

Each department is analysed individually to identify operational peculiarities and map the tasks performed, in order to identify sources of potential hazards and prepare targeted interventions. This approach makes it possible to segment the production environment into well-defined operational units, facilitating subsequent risk analysis.

Next, the process focuses on filling out the risk assessment sheets, which are divided into three categories: 'work environment', 'equipment' and 'work activities'. Each sheet provides a brief description of the context, identifies the specific risks, outlines the mitigation measures adopted and assesses the residual risk, calculating the risk value in terms of probability of damage, together with the list of personal protective equipment (PPE) required to ensure adequate protection of personnel. Through the integration of these steps, the system allows for the continuous monitoring and updating of safety measures.

This dynamic approach, based on periodic review and benchmarking, makes it possible to optimise preventive strategies and to ensure, on an ongoing basis, the protection of personnel and compliance with current regulations. This method ensures effective risk management.

3.3.1. Production department

The production department is the operational heart of the company, a highly specialized area dedicated to the assembly and handling of satellites. Designed to guarantee efficiency, precision and safety, the department is equipped with technologically advanced environments and spaces optimized to support each stage of the production process.

The central element of the department is the clean room, or 'integration chamber', a contamination-controlled environment that meets strict cleanliness standards, essential for satellite assembly. Inside there is a dedicated warehouse, which ensures quick access to the necessary materials, optimizing working time. Activities are coordinated in the control room, an area reserved for monitoring operations in the clean room, equipped with advanced control instruments to guarantee maximum precision and safety the assembly phases. To access the clean room, personnel must pass through changing rooms with decontamination units, structured to allow a controlled change of clothing and minimize the presence of contaminating particles.

The department's infrastructure is supported by essential technical spaces, including the MV/LV cabin, intended for the management and distribution of medium and low voltage, and a technical room for the maintenance and control of installations. In addition, there is a prototyping area, equipped for the development and testing of new models and components. To complete the department, an infirmary with a waiting room accessible to all personnel guarantees a first aid point to respond promptly to any medical needs.

Description of activity

Plant production technicians are responsible for managing and coordinating all production-related activities, working mainly in the office to monitor and solve technical problems that may arise in the production process. They are also responsible for managing the development and maintenance budgets in the area responsibility, ensuring the proper functioning of the facilities and the optimization of resources.

Within the production department, there are also workers dedicated to the minor maintenance of special equipment in the production areas, with the task of carrying out initial supervision, identifying any faults and interfacing specialized companies for technical interventions.

A crucial role is played by the clean room technicians, who work inside the clean room for the assembly and testing of the satellites. Here, in a contamination-controlled environment, the integration of the components is carried out with the utmost precision, followed by a rigorous testing phase verifying proper functioning before commissioning.

List of jobs performed within the department

The following jobs were identified within the department:

Code	Job description
09	Warehouse/logistics staff
08	Small maintenance workers
01	Clean room operators
02	General technicians

Table 3 - Job list production department

List of equipment used within the department

The equipment used within this department are:

- Electrically powered equipment;
- Manual office equipment;
- Manual operating equipment;
- Equipment fitted with video terminals;
- Motor vehicles;
- Cordless screwdriver;

- Ultrasonic laboratory bath (metal washer);
- Testing/testing bench or desk;
- Robotic arm;
- Laboratory fume hood;
- Soldering iron for tin soldering;
- Hydraulic crane (goat)
- Technological vacuum machine - TVAC;
- Oscilloscope;
- Strapping machine;
- Tin welder;
- Electrodynamic shaker;
- Laser printer;
- Column drill.

3.3.2. Laboratory department

The laboratory department is a highly specialized area dedicated to research, development and testing of satellites and their components. Designed to ensure precision, safety and reliability, the department houses technologically advanced environments, equipped to support each stage of the technology validation process.

The central element of the department is the thermal laboratory, where the satellites are analyzed and tested in every component before assembly in the clean room. Here, extensive checks are carried out to ensure the required quality standards are met. The mechanical laboratory, on the other hand, is dedicated to precision machining on structural components, which are essential for the construction of satellite platforms. To support innovative activities, the research and development (R&D) laboratory has a dedicated warehouse for specific materials and a technical room, optimized for testing new technological solutions.

The electronics laboratory includes a protected area for testing lithium batteries, ensuring strict security and control conditions. Next to this, the CED Data

Processing Centre) room houses a server room for the management and monitoring of business data, ensuring business continuity and protection critical information. To complete the infrastructure, the technical room provides the necessary support for the proper functioning of the laboratory equipment and infrastructure.

Description of the activity carried out

Personnel authorized to access and work in the technical engineering areas and laboratories of an industrial or corporate facility perform highly specialized activities that require advanced technical skills, in-depth knowledge of the systems and equipment present, and strict adherence to safety protocols. These professionals are involved in the research, development, testing and maintenance of components and technologies, making a key contribution to the company's innovation and operational efficiency.

Their activities include managing and calibrating laboratory instrumentation, analyzing experimental data, optimizing processes and implementing advanced engineering solutions. In addition, they collaborate closely with other departments to ensure proper system integration and compliance with quality and regulatory standards.

In some cases, technicians may sporadically access the clean room to perform tests and checks on critical components prior to final assembly. Access to this contamination-controlled environment takes place under strict procedures, which include the use of appropriate protective equipment and a strict decontamination protocol. The activities carried out within the clean room are aimed at ensuring the quality, reliability and conformity of products to aerospace requirements.

List of jobs performed within the department

The following jobs were identified within the department:

Code	Job description
05	Mechanical operators
06	Electronics technicians
07	Mechanical technicians
03	Research and Development (R&D) Technicians
08	Small maintenance workers

Table 4 - Task list laboratory department

List of equipment used within the department

The equipment used within this department are:

- Electrically powered equipment;
- Manual office equipment;
- Manual operating equipment;
- Equipment fitted with video terminals;
- Motor vehicles;
- Cordless screwdriver;
- Ultrasonic laboratory bath (metal washer);
- Testing/testing bench or desk;
- Robotic arm;
- Laboratory fume hood;
- Soldering iron for tin soldering;
- Sealing muffle furnace;
- Hydraulic crane (goat);
- CNC machine;
- Technological vacuum machine - TVAC;
- Oscilloscope;
- Strapping machine;

- Tin welder;
- Electrodynamic shaker;
- LCD 3D printer;
- Laser printer;
- Hand pallet truck;
- Column drill.

3.3.3. Facility management department

The facility management department represents a strategic area dedicated to operational management and coordination of business processes.

The central element of the department is the open plan office, a dynamic environment designed to stimulate collaboration and sharing between teams, facilitating teamwork and interdepartmental communication. To support management activities, there are individual offices, designed to ensure privacy and concentration in strategic planning and management activities.

The department has a meeting room, equipped with advanced technological tools to facilitate meetings, presentations and video conferences, offering an ideal environment for discussion and definition of company strategies. Next to this, the relaxation room represents an area dedicated to the well-being of personnel, a space designed to guarantee moments of regenerative break in a comfortable and welcoming context.

The infrastructure is complemented by essential technical spaces, including the office archive, an organized area for the management and storage of company documentation, and the printer room, designed to support printing and copying activities with modern and efficient equipment.

Description of the activity carried out

Plant engineers are professional figures responsible for managing the company's facilities and infrastructure, working mainly in the office to coordinate and supervise the proper functioning of production plants and facilities. Their role is essential to ensure the efficiency, safety and compliance of company

infrastructures, through monitoring, optimization and maintenance activities. In addition to internal operational management, these professionals can carry out external inspections at other companies or suppliers in order to evaluate technical solutions, supervise interventions or ensure compliance with required quality standards.

Small plant maintenance workers also operate within the department, whose main task is to carry out an initial technical supervision, identify any anomalies and interface with specialized companies for the resolution of faults or complex interventions. In addition, they take care of the general maintenance of the plant, contributing to the correct functioning of the company structures.

List of jobs performed within the department

The following jobs identified within the department:

Code	Job description
08	Small maintenance workers
04	Facility Technicians

Table 5 - Job list technical plant management department

List of equipment used within the department

The equipment used within this department are:

- Electrically powered equipment;
- Manual office equipment;
- Manual operating equipment;
- Equipment fitted with video terminals;
- Motor vehicles;
- Cordless screwdriver;
- Laser printer.

3.3.4. Warehouse department

The warehouse department plays a crucial role in the logistical management of the company, ensuring optimal flow goods and materials within the facility. Designed to meet the needs of efficiency, organization and speed, the department is divided into specific areas, each dedicated to a fundamental phase of the logistics process.

The goods unloading area is the first point of entry for received materials, where unloading, control and sorting operations take place. Subsequently, the goods acceptance centre verifies the conformity of the products with the order specifications, accurately recording the data in the company's management system. This ensures accurate management of incoming supplies. The goods loading area, on the other hand, is dedicated to the preparation and dispatch of products destined for customers, with the aim of ensuring timely distribution in accordance with the company's quality standards.

To support all these operations, the logistics department takes care of the administrative side, managing documentation, monitoring stock and coordinating warehouse activities. For the well-being of the staff, there is a relaxation room, which offers a comfortable space where employees can relax during their breaks. The department is also supported by a technical room, dedicated to the operation and maintenance of logistics equipment.

Description of the activity carried out

In this department, material is loaded and unloaded from trucks, using forklifts and electric pallet trucks. After unloading the pallets containing the products, the quantity and patterns received are checked against delivery note and purchase. The results of the check are recorded in the company system to ensure traceability. Subsequently, the products are labelled with stickers generated by printers connected to personal computers and transferred to the warehouse attendant storage in the assigned areas.

List of jobs performed within the department

The following work tasks were identified within the department:

Code	Job description
08	Small maintenance workers
04	Warehouse/logistics staff

Table 6 - Job list warehouse department

List of equipment used within the department

The equipment used within this department are:

- Electrically powered equipment;
- Manual office equipment;
- Manual operating equipment;
- Equipment fitted with video terminals;
- Cordless screwdriver;
- Electric front forklift truck;
- Crane;
- Hydraulic crane (goat);
- Strapping machine;
- Metal shelving;
- Laser printer;
- Hand pallet truck.

3.3.5. Canteen department

The canteen department plays a key role in ensuring the well-being of staff, an environment dedicated to refreshment during the working day. The central element of the department is the kitchen, a well-equipped environment divided into several operational areas, each dedicated to specific stages of the meal preparation process, guaranteeing the highest quality and safety in food handling.

The raw food preparation area is dedicated to washing, cleaning and processing ingredients. Equipped with sinks, work tables, this area also includes specific equipment for food processing. The cooking area is the beating heart of the kitchen, where the cooking staff prepares dishes with pots, pans and other equipment according to predetermined recipes.

Once cooked, the food is transferred to the serving area, where the dishes are plated or packaged, if destined for transport. Containers, trays and accessories are used to portion and serve meals, ensuring care and presentation of the final product. The washing and sanitizing area is equipped with dishwashers, immersion tanks and specific detergents to clean all the utensils used.

Next to the kitchen is the administration room, designed to encourage relaxation and socialization during the lunch break. Here staff can take their meals in a comfortable environment.

Description of the activity carried out

Kitchen workers are professionals who support staff in culinary activities and workspace management. They are responsible for the preparation ingredients, including cleaning, cutting, peeling and weighing, and the cleaning of kitchen utensils and equipment, ensuring proper hygiene and storage. Responsible for the maintenance of the working environment, they take care of the tidiness and cleanliness of worktops, floors and equipment. They also manage food stocks, checking supplies and maintaining order in the pantry. They are in charge of purchasing raw materials and handling loads. They support menu preparation and expense reporting. They also take care of waste disposal.

List of jobs performed within the department

The following jobs were identified within the department:

Code	Job description
08	Small maintenance workers
04	Kitchen workers

Table 7 - Job list canteen department

List of equipment used within the department

The equipment used within this department are:

- Blast chiller;
- Electric slicer;
- Electrically powered equipment;
- Kitchen hand tools;
- Kitchen counter kettle;
- Freezer;
- Electric oven;
- Fryer;
- Refrigerator;
- Dishwashers;
- Food processor.

3.3.6. Administrative department

The administrative department is located entirely on the first floor of the building, an area dedicated to the company's strategic and management activities. This floor is divided into four main wings, each designed to accommodate specific operational functions, ensuring seamless integration between the various departments and promoting efficiency in the management of company operations.

The management wing, in particular, houses the management, legal and human

resources departments, with optimized spaces for strategic meetings and a well-organized company archive. These rooms are crucial for the administrative management and coordination of internal resources, contributing to the smooth running of the company as a whole. Next to this, technical wing is dedicated to research and development, housing the mechanical, electronics and design offices. Each office is equipped with a meeting room, which allows for collaborative and project-based activities that are fundamental for innovation and company growth. In this way, administrative and technical activities are perfectly integrated, creating a harmonious workflow. The flight operations department, on the other hand, includes the mission control centre (MCC) and the flight operations co-ordination office, a highly specialized environment for monitoring and managing space missions in real time. Complemented by a meeting room for operational briefings, this department represents the operational heart of the company in the context of space missions.

Finally, the meeting wing is intended for meetings, presentations and workshops, with modern and functional spaces that promote the sharing of ideas, planning and organization of corporate events. Here, communication collaboration between the various departments is fostered, supporting the company's strategic planning.

The work areas are designed to optimally support the management, organization and communication activities of the employees. Each room is equipped with the necessary tools to ensure efficient and comfortable working. Each employee has a well-organized desk, equipped with computers, stationery and necessary documents. Spaces are complete with drawer cabinets or lockers to keep work material tidy. The meeting rooms are equipped with large tables, chairs and screens or projectors for presentations, as well as video conferencing devices, creating an ideal environment for meetings and discussions. The reception desk is equipped to welcome visitors, customers or suppliers, and provides access to a telephone and computer for managing communications. Employees also have access to common areas for breaks or informal meetings, including canteen and break area, equipped with tables, chairs, coffee machines and vending machines,

as well as a refrigerator for storing food and drinks. Finally, for external errands, administrative employees can access the premises of customers and suppliers, ensuring direct and timely management of activities in the area.

Description of activity

Administrative employees play a crucial role within the company, performing a wide range of tasks from documentation management to accounting, from customer and supplier relations to human resources management. Their daily work is essential to ensure that the organization functions smoothly and efficiently, maintaining order, coordination and communication between the various company departments. Specifically, administrative employees are responsible for ongoing management and updating of company documentation, drafting reports, meeting minutes and other written communications required by the organization. They manage and update company records, such as lists of suppliers, customers, collaborators and employees, ensuring that all data is correctly filed and easily retrievable. A key area of their work is finance. They are in charge of general accounting, recording and monitoring economic transactions, dealing with the issuing and recording of invoices, payments and collections. They work closely with the accounting department prepare budgets and financial reports, contributing to the preparation of periodic financial statements that reflect the health of the company. In addition, administrative clerks crucial administrative assistance to managers and company departments. They manage meetings, travel, company events, and managers' personal agendas, and handle communications with customers and suppliers, answering enquiries and resolving administrative issues. Another important aspect is human resources management, from personnel selection to the onboarding process (training and orientation). They are also responsible for monitoring staff attendance and managing payroll. In addition to these tasks, the administrative department also takes care of reception activities, receiving visitors, customers and suppliers, and handling deliveries or document pick-ups and errands in the area.

List of jobs performed within the department

The following jobs were identified within the department:

Code	Job description
08	Small maintenance workers
10	Administrative clerks

Table 8 - Job list administrative department

List of equipment used within the department

The equipment used within this department are:

- Electrically powered equipment;
- Manual office equipment;
- Equipment fitted with video terminals;
- Motor vehicles;
- Laser printer.

3.3.7. Evaluation sheets

Work environment: Clean room

The clean room is an environment with a presence of pure air, that is to say very low content of microparticles of dust in suspension. This area is extremely clean and sterile as it is designed to avoid any possible contamination of the products. The equipment used is a vacuum machine, shakers, robotic arm and electrically powered equipment.

In this sheet, the risks related to transit and parking inside the premises are considered.

Risk identification	Measures taken	Residual risk assessment	P	D	R
Crushes: related to falling material from worktop.	The use of large worktops ensures safe storage of the material. The cupboards and shelves were chosen so that they could support the weight of the material to be stored on top.	As regards the fall of material from shelves, this event is to be considered related to incorrect behaviour on the part of workers. In this case, the possibility of serious damage can be excluded.	2	2	4
Electrocution: the presence of electrical system and electrically powered equipment does not exclude the possibility of direct or indirect contact with live parts.	All live parts of the electrical system have been made inaccessible by means of fixed protections (screens, sheaths and ducts). In addition, the conductors are passed inside the floors, walls or false ceilings. A grounding system has been installed in order to prevent the risk of indirect contacts. The presence of a differential switch is a suitable measure to reduce damage related to accidental contact with live parts.	Considering the measures taken, it is possible to exclude the possibility of accidental contact with live parts, unless the protections to the conductors are removed, or in case of tampering with safety systems, including the grounding system and the differential switch. Informing workers of the risks related to the presence of electrical system is considered a useful measure to reduce risk, as well as the preparation of procedures and register of checks to be carried out periodically in order to highlight any anomalies.	1	3	3
Impacts: against furniture and structures inside the work environment**.**	The workstations have been arranged in such a way as to leave sufficient space for safe transit, inside the premises and at the stations themselves.	Accidents of this type can occur in case of inattention by workers when passing inside the premises. Events of this type, hardly can have	2	1	2

		significant consequences such as to determine an absence from work			
Level falls: possible due to accidental contact with material improperly left on the ground.	The arrangement of the stations inside the premises allows safe transit. There are cabinets and shelves inside which to place all the material not in use, thus avoiding having to leave it on the ground where it could be an obstacle.	Risk not excluded in case of non-compliance with company rules regarding the storage of material inside the department. The information of workers about the risks related to the work environment and the company rules in this regard, is considered a measure to increase the sensitivity of workers on the subject. The damages that can be generated are to be considered overall contained	2	2	4
Slipping: possible risk in case of spillage of liquid material on the ground, in particular process liquids.	The floor of the department is made of cement material and with a rough surface to reduce the risk of slipping. The floors of the rooms, where there is a greater risk of spillage of liquids on the ground, are inclined so that the spilled products are conveyed into a channel and removed from the work environment. In case of spills on the ground or leaks of liquids, workers proceed to absorb them using specific material (sepiolite), then remove the material with the use of manual equipment. Inside the department, workers have the obligation to wear safety shoes with rubber sole with non-slip profile.	It cannot be excluded the possibility that events of this type occur. However, the type of flooring present and the adoption of specific personal protective equipment, mean that the possibility of incidental events is to be considered contained. In general, any accidents should not have particularly serious consequences.	2	2	4
Biological risk: the presence of air conditioning system and water system, does not exclude the possibility of exposure of workers to this risk in case of poor maintenance and cleaning of splits and pipes of the system. In particular, the risk of exposure to legionella is reported.	The individual split acclimation systems are periodically checked and/or maintained, as also indicated on the machine, in order to eliminate any accumulation of microorganisms. The water system is monitored through a rigorous control program, as per the appropriate procedure attached to this document, in order to verify the absence of Legionella. A specific procedure has been adopted for the reduction of the risk, with behavioral rules for workers and for the companies of maintenance	The risk is to be considered excluded, unless the necessary maintenance and sanitation operations are not carried out periodically. Even in these cases, periodic checks ensure that any incorrect behavior is identified promptly. From the checks carried out so far, the presence of legionella has not been identified. Please refer to the specific report of biological risk assessment, work procedures and control recording tables	1	2	2

	of the water and heating system. Among the activities adopted, we point out the periodic use of specific chemical products (sodium hypochlorite) for the elimination of any colonies.				
Fire risk: inside the department there are combustible materials. There may also be small quantities of flammable products. The possible sources of ignition are mostly of electrical origin (short circuits, overloads) and due to the presence of surfaces at high temperature.	The electrical system has been built in a workmanlike manner, and is periodically checked. The amount of combustible material present is reduced to a minimum, to meet the needs of production. All the material not in use, is stored inside cabinets. Inside the department, there are means of extinction, in order to allow to intervene promptly in case of emergency.	Although the risk has not been eliminated, measures have been taken to contain the effects of possible fires.	2	3	6
Violence: Violence is defined as any behavior that causes physical, psychological, sexual or economic harm to a person, compromising their safety, health, well-being and dignity. This definition includes acts of coercion or threat, with the aim of intimidating or controlling an individual, creating a dangerous and intimidating work environment.	Training: Training programs to raise awareness among employees and managers. Reporting Procedures: Safe and confidential systems for reporting episodes of violence.	Structural and organizational conditions that do not favor gender equality.	1	2	2
Harassment: Harassment means any unwanted behavior, carried out for reasons of race or ethnic origin, which has the effect of violating the dignity of a person and creating an intimidating, hostile, degrading, humiliating or offensive climate.	Staff training: Extend the risk in regular training programs to raise employee awareness of harassment and discrimination issues. Promote an inclusive and respectful work environment that values diversity and fosters mutual respect among all employees. Design and organize work spaces taking into account the needs of all genders in order to make them accessible and safe. Structural and organizational conditions that do not favor gender equality	Structural and organizational conditions that do not favor gender equality.	1	2	2

Table 9 - Clean room risks list

PPE	
Gloves	Protective gloves against mechanical risks with knurled rubber palm
Protective clothing	Disposable suit
Mask	Protective mask with FFP1 filter or higher
Glasses	Protective polycarbonate glasses with side shields
Headphones	Headphones or earplugs
Mask	Mask with specific filter for aerosols and organic vapors
Gloves	Waterproof vinyl or nitrile gloves
Shoes	Safety shoes with reinforced toe and rubber sole with non-slip profile

Table 10 - Clean room PPE list

Work Environment: Kitchen

The kitchens are located within areas physically separate from the rest of the structure. The premises are also divided according to their destination: ingredient preparation, food cooking, plating, dishwashing. The premises are all tiled on the floor and walls up to a certain height. Inside the premises, the various machines provided have been installed and workbenches arranged.

Risk identification	Measures taken	Residual risk assessment	P	D	R
Level Falls: Possible due to accidental contact with material improperly left on the ground or in case of contact with steps, protrusions on the ground, etc.	Inside the premises, the workstations and furnishings have been arranged mostly on the sides and in the center in order to leave transit lanes that must be kept clear. All unnecessary material is stored inside cabinets. As for personal effects, these are placed inside lockers or in offices. The use of extension cords is prohibited as there are interlocked electrical sockets in such number and position as not to make their use necessary.	Risk cannot be excluded in case of non-compliance with company regulations regarding the storage of material. Informing workers about the risks associated with the work environment and company regulations in this regard is considered a measure to increase workers' awareness of the issue. The damage that can be generated is considered overall limited.	2	2	4
Impacts: Against furniture and structures inside the work environment.	The premises are made in such a way as to allow safe transit. The furnishings are arranged in such a way as to leave sufficient space for transit inside the rooms. Avoid leaving furniture or obstacles in areas with poor visibility, such as behind a door or a corner.	Incidents of this type can occur in case of inattention by workers when passing through the premises. In these cases, it is difficult for significant consequences to occur that could lead to absence from work.	2	1	2
Electrocution: The presence of electrical systems and electrically powered equipment does not exclude the possibility of direct or indirect contact with live parts. Risks related to direct or indirect lightning cannot be excluded either. On the other hand, risks related to overvoltages induced by strong electromagnetic fields are excluded, in addition to the aforementioned lightning.	All live parts of the electrical system have been made inaccessible by means of fixed protections (screens, sheaths, and conduits). Furthermore, the conductors are passed inside the floors, walls, or false ceilings in order to make them unreachable. The electrical sockets have a safety door that prevents contact unless a double tool is used. A grounding system has been installed to prevent the	Considering the measures adopted, the possibility of accidental contact with live parts can be excluded, unless the conductor protections are removed, or in case of tampering with safety systems, including the grounding system and the differential switch. Informing workers of the risks associated with the presence of electrical systems is considered a useful measure to reduce risk, as is	1	3	3

	risk of indirect contact. The presence of a differential switch is a suitable measure to reduce damage related to accidental contact with live parts and allows for the timely identification of any leaks before they can cause damage to workers. The electrical system is made in compliance with technical standards as attested by the declaration of conformity of the system itself, issued by the installing technician, qualified for the specific type of system.	the preparation of procedures and a register of checks to be carried out periodically in order to highlight any anomalies.			
Biological Risk: The presence of a water system does not exclude the possibility of exposure of workers to this risk in case of poor maintenance and cleaning of the pipes of the system. In particular, the risk of exposure to legionella is reported.	The water system is monitored through a strict control program in order to verify the absence of *Legionella*. A specific procedure has been adopted for the reduction of risk, with behavioral rules for workers and for companies maintaining the water and heating system. Among the activities adopted, we note the periodic use of specific chemical products (sodium hypochlorite) for the elimination of any colonies.	The risk is to be considered excluded, unless the necessary maintenance and periodic sanitation interventions are not carried out. Even in these cases, periodic checks ensure that any incorrect behavior is identified promptly.	1	2	2
Microclimate: Since systems for cooking and heating and ovens are used inside the kitchen, in addition to handling hot foods, unfavorable microclimatic conditions cannot be excluded, related to excessive temperatures and humidity.	The food cooking area and the ovens are located under extractor hoods, designed to extract steam and hot air generated during food cooking from the room. The use of hoods during cooking activities allows the extraction of hot air from the room and prevents accumulation in the room. Sufficient openings have been made to determine an adequate air exchange and avoid the accumulation of hot and humid air.	Considering the technical measures adopted, it is believed that the risk, although not eliminated, is not, at the moment, further reducible.	3	2	6
Fire Risk: Inside the kitchen, there are small quantities of combustible materials such as paper, wood, and plastic. Furthermore, the presence of combustible gas used for cooking is noted. Among	All unnecessary material is stored in specific rooms (pantries) in order to reduce the fire load of the premises. Shut-off valves are installed on the gas supply system in order to allow timely shut-off in case of need; gas leak detectors have been	Risk contained thanks to the adoption of suitable prevention and protection measures. However, the risk cannot be excluded and must be constantly monitored in order to maintain the efficiency of the systems and fire management.	2	3	6

the ignition sources, there are heat sources and the presence of electrical systems and equipment.	installed. The electrical system is made in compliance with applicable technical standards, and the use of equipment in good condition reduces the risk of ignition due to faults or overloads. Portable fire extinguishers have been installed near the kitchen to be used in case of fire.				
Crushing: The presence of pots, even large ones, does not exclude this risk in case of accidental falls.	The pots are stored on shelves in non-traffic areas. Operators place the heavier pots on the lower shelves in order to reduce physical effort when handling them or damage resulting from their fall; the shelves have sufficient surface to safely hold the pots. Workers have been instructed not to store pots on work surfaces, unless this is strictly necessary for work activities. Workers accessing the kitchen must wear safety shoes with reinforced toecaps in order to contain the damage that the fall of pots can cause.	The risk cannot be excluded but has been effectively contained by means of the measures adopted. Compliance with the rules regarding the storage of materials and the constant use of PPE allow for the containment of related damage.	2	2	4
Slips: Possible risk in case of spillage of liquid material on the floor. This condition is frequent, in particular, during cleaning operations and inside the dishwashing area.	The floor is made of ceramic material with a non-slip surface to reduce the risk. In order to prevent liquids from stagnating on the floor, it is inclined in such a way as to convey any spills towards a channel with a siphon drain. In case of accidental spills of liquids on the floor, workers absorb them using cloths or push them towards the channel, using a specific manual tool. If the intervention cannot be carried out immediately, the area is marked with a specific sign indicating the presence of a wet floor and the risk of slips; in this case, workers are prohibited from crossing the area until the intervention is completed. Inside the structure, workers are required to wear safety shoes with rubber soles with a non-slip profile.	It cannot be excluded that events of this type may occur, in particular, when cleaning operations are in progress. However, the type of flooring present means that the risk itself is to be considered contained, as is the correct use of signaling systems. In general, any accidents should not have particularly serious consequences.	2	2	4

Violence: Violence is defined as any behavior that causes physical, psychological, sexual, or economic harm to a person, compromising their safety, health, well-being, and dignity. This definition includes acts of coercion or threat, with the aim of intimidating or controlling an individual, creating a dangerous and intimidating work environment.	Training: Training programs to raise awareness among employees and managers. Reporting Procedures: Safe and confidential systems for reporting incidents of violence.	Structural and organizational conditions that do not favor gender equality.	1	3	3
Harassment: Harassment means any unwanted behavior, carried out for reasons of race or ethnic origin, which has the effect of violating the dignity of a person and creating an intimidating, hostile, degrading, humiliating, or offensive climate.	Staff training: Extend the risk in regular training programs to raise employee awareness of harassment and discrimination issues. Promote an inclusive and respectful work environment that values diversity and fosters mutual respect among all employees. Design and organize workspaces taking into account the needs of all genders in order to make them accessible and safe.	Structural and organizational conditions that do not favor gender equality.	1	3	3

Table 11 - Kitchen risks list

PPE	
Shoes	Safety shoes with reinforced toecaps and rubber soles with a non-slip profile
Gloves	Heat-resistant gloves
Gloves	Cut-resistant protective gloves
Gloves	Use appropriate protective gloves during processing

Table 12 - Kitchen PPE list

Work Environment: Research & Development and Prototyping Laboratories

This area is where technicians perform programming, study, and development activities of various kinds. These activities are primarily carried out using personal computers and connected peripherals within rooms used as laboratories for the integration of flight or pre-flight components.

This document considers the risks associated with transit and staying within these premises.

Risk identification	Measures taken	Residual risk assessment	P	D	R
Crushing: Related to falling material from work surfaces.	The adoption of work surfaces with ample space allows for the safe arrangement of materials. Cabinets and shelves have been chosen to withstand the weight of the material to be stored on them.	Regarding the fall of material from shelves, this event is considered related to incorrect behavior by workers. In this case, the possibility of serious damage is excluded.	2	2	4
Electrocution: The presence of electrical systems and electrically powered equipment does not exclude the possibility of direct or indirect contact with live parts.	All live parts of the electrical system have been made inaccessible by means of fixed protections (screens, sheaths, and conduits). Furthermore, conductors are routed inside floors, walls, or false ceilings. A grounding system has been installed to prevent the risk of indirect contact. The presence of a differential switch is a suitable measure to reduce damage related to accidental contact with live parts.	Considering the measures taken, the possibility of accidental contact with live parts can be excluded, unless the conductor protections are removed, or in case of tampering with safety systems, including the grounding system and the differential switch. Informing workers of the risks associated with the presence of electrical systems is considered a useful measure to reduce risk, as is the preparation of procedures and a register of checks to be carried out periodically in order to highlight any anomalies.	1	3	3
Impacts: Against furniture and structures within the work environment.	Workstations have been arranged to leave sufficient space for safe transit within the premises and at the stations themselves.	Incidents of this type can occur in case of inattention by workers when passing through the premises. Events of this type are unlikely to have significant consequences that could lead to absence from work.	2	1	2

Level Falls: Possible due to accidental contact with material improperly left on the ground.	The arrangement of workstations within the premises allows for safe transit. There are cabinets and shelves inside which to store all unused material, thus avoiding having to leave it on the ground where it could cause obstruction.	Risk is not excluded in case of non-compliance with company rules regarding the storage of material within the department. Informing workers about the risks associated with the work environment and company rules in this regard is considered a measure to increase workers' awareness of the issue. The damage that can be generated is considered overall contained.	2	2	4
Slips: Possible risk in case of spillage of liquid material on the ground, in particular process liquids.	The floor of the department is made of cementitious material with a rough surface to reduce the risk of slipping. The floors of the rooms, where there is a greater risk of liquid spillage on the ground, are inclined so that spilled products are conveyed into a channel and removed from the work environment. In case of spills or leaks of liquids, workers absorb them using specific material (sepiolite), then remove the material with the use of manual equipment. Within the department, workers are required to wear safety shoes with rubber soles with a non-slip profile.	It cannot be excluded that events of this type may occur. However, the type of flooring present and the adoption of specific personal protective equipment mean that the possibility of incidents is considered contained. In general, any incidents should not have particularly serious consequences.	2	2	4
Biological Risk: The presence of air conditioning and water systems does not exclude the possibility of workers being exposed to this risk in case of poor maintenance and cleaning of the splits and pipes of the system. In particular, the risk of exposure to Legionella is noted.	The individual split air conditioning systems are periodically checked and/or maintained, as also indicated on the machine, in order to eliminate any accumulation of microorganisms. The water system is monitored through a rigorous control program, as per the appropriate procedure attached to this document, in order to verify the absence of Legionella. A specific procedure has been adopted to reduce the risk, with behavioral rules for workers and for the companies maintaining the water and heating system. Among the activities adopted, the periodic use of specific chemicals	The risk is to be considered excluded, unless the necessary periodic maintenance and sanitization interventions are not carried out. Even in these cases, periodic checks ensure that any incorrect behavior is identified promptly. From the checks carried out so far, the presence of legionella has not been identified. Please refer to the specific biological risk assessment report, the work procedures and the control registration tables.	1	2	2

	(sodium hypochlorite) for the elimination of any colonies is noted.				
Fire Risk: Combustible materials are present inside the department. Small quantities of flammable products may also be present. The possible sources of ignition are mostly of electrical origin (short circuits, overloads) and due to the presence of high-temperature surfaces.	The electrical system has been built in a workmanlike manner and is periodically checked. The quantity of combustible material present is reduced to a minimum to meet production needs. All unused material is stored inside cabinets. Inside the department, there are fire extinguishers in order to allow timely intervention in case of emergency.	Although the risk has not been eliminated, measures have been taken to contain the effects of any fires.	2	3	6
Violence: Violence is defined as any behavior that causes physical, psychological, sexual, or economic harm to a person, compromising their safety, health, well-being, and dignity. This definition includes acts of coercion or threat, with the aim of intimidating or controlling an individual, creating a dangerous and intimidating work environment.	Training: Training programs to raise awareness among employees and managers. Reporting Procedures: Safe and confidential systems for reporting incidents of violence.	Structural and organizational conditions that do not favor gender equality.	1	2	2
Harassment: Harassment is understood as any unwanted behavior, carried out for reasons of race or ethnic origin, which has the effect of violating the dignity of a person and creating an intimidating, hostile, degrading, humiliating, or offensive climate.	Staff training: Extend the risk in regular training programs to sensitize employees on issues of harassment and discrimination. Promote an inclusive and respectful work environment that values diversity and fosters mutual respect among all employees. Structural and organizational conditions that do not favor gender equality.	Design and organize work spaces taking into account the needs of all genders in order to make them accessible and safe.	1	2	2

Table 13 - Research & development and prototyping laboratories risks list

PPE	
Gloves	Protective gloves against mechanical risks with a knurled rubber palm
Shoes	Safety shoes with reinforced toe cap and rubber sole with non-slip profile

Table 14 - Research & development and prototyping laboratories PPE list

Work environment: Electronic Laboratory

Within this area, technicians design and manually and automatically assemble electronic components. The laboratory includes an area for storing and testing the power of lithium cells, as well as integrating battery systems and power distribution and conversion systems.

This sheet considers the risks associated with transit and being present inside the premises.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Crushing: related to falling material from work surfaces.	The use of surfaces that have a wide working area makes it possible to arrange the material safely. Cabinets and shelves have been chosen to withstand the weight of the material to be stored on them.	Regarding the fall of material from shelves, this event is to be considered related to incorrect behavior by workers. In this case, the possibility of serious damage occurring can be excluded.	2	2	4
Electrocution: the presence of electrical systems and electrically powered equipment does not exclude the possibility of direct or indirect contact with live points.	All live points of the electrical system have been made inaccessible by means of fixed protections (screens, sheaths, and conduits). Furthermore, the conductors are passed inside the floors, walls, or false ceilings. A grounding system has been installed to prevent the risk of indirect contact. The presence of a differential switch is a suitable measure to reduce damage related to accidental contact with live points.	Considering the measures adopted, the possibility of accidental contact with live points can be excluded, unless the conductor protections are removed, or in the event of tampering with the safety systems, including the grounding system and the differential switch. Informing workers of the risks associated with the presence of an electrical system is considered a useful measure to reduce risk, as is the preparation of procedures and a register of checks to be carried out periodically in order to highlight any anomalies.	1	3	3
Impacts: against furniture and structures inside the work environment.	Workstations have been arranged to leave sufficient space for safe transit inside the premises and at the stations themselves.	Incidents of this type can occur in the event of inattention by workers when moving inside the premises. Events of this type can hardly have significant consequences such as to determine an absence from work.	2	1	2

Level falls: possible due to accidental contact with material improperly left on the ground.	The layout of the workstations inside the premises allows safe transit. There are cabinets and shelves inside which to place all unused material, thus avoiding having to leave it on the ground where it could cause an obstruction.	Risk cannot be excluded in the event of failure to comply with company regulations regarding the storage of material inside the department. Informing workers about the risks associated with the work environment and company regulations in this regard is considered a measure to increase workers' sensitivity on the subject. The damage that can be generated is to be considered overall limited.	2	2	4
Slipping: possible risk in the event of spillage of liquid material on the ground, in particular process liquids.	The floor of the department is made of cementitious material and with a rough surface to reduce the risk of slipping. The floors of the rooms, where there is a greater risk of spillage of liquids on the ground, are inclined so that the products spilled are conveyed into a channel and removed from the work environment. In the event of spills on the ground or leaks of liquids, workers proceed to absorb them using specific material (sepiolite), then remove the material with the use of manual equipment. Inside the department, workers are required to wear safety shoes with rubber soles with a non-slip profile.	The possibility of events of this type occurring cannot be excluded. However, the type of floor present and the adoption of specific personal protective equipment mean that the possibility of accidental events is to be considered limited. In general, any incidents should not have particularly serious consequences.	2	2	4
Biological risk: the presence of an air conditioning system and water system does not exclude the possibility of workers being exposed to this risk in the event of poor maintenance and cleaning of the splits and pipes of the system. In particular, the risk from exposure to legionella is reported.	The individual split air conditioning systems are periodically checked and/or maintained, as also indicated on the machine, in order to eliminate any accumulation of microorganisms. The water system is monitored through a strict control program, as per the appropriate procedure attached to this document, in order to verify the absence of Legionella. A specific procedure has been adopted for the reduction of risk, with behavioral rules for workers and for companies maintaining the water and heating system. Among the activities adopted,	The risk is to be considered excluded, unless the necessary periodic maintenance and sanitation interventions are not carried out. Even in these cases, periodic checks ensure that any incorrect behavior is identified promptly. From the checks carried out so far, the presence of legionella has not been identified. Please refer to the specific report on the assessment of biological risk, the work procedures and the control registration tables.	1	2	2

	the periodic use of specific chemical products (sodium hypochlorite) for the elimination of any colonies is reported.				
Fire risk: there are combustible materials inside the department. Small quantities of flammable products may also be present. The possible sources of ignition are mostly of electrical origin (short circuits, overloads) and due to the presence of high temperature surfaces.	The electrical system has been built in a workmanlike manner and is periodically checked. The quantity of combustible material present is reduced to a minimum, to satisfy the needs of production. All unused material is stored inside cabinets. Inside the department, there are fire extinguishers, in order to allow timely intervention in the event of an emergency.	Although the risk has not been eliminated, measures have been taken to contain the effects of any fires.	2	3	6
Violence: violence is defined as any behavior that causes physical, psychological, sexual, or economic harm to a person, compromising their safety, health, well-being, and dignity. This definition includes acts of coercion or threat, with the aim of intimidating or controlling an individual, creating a dangerous and intimidating work environment.	Training: Training programs to raise awareness among employees and managers. Reporting Procedures: Safe and confidential systems for reporting incidents of violence.	Structural and organizational conditions that do not favor gender equality.	1	2	2
Harassment: harassment is understood as any unwanted behavior, carried out for reasons of race or ethnic origin, which has the effect of violating the dignity of a person and creating an intimidating, hostile, degrading, humiliating, or offensive climate.	Staff training: Extend the risk in regular training programs to sensitize employees on issues of harassment and discrimination. Promote an inclusive and respectful work environment that values diversity and promotes mutual respect among all employees. Design and organize work spaces taking into account the needs of all genders in order to make them accessible and safe.	Structural and organizational conditions that do not favor gender equality.	1	2	2

Table 15 - Electronic laboartory risk list

PPE	
Gloves	Protective gloves against mechanical risks with knurled rubber palm
Shoes	Safety shoes with reinforced toe and rubber sole with non-slip profile

Table 16 - Electronic laboartory PPE list

Workplace Environment: Customer & Supplier premises

This document considers the risks associated with performing activities at customer or supplier locations. The risks listed in this document are those generally present within third-party workplaces. Please refer to the risk information that the client must provide to contracting companies.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Level falls: Possible due to accidental contact with improperly discarded material on the ground.	Work areas generally have designated furniture or areas for material storage to limit storage in work areas or passageways.	Risk cannot be excluded if regulations regarding material storage within the premises where the activity takes place are not followed. The potential damage is considered overall limited.	2	2	4
Slips: Risk possible in case of accidental or intentional spills of liquid material on the ground, such as beverages, etc., or due to weather conditions that may make the surface slippery (heavy rain, snow, ice).	The internal floors of the premises are generally made of material with non-slip characteristics. Workers are informed of the need to promptly remove any liquid material spilled on the ground.	The possibility of such events occurring cannot be excluded. In general, any incidents should not have particularly serious consequences.	2	2	4
Investment: The presence of lifting and transport equipment within the work areas where workers may be operating does not allow excluding the risk of being struck.	Areas outside buildings where there is mixed traffic of vehicles and pedestrians generally have sidewalks or lanes to separate paths, and vehicles are required to proceed at walking speed. Inside premises where there may be mixed traffic, lanes are generally identified and indicated.	The risk cannot be completely excluded. Although the possibility is limited, the consequences can be severe.	2	3	6
Electrocution: The presence of electrical systems and electrically powered equipment does not allow excluding the possibility of direct or indirect contact with live parts.	Regulations require that all live parts of the electrical system be made inaccessible by means of fixed protections (screens, sheaths, and ducts). Furthermore, conductors are passed through protective sheaths. The presence of a grounding system is assumed to prevent the risk of indirect contact. The presence of a differential switch, which is mandatory, is an essential measure to reduce damage related to accidental contact with	In the presence of a compliant electrical system, the possibility of accidental contact with live parts can be excluded, unless protections are removed from conductors, or in case of tampering with safety systems, including the grounding system and the differential switch.	1	3	3

	live parts. Informing workers of the risks related to the presence of electrical systems is considered a useful measure to reduce risk, as is the preparation of procedures and a register of controls to be carried out periodically in order to highlight any anomalies.				
Impacts: Against structures and materials presumably present within the work environment.	Inside the work premises, areas are generally identified for material storage, transit lanes, and work areas.	Incidents of this type can occur in case of inattention by workers when passing through work areas.	2	1	2
Fire Risk: Combustible materials are found inside the work premises. In the presence of electrical systems and electrically powered equipment, possible sources of ignition include electrical faults or overloads that can cause ignition of sheaths or sparks related to short circuits. Furthermore, depending on the type of activity carried out, there may be additional sources of ignition inside the premises.	It is assumed that the electrical system is equipped with safety systems to avoid overloads or, in the event of faults and leakages, thus allowing the containment of ignition risks. Adequate extinguishing systems must be present inside the work premises with respect to the characteristics of the premises and the work activity carried out.	The level of risk depends on the type of activity carried out within the premises. Informing workers is a useful measure to further reduce risk.	3	3	9
Microclimatic Comfort: During the summer and winter periods, microclimatic conditions cannot be excluded, which may compromise the comfort of workers with respect to the specific activity carried out.	The premises are equipped with a heating system that allows maintaining the microclimate in a situation of well-being even in winter. In summer, the large volume and the opening of the doors allow for good compensation.	The risk may arise in the event of a malfunction of the system; in this case, the damage would be limited unless the failure situation persists for prolonged periods, in which case it becomes necessary to interrupt the activity. However, reference is made to any assessments of comfort conditions should they be considered useful to verify the adequacy of the system instrumentally.	2	1	2
Violence: Violence is defined as any behavior that causes physical, psychological, sexual, or economic harm to a person, compromising their safety, health, well-being, and dignity. This definition includes acts of coercion or threat, with the aim of intimidating or controlling an	Training: Training programs to raise awareness among employees and managers. Reporting Procedures: Safe and confidential systems for reporting incidents of violence.	Structural and organizational conditions that do not favor gender equality.	1	4	4

individual, creating a dangerous and intimidating work environment.					
Harassment: Harassment is defined as any unwanted behavior, carried out for reasons of race or ethnic origin, which has the effect of violating the dignity of a person and creating an intimidating, hostile, degrading, humiliating, or offensive climate.	Staff training: Extend the risk in regular training programs to sensitize employees on issues of harassment and discrimination. Promote an inclusive and respectful work environment that values diversity and fosters mutual respect among all employees. Design and organize workspaces taking into account the needs of all genders in order to make them accessible and safe.	Structural and organizational conditions that do not favor gender equality.	2	2	4

Table 17 - Customer & Supplier Premises risks list

PPE
No PPE deemed necessary

Table 18 - Customer & Supplier Premises PPE list

Work Environment: Warehouse

Within environments of this type, temporary storage of materials intended for production or delivery is provided. Lifting and transport equipment may operate in the premises to facilitate handling operations.

This sheet considers only the risks related to the mere parking and transit within these premises; the risks related to the activities carried out within them are reported in the specific assessment sheets.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Level falls: possible due to accidental contact with material improperly left on the ground (pallets, plastic film, etc.).	Areas for material storage, transit lanes, and work areas have been identified within the warehouse.	Risk cannot be excluded in case of failure to comply with company regulations regarding the storage of material within the premises. The damages that can be generated are to be considered overall contained.	2	2	4
Crushing: related to overturning of pallets or falling material from pallets, shelves, or workbenches.	Stacking of material is reduced to the bare minimum and, in any case, regulated.	The risk cannot be excluded and must, therefore, be reduced through organizational measures.	2	2	4
Impacts: against furniture, structures, and materials present within the work environment.	Areas for material storage, transit lanes, and work areas have been identified within the warehouse.	Incidents of this type can occur in case of inattention by workers while passing through the premises.	2	1	2
Slips: possible risk in case of spillage of liquid material on the ground, such as beverages, etc.	The warehouse floor is made of cementitious material with anti-slip characteristics. Consumption of beverages is only allowed in the area designated for this purpose, in order to prevent the spillage of liquids on the ground in transit areas. Workers are informed of the need to take action promptly to remove any liquid material spilled on the ground.	It cannot be excluded that events of this type may occur. However, the type of flooring present means that the risk itself is to be considered contained. In general, any incidents should not have particularly serious consequences.	2	2	4
Electrocution: the presence of electrical systems and electrically powered equipment does not	All live parts of the electrical system have been made inaccessible by means of fixed protections	Considering the measures taken, it is possible to exclude the possibility of accidental contact with	1	3	3

exclude the possibility of direct or indirect contact with live parts.	(screens, sheaths, and conduits). In addition, the conductors are passed inside the floors, walls, or false ceilings. A grounding system has been installed to prevent the risk of indirect contact. The presence of a differential switch is an appropriate measure to reduce damage related to accidental contact with live parts.	live parts, unless the protections to the conductors are removed, or in case of tampering with the safety systems, including the grounding system and the differential switch. Informing workers of the risks related to the presence of electrical systems is considered a useful measure to reduce risk, as is the preparation of procedures and a register of checks to be carried out periodically in order to highlight any anomalies.			
Investment: the presence of equipment for lifting and transporting material does not exclude the risk of investment.	Transit lanes for forklifts have been identified and indicated within the premises. The same equipment has been entrusted to personnel specifically appointed and trained on its correct use. Near points with poor visibility, technical means such as mirrors or barriers have been adopted in order to reduce the risk.	The risk cannot be completely excluded but, considering the measures implemented, any incidents should be attributed to incorrect behavior on the part of the operators in charge of driving the vehicles or by the workers themselves. Although the possibility is contained, the consequences can also be serious.	2	3	6
Fire risk: combustible materials such as paper, plastic, and wood are present inside the warehouse. Possible sources of ignition include electrical faults or overloads that can cause ignition of the sheaths or sparks related to short circuits.	The electrical system is equipped with safety systems designed to avoid overloads or, in the event of faults and leaks, to interrupt the power supply. Portable fire extinguishers have been installed inside the premises so that workers can intervene promptly in case of emergency. Escape from the premises is also easy.	Although the risk cannot be completely excluded, the type of activity carried out does not present specific fire hazards. Informing workers, in addition to constantly monitoring the safety conditions in the premises (e.g., accessibility of escape routes), the electrical system, and the extinguishing systems, is a useful measure to further reduce the risk.	2	3	6
Microclimatic comfort: during the summer and winter periods, conditions that may compromise the comfort of workers with respect to the specific activity carried out cannot be excluded.	Workers wear clothing to protect themselves from the cold, while adequate air exchange is guaranteed in summer to also have an air speed to reduce the feeling of heat.	It cannot be excluded that workers, even in significant numbers, may report conditions of lack of microclimatic comfort. It is considered appropriate to carry out, in this case, an instrumental assessment aimed at understanding which elements to influence in order to reduce discomfort.	2	2	4

Violence: Violence is defined as any behavior that causes physical, psychological, sexual, or economic harm to a person, compromising their safety, health, well-being, and dignity. This definition includes acts of coercion or threat, with the aim of intimidating or controlling an individual, creating a dangerous and intimidating work environment.	Training: Training programs to raise awareness among employees and managers. Reporting Procedures: Safe and confidential systems for reporting incidents of violence.	Structural and organizational conditions that do not favor gender equality.	1	3	3
Harassment: Harassment is defined as any unwanted behavior, carried out for reasons of race or ethnic origin, that has the effect of violating a person.	Staff training: Extend the risk in regular training programs to sensitize employees on issues of harassment and discrimination. Promote an inclusive and respectful work environment that values diversity and fosters mutual respect among all employees. Design and organize workspaces taking into account the needs of all genders in order to make them accessible and safe.	Structural and organizational conditions that do not favor gender equality.	2	2	4

Table 19 - Warehouse risks list

PPE	
Shoes	Safety shoes with reinforced toe and rubber sole with non-slip profile

Table 20 -Warehouse PPE list

Work Environment: Production Department

This document considers the risks associated with transit and presence within production areas.

Risk Identification	Implemented Measures	Residual Risk Assessment	P	D	R
Harassment: Any unwanted behavior related to race or ethnic origin that violates a person's dignity and creates an intimidating, hostile, degrading, humiliating, or offensive environment.	Staff Training: Expand regular training programs to include the risk, raising employee awareness about harassment and discrimination issues. Promote an inclusive and respectful work environment that values diversity and fosters mutual respect among all employees. Design and organize workspaces considering the needs of all genders to make them accessible and safe.	Conditions Structural and organizational that do not favor gender equality.	2	2	4
Fire Risk: Combustible materials are present in the department. Small quantities of flammable products may also be present. Possible ignition sources are mostly electrical (short circuits, overloads), but ignition related to activities such as welding and grinding cannot be ruled out.	The electrical system was constructed according to regulations and is periodically checked. The quantity of combustible material present is minimized to meet production needs. All unused material is stored in areas separate from work areas. Fire extinguishers are present in the department to allow for timely intervention in case of emergency.	Although the risk has not been eliminated, measures have been taken to contain the effects of potential fires.	2	3	6
Crushing: Related to falling material from work surfaces or material falling while being moved by a forklift.	The adoption of work surfaces with a large area allows for the safe placement of material. Cabinets and shelves have been chosen to withstand the weight of the material to be stored on them.	Regarding the falling of material from shelves, this event is considered to be linked to incorrect behavior by workers. In this case, the possibility of serious damage occurring can be excluded. Regarding the falling of material transported with	2	2	4

		the use of lifting equipment, events of this type are also attributable to errors by workers. In this case, the damage linked to falling material can have more serious effects.			
Chemical Risk: The risk is related to the possible dispersion of chemical products in the air, particularly lubricants.	Since oil vapors are heavy, the dispersion is linked to the actual working phases of the machinery. The size of the premises and the natural ventilation present allow concentration levels to be kept below legal limits.	The risk cannot be excluded, especially during periods of higher production that result in greater oil emissions into the air. Considering the foreseeable concentrations and the low hazard of the products, the possibility of damage related to this risk can be considered low.	1	2	2
Electrocution: The presence of an electrical system and electrically powered equipment does not exclude the possibility of direct or indirect contact with live parts.	All live parts of the electrical system have been made inaccessible by means of fixed protections (screens, sheaths, and conduits). Furthermore, the conductors are run inside the floors, walls, or false ceilings. A grounding system has been installed to prevent the risk of indirect contact. The presence of a differential switch is a suitable measure to reduce damage related to accidental contact with live parts.	Considering the measures taken, the possibility of accidental contact with live parts can be excluded, unless the conductor protections are removed, or in case of tampering with the safety systems, including the grounding system and the differential switch. Informing workers of the risks related to the presence of an electrical system is a useful measure to reduce the risk, as is the preparation of procedures and a register of checks to be carried out periodically in order to highlight any anomalies.	1	3	3
Impacts: Against furniture and structures present inside the work environment. The possibility of impacts against material stored on the ground or with the forklift cannot be excluded.	Workstations have been arranged to leave sufficient space for safe transit inside the premises and at the stations themselves. Specific areas have been provided for the storage of material being processed, in order to leave sufficient space for transit.	Incidents of this type can occur in case of inattention by workers when passing through the premises. Events of this type are unlikely to have significant consequences that could lead to absence from work.	2	1	2
Level falls: Possible due to accidental contact with material improperly left on the ground.	Work areas, storage areas, and transit areas have been identified within the department. Workbenches have been placed at the various workstations to store unused material.	Risk not excludable in case of non-compliance with company regulations regarding the storage of material inside the department. Informing workers about the risks related to the work environment and company regulations in this regard is	2	2	4

		considered a measure to increase workers' awareness of the issue. The damage that can be generated is considered overall limited.			
Slips: Possible risk in case of spillage of liquid material on the ground, in particular of lubricating-cooling liquids.	The department's floor is made of cementitious material with a rough surface to reduce the risk of slipping. In case of spills or leaks of liquids on the ground, workers absorb them using specific material (sepiolite), then remove the material with the use of manual equipment. Inside the department, workers are required to wear safety shoes with rubber soles with a non-slip profile.	The possibility of events of this type occurring cannot be excluded. However, the type of floor present and the adoption of specific personal protective equipment mean that the possibility of incidents is to be considered limited. In general, any incidents should not have particularly serious consequences.	2	2	4
Violence: Violence is defined as any behavior that causes physical, psychological, sexual, or economic harm to a person, compromising their safety, health, well-being, and dignity. This definition includes acts of coercion or threat with the aim of intimidating or controlling an individual, creating a dangerous and intimidating work environment.	Training: Training programs to raise awareness among employees and managers. Reporting Procedures: Safe and confidential systems for reporting incidents of violence.	Structural and organizational conditions that do not favor gender equality.	1	4	4

Table 21 -Production Department risks list

PPE
No PPE deemed necessary

Table 22 - Production Department risks list

Work Environment: OFFICE

The following are the risks associated with transit and staying within office premises. Clerical activities are carried out within them using video display terminals. Specific risks related to the activity carried out by the individual operator, which are reported in the activity sheets, are not considered.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Chemical Risk: Inkjet printers and photocopiers are present inside the premises. Physical and chemical processes take place inside these devices that can cause the release of volatile organic compounds, fine dust, etc. into the room. The quantity and type of products emitted depend on the printing technology used, the type of paper used, and the correct maintenance of the machines. Regarding ozone, emitted by printers with outdated technologies, this is practically eliminated.	The most used photocopiers and laser printers are placed away from workstations, in large or well-ventilated rooms. The equipment undergoes regular maintenance to maintain its correct functioning and reduce, at the same time, the emission of dangerous products into the air. The printers and photocopiers present have toner cylinders that are physically replaced, and toner is not poured inside the machine; this condition leads to a reduction of dust emissions inside the premises.	Considering the average use of printers and photocopiers, as well as the characteristics of the rooms, it can be excluded that the exposure could be significant. From epidemiological studies carried out, especially in Germany, no specific critical issues have emerged in rooms used as normal offices.	2	1	2
Fire Risk: Combustible materials such as paper, plastic, and wood are present inside the offices. Flammable agents based on alcohol may also be used for cleaning the premises. Possible sources of ignition include electrical faults or overloads that can cause ignition of the sheaths or sparks related to short circuits.	The quantity of combustible material inside the work premises is reduced to a minimum. This objective is pursued by storing all unnecessary material inside special rooms such as archives or small warehouses. The electrical system is equipped with safety systems to avoid overloads or, in the event of faults and dispersions, to interrupt the power supply. Portable fire extinguishers have been installed inside the premises so that workers can intervene promptly in case of emergency.	Although the risk cannot be completely excluded, the type of activity carried out does not present specific fire hazards. Informing workers, in addition to constantly monitoring the safety conditions in the premises (e.g., accessibility of escape routes), the electrical system, and the extinguishing systems, is a useful measure to further reduce the risk.	1	3	3
Electrocution: The presence of an electrical system and electrically powered equipment does	All live parts of the electrical system have been made inaccessible by means of fixed protections	Considering the measures adopted, it is possible to exclude the possibility of accidental contact with	1	3	3

not exclude the possibility of direct or indirect contact with live parts.	(screens, sheaths, and conduits). Furthermore, the conductors are passed inside the floors, walls, or false ceilings. A grounding system has been installed to prevent the risk of indirect contact. The presence of a differential switch is a suitable measure to reduce damage related to accidental contact with live parts.	live parts, unless the protections to the conductors are removed, or in case of tampering with the safety systems, including the grounding system and the differential switch. Informing workers of the risks related to the presence of the electrical system is to be considered a useful measure to reduce the risk, as well as the preparation of procedures and a register of checks to be carried out periodically in order to highlight any anomalies.			
Slips: Possible risk in case of spillage of liquid material on the ground, such as drinks, etc. During cleaning operations, slips related to the presence of liquids on the ground cannot be excluded.	The floor of the offices is made of material with non-slip characteristics. The consumption of drinks is only allowed in the area identified for this purpose, in order to prevent the spillage of liquids on the ground in transit areas. Workers are informed of the need to take action promptly to remove any liquid material spilled on the ground. During the cleaning of the premises, signaling panels are installed to indicate the area subject to the intervention. Workers have been informed of the need to wear comfortable shoes with rubber soles.	It cannot be excluded that events of this type may occur. However, the type of floor present means that the risk itself is to be considered contained. In general, any accidents should not have particularly serious consequences.	2	2	4
Level falls: Possible due to accidental contact with material improperly left on the ground (bags, briefcases, etc.). Events of this type could also be related to contact with extension cords that cross transit areas.	Cabinets and drawers have been placed near the workstations to contain all unused material, thus avoiding having to leave them on the ground. Sockets have been installed near the workstations in order to avoid, as far as possible, the use of extension cords that could cause falls at the same level. The power and connection cables, when possible, are collected.	Risk not excludable in case of non-compliance with company regulations regarding the storage of material inside the premises. The damage that can be generated is to be considered overall contained.	2	2	4
Impacts: Against furniture and structures present inside the work environment.	The workstations have been arranged in such a way as to leave sufficient space for safe transit	Accidents of this type can occur in case of inattention on the part of workers when passing through the premises. In the event of an accident, it	2	1	2

	inside the premises and at the workstations themselves. The furnishings have rounded edges.	is unlikely that there will be significant consequences such as to determine an absence from work.			
Crushing: Related to the fall of material from desks or cabinets.	Inside the premises, cabinets and drawers have been placed to collect all unnecessary material, thus avoiding having to leave it on the desks. Inside the cabinets, workers place the heavier material on the lower shelves.	Although this risk cannot be excluded, the risk is to be considered very low considering the average weight of the objects present in the office.	2	1	2
Biological Risk: The presence of an air conditioning system and a water system does not exclude the possibility of workers' exposure to this risk in case of poor maintenance and cleaning of the heating system and the water system pipes.	The air conditioning systems are periodically verified and/or maintained, as also indicated by the manufacturer, in order to eliminate any accumulation of microorganisms. The maintenance of the water and heating system is also an effective measure to contain the risk.	The risk is to be considered excluded, unless the necessary periodic maintenance and sanitization interventions are not carried out. Even in these cases, the periodic checks ensure that any incorrect behavior is identified promptly.	1	2	2
Harassment: Harassment is defined as any unwanted conduct related to race or ethnic origin that has the effect of violating a person's dignity and creating an intimidating, hostile, degrading, humiliating, or offensive environment.	Staff Training: Extend the risk in regular training programs to sensitize employees on issues of harassment and discrimination. Promote an inclusive and respectful work environment that values diversity and promotes mutual respect among all employees. Design and organize workspaces taking into account the needs of all genders in order to make them accessible and safe.	Structural and organizational conditions that do not favor gender equality.	2	2	4
Violence: Violence is defined as any behavior that causes physical, psychological, sexual, or economic harm to a person, compromising their safety, health, well-being, and dignity. This definition includes acts of coercion or threat, with the aim of intimidating or controlling an individual, creating a dangerous and intimidating work environment.	Training: Training programs to raise awareness among employees and managers. Reporting Procedures: Secure and confidential systems for reporting incidents of violence.	Structural and organizational conditions that do not favor gender equality.	1	4	4

Table 23 - Office risks list

PPE
No PPE deemed necessary

Table 24 - Office PPE list

Equipment: Blast Chiller

Electrically powered equipment used to quickly cool food for longer shelf life.

Risk Identification	Measures Taken	Residual Risk Assessment	P	D	R
Cuts and abrasions: there are sharp surfaces inside the condenser.	The condenser has been made inaccessible by means of removable guards. Cleaning the condenser, which requires the removal of the guards, is carried out exclusively with a brush.	The risk is present when the guards are removed to access the condenser, in particular for cleaning it. In these cases, the use of suitable equipment significantly reduces the risk.	2	1	2
Electrocution: since the equipment is electrically powered, contact with live parts, both direct and indirect, cannot be excluded.	All live parts are made inaccessible by means of fixed protections such as screens and protective sheaths. Active protection systems such as differential switches and passive systems such as earthing systems are installed on the electrical system.	The risk can occur if the protections on the electrical parts have been damaged in such a way as to expose the cables to direct or indirect contact. It is therefore necessary to carry out periodic checks on the condition of the equipment in order to identify any anomalies in good time before they cause an accident.	1	3	3

Table 25 - Blast chiller risks list

PPE
No PPE deemed necessary

Table 26 - Blast chiller PPE list

Equipment: Electric slicer

The slicer is an electrically powered machine consisting of two elements: a fixed base and a horizontally moving carriage. The products to be sliced are placed on the carriage, and by moving the carriage, the product is passed in contact with a rotating circular blade. The thickness of the slices is defined by the distance between the blade and the support surface, which can be adjusted using a special crank.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Contact with moving parts: inside the machine there are moving or rotating parts.	All moving parts of the machine are enclosed within it and segregated from contact by means of fixed guards.	Contact with moving parts can be ruled out unless the guards with which the machine is equipped are intentionally removed. This event represents a violation of company behavioral standards.	1	3	3
Cuts: the possibility of accidental contact with the blade cannot be completely ruled out. The risk is possible, in particular, during blade cleaning operations.	The cut occurs by placing the product on a self-moving carriage. In this way, the operator does not need to bring his hands close to the blade. The cutting thickness is adjustable, in order to reduce the distance between the blade and the piece to be cut to the minimum necessary. When cleaning the blade, workers zero the thickness and deactivate the machine. During cleaning activities, workers are required to wear cut-resistant protective gloves.	Cuts can only occur in the event of errors in the use of the machine. The risk of contact with the blade is to be considered possible during the operation of positioning the product on the carriage. In order to reduce the risk even in this operation, it is necessary to pull the carriage as close as possible to the operator so that the blade is located as far away as possible. To further reduce the risk, it is necessary for the operation to take place by setting the cutting thickness to a minimum. During machine cleaning, the possibility of cuts due to contact with the blade cannot be ruled out.	2	2	4
Electrocution: since the machine is electrically powered, the possibility of contact with live parts of the machine or its power cord cannot be ruled out.	The live parts have been made inaccessible by means of fixed protections. The connecting wires are enclosed within a double protection sheath. The electrical system is equipped with protection	Electrocution is only possible if the protections that prevent contact with live parts are removed. The removal, tampering or exclusion of safety devices and systems is prohibited to all workers.	1	3	3

	devices which, in the event of an accident, provide for the timely disconnection of the current.				
Biological risk: the handling of food does not allow to exclude the risk of exposure to bacteria present on food.	Within the company, the management rules provided for by the HACCP regulation are applied, which provides for the periodic control of the environments and food, as well as the qualification of suppliers. Workers are required to wear protective gloves during all food handling activities. Inside the work area there are toilets to ensure maximum hygiene for workers.	The risk, although not excludable, is adequately contained, provided that the rules of good practice in food management are respected and workers wear the necessary personal protective equipment.	2	1	2

Table 27 - Electric slicer risks list

PPE	
Gloves	Cut-resistant metal thread protective gloves

Table 28 - Electric slicer PPE list

Equipment: Electrical equipment

For work activities, electrically powered equipment is used. This equipment can be portable tools, which are connected to the power grid only when they are actually used, or machinery that remains constantly connected to the grid.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Electrocution: Since the equipment is electrically powered, the possibility of direct or indirect contact with live parts of the equipment itself or the power cord cannot be excluded.	All equipment provided to workers is manufactured in compliance with applicable technical standards, including for the electrical part, as evidenced by the CE marking on them. Live parts have been made inaccessible by means of fixed guards that prevent contact with them unless they are removed or fail. The power cables are enclosed within a double-insulated sheath. Protective devices are present on the electrical system which, in the event of an accident, provide for the prompt disconnection of the current. Except for double-insulated equipment, or where the external structure is made of plastic, all electrical tools are equipped with grounding that allows connection to the building's system, in order to reduce the risk associated with indirect contact.	Electrocutions are only possible if the protections that prevent contact with live parts are removed. The removal, tampering, or exclusion of safety devices and systems is prohibited to all workers. Even in the event of contact with live parts, the presence of a differential switch ensures that the effects are not lethal.	1	3	3

Table 29 - Electrical equipment risks list

PPE
No PPE deemed necessary

Table 30 - Electrical equipment PPE list

Equipment: Office manual equipment

For office activities, manual tools such as scissors and cutters are used.

Hazard Identification	Adopted Measures	Residual Risk Assessment	P	D	R
Projections: Event that may occur if a cutter notch should jump during removal because it is too worn. The cutter in use have a mechanical device for removing the notches. This device allows safe removal as it retains the blade section to be released. The risk can occur if a worker removes the blade notches without using the appropriate safety device but by impact. This practice is prohibited by the company through information.	The cutters in use have a mechanical device for removing the notches. This device allows safe removal as it retains the blade section to be released.	The risk can occur if a worker removes the blade notches without using the appropriate safety device but by impact. This practice is prohibited by the company through information.	1	3	3
Cuts: As a result of incorrect use of simple tools, but having sharp surfaces such as scissors and cutters.	Manual tools are equipped with a handle that allows a firm grip of the tool; the same handle has been designed so that at least the hand holding the tool is safe from the risk of cuts. The cutters used have a retractable blade equipped with devices that prevent involuntary extraction of the blade. For the removal of notches of blade no longer usable, it employs a special tool, placed on the handle of the tool itself, which reduces the risk of cuts at the time of removal. Accidents cannot be completely excluded as a result of errors in the use of these tools. Having tools in good condition, sharp scissors and cutters etc. allows to reduce the risk by reducing the force that the worker must impress the tool for the execution of the intervention. In this way, the worker can hold the same tool with a secure grip. Considering the fact that the correct	Accidents cannot be completely excluded as a result of errors in the use of these tools. Having tools in good condition, sharp scissors and cutters etc. allows to reduce the risk by reducing the force that the worker must impress the tool for the execution of the intervention. In this way, the worker can hold the same tool with a secure grip. Considering the fact that the correct use of tools is an essential measure of risk reduction, it is necessary to provide information to workers about the risks related to the use of tools and how to use them.	2	2	4

	use of tools is an essential measure of risk reduction, it is necessary to provide information to workers about the risks related to the use of tools and how to use them.				

Table 31 - Office manual equipment risks list

PPE
No PPE deemed necessary

Table 32 - Office manual equipment PPE list

Equipment: Operating manuals equipment

In carrying out the activity, manual tools such as scissors, cutters, hammers, screwdrivers, etc. are used.

Hazard Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Cuts: resulting from incorrect use of tools with sharp surfaces such as scissors, cutters, saws, etc.	Manual tools are equipped with a handle that allows a firm grip of the tool; the handle itself has been designed so that at least the hand holding the tool is safe from the risk of cuts. The cutters used have a retractable blade equipped with devices that prevent unintentional extraction of the blade. For the removal of notches of blades that are no longer usable, a special tool is used, placed on the handle of the tool itself, which reduces the risk of cuts during removal.	Accidents cannot be completely excluded as a result of errors in the use of these tools. Having tools in good condition, sharp scissors and cutters, etc., reduces the risk by reducing the force that the worker must apply to the tool to perform the intervention. In this way, the worker can hold the tool itself with a secure grip. Considering that the correct use of tools is an essential measure to reduce risk, it is necessary to provide workers with information about the risks associated with the use of tools and how to use them.	2	2	4
Crushing: in case of use of hammers and other impact tools. The fall of the tool can also cause crushing to the feet.	The tools are equipped with a shaped handle in order to allow the worker to have the correct grip of the tool and to be able to direct it with greater precision. Workers are provided with safety shoes with reinforced toe caps in order to protect their toes.	The risk of crushing is possible in case of errors in the use of hammers as a result of which damage may occur, predictably, to the free hand.	2	2	4
Projections: in case of breakage of pieces during the use of hammers and chisels.	Workers are provided with protective glasses with which to protect themselves from any projections.	The possibility that projections may be generated cannot be excluded, but the correct use of protective glasses makes it possible to consider that the possibility of damage to the health of workers is reduced.	2	2	4

Table 33 - Operating manuals equipment risks list

PPE	
Gloves	Protective gloves against mechanical risks with knurled rubber palm
Shoes	Safety shoes with reinforced toe cap and rubber sole with non-slip profile
Glasses	Polycarbonate protective glasses with side shields | $$list of PPE for operational manual equipment

Table 34 - Operating manuals equipment PPE list

Equipment: Equipment fitted with video terminals

A video display unit is defined as: "an alphanumeric or graphic screen regardless of the type of display process used." The risks associated with the use of equipment fitted with video display units are not exclusively related to the use of video display units (monitors), but to a series of issues related to the type of work performed by those working at computer workstations. Personal computers, as well as other connected equipment, such as printers, scanners, etc., are used for various activities.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Musculoskeletal disorders: prolonged use of equipment fitted with video display units can lead to back problems due to maintaining incorrect postures for extended periods, and upper limb disorders related to performing frequent repetitive movements. The effects may include: crushing and degeneration of intervertebral discs due to prolonged compression, damage to joints (elbow and shoulder), inflammation of the most stressed ligaments (carpal tunnel syndrome, epicondylitis, epitrochleitis). Incorrect postures can also cause damage to the cervical spine.	The chairs at the workstations are ergonomic, i.e. equipped with five spokes with castors at the base to allow safe positioning and, at the same time, to perform small movements. The chairs themselves have seats and backrests that are adjustable in height, soft and without rigid edges. The backrest is also adjustable in inclination. The desks are sufficiently large to correctly position the work equipment, leaving space to rest the forearms. The surface of the top is light and opaque. Footrests are provided to anyone who requests them if the chair, when placed at the correct height, does not allow the feet to be placed on the floor. The keyboards of fixed workstations are detached from the other elements that make up the personal computers so as to allow the operator to position them in accordance with their own dimensions.	The risk cannot be excluded, however, the fact that ergonomic adjustable chairs and sufficient space are present at the workstations for the correct arrangement of the various peripherals (keyboard, mouse, screen, etc.). In view of the fact that the risk is closely linked to the correct arrangement of the equipment, the need to inform workers about the risk and the rules to be followed in order to reduce it is highlighted.	2	3	6
Mental fatigue: the activity carried out may lead to mental fatigue depending on the difficulty and weight of the individual activities. The level of risk depends on the following factors: difficulty of the	The software used for the activity that workers have to carry out is simple and developed to be accessible and easy to use. Various applications are used for the work activity, many of which have an	In consideration of the type of activity carried out, the risk is to be considered reduced. Correct training of workers on the use of the software provided allows to reduce the mental fatigue	2	1	2

activities carried out, availability of effective help, independence in carrying out the activity. In the case of the use of personal computers, the man-software interface with which the operator is confronted during work and the fact that this interface is actually designed to be user-friendly or not is also of great importance.	online manual that provides useful information to solve any problems that may arise. Workers do not operate on automatic systems, therefore, they are not exposed to work rhythms imparted by the machine itself or by the work cycle. If necessary, the company uses the advice of IT technicians, who can provide workers with the necessary information and intervene in case of malfunctions. Workers have sufficient autonomy in carrying out their work.	related to a poor knowledge of the best ways to use the software provided.			
Visual fatigue: frequent and prolonged use of equipment fitted with video display units can cause visual disturbances such as difficulty in accommodation and adaptation. These effects are linked to the prolonged vision of objects at the same distance and at the same brightness/contrast. The damage to eyesight related to the use of equipment fitted with video display units is not permanent but related to visual fatigue.	The monitors are of the active matrix LCD type. These models allow easier adjustment and, taking up less space, allow correct positioning on the work surface. The screens are adjustable in inclination, brightness and contrast. There are windows that allow adequate natural lighting, having a higher illuminating value than artificial light. In order to integrate natural lighting in the hours of the day with less sunshine, ceiling lighting systems have been installed in such number and position as to determine adequate visibility of the workstations. In order to reduce reflections or glare, adjustable curtains have been installed on the windows facing the screens, or behind them.	The use of suitable and correctly arranged work equipment allows to reduce the risk, as well as the execution of frequent breaks during which the operator can perform some exercises including focusing on distant objects. Informing workers about the risk and the behavioral rules to be followed is to be considered an effective measure to reduce the risk.	2	1	2
Electrocution: the presence of electrical system and electrically powered equipment does not exclude the possibility of direct or indirect contact with live parts.	All live parts of the electrical system have been made inaccessible by means of fixed protections (screens, sheaths and conduits). Furthermore, the conductors are passed inside the floors, walls or false ceilings. A grounding system has been installed in order to prevent the risk of indirect contact. The presence of a differential switch is a suitable measure to reduce the damage related to accidental contact with live parts.	In consideration of the measures adopted, it is possible to exclude the possibility of accidental contact with live parts, unless the protections to the conductors are removed, or in case of tampering with the safety systems, including the grounding system and the differential switch. Informing workers of the risks related to the presence of electrical system is to be considered a useful measure to reduce the risk, as well as the	1	3	3

		preparation of procedures and a register of checks to be carried out periodically in order to highlight any anomalies.			

Table 35 - Equipment fitted with video terminals risks list

PPE
No PPE deemed necessary

Table 36 - Equipment fitted with video terminals PPE list

Equipment: Manual kitchen tools

Manual tools such as knives, mezzalunas, meat tenderizers, etc. are used inside kitchens.

Hazard Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Cuts: due to incorrect use of tools with cutting surfaces such as knives and mezzalunas.	The manual tools are equipped with a handle that allows a firm grip of the tool; the handle itself has been designed so that at least the hand holding the tool is safe from the risk of cuts. Having tools in good condition helps reduce the risk by reducing the force that the worker must apply to the tool to perform the intervention. In this way, the worker can hold the tool itself with a secure grip.	Accidents cannot be completely excluded due to errors in the use of these tools.	2	2	4
Crushing: in case of use of meat tenderizers and other impact tools.	The meat tenderizers are equipped with a shaped handle in order to allow the worker to have the correct grip of the tool and to be able to direct it with greater precision.	The risk of crushing is possible in case of errors in the use of the meat tenderizer following which damage can occur, predictably, to the free hand.	2	2	4

Table 37 - Manual kitchen tools risks list

PPE	
Gloves	Metal wire gloves.
Shoes	Safety footwear with reinforced toe cap and rubber sole with non-slip profile

Table 38 - Manual kitchen tools PPE list

Equipment: Vehicles

Workers use company vehicles to reach different work locations or to carry out work activities such as errands, deliveries, commercial activities, etc. For some workers, it may also be used for the (sporadic) transport of people. The vehicles may be owned by the company, leased, or the individual worker may use their own vehicle. Although not required by law, it should be noted that the associated risks may also arise for those who use the vehicle to get to work.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Burns: following contact with high-temperature points inside the vehicle's hood.	All high-temperature points are located inside the hood, therefore in a position not accessible by the worker, unless the hood is opened.	The risk is normally absent, although, in the event of faults, workers may open the hood. In order to avoid accidents, workers are prohibited from carrying out repair or maintenance operations.	1	2	2
Chemical risk: related to the refueling operation.	The operation is performed infrequently and takes only a few seconds. Furthermore, the operation is carried out outdoors, in this way, the vapors that are released are rapidly diluted in the air.	The risk is reduced considering the frequency and duration of the operation, in addition to the fact that it is carried out outdoors.	2	2	4
Crushing: in the event of replacing a punctured tire, accidents cannot be ruled out.	Workers are prohibited from carrying out repair work on company vehicles, but they are obliged to request the intervention of specialized technicians.	Risk can be excluded unless incorrect behavior by workers.	2	2	4
Impacts: following a road accident. This risk is greater in particular conditions such as fog, heavy rain or snow. Driver conditions can also lead to a greater risk of an accident.	The use of vehicles is reserved for personnel with a regular driving license, which certifies knowledge of the highway code and the ability to use the vehicle. The company's vehicles are equipped with safety systems designed to reduce the possibility of accidents and the damage that may result from them. The vehicles undergo periodic maintenance (servicing) carried out by qualified personnel.	Accidents can occur in the event of negligence on the part of the worker or other people.	2	2	4
Investment: during ground operations, the risk of being hit by other vehicles cannot be excluded.	Inside the vehicle there are systems to increase the visibility of the operator and their vehicle during any stops on the roadside. In this regard, it is	The risk cannot be completely excluded but, considering the measures taken, any accidents	2	3	6

	mandatory to wear a high-visibility vest and position the triangle in the correct positions.	should be attributed to incorrect behavior by other drivers.			
Vibrations: transmitted to the whole body of the driver and, to a lesser extent, also to the hand-arm system.	Vehicles undergo regular maintenance to reduce the level of vibrations.	The level of vibrations transmitted by normal vehicles is extremely low.	2	1	2

Table 39 - Vehicles risks list

PPE	
Protective clothing	High visibility vest (available on vehicles)
Gloves	Protective gloves against mechanical risks with knurled rubber palm

Table 40 - Vehicles PPE list

Equipment: Cordless screwdriver

A battery-powered tool used to screw in locking devices. Screwing occurs through the rotation of the bit, controlled by pressing the appropriate button. It is possible to screw in or unscrew by setting the direction of rotation with a special lever.

Risk Identification	Adopted Measures	Residual Risk Assessment	P	D	R
Entanglements: The rotating tool, upon contact, can cause entanglements.	The screwdriver is equipped with a handle to maintain a firm grip on the tool, keeping hands at a safe distance from the bit. During use, workers are prohibited from wearing protective gloves, bracelets, and other objects or clothing that could cause entanglement.	The tool's usage ensures the operator doesn't need to keep their hands close to the drill bit. However, incidents due to worker errors cannot be ruled out, such as contact with the bit when it hasn't completely stopped, etc.	2	2	4
Contact with moving parts: Following access to internal moving parts of the tool.	Fixed guards have been placed around the motion transmission parts, making them inaccessible to contact.	The risk is possible if the worker, violating company rules, removes the guards or safety systems.	1	3	3
Vibrations: Screwdrivers transmit varying levels of vibration to the operator.	The tool is equipped with a handle designed to reduce the transmission of vibrations to the operator. The tool itself and the bits are periodically checked to identify any anomalies that may cause an increase in the level of vibrations transmitted.	The risk of vibration cannot be assessed in absolute terms on a single source but must be analyzed to obtain the daily exposure level, based on the exposure time to individual sources	2	2	4

Table 41 - Cordless screwdriver risks list

PPE	
Shoes	Safety shoes with reinforced toe and non-slip rubber sole
Gloves	Protective gloves against mechanical hazards with knurled rubber palm
Protective clothing	Work clothes with long sleeves and trousers and elastic ends
Glasses	Polycarbonate goggles with side protectors

Table 42 - Cordless screwdriver PPE list

Equipment: Ultrasonic bath for laboratory (metal washer)

Ultrasonic cleaning is the most appropriate process for cleaning delicate items/products. This cleaning technique uses ultrasound (generally from 15 to 400 kHz). Effective cleaning is achieved through the phenomenon of "cavitation," during which a "cavitation bubble" with extremely high internal pressure is generated in the solution.

Hazard Identification	Measures Taken	Residual Risk Assessment	P	D	R
Burns: Possible due to accidental contact with hot surfaces of the tank and water.	The material is immersed in water and retrieved using heat-resistant gloves. Water changes are performed only with the machine switched off and water at room temperature.	The risk of burns cannot be excluded. The damage that can be generated is foreseeably contained if limited to small splashes of oil.	2	2	4
Electrocution: Since the machine is electrically powered, the possibility of contact with live parts of the machine itself or its power cord cannot be excluded.	Live parts have been made inaccessible by means of fixed guards. The connecting wires are enclosed within a double-insulated sheath. There are protective devices on the electrical system that provide for the prompt disconnection of the current in the event of an accident.	Electrocution is only possible if the guards preventing contact with live parts are removed. The removal, tampering or exclusion of safety devices and systems is prohibited to all workers.	1	3	3

Table 43 - Ultrasonic bath for laboratory risks list

PPE
No PPE deemed necessary

Table 44 - Ultrasonic bath for laboratory PPE list

Equipment: Test/inspection bench or desk

Electrically powered bench used for product testing. The bench is equipped with electrical outlets, meters, and regulators. The operator places the product to be tested on or near the bench, connects it to the bench, and starts the inspection process using the knobs/controls.

Hazard Identification	Measures Taken	Residual Risk Assessment	P	D	R
Cuts and Abrasions: Contact with rough or sharp surfaces of the parts being tested.	Workers are provided with protective gloves to be worn constantly during material handling.	The risk is reduced, except in the case of failure to use the provided personal protective equipment.	2	2	4
Electrocution: Because the benches are electrically powered, the possibility of direct or indirect contact with live points or cables connected to the grid or to the products being tested cannot be ruled out.	All equipment provided to workers is manufactured in compliance with applicable technical standards, including for the electrical part, as evidenced by the CE marking on them. Live points have been made inaccessible by fixed guards that prevent contact with them unless they are removed or fail. The power cables are enclosed within a double-insulated sheath. Protection devices are installed on the electrical system that provide, in the event of an accident, for the timely disconnection of the current. Except for double-insulated equipment, or where the outer structure is made of plastic, all electrical tools are equipped with grounding that allows connection to the building system, in order to reduce the risk associated with indirect contacts.	Electrocutions are possible only if the protections that prevent contact with live points are removed. The removal, tampering or exclusion of safety devices and systems is prohibited to all workers. Even in the event of contact with live points, the presence of a differential switch ensures that the effects are not lethal.	1	3	3
Crushing: It is not entirely possible to rule out the possibility of crushing due to falling material placed on the bench, in particular during manual lifting.	Workers are required to wear safety shoes with reinforced toecaps, which reduces the damage that any falling material may cause.	Although the risk cannot be excluded, the possibility of events of this type is generally considered reduced, as are the damages they can cause.	2	2	4

Table 45 - Test/inspection bench or desk risks list

PPE	
Shoes	Safety shoes with reinforced toecaps and rubber sole with non-slip profile
Gloves	Protective gloves against mechanical risks with knurled rubber palm

Table 46 - Test/inspection bench or desk PPE list

Equipment: Countertop kitchen kettle

Appliance used as a perfect cooking system for those who want to have hot water at hand quickly and safely; use occurs through a power supply that brings the cooking water to a boil.

Risk	Adopted Measures	Residual Risk Evaluation	P	D	R
Biological risk: is due to the presence of water which does not exclude the possibility of contact with biological agents.	The high temperature due to boiling reduces the presence of the risk, as well as the fact that the water is replaced frequently.	The high temperature allows the residual risk to be considered reduced.	2	2	4
Burns: possible in case of contact, by immersion, in the cooking liquid and in contact with the draining basket.	The high temperatures are present during the boiling and cooking phase of the food. The draining baskets are equipped with plastic handles or, in any case, made of material with reduced thermal conductivity, and the use of pot holders further reduces the possibility of contact with points at high temperature.	The risk of burns cannot be excluded during the various operations. However, the risk is linked to behavioral errors in the same performance of the activities.	2	2	4
Projections: liquid projections cannot be excluded during the boiling phase and during the use of the draining baskets.	The use of lids reduces the risk by preventing any splashes from being projected during boiling.	The projections that occur normally represent a contained danger.	2	1	2

Table 47 - Countertop kitchen kettle risks list

PPE	
Protective clothing	Work clothes with long sleeves and long pants with elasticated ends

Table 48 - Countertop kitchen kettle PPE list

Equipment: Robotic arm

The 6-axis robotic arm is an advanced device designed for precision assembly operations in controlled environments, such as clean rooms. Thanks to its articulated configuration, the robotic arm offers high flexibility and freedom of movement, making it particularly suitable for tasks that require accuracy and repeatability. The 6-axis robotic arm is distinguished by its similarity to human arms, so it is able to assume/reach almost any position. This feature allows complex operations to be performed, such as assembling delicate components, manipulating objects in confined spaces, and interacting with other machines or tools.

Risks	Measures Adopted	Residual Risk Assessment	P	D	R
Cuts: possible due to contact with the surfaces of the internal parts of the machine during any unblocking interventions.	The use of protective gloves helps to contain the damage.	The risk, although not excludable, is to be considered reduced thanks to the use of appropriate personal protective equipment. Given the current conditions, it can be excluded that events occur that could cause damage to workers, unless protective gloves are not used.	2	2	4
Contact with moving parts: the machinery has rotating parts inside.	All moving parts are segregated from contact by means of fixed and mobile screens, the latter are connected to microswitches designed to prevent the machine from starting when not correctly positioned, or its stopping in case of opening.	The risk is normally absent. However, the possibility of accidents cannot be excluded following the removal of protections and/or deactivation of the safety systems with which the machinery is equipped.	1	3	3
Electrocution: the machines are electrically powered.	All live points of the machinery are made inaccessible by means of fixed protections secured by locking systems. The connection cables pass inside protective sheaths. Protection systems have been installed on the electrical system to interrupt the power supply, in the event of contact with live parts (earthing system, differential switch, etc.)	The risk can be excluded unless the worker removes the protections that prevent access to the live points of the equipment. In the event of events of this type, the damage that can be generated can also be serious.	1	3	3

Manual handling of loads: the machine loading and unloading activities expose the worker to the risk of musculoskeletal disorders related to the weights lifted and the frequency of handling.	Specific aids are used for handling loads, in order to facilitate operations and reduce the risk of accidents. The workstations are designed ergonomically, to ensure maximum comfort and prevent physical discomfort. Furthermore, adequate training is provided on the correct postures to be adopted during work activities, thus helping to promote a safe and healthy work environment.	Although it is not possible to completely eliminate the risk, the mitigation measures adopted allow it to be reduced significantly and effectively.	1	2	2
Chemical risk: the bags are filled with powdered chemical products. These products are mostly irritating or slightly harmful. The risk of exposure occurs in all cases in which product leaks should occur during filling due to faults or breakages. It should be noted that small quantities of dust escape when the bag falls onto the conveyor belt. During component cleaning operations, the operator may be exposed to higher levels of chemical agents, as well as during unblocking operations.	The loading of the products into the bags takes place completely automatically and in a segregated position with respect to the operator. Therefore, under normal conditions, exposure is zero. Workers have received a vacuum cleaner to collect the dust that escapes during the bag filling phases, in order to reduce the deposit and, consequently, the release into the work environment. As for cleaning operations, these are also carried out using a vacuum cleaner and workers are obliged to wear protective masks, glasses or visors.	The risk, overall, is reduced considering the operator's level of exposure. However, correct operation and the use of the prescribed personal protective equipment, in particular, in non-routine situations such as cleaning and unblocking, is an essential measure to contain the risk and thus avoid accidental events.	1	2	2

Table 49 - Robotic arm risks list

PPE	
Gloves	Protective gloves against mechanical risks with knurled rubber palm
Shoes	Safety shoes with reinforced toe and rubber sole with non-slip profile
Protective clothing	Disposable suit
Mask	Protective mask with FFP1 filter or higher
Glasses	Polycarbonate protective glasses with side shields

Table 50 - Robotic arm PPE list

Equipment: Fume hood (laboratory aspirator)

A fume hood is a device used in laboratories to extract harmful vapors or to protect against pathogenic microbial agents. The fume hood in the chemical field has the function of protecting the operator from any vapors released by the chemicals handled. Some substances produce toxic vapors that should not be inhaled by operators: to avoid this, hoods are used to extract these vapors and eliminate them in the environment outside the building in which one works.

Risk	Measures Adopted	Residual Risk Assessment	P	D	R
Impacts: against furniture and structures inside the work environment.	The workstation is arranged to leave sufficient space for safe transit inside the premises and at the workstations themselves.	Incidents of this type can occur in case of inattention by workers when passing through the premises. Events of this type are unlikely to have significant consequences such as to determine an absence from work.	2	1	2
Electrocution: the presence of electrical systems and electrically powered equipment does not exclude the possibility of direct or indirect contact with live parts.	All live parts of the electrical system have been made inaccessible by means of fixed protections (screens, sheaths and ducts). In addition, the conductors are passed inside the floors, walls or false ceilings. A grounding system has been installed in order to prevent the risk of indirect contact. The presence of a differential switch is a suitable measure to reduce damage related to accidental contact with live parts.	Considering the measures taken, it is possible to exclude the possibility of accidental contact with live parts, unless the protections to the conductors are removed, or in case of tampering with the safety systems, including the grounding system and the differential switch. Informing workers of the risks related to the presence of electrical systems is considered a useful measure to reduce risk, as well as the preparation of procedures and a register of checks to be carried out periodically in order to highlight any anomalies.	1	3	3
Biological risk: the presence of recirculated water could lead to the formation of bacteria.	Since the water falls in the form of a blade and the suction takes place towards the filter, not towards the room, the quantity of water that is dispersed in the room is extremely contained. The water in the aspirator is periodically replaced in order to reduce the residence time. The water system of the	Although the risk is contained, it is necessary to adopt organizational and technical measures to further reduce the risk. It is necessary to adopt disinfection programs by pouring antibacterial agents.	2	2	4

	workplace is subjected to checks to highlight the presence of microbial agents; the latest checks carried out have shown the absence, in particular, of Legionella.				
Noise: while the aspirator is on, the operator who carries out his activity in the vicinity of the same is exposed to noise levels above 80 dB(A), although lower than 85 dB(A).	The exposure time is limited as it is reduced to the period of use of the machine only. During the use of the aspirator, generally, tools are used that generate noise levels such as to make it necessary to wear adequate acoustic protection devices such as headphones or earplugs.	The overall risk is determined not by a single exposure but by the daily level, please refer to the specific assessment for the indication of this value.	2	2	4

Table 51 - Fume hood risks list

PPE	
Gloves	Nitrile gloves
Mask	Plastic with side protection

Table 52 - Fume hood PPE list

Equipment: Electric forklift truck

Forklift stacker equipped with forks on which the load is cantilevered with respect to the wheels and is balanced by the mass of the truck itself. The truck is used to handle forked pallets, i.e. those equipped with special spaces at the base, in which to insert the forks to obtain greater load stability. The operator is located inside a cab on the opposite side of the upright from the forks.

Risk	Measures Taken	Residual Risk Assessment	P	D	R
Impacts: In the event of impacts against structures or furnishings while driving the vehicle.	The speed of the vehicle is reduced and the conformation allows rotation in small spaces.	Although the risk cannot be excluded, the maneuverability makes it possible to reduce the possibility of impacts and the contained speed reduces the damage that can be determined by any accidents.	2	2	4
Crushing: In the event of the truck overturning or tipping over, the possibility that the driver will be thrown out of the vehicle and crushed by the vehicle cannot be ruled out, or remain trapped inside.	Each truck is equipped with a seat belt which, when worn correctly, prevents the operator from being thrown out of the passenger compartment in the event of overturning or tipping.	The risk of overturning is to be considered correlated to the incorrect use of the forklift, such as excessive speed or too tight curves. In the event of overturning, any accidents due to crushing are to be considered strictly linked to the failure to use seat belts.	2	2	4
Contact with moving parts: Possible risk in the event of removal of protections that prevent access to dangerous points of the vehicle.	All moving parts of the truck are made inaccessible by means of fixed and mobile guards which prevent contact with the aforementioned points at risk. Any maintenance on the trucks is prohibited but entrusted to qualified external personnel.	The presence of the protections makes it possible to exclude the risk unless the worker removes them, making dangerous parts of the machine accessible. Maintenance operations are carried out by specialized external personnel.	1	3	3
Electrocution: In the event of removal of protections to the voltage areas of the engine or battery. The risk is also possible in the event of removal of protections from the connection system to the battery charger, in the event of makeshift connections or in the event of short circuits due to	Protections have been placed on the battery and on the voltage points of the trucks to prevent contact. The socket with which the forklifts are connected to the battery chargers are shaped in such a way that the voltage points are not accessible to contact.	The risk is also to be considered excluded unless there are transgressions of company regulations which expressly prohibit the removal or tampering of machine protections. The technician in charge of maintenance accesses the battery compartment for acid topping up operations; during these	1	3	3

contact with metal objects. When disconnecting the battery charger from the truck, an electric arc can be generated.	Workers are required to de-energize the battery charger before disconnecting it from the truck.	operations, accidents due to errors by the technician himself cannot be completely excluded.			
Chemical risk: Workers also take care of topping up demineralized water inside the battery. This last operation, although it does not directly expose to dangerous products, can cause the leakage, due to excessive filling, of the 30% sulfuric acid mixture contained in the batteries.	The demineralized water topping up operation does not expose workers to the direct risk of contact with dangerous products. The operation is performed with the use of appropriate equipment that allows safe topping up. The use of protective gloves represents an effective measure to reduce the risk.	The topping up of demineralized water of the batteries is to be considered a low chemical risk, as it is carried out only rarely and involves the risk of exposure to chemical agents with reduced danger, for which the use of adequate personal protective equipment is sufficient.	2	2	4
Vibrations: The use of forklifts exposes workers to whole-body vibrations.	Correct maintenance of the trucks is carried out in order to contain wear which can increase the level of vibrations.	The level of risk is defined based on the exposure times to the individual sources of vibration.	2	2	4
Electromagnetic fields: Since the truck is powered by a low-voltage but high-amperage battery and since the operator is stationed above the battery pack, there is a possible exposure to risk. From the indications of the manufacturers in the sector, it emerges that the danger is limited to carriers of active medical devices (pacemakers).	The use of the equipment is linked to the health suitability issued by the doctor based on the visit which includes the assessment of this specific element during the visit itself.	The risk is to be considered canceled in consideration of the fact that it can only occur in the case of an active medical device that the worker must report to the company doctor during the medical examination.	0	0	0

Table 53 - Electric forklift truck risks list

PPE	
Shoes	Safety shoes with reinforced toe and rubber sole with non-slip profile
Gloves	Protective gloves against mechanical risks with knurled rubber palm
Glasses	Protective polycarbonate glasses with side shields

Table 54 - Electric forklift truck PPE list

Equipment: Overhead crane

Lifting and transport equipment for appropriately slung loads. The equipment consists of a horizontal structure that moves along two rails by means of a worm screw or other traction system. A winch is mounted on the structure, which allows the load to be lifted. Overall, the equipment allows loads to be lifted and transferred within the room relative to the area between the two rails. The equipment is controlled by a pendant push-button connected to the handling systems by means of cables contained in a sheath.

Risk	Measures Adopted	Residual Risk Assessment	P	D	R
Crushing Hazards: the possibility of falling objects in case of errors in the harness or in the event of a breakdown of the Lifting and restraining devices.	Both the overhead crane and the sling systems, such as ropes, chains, hooks, etc., are subjected to periodic checks carried out by a specialized company, in order to identify any critical issues due to the inevitable wear and tear that these components may undergo, and to intervene promptly for the repair or replacement of the components. The ropes and chains are checked quarterly. Workers who use the overhead crane are provided with protective helmets and safety shoes with reinforced toe caps. Workers are trained on the correct methods of using overhead cranes, slinging loads and handling them.	In normal conditions, the possibility of incidents of this type can be excluded. However, malfunctions or human errors cannot be ruled out, especially during the slinging, lifting and transport of loads, which can cause the load or part of it to fall. In these cases, the resulting damage can also be serious.	2	2	4
Impact Hazards: by contact with the material being moved. This possibility is linked in particular to: errors in the use of the crane, as a result of which may have oscillation of the handled load.	Workers who use the overhead crane are provided with protective helmets in order to reduce damage related to any impacts with the material being handled. Workers are trained on the correct methods of using overhead cranes and handling loads.	Incidents are related to errors in the use of the lifting equipment. The damage that events of this kind can cause can also be of high severity, depending on the part of the body affected.	2	2	4

Cuts and Abrasions: during the operations of harness and sling, cuts may occur and abrasions to the hands following contact with sharp or rough surfaces.	Workers are provided with protective gloves to protect themselves from the risk of cuts and abrasions.	The damage resulting from contact with sharp or rough surfaces of ropes, chains or parts to be handled can be considered reduced overall. The risk is contained as long as workers wear the gloves provided to them.	2	2	4

Table 55 - Overhead crane risks list

PPE	
Shoes	Safety shoes with reinforced toe cap and rubber sole with non-slip profile
Helmet	Protective helmet
Gloves	Protective gloves against mechanical risks with knurled rubber palm

Table 56 - Overhead crane PPE list

Equipment: Combined belt sander and grinder

Combined machine consisting of a belt sander and a grinding wheel with a disc, it is a bench tool designed for sanding, finishing and shaping various types of materials. It is often used in laboratories and/or metal workshops for precision work or finishing.

Risk	Measures Adopted	Residual Risk Assessment	P	D	R
Electrocution: risk possible in the event of direct contact with live parts of the machine or connecting cables or in case of contact with metal parts connected to earth.	All live parts of the machine are made inaccessible by means of fixed guards secured by locking systems. The connecting cables run inside protective sheaths. Protective systems have been installed on the electrical system to interrupt the power supply in the event of contact with live parts (earthing system, differential switch, etc.)	The risk is possible if the protections are removed, following which it is possible to access the points at risk of electrocution. Interventions of this type are prohibited by company regulations.	1	3	3
Contact with moving parts: the tool is equipped with moving parts that can cause crushing, entanglement and cuts.	Fixed guards have been placed around the moving parts of the transmission to make them inaccessible to contact.	The risk is possible if the worker, violating company regulations, removes the protections or safety systems.	1	3	3
Dust: the activity can cause the release of dust into the air.	When using the sander on material that can generate dust, the worker must wear a protective mask.	Dust is generated when machining pieces in inert material. This risk can be excluded when machining metals. Use inside rooms with high volume or adequate ventilation helps to contain the risk. The use of protective masks is considered a correct protection measure.	2	2	4
Projections: due to breakage of the piece or the belt.	The presence of fixed and mobile protections prevents the production of projections as a result of belt breakage.	In normal conditions, this possibility can be excluded, however, removing the protections exposes workers to risk.	2	2	4
Cuts and abrasions: due to contact with the belt or sharp surfaces of the workpiece.	The use of protective gloves, in particular when replacing the belt, helps to contain the risk.	The risk of contact with the belt is considered to be linked to the removal of the guards present. Cuts, although of a minor nature, can occur during the belt replacement operation, when it is worn. The	2	2	4

		use of personal protective equipment reduces the risk.			

Table 57 - Combined belt sander and grinder risks list

PPE	
Earmuffs	Earmuffs or earplugs
Shoes	Safety shoes with reinforced toe and rubber sole with non-slip profile
Gloves	Protective gloves against mechanical risks with knurled rubber palm
Glasses	Polycarbonate safety glasses with side shields

Table 58 - Combined belt sander and grinder PPE list

Equipment: Freezer

The freezer is used for food storage. The equipment is electrically powered by connection to the system, most often by means of interlocking sockets. The temperature is adjusted by means of controls, generally external.

Hazard Identification	Measures Taken	Residual Risk Assessment	P	D	R
Pinching: During the opening and closing of the doors, it is possible that fingers may be crushed.	The doors are equipped with a sheath which, in addition to determining the airtight closure, reduces damage in the event of pinching. The doors are equipped with handles which, when used, avoid this danger.	The risk, although not excludable, is to be considered almost negligible both because the probability of events of this type is reduced, and because the consequent damage should be nil.	2	1	2
Burns: It is possible that moderate cold burns may occur due to contact with ice or particularly cold surfaces.	The coldest parts are located away from the door; therefore, contact is only possible if the worker has to take material from the bottom.	The risk cannot be completely excluded, however, under normal conditions, only limited contacts can occur, in terms of duration and extent, which do not cause damage such as to cause absence from work.	2	1	2
Electrocution: Since the equipment is electrically powered, contact with live parts, both direct and indirect, cannot be excluded.	All live parts are made inaccessible by means of fixed protections such as screens and protective sheaths. Active protection systems such as differential switches and passive systems such as a grounding system are installed on the electrical system.	The risk can occur if the protections to the electrical parts have suffered damage such as to expose the cables to direct or indirect contact. It is therefore necessary to carry out periodic checks on the condition of the equipment in order to promptly highlight any anomalies before they cause an accident.	1	3	3

Table 59 - Freezer risks list

PPE
No PPE deemed necessary

Table 60 - Freezer PPE list

Equipment: Circulating cryostat

Fixed equipment, electrically powered, is an apparatus designed to cool and maintain a constant temperature of a working fluid, circulating through a closed system. Mainly used in research laboratories, in industrial and scientific fields, the circulating cryostat is essential for applications that require precise control of low temperatures, such as physical chemistry experiments, materials engineering, biotechnologies and electronic devices.

Hazard Identification	Measures Taken	Residual Risk Assessment	P	D	R
Burns: Possible due to accidental contact with the hot surfaces of the tank and water.	The material is immersed in water and picked up using anti-burn gloves. Water changes are only carried out with the machine switched off and water at room temperature.	The risk of burns cannot be excluded. The damage that can be generated is foreseeably contained if limited to small splashes of oil.	2	2	4
Electrocution: Since the machine is electrically powered, the possibility of contact with live parts of the machine itself or its power cord cannot be excluded.	The live parts have been made inaccessible by means of fixed protections. The connecting wires are enclosed inside a double protection sheath. Protection devices are present on the electrical system which, in the event of an accident, provide for the prompt disconnection of the current.	Electrocutions are only possible if the protections that prevent contact with live parts are removed. The removal, tampering or exclusion of safety devices and systems is prohibited to all workers.	1	3	3

Table 61 - Circulating cryostat risks list

PPE	
Gloves	Anti-burn protective gloves
Glasses	Polycarbonate protective glasses with side shields

Table 62 - Circulating cryostat PPE list

Equipment: Desoldering tool for tin welding

Electrically powered equipment used to remove tin welds. The operation involves heating the filler material and sucking up the material once it has liquefied. The equipment consists of a base called a station connected to the power supply and the desoldering lance, at the end of which is the heating tip and the suction hole. The lance is normally stored inside its housing in the station. When necessary, the operator picks up the lance and brings the tip close to the soldering point to be removed; due to the heat emitted, the soldering material melts and is sucked in by the suction system. Once the removal of the soldering point is completed, the lance is placed back into its housing.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Chemical risk: In the desoldering process, due to the high temperature reached, vapors of metals and combustion fumes are generated, mainly containing carbon and metal oxides. All these represent health risks, while the safety risks, in this case, are absolutely negligible.	At the end of the lance, there is a suction hole that serves to remove the molten material and, at the same time, extracts the vapors generated by the melting. The legislation regarding electrical components sets limits on the hazardous materials present. The quantity of material used and, consequently, of the products that are generated is almost negligible, considering the type of activity carried out. The room in which the operations are carried out has sufficient volume for the dilution of the vapors.	Considering the working methods, the quantities used, and the frequency of execution of the work, the risk is to be considered reduced.	2	3	6
Electrocution: Since the equipment is electrically powered, direct contact with live parts of the equipment that remain uncovered or indirect contact with metal parts under voltage following failures of the main protections of internal power cables cannot be excluded.	The equipment is equipped with protection systems such as fixed screens that prevent accidental contact with live parts of the tool itself. The equipment has a ground connection. The electrical system has protection devices to protect the worker (grounding system and differential switch).	The possibility of accidents in the event of incorrect behavior such as the removal of protections or the incorrect use of the equipment cannot be excluded. In the event of events of this type, the use of footwear with rubber soles makes it possible to effectively reduce the damage, as does working on wooden platforms or other measures useful to counter the risk.	1	3	3

Burns: Near the tip of the lance there are high temperatures with which the filler material melts. Therefore, exposure to high temperatures or accidental contact with hot material cannot be excluded.	The worker does not need to work directly on the material being worked on as the high temperature is generated at the end of the desoldering machine.	The risk of burns is to be considered contained when workers carry out their work correctly.	2	2	4

Table 63 - Desoldering tool for tin welding risks list

PPE
No PPE deemed necessary

Table 64 - Desoldering tool for tin welding PPE list

Equipment: Sealing muffle furnace

It is a type of industrial and laboratory furnace, used to heat materials to a very high temperature, generally between 300°C and 1,800°C, in a closed and controlled environment. It is an essential tool in chemistry, metallurgy, ceramics, materials science and research laboratories, where it is used for heat treatments such as calcination, melting, sintering and incineration of matter.

Hazard Identification	Measures Taken	Residual Risk Assessment	P	D	R
Burns: following contact with hot surfaces of the equipment or contact with the sample container.	All high-temperature points on the equipment have been made inaccessible by means of fixed screens. The furnace door is connected to an interlock system that prevents it from being opened unless the machine is stopped. Samples are taken using special tools such as pliers and wearing heat-resistant gloves.	The risk cannot be completely excluded, although it is contained thanks to the correct use of special auxiliary tools and adequate personal protective equipment. Damage is unlikely to be such as to cause absence from work.	2	1	2

Table 65 - Sealing muffle furnace risks list

PPE	
Gloves	Heat-resistant protective gloves
Protective clothing	Work clothes with long sleeves and trousers and elasticated ends

Table 66 - Sealing muffle furnace PPE list

Equipment: Electric oven

The oven is an appliance used to heat food. Food is heated by means of an electrical resistance. The food is placed on the various removable shelves.

Hazard Identification	Measures Taken	Residual Risk Assessment	P	D	R
Electrocution: Since the machine is electrically powered, the possibility of contact with live parts of the machine itself or its power cord cannot be excluded.	The live points have been made inaccessible by fixed protections. The connection wires are enclosed within a double protection sheath. There are protection devices on the electrical system which, in the event of an accident, provide for the prompt disconnection of the current.	Electrocution is only possible if the protections that prevent contact with live parts are removed. The removal, tampering or exclusion of safety devices and systems is prohibited to all workers.	1	3	3
Burns: possible when removing containers of cooked food or due to accidental contact with hot internal surfaces of the oven itself.	The possibility of extracting the shelves allows the food to be taken outside the oven, therefore away from the hottest points of the oven. The use of potholders and silicone gloves reduces the risk.	The risk of burns cannot be excluded. The damage that can be generated is predictably contained.	2	2	4
Contact with moving parts: inside the oven there are motion transmission parts that can cause cuts, entanglement or crushing.	All moving parts have been made inaccessible by means of fixed protections.	The risk can be excluded unless the company rules which prohibit workers from removing the screens are violated.	1	3	3

Table 67 - Electric oven risks list

PPE	
Gloves	Heat-resistant protective gloves

Table 68 - Electric oven PPE list

Equipment: Fryer

The fryer is equipment used for cooking potatoes and other foods. The product is immersed in boiling oil and cooked for a few minutes. Once cooking is complete, the basket immersed in the oil is removed, placed above the cooking tank to drain the oil, and the food is plated.

Risk Identification	Measures Taken	Residual Risk Assessment	P	D	R
Burns: Possible due to accidental contact with hot surfaces of the basket and boiling oil.	The basket that is immersed in boiling oil is equipped with a handle that prevents burns and ensures adequate distance between the hands and the boiling oil. Oil change operations are carried out only with the machine switched off and the oil at room temperature.	The risk of burns cannot be excluded. The damage that can be generated is foreseeably contained if limited to small splashes of oil.	2	2	4
Electrocution: Since the machine is electrically powered, the possibility of contact with live parts of the machine itself or its power cord cannot be excluded.	The live parts have been made inaccessible by means of fixed protections. The connecting wires are enclosed within a double protection sheath. There are protection devices on the electrical system which, in the event of an accident, provide for the timely disconnection of the current.	Electrocution is possible only if the protections that prevent contact with live parts are removed. The removal, tampering or exclusion of safety devices and systems is prohibited to all workers.	1	3	3

Table 69 - Fryer risks list

PPE
No PPE deemed necessary

Table 70 - Fryer PPE list

Equipment: Refrigerator

The refrigerator is used for the storage of food and drinks. The equipment is electrically powered by connection to the system, most often by means of interlocked sockets. The temperature is adjusted by means of controls, generally external.

Risk Identification	Measures Taken	Residual Risk Assessment	P	D	R
Pinching: During opening and closing operations of the doors, it is possible for fingers to be crushed.	The doors are equipped with a sheath which, in addition to determining the watertight closure, reduces damage in the event of pinching. The doors are equipped with handles which, when used, avoid this danger.	The risk, although not excludable, is to be considered almost negligible both because the probability of events of this type is reduced, and because the consequent damage should be nil.	1	1	1
Electrocution: Since the equipment is electrically powered, contact with live parts, both direct and indirect, cannot be excluded.	All live parts are made inaccessible by means of fixed protections such as screens and protective sheaths. Active protection systems such as a differential switch and passive systems such as a grounding system are installed on the electrical system.	The risk can occur if the protections to the electrical parts have suffered damage such as to expose the cables to direct or indirect contact. It is therefore necessary to carry out periodic checks on the condition of the equipment in order to highlight any anomalies in a timely manner, before they cause an accident.	1	3	3
Burns: If the refrigerator is integrated with the freezer, it is possible that moderate cold burns may occur due to contact with ice or particularly cold surfaces.	The coldest parts are located away from the door; therefore, contact is only possible if the worker has to collect material at the bottom.	The risk cannot be completely excluded, however, under normal conditions, only limited contacts can occur, in terms of duration and extent, which do not cause damage such as to cause absence from work.	1	1	1

Table 71 - Refrigerator risks list

PPE
No PPE deemed necessary

Table 72 - Refrigerator PPE list

Equipment: Hydraulic crane

Hydraulic device used to lift material. The material is slung and hooked to the end of the arm. Using a manual system connected to the hydraulic system, the load is lifted. The device is equipped with wheels to allow movement.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Crushing: possible due to contact with the crane during movement or due to falling of the lifted load.	The controls are located on the opposite side from the lifted load; in this way, even in the event of a fall, the worker is safe. Workers are required to wear safety shoes with reinforced toe caps in order to reduce damage.	Events of this type cannot be excluded; however, the use of personal protective equipment makes it possible to reduce damage.	2	2	4

Table 73 - Hydraulic crane risks list

PPE	
Shoes	Safety shoes with reinforced toe cap and rubber sole with non-slip profile
Gloves	Protective gloves against mechanical risks with knurled rubber palm

Table 74 - Hydraulic crane PPE list

Equipment: Dishwasher

Electrically powered equipment used for washing dishes. These are inserted inside the machine, after which the washing cycle is started. The machine draws the dishwashing detergent directly from the canister, then mixes it with water heated by electrical resistances. At the end of the washing, the operator opens the door and removes the clean dishes.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Chemical risk: chemical detergents are used for washing dishes.	The machine is automatic and the detergent is not poured manually, but the canister is connected directly to the machine. An extraction hood has been installed above the dishwasher to extract the vapors.	Considering that the most dangerous products are automatically tapped from the canister, it can be assumed that the chemical risk related to the operation is reduced.	2	2	4
Crushing: when extracting the basket from the washing machines, it could fall.	The basket is normally slid onto the door until it comes out of the housing. From this position, workers take the dishes. However, workers are equipped with safety shoes with reinforced toe caps.	The risk is, as a rule, excludable. Any accidents, related to incorrect behavior, should not cause significant damage, unless personal protective equipment is not used.	2	1	2
Cuts: during the handling of the dishes, cuts due to contact with sharp surfaces of the dishes or in the event of their breakage cannot be excluded.	Workers are required to wear waterproof protective gloves which result in a considerable reduction in the risk of cuts.	Although the risk cannot be completely excluded, the use of adequate personal protective equipment makes it possible to effectively contain the risk, in particular damage which is unlikely to involve absence from work.	2	1	2
Burns: removing dishes from the dishwasher immediately after finishing the washing process can cause burns, mostly of a minor nature.	The basket with the dishes, once the washing is finished, is left on a surface to cool. The use of protective gloves further reduces the risk.	The way in which the operation is carried out makes it possible in itself to consider the risk reduced.	2	1	2
Electrocution: dishwashers are electrically powered.	All live points of the machine have been made inaccessible by means of fixed protections and double insulation sheaths.	Electrocution can be excluded unless the machine's protections are removed, thus exposing live points to possible contact.	1	3	3

Contact with moving parts: dishwashers have moving parts inside.	All moving parts are segregated from contact by means of fixed and mobile screens, the latter are connected to microswitches designed to prevent the machine from starting when not correctly positioned, or to stop it in the event of opening.	The risk is normally absent. However, it is impossible to exclude the possibility of accidents following the removal of protections and/or deactivation of the safety systems with which the machine is equipped.	1	3	3
Biological risk: in the course of washing kitchen equipment and dishes, the possibility of unintentional exposure to this risk cannot be completely excluded.	Workers wear protective gloves in order to eliminate the risk of contact. Workers are required to strictly comply with hygiene standards.	The risk cannot be completely excluded, however, the use of the precautions taken ensures that the worker is comprehensively protected from the risk.	1	2	2

Table 75 - Dishwasher risks list

PPE	
Gloves	Waterproof protective gloves in nitrile or vinyl
Shoes	Safety shoes with reinforced toe cap and rubber sole with non-slip profile

Table 76 - Dishwasher PPE list

Equipment: CNC Machine

Numerical control machine for processing parts. The machine consists of a main body, which houses the tool holder and the tool magazine. The worker programs the machine according to the drawing, then loads the necessary tools into the housing. After that, the machining cycle is started. Once the machining is complete, the operator removes the finished part from the workpiece table.

Risk Identification	Measures Taken	Residual Risk Assessment	P	D	R
Cuts: due to contact with sharp edges of the tools.	The use of protective gloves reduces the damage related to events of this type.	Although events of this type cannot be excluded, the use of protective gloves helps to contain the damage.	2	2	4
Projections: During the machining of parts, projections of material such as dust or fragments can be generated.	Workers remain inside the cabin, in a protected position with respect to the work area.	The risk can be excluded unless the worker leans out of the cabin during the machining of the part.	2	2	4
Contact with moving parts: The machine is equipped with moving parts that can cause crushing, entanglement and cuts.	All moving parts of the machine have been made inaccessible by means of fixed guards. The openable guards of the machine are connected to microswitches which, in case of opening, stop the operation of the machine. Similarly, failure to close the guards makes it impossible to start the machine.	The risk can be excluded, unless the protections are removed or the safety systems installed on the machine are excluded. The above is explicitly prohibited by company regulations.	1	3	3
Electrocution: Possible risk in the event of direct contact with live points of the machine or connection cables, or in the event of contact with grounded metal parts.	All live points of the machine are made inaccessible by means of fixed protections secured by locking systems. The connection cables pass inside protective sheaths. Protection systems have been installed on the electrical system to interrupt the power supply in the event of contact with live parts (earthing system, differential switch, etc.)	The risk can be excluded unless the worker removes the protections that prevent access to the live points of the equipment. In the event of events of this type, the damage that can be generated can also be serious.	1	3	3

Crushing: possible in the event of the tool releasing during the insertion of the tools into the tool magazine.	Workers are required to wear safety shoes with reinforced toe caps in order to reduce damage.	Events of this type cannot be excluded; however, the use of personal protective equipment reduces damage.	2	2	4
Biological risk: the presence of lubricating oil can lead to the formation of colonies of bacteria in the distribution system, especially where these liquids remain for a long time, or in the event of prolonged non-use of the machine.	The lubricating oil flows inside the distribution system and contacts with this liquid are reduced to a minimum. any leaks, accidental contacts linked to the permanence of liquids for a long time in the machine do not allow contamination to be excluded. The use of specific antibacterial additives helps to contain the risk.		2	2	4
Noise: during the use of the machine, the worker may be exposed to noise levels exceeding 80 dB(A).	Workers are required to wear specific hearing protectors, headphones or earplugs.	The risk cannot be excluded, although the use of hearing protection allows the exposure level to be lowered below the 80 dB(A) threshold.	2	2	4
Chemical risk: linked to the use of oils for the lubrication of the components.	The oil is applied with the use of special dispensers equipped with a spout and handle which thus minimizes the risk of contact with the oil. The use of protective gloves protects the worker from the risk of accidental skin contact.	The risk, considering the reduced duration and frequency of operations that may expose to chemical agents, is to be considered contained. The correct use of personal protective equipment further reduces the risk.	2	1	2

Table 77 - CNC Machine risks list

PPE	
Glasses	Polycarbonate protective glasses with side shields
Protective clothing	Work clothes with long sleeves and trousers and elasticated ends
Gloves	Protective gloves against mechanical risks with knurled rubber palm
Shoes	Safety shoes with reinforced toe cap and rubber sole with non-slip profile
Headphones	Noise-canceling headphones or earplugs

Table 78 - CNC Machine PPE list

Equipment: Technological vacuum machine (TVAC)

This machine is used for dimensional control, testing, leak tests, and operation of small electronic components for flight testing. Inside the shelter, the temperature of the component is regulated by irradiation in the absence of oxygen. The operation involves creating an internal vacuum, and once suitable conditions are reached, the desired temperature regulation activity begins. The benchtop equipment is electrically powered with an activation or deactivation procedure. Nitrogen gas is used for activating the machine, managing pneumatic valves, and for vacuum breaking. A CO2 detector is present in the environment for personnel safety.

Hazard Identification	Adopted Measures	Residual Risk Assessment	P	D	R
Burns: due to contact with the lower surface of the door edge, where the heating element used for sealing the bag passes. The heating element is activated only when the door is lowered; in this way, the edge heats up only when it is not accessible to contact.	The risk is to be excluded, considering the installed safety systems.	Very slight burns can occur in case of accidental contact when lifting the door.	1	1	1
Electrocution: due to contact with live parts of the machinery or the power supply cable.	All live points have been made inaccessible to contact by means of fixed guards. Safety systems (residual current circuit breaker and earthing system) are installed on the electrical system to prevent the risk of direct and indirect contact.	The risk is possible if the guards are removed, after which it is possible to access points at risk of electrocution. Interventions of this type are prohibited by company regulations.	1	3	3

Table 79 - Technological vacuum machine (TVAC) risks list

PPE	
Gloves	Heat-resistant protective gloves

Table 80 -Technological vacuum machine (TVAC) PPE list

Equipment: Oscilloscope

Electrically powered equipment, it is an electronic measuring instrument that allows you to view and analyse electrical signals that vary over time. It is particularly used to study the waveform, frequency, amplitude and other characteristics of signals, and is widely used in electronics, physics, engineering, and similar fields laboratories. The equipment, connected to the instrument to be tested, measures the passage of current and graphically highlights its characteristics.

Hazard Identification	Adopted Measures	Residual Risk Assessment	P	D	R
Electrocution: since the equipment is electrically powered, the possibility of direct or indirect contact with live parts of the equipment itself or the power supply cable cannot be excluded.	The wave generator supplied to workers is manufactured in compliance with applicable technical standards, also for the electrical part, as certified by the CE marking present. The live points have been made inaccessible by means of fixed protections that prevent contact with them unless they are removed or fail. The power cables are enclosed within a double protection sheath. The electrical system has protection devices that provide, in the event of an accident, for the prompt disconnection of the current. Except for double-insulated equipment, or where the external structure is made of plastic, all electrical tools are equipped with earthing which allows connection to the building's system, in order to reduce the risk associated with indirect contacts.	Electrocutions are only possible if the protections that prevent contact with live points are removed. The removal, tampering or exclusion of safety devices and systems is prohibited to all workers. Even in the case of contact with live points, the presence of a residual current circuit breaker ensures that the effects are not lethal.	1	3	3

Table 81 - Oscilloscope risks list

PPE
No PPE deemed necessary

Table 82 - Oscilloscope PPE list

Equipment: Strapping machine

The material on the pallets, once finished, is secured using straps, i.e. strips of plastic material. The straps are secured using a special manual or pneumatic tool that tensions the strap and joins the two edges.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Crushing: due to falling material on the pallet or falling of the strapping tensioner.	Correct operation requires workers to wear safety shoes with reinforced toe caps to reduce damage related to possible falling material.	Although the risk cannot be completely excluded, the use of safety shoes effectively contains the risk.	2	2	4
Cuts: related to possible contact with the cutting part of the strapping tensioner or contact with the surfaces of the boxes on the pallets.	The cutting surface present in the strapping tensioner is inaccessible to contact. Workers are required to wear protective gloves to prevent damage related to contact with sharp surfaces of the packaged material.	The risk is considered almost negligible, taking into account the possibility of cuts occurring and the extent of the damage they can cause.	2	1	2
Projections: in the event of the strap breaking during tensioning, projections can be generated.	The use of the appropriate equipment also prevents this type of damage as the operator maintains a safe position with respect to the direction of the strap in the event of breakage.	Considering the methods of execution and the type of equipment used, the risk can be considered extremely reduced.	1	1	1

Table 83 - Strapping machine risks list

PPE	
Shoes	Safety shoes with reinforced toe and rubber sole with non-slip profile
Gloves	Protective gloves against mechanical risks with knurled rubber palm

Table 84 - Strapping machine PPE list

Equipment: Food processor

Electrically powered machine used to knead, mix, chop and mince ingredients. It consists of a base, a planetary mixer and accessories such as hooks, whisks and beaters.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Burns: possible risk in case of handling hot food during pouring into the planetary mixer.	Workers are prohibited from pouring excessively hot food into the blender that could damage the machine. Workers must wear heat-resistant protective gloves when handling very hot food.	Risk reduced both due to the method of use of the equipment and the fact that workers have heat-resistant gloves.	2	1	2
Electrocution: since the machine is electrically powered, the possibility of contact with live parts of the machine itself or its power cable cannot be excluded.	The live parts have been made inaccessible by means of fixed protections. The connection cables are enclosed within a double protection sheath. There are protection devices on the electrical system which, in the event of an accident, provide for the prompt disconnection of the current.	Electrocution is only possible if the protections that prevent contact with live parts are removed. The removal, tampering or exclusion of safety devices and systems is prohibited to all workers.	1	3	3
Contact with moving parts: there are moving parts inside the machine.	All moving parts of the machine are enclosed within the machine itself and segregated from contact by means of protections.	Contact with moving parts can be excluded unless the machine's protections are intentionally removed. This event represents a transgression of company behavioral rules.	1	3	3

Table 85 - Food processor risks list

PPE
No PPE deemed necessary

Table 86 - Food processor PPE list

Equipment: Tin welding machine

Welding used in the field of electronics for the creation of printed circuits in particular. The operator positions the component on the plate at the connection point, then solders the connections using tin as a filler material. With the use of a welding machine, the tin melts. The system is complete with fume extraction with an activated carbon abatement system. The whole system consists of a soldering iron equipped with pen and tweezers, air gun, infrared plate and extractor.

Risks	Measures Adopted	Residual Risk Assessment	P	D	R
Burns: High temperatures are present near the welding point with which the filler material melts. Therefore, exposure to high temperatures or accidental contact with hot material cannot be excluded.	The worker does not need to operate directly on the material being worked on, as the arc is generated at the end of the welding machine.	The risk of burns is considered low when workers carry out their work correctly.	2	2	4
Electrocution: Since the equipment is electrically powered, direct contact with live parts of the equipment that remain uncovered or indirect contact with metal parts under voltage following failures of the main protections of internal powered cables cannot be excluded.	The equipment is equipped with protection systems such as fixed screens that prevent accidental contact with live parts of the tool itself. The equipment has a ground connection. The electrical system has protection devices to protect the worker (grounding system and differential switch). The possibility of accidents in the event of incorrect behavior such as removing protections or incorrect use of the equipment cannot be excluded.	In the event of such events, the use of shoes with rubber soles makes it possible to effectively reduce the damage, as does working on wooden platforms or other measures useful in counteracting the risk.	1	3	3
Chemical Risk: In the welding process, due to the high temperature reached, metal vapors and combustion fumes are generated, mostly containing carbon and metal oxides. All these represent health risks while the safety risks, in this case, are absolutely negligible.	The use of table extractors reduces exposure to risk. The legislation on electrical components sets limits on the hazardous materials present. The quantity of material used and, consequently, of the products generated, is almost negligible, considering the type of activity carried out. The room in which the operations are carried out has sufficient volume to dilute the vapors.	Considering the working methods, the quantities used and the frequency of execution of the work, the risk is to be considered reduced.	2	3	6

Table 87 - Tin welding machine risks list

PPE
No PPE deemed necessary

Table 88 - Tin welding machine PPE list

Equipment: Metal shelving

Shelves are furnishings used for the storage of materials. They are placed in workplaces and appropriately anchored to fixed structures. The characteristics of the shelves determine the maximum load capacity of the individual shelves. Workers place loads on the different shelves using forklifts.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Falling: Events of this type can occur if workers climb on the lower shelves to reach the higher levels on which to place any material.	Objects handled more frequently are stored on the more easily accessible shelves, leaving objects handled less frequently on the higher shelves. A portable ladder is available within the department to allow workers to safely access the higher shelves without having to climb on the shelves. The prohibition of climbing on the shelves is highlighted by means of written information and signs affixed to the shelves themselves.	Considering the measures taken, it is evident that risks of this type can only emerge if workers do not respect the information received and highlighted by means of signs. In these cases, considering the height of the shelves themselves, the probability of serious damage occurring can be considered reduced.	1	3	3
Falling material from above: Events of this type can occur if the material is not positioned correctly on the shelves themselves. In this case, containers or part of the contents may fall in the case of loose material.	The shelves are made in such a way as to support the expected weights based on the type of loads stored, both in terms of weight and width of the shelves. The shelves themselves are anchored to fixed structures to guarantee their stability. The maximum load capacity is highlighted by means of signs affixed in a visible place. Workers are informed of the prohibition of loading the shelves with weights exceeding their capacity. In order to reduce damage, the heaviest weights are stored on the lower shelves.	Damaging events can occur in the event of errors in loading the shelves (excessive weight or incorrect storage). Therefore, compliance with the rules transmitted to workers is an essential measure to avoid such risks. A further risk condition may be the failure of the structures or the coupling devices; it is therefore necessary to proceed with periodic checks of the condition of the shelves and the maintenance of their safety status.	2	2	4

Table 89 - Metal shelving risks list

PPE	
Shoes	Safety shoes with reinforced toe and rubber sole with non-slip profile
Gloves	Protective gloves against mechanical risks with knurled rubber palm

Table 90 - Metal shelving PPE list

Equipment: Electrodynamic shaker

The shaker is a machine used to test the resistance of components and structures to mechanical vibrations. By simulating the dynamic stresses that devices will undergo during launch or operation in space, the shaker allows verification of their reliability and robustness. The system consists of an electronically controlled vibrating platform, capable of generating vibrations with different frequencies and intensities. To ensure safety during operations, the machine is equipped with advanced fixing systems and protections against the risk of detachment of the tested components.

Risk	Measures Adopted	Residual Risk Assessment	P	D	R
Noise and vibrations: During operation, the shaker generates high levels of noise and vibration that can cause hearing damage and musculoskeletal disorders.	The use of ear protection helps to contain the damage.	The risk, although not excludable, is considered reduced thanks to the use of appropriate personal protective equipment. Given the current conditions, it can be excluded that events occur that could cause damage to workers, unless protective headphones are not used.	2	2	4
Crushing: Possibility of entrapment or impact with the moving parts of the load fixing system.	The machinery is designed with specific physical barriers and protections around the moving parts, thus ensuring a high level of safety. It is equipped with an easily accessible emergency stop, which allows rapid intervention in case of need. In addition, the work area is clearly marked with specific safety signs to highlight danger zones. Workers operating this machinery receive adequate training, are informed about the risks and trained to use the equipment safely and responsibly.	Although it is not possible to completely eliminate the risk, the mitigation measures adopted allow it to be reduced significantly and effectively.	1	3	3
Electrocution: The machines are electrically powered.	All live points of the machinery are made inaccessible by fixed protections secured by locking systems. The connection cables pass inside protective sheaths. Protective systems have been	The risk can be excluded unless the worker removes the protections that prevent access to the live parts of the equipment. In the event of events	1	3	3

	installed on the electrical system to interrupt the power supply in the event of contact with live parts (grounding system, differential switch, etc.)	of this type, the damage that can be generated can also be serious.			
Projections: In the event of incorrect load fixing, sudden detachments with projection of materials at high speed may occur during the test.	Before starting, the operators carefully ensure that the load is securely fastened. To ensure maximum safety during operations, transparent protections are used to shield the test area. Furthermore, access to the test area is strictly limited to prevent risky situations.	Although it is not possible to completely eliminate the risk, the mitigation measures adopted allow it to be reduced significantly and effectively.	1	3	3
Manual handling of loads: The activities of loading and unloading the machine expose the worker to the risk of musculoskeletal disorders related to the weights lifted and the frequency of handling.	Specific aids are used for handling loads, in order to facilitate operations and reduce the risk of accidents. The workstations are designed ergonomically, to ensure maximum comfort and prevent physical discomfort. In addition, adequate training is provided on the correct postures to adopt during work activities, thus helping to promote a safe and healthy work environment.	Although it is not possible to completely eliminate the risk, the mitigation measures adopted allow it to be reduced significantly and effectively.	1	2	2
Fire: Possible overheating of electrical components or excessive friction between moving parts.	Periodic checks of the temperature of critical parts are carried out to ensure correct system operation. There is an efficient cooling system, designed to keep temperatures within safe limits. In addition, suitable fire extinguishers are available nearby, ready for use in case of emergency.	Although the risk has not been eliminated, measures have been taken to contain the effects of any fires.	2	3	6

Table 91 - Electrodynamic shaker risks list

PPE	
Gloves	Protective gloves against mechanical risks with knurled rubber palm
Shoes	Safety shoes with reinforced toe and rubber sole with non-slip profile
Protective clothing	Disposable jumpsuit
Mask	Protective mask with FFP1 or higher filter
Glasses	Polycarbonate protective glasses with side shields
Headphones	Ear muffs or earplugs

Table 92 - Electrodynamic shaker PPE list

Equipment: LCD 3D Printer

Resin 3D printers are particularly suitable for sectors such as jewelry, dental, and audiology. But also for those engineering applications that require particular precision in details. The processes take place using special resins.

Hazard Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Electrocution: due to contact with live parts of the machinery or the power supply cable.	All live points have been made inaccessible to contact by means of fixed guards. Safety systems (differential switch and grounding system) are installed on the electrical system, which prevent the risk of direct and indirect contact.	The risk is possible if the protections are removed, after which it is possible to access the points at risk of electrocution. Interventions of this type are prohibited by company regulations.	1	3	3
Burns: following contact with the hot surfaces of the machinery.	The heating element is only activated when the door is lowered; in this way, the plate only heats up when it is not accessible to contact. The lever that allows the upper plate to be lowered is made of heat-resistant plastic material.	The risk is to be excluded, considering the installed safety systems. Minor burns may occur in the event of accidental contact when lifting the door.	1	1	1

Table 93 - LCD 3D Printer risks list

PPE	
Gloves	Gloves Impermeable protective gloves in nitrile or vinyl

Table 94 - LCD 3D Printer PPE list

Equipment: Laser printer

Office printer, electrically powered, with which it is possible to print on sheets of paper. Inside the machine, a laser operates which traces the parts to be printed on the sheet to which the magnetized toner adheres. After the toner is applied, the sheet undergoes a fixing treatment and is ejected. The operator has the task of feeding the blank sheets and collecting the printed sheets; occasionally, with a frequency dependent on the extent of use, the toner cartridge is replaced by removing the empty cartridge.

Risk Identification	Measures Taken	Residual Risk Assessment	P	D	R
Contact with moving parts: the machinery is equipped with moving parts that can cause trapping and cuts.	All moving parts of the machine have been made inaccessible by means of fixed screens.	The risk can be excluded, unless the protections are removed or the safety systems installed on the machine are excluded. The above is explicitly prohibited by company regulations.	1	3	3
Chemical risk: related to possible exposure to toner dust during cartridge replacement. To date, no serious effects on the health of those exposed to toner dust have been reported.	The toner is not handled directly as it is contained within cartridges or cylinders that are completely replaced. Workers have been instructed to operate with wet cloths to remove any toner residue that may have escaped from the cylinder.	The methods with which the operation is carried out allow the risk of exposure to the chemical agent to be considered very low. Likewise, the frequency and duration of the operation are extremely limited. Furthermore, the agent itself has very low dangerousness.	1	1	1
Electrocution: since the equipment is electrically powered, the possibility of direct or indirect contact with live points of the equipment itself or the connection cable to the power supply network cannot be excluded.	All equipment supplied to workers is manufactured in compliance with the applicable technical standards, also for the electrical part, as certified by the CE marking on the same. The live points have been made inaccessible by means of fixed protections that prevent contact with them unless they are removed or fail. The power cables are enclosed within a double protection sheath. Protection devices are present on the electrical system which, in the event of an accident, provide for the timely disconnection of the current. Except	Electrocutions are only possible if the protections that prevent contact with live points are removed. The removal, tampering or exclusion of safety devices and systems is prohibited to all workers. Even in the case of contact with live points, the presence of a residual current circuit breaker ensures that the effects are not lethal.	1	3	3

	for double-insulated equipment, or where the external structure is made of plastic, all electrical tools are equipped with grounding which allows connection to the building's system, in order to reduce the risk associated with indirect contacts.				

Table 95 - Laser printer risks list

PPE
No PPE deemed necessary

Table 96 - Laser printer PPE list

Equipment: Manual pallet truck

Manually operated lifting equipment with a hydraulic system for vertical lifting of the forks. Pallets are transported by inserting the forks into the designated openings in the pallets and lifting the forks until the pallet is off the ground.

Hazard Identification	Measures Taken	Residual Risk Assessment	P	D	R
Manual Handling of Loads: Depending on the weight of the pallet being moved, workers may be exposed to a variable level of risk associated with pulling and pushing operations.	The equipment is equipped with systems to reduce the effort required to move the transported load. The flooring of the work area does not have holes or unevenness that could create additional risks.	The risk should be evaluated considering the condition of the flooring, the equipment, and the weights being moved. The frequency of performing the activities is also an essential element in defining the level of risk.	1	3	3
Crushing: Possible in the event of impact with the moving pallet truck or due to falling transported material.	The pallet truck controls are located on the opposite side of the transported load. Workers are required to wear safety shoes with reinforced toe caps to reduce injuries.	The risk cannot be excluded; however, correct operation reduces the risk of accidental events, and the use of personal protective equipment ensures that the damage related to such events is limited.	2	2	4

Table 97 - Manual pallet truck risks list

PPE	
Shoes	Safety shoes with reinforced toe caps and rubber soles with non-slip tread
Gloves	Protective gloves against mechanical risks with a knurled rubber palm

Table 98 - Manual pallet truck PPE list

Equipment: Bench drill

The bench drill is a power tool for metalworking. The machine consists of a central body where the point slides vertically towards the support surface of the pieces, where the workpiece clamp is also located. The machine is used for making holes in metal components.

Hazard Identification	Measures Taken	Residual Risk Assessment	P	D	R
Contact with Moving Parts: The machine has moving parts that can cause crushing, entanglement, and cuts.	All moving parts of the machine have been made inaccessible by means of fixed guards. Contact with the moving parts of the gearbox is prevented by an openable door connected to a microswitch designed to stop the machine from operating if opened.	The risk can be excluded unless the guards are removed or the safety systems installed on the machine are disabled. The above is explicitly prohibited by company regulations.	1	3	3
Entanglement and Abrasions: The drill bit that removes the chips operates by rotation. Therefore, the possibility of contact with the bit itself while it is rotating exposes workers to risk.	A rotating protective screen connected to a microswitch is installed around the working area of the bit. If the screen is rotated, the machine stops operating.	The risk can be excluded unless there are incorrect maneuvers, removal of protective devices, or disabling of safety systems.	2	2	4
Electrocution: Possible risk in the event of direct contact with live points of the machine or connection cables, or in the event of contact with grounded metal parts.	All live points on the machine are made inaccessible by means of fixed guards secured with locking systems. The connecting cables run inside protective sheaths. Protective systems have been installed on the electrical system to cut off the power in the event of contact with live parts (grounding system, differential switch, etc.).	The risk can be excluded unless the worker removes the guards that prevent access to the live points of the equipment. In the event of events of this type, the damage that can be generated can also be serious.	1	3	3
Crushing: Possible in the event of the piece falling when being placed on the work surface or when being picked up after processing.	Workers are required to wear safety shoes with reinforced toe caps to reduce injuries.	Events of this type cannot be excluded; however, the use of personal protective equipment reduces the damage.	2	2	4
Cuts: Due to contact with sharp surfaces of the pieces to be worked or due to contact with the tool when changing the drill bit.	The use of protective gloves reduces the damage related to events of this type.	Although events of this type cannot be excluded, the use of protective gloves helps to contain the damage.	2	2	4

Projections: During the processing of the pieces, projections of material such as dust or fragments of the piece being processed or the drill bit can be generated.	A screen has been installed around the bit and the work area to prevent the risk.	The risk can be excluded unless the worker removes the guards or disables the safety systems installed on the machine.	1	2	2

Table 99 - Bench drill risks list

PPE	
Shoes	Safety shoes with reinforced toe caps and rubber soles with non-slip tread
Gloves	Protective gloves against mechanical risks with a knurled rubber palm
Protective clothing	Work clothes with long sleeves and pants and elasticated ends
Glasses	Polycarbonate safety glasses with side shields

Table 100 - Bench drill PPE list

Work activity: Ground activities in the warehouse

In performing work activities, the operator may need to work on the ground in relation to the vehicle. These activities may include: picking up material, wrapping a pallet, checking material on shelves, preparing pallets. These activities are carried out, when possible, within specific work areas but, especially with regard to picking up packages from shelves, this may require the operator to get off the vehicle.

Hazard Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Collision: The operator on the ground is exposed to the risk of collision by vehicles operating within the warehouse.	Pallet preparation operations are generally carried out within designated work areas or, in any case, outside the vehicle lanes normally used. Within the aisles between the shelves, the operator can only get off the vehicle while wearing clothing with reflective strips in order to increase their visibility; overtaking a vehicle within an aisle is regulated by a procedure aimed at minimizing the risk of collision.	The presence of marked lanes and specific areas for pallet storage minimizes the risk. Regarding foot injuries, operators wear safety shoes with reinforced toe caps.	2	3	6
Manual Handling of Loads: The activity requires moving heavy loads, including empty wooden pallets.	Manual handling of loads mainly involves moving materials of limited weight. The height of stacks of empty pallets, from which pallets are taken to form the pallets, are chosen in order to contain this risk as well. Workers have received adequate training on the risk of manual handling of loads and on the correct methods of handling them.	Risk not entirely excludable but reduced by technical and organizational measures. Health surveillance allows adequate monitoring of the physical conditions of workers. It is considered necessary to plan specific training interventions on the maneuvers normally performed by workers.	2	3	6
Crushing: During the handling of heavy material, mostly when handling empty wooden pallets, the operator could suffer crushing of their hands and feet. When preparing pallets, crushing can occur due to impact between pallets or palletized loads.	Workers must wear protective gloves against mechanical risks, with a knurled rubber palm to increase the grip of the objects handled. The height of the stacks of pallets from which to take the pallets to be formed has been chosen in order to reduce the risk of loss of control and damage resulting from the fall.	Risk not entirely excludable but effectively contained by the individual protection measures and procedures adopted. The importance of monitoring compliance with behavioral rules is highlighted in order to avoid risky conditions.	2	3	6

Cuts and Abrasions: During the handling and movement of material such as, for example, empty wooden pallets, the operator may suffer injury, mostly to the hands.	The handling of potentially sharp or abrasive material takes place with the use of protective gloves against mechanical risks.	Risk reduced to a minimum provided that workers wear the prescribed personal protective equipment.	2	1	2

Table 101 - Ground activities in the warehouse risks list

PPE	
Shoes	Safety shoes with reinforced toe cap and rubber sole with non-slip profile with anti-perforation foil
Gloves	Protective gloves against mechanical risks with knurled rubber palm
Protective Clothing	High visibility clothing

Table 102 - Ground activities in the warehouse PPE list

Work activity: Kitchen activities with electric plates

Various food preparation activities are carried out in the kitchen. Depending on the dishes to be prepared, it may be necessary to use knives and other manual tools, electric appliances such as mixers, robots, etc. The kitchen also contains electrically powered plates for cooking food in pots and pans, as well as an oven and refrigerator. Periodically throughout the day, the room, countertops, and all objects used for food preparation are cleaned.

Risk	Mitigation Measures	Residual Risk Assessment	P	D	R
Burns: Possible in case of accidental contact with high-temperature points of the oven or electric plates, as well as in case of errors in handling pots and pans.	The temperature of the plates can be adjusted using the knobs. Correct operation involves heating the plates only after the pot or pan has been placed on them; in this way, the risk of direct contact can be considered reduced. The pots and pans are equipped with plastic handles or, in any case, made of material with reduced thermal conduction, and the use of pot holders further reduces the possibility of contact with high-temperature points. Inside the oven, there are several removable shelves, thanks to this, the removal of products can take place safely, as the shelf is first extracted; then, the products or the container are removed when they are outside the oven.	The risk of burns, although of reduced intensity, cannot be excluded during the various operations. However, the risk is linked to behavioral errors in the performance of the activities themselves.	2	2	4
Projections: Liquid projections cannot be excluded in case of contact between cold liquid products, for example water, and high-temperature liquids, such as oil. During the cooking of some products in oil, splashes occur.	The use of lids helps reduce the risk by preventing particles of cold liquids from ending up inside the hot liquids in the pots.	The projections that occur normally represent a contained danger.	2	1	2
Electrocution: The presence of an electrical system and the use of some electrically powered	All live parts of the electrical appliances used in the kitchen, as well as those of the appliances and the electrical system itself, have been made	The risk is only possible if the worker removes the protections that prevent access to dangerous points. The safety systems on the electrical system ensure	1	3	3

tools do not completely exclude the risk of contact with live parts, both directly and indirectly.	inaccessible by means of fixed protections. Furthermore, the metal parts are connected to the earthing system in order to avoid indirect contacts. The system has been installed with systems to interrupt the power supply in case of faults or overloads, such as a magneto-thermal switch and a differential switch. There are three-hole plugs that prevent, thanks to the diameter, access to live points. The electrical system was built in compliance with technical standards, as per the declaration of conformity, as well as the electrically powered equipment and appliances, "CE" certified.	that, even in the event of accidents, the power supply is promptly interrupted.			
Biological Risk: The handling of food products does not exclude the possibility of contact with dangerous biological agents remaining on the products as raw, in particular from animals. Among the germs that may be present in food products, the following are identified: staphylococci, salmonella, botulinum.	The handled products are subject to specific legal controls before being placed on the market. Specific storage methods are also respected to reduce the risk. The use of protective gloves is a suitable protection measure to avoid contact with products, as is proper personal and tool hygiene.	The use of protective gloves and compliance with hygiene rules allow the risk to be considered reduced, as well as the fact that the products are purchased from authorized vendors.	2	2	4
Crushing: Possible in case of falling heavy material (e.g. pots) during the movement from one floor to another.	Workers are required to wear safety shoes with reinforced toecaps. The pots, pans and trays themselves are equipped with handles to ensure a correct grip and thus reduce the risk of falling.	The risk cannot be completely excluded. However, the correct operation and the use of the planned protective devices ensure that this is reduced.	1	2	2
Cuts: Accidents of this type can occur as a result of errors in the use of manual tools, such as knives, or in the event of accidents involving the breaking of glass objects. When using and cleaning some electrical appliances, such as whisks, robots and slicers, cuts can occur; more serious accidents cannot be completely excluded in the event that the appliance itself is switched on during cleaning.	The knives are equipped with a non-slip and ergonomic handle to ensure adequate and stable grip of the tool itself. There are different types of knives with characteristics suitable for the different foods to be cut: for harder foods it is necessary to use more sharpened knives, unlike softer foods; in this way it is possible to reduce the use of the most sharpened knives only to foods for which this is necessary. Furthermore, since the knives are	Under normal conditions, cuts can occur due to errors in handling knives. In many of these cases, the gloves used are effective in protecting the worker. Correct operation also ensures that accidents do not occur in the handling of cutting parts of household appliances.	2	2	4

	periodically sharpened, their use does not require the application of high force, thus reducing the risk of loss of control of the tool. The cutting parts of the appliances are connected directly to non-cutting parts that allow to handle the pieces without risk of cuts. Small appliances, such as whisks, robots, etc. must necessarily be cleaned not in operation as they are equipped with systems that prevent access to dangerous points, such as blades, before the operation of the appliance has been actually stopped. Finally, in case of breakage of glass products, the residues are collected not manually but with the use of brooms and shovels in order to avoid contact with cutting parts.				

Table 103 - Kitchen activities with electric plates risks list

PPE	
Gloves	Waterproof protective gloves in nitrile or vinyl
Shoes	Safety shoes with reinforced toecap and rubber sole with non-slip profile
Hairnet	Protective hairnet

Table 104 - Kitchen activities with electric plates PPE list

Work activity: Lithium battery charging and discharging

This category includes charging and discharging activities performed on Lithium-ion batteries. Within the technology laboratory, the batteries are placed on a suitable workbench positioned under a fume hood. The battery is connected to control and monitoring equipment so that it can be charged and/or discharged to perform tests. Initially, the battery has a state of charge (SoC) of less than 10%. Note that this does not correspond to 0 V at the power connector terminals, and care must be taken when handling the battery to avoid short-circuiting it. This requires the use of insulating cleanroom gloves and non-conductive equipment. The battery contains a large amount of electrical energy. Even when the battery is discharged to 0% SoC, it still maintains a potential difference. For this reason, standard electrical safety precautions must be taken. These interventions are carried out extremely infrequently.

Risk	Adopted Measures	Residual Risk Assessment	P	D	R
Explosion: If batteries are overcharged, the increase in internal pressure within the cells that make up the battery can cause an explosion.	The batteries incorporate protection devices capable of reducing internal pressure, such as a rupture disc. Charging activities are managed by an automatic control system capable of detecting the battery's status and temperature in real-time and interrupting the activity in the event of thermal and/or electrical anomalies. A metal shield designed to contain the explosion is positioned between the battery and the operator.	The risk cannot be completely excluded due to errors in the execution of procedures, even though tests show that to cause an explosion, it is necessary to overcharge the cells for several hours to exceed 250% of the maximum useful charge. Informing workers and constantly monitoring safety conditions in the premises (e.g., clear escape routes) is a useful measure to further reduce the risk.	2	2	4
Fire Hazard: Batteries contain Lithium and other combustible chemicals. Potential ignition sources include electrical arcs and increased temperature and pressure due to battery overload.	Batteries incorporate protection devices capable of electrically isolating the cells in the event of increased temperature or internal pressure. A Class D fire extinguisher specifically for fires involving Lithium is present near the batteries. A fire blanket is also present. Charging and discharging activities are managed by an automatic control system capable of detecting the battery's status and	Accidents cannot be completely excluded due to errors in the execution of procedures. Informing workers, in addition to constantly monitoring the safety conditions of the premises (e.g., clear escape routes) and extinguishing systems, is a useful measure to further reduce the risk.	2	2	4

	temperature in real-time and interrupting the activity in the event of thermal and/or electrical anomalies. An emergency button allows the operator to manually isolate the battery if they notice the presence of fumes generated by the battery, which are precursors to cell fire.				
Electrocution: Possible risk in the event of direct contact with live parts of machinery or connecting cables or in the event of contact with grounded metal parts.	All live parts of the machinery are made inaccessible by means of fixed protections secured with locking systems. The connecting cables run inside protective sheaths. Protective systems have been installed on the electrical system to interrupt the power supply in the event of contact with live parts (grounding system, differential switch, etc.).	The risk can be excluded unless the worker removes the protections that prevent access to the live parts of the equipment. In the event of such incidents, the damage that can be generated can also be serious.	1	3	3
Chemical Risk: Correlated to the use of chemical agents.	The quantities of chemical agents used are extremely small. The workers who carry out activities in the galenic laboratories are graduated professors, therefore, trained about the risks related to the use of chemical agents and the measures suitable for protection. The employer provides them with adequate personal protective equipment, including gloves, goggles, and a mask.	Although the level of exposure is extremely low, the chemical risk for teachers working in the laboratory cannot be considered low.	2	3	6
Burns: The use of flame means that there is a risk of burns in the event of accidental contact with the flame or with high-temperature samples.	The use of specific equipment and, when necessary, protective gloves allows the safe handling of high-temperature objects.	The risk is to be considered contained unless there are errors on the part of the operator.	2	2	4

Table 105 - Lithium battery charging and discharging risks list

PPE	
Gloves	Gloves made of electrically non-conductive material
Glasses	Polycarbonate safety glasses with side shields

Table 106 - Lithium battery charging and discharging PPE list

Work activity: Work at clients & suppliers

This sheet considers the common risks always present when carrying out activities at clients. Refer to the information on specific risks that the client must provide to the contracting companies.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Electrocution: The presence of an electrical system and electrically powered equipment does not exclude the possibility of direct or indirect contact with live parts.	Regulations require that all live parts of the electrical system be made inaccessible by means of fixed protections (shields, sheaths, and conduits). Furthermore, conductors are passed through protective sheaths. The presence of a grounding system prevents the risk of indirect contact. The presence of a differential switch is an essential measure to reduce damage related to accidental contact with live parts.	In the presence of a standard electrical system, the possibility of accidental contact with live parts can be excluded, unless the conductor protections are removed, or in the event of tampering with safety systems, including the grounding system and the differential switch. Informing workers of the risks associated with the presence of an electrical system is a useful measure to reduce risk, as is the preparation of procedures and a register of checks to be carried out periodically in order to highlight any anomalies.	1	3	3
Fallings: Risk cannot be excluded in the event of work in an elevated position not adequately protected by systems such as parapets.	Under normal conditions, it can be excluded that the elevated areas are not equipped with parapets to prevent falls from above.	The risk is normally excluded, unless there are structural deficiencies in the work environment or incorrect behavior.	2	3	6
Level falls: Possible due to accidental contact with material improperly left on the ground (pallets, plastic film, etc.).	Usually, within the workplace, areas are identified for the storage of material, in order to ensure transit lanes and work areas.	Risk cannot be excluded in the event of failure to comply with company regulations regarding storage or material inside. The damage that can be generated is to be considered overall contained.	2	2	4
Microclimate: The fact that workers also operate outdoors exposes them to both low and high temperatures. During the cold seasons, workers wear protective clothing suitable for the temperature and can still take shelter inside sheds or structures available to them to warm up. During hot periods, workers can obtain fresh water to	The risks associated with the external climate are extremely variable. In order to fully assess the risk, the heat index calculation can be implemented, in order to evaluate the risk linked to heat from time to time.	2	2	1	2

lower the temperature and restore fluids lost through sweating, and the pace of strenuous work is reduced. Workers are provided with breathable personal protective equipment to be used during the hot months.					
UV Rays: In case of prolonged stay outside, workers may be exposed to ultraviolet rays.	The use of specific protective creams and suitable clothing allows to reduce the risk	The correct use of protective equipment significantly reduces the risk, although it is not possible to exclude it completely.	1	1	1
Fire Risk: Inside the premises there are generally combustible materials such as paper, plastic and wood. Possible sources of ignition include electrical faults or overloads that can cause ignition of the sheaths or sparks related to short circuits. Furthermore, inside the premises, depending on the type of activity carried out, there may be further sources of ignition.	The presence of an electrical system equipped with safety systems to avoid overloads or, in the event of faults and dispersions, allows to contain the risks of ignition. Portable fire extinguishers are present inside the premises so as to allow workers to intervene promptly in case of emergency.	Although the risk cannot be completely excluded, the type of activity carried out does not present specific fire hazards. Informing workers, in addition to constantly checking the safety conditions in the premises (e.g. accessibility of escape routes), the electrical system and the extinguishing systems, is a useful measure to further reduce the risk.	2	2	4
Crushing: Related to falling material. The risk cannot be excluded. possibly present in the premises.	Companies generally provide specific areas for storage, located at a safe distance from transit lanes.	The risk cannot be excluded.	2	2	4
Slips: Risk cannot be excluded, particularly in the event of spillage of liquid products on the ground.	Workers must wear shoes with rubber soles and non-slip profiles in order to reduce the risk.	Possible risk, although limited both in terms of possibility and foreseeable damage.	2	2	4
Impacts: Against structures and materials present inside the work environment.	Inside the workplace, in general, areas are identified for the storage of material, transit lanes and work areas.	Accidents of this type can occur due to inattention on the part of workers when passing inside the construction site. In the event of an accident, it is difficult to have significant consequences such as to cause absence from work	2	1	2

Table 107 - Work at clients & suppliers risks list

PPE
No PPE deemed necessary

Table 108 - Work at clients & suppliers PPE list

Work activity: Night work

Shift work, and particularly night shifts, can expose workers to specific risks.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Work-related stress: Performing night work exposes individuals to risks such as cardiovascular problems, sleep and eating disorders, etc., typical of exposure to work-related stress. Effects include both health damage and an increased risk to safety due to reduced attention.	Workers who perform night shifts are chosen based on specific characteristics and only after a specific medical examination.	The risk cannot be completely excluded but can only be contained through monitoring of the operator's health and their collaboration.	2	2	4
Harassment: Harassment is defined as any unwanted behavior, carried out for reasons of race or ethnic origin, which has the effect of violating a person's dignity and creating an intimidating, hostile, degrading, humiliating, or offensive climate.	Staff training: Extend the risk in regular training programs to sensitize employees on issues of harassment and discrimination. Promoting an inclusive and respectful work environment that values diversity and promotes mutual respect among all employees. Designing and organizing work spaces taking into account the needs of all genders in order to make them accessible and safe.	Structural and organizational conditions that do not favor gender equality.	2	3	6
Violence: Violence is defined as any behavior that causes physical, psychological, sexual, or economic harm to a person, compromising their safety, health, well-being, and dignity. This definition includes acts of coercion or threat, with the aim of intimidating or controlling an individual, creating a dangerous and intimidating work environment.	Training: Training programs to sensitize employees and managers. Reporting Procedures: Safe and confidential systems for reporting incidents of violence.	Structural and organizational conditions that do not favor gender equality.	2	4	8

Table 109 - Night work risks list

PPE
No PPE deemed necessary

Table 110 - Night work PPE list

Work activity: Missions abroad

This activity may involve missions abroad. This sheet considers the most common risks to consider, but refers to the specific procedure for managing individual missions and the precise assessment of risks in order to identify effective countermeasures. This sheet does not consider the dangers related to the specific work environment where the worker will have to go, for which reference should be made to the specific sheet of the work environment.

Risk Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Aggression: During the mission, the worker may be attacked by other people for economic, political or religious reasons.	At the time of the mission assessment, through the Ministry channels, any dangerous conditions related to the expected period of the mission are identified. Information on local conditions and behaviors to be held are shared with the worker.	Incidental events of this type cannot be excluded, but the pedestrian respect of the rules indicated by official channels allows to contain these risks. It is useful to collect, after each mission, detailed indications in order to evaluate changes in the event of a subsequent mission.	2	3	6
Biological Risk: Some countries present dangers of infection from territorial biological agents.	The worker is informed of the vaccination practices necessary to be able to go to the country of destination. The ticket for the mission is given to the worker only upon verification of the completion of the vaccination protocol.	Vaccination significantly reduces the risks, but workers need to maintain a hygienically safe behavior during their stay.	2	3	6
Harassment: Harassment means any unwanted behavior, put in place for reasons of race or ethnic origin, which has the effect of violating the dignity of a person and creating an intimidating, hostile, degrading, humiliating or offensive climate.	Staff training: Extend the risk in regular training programs to sensitize employees on issues of harassment and discrimination. Promote an inclusive and respectful work environment that values diversity and fosters mutual respect among all employees. Structural and organizational conditions that do not favor gender equality.	Design and organize work spaces taking into account the needs of all genders in order to make them accessible and safe.	2	2	4
Violence: Violence is defined as any behavior that causes physical, psychological, sexual or economic harm to a person, compromising their safety, health, well-being and dignity. This definition	Training: Training programs to sensitize employees and managers. Reporting Procedures: Secure and confidential systems for reporting episodes of violence.	Structural and organizational conditions that do not favor gender equality.	1	4	4

includes acts of coercion or threat, with the aim of intimidating or controlling an individual, creating a dangerous and intimidating work environment.					

Table 111 - Missions abroad risks list

PPE
No PPE deemed necessary

Table 112 - Missions abroad PPE list

Work activity: Minor maintenance interventions

This category includes minor maintenance interventions, including gluing pieces, unblocking, and lubrication. These interventions are carried out with extremely low frequency.

Hazard Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Crushing: In case of using hammers and other impact tools.	The tools are equipped with a shaped handle to ensure an adequate grip of the equipment itself.	The risk of crushing is possible in case of errors in the use of hammers, following which damage, foreseeably, to the free hand may occur. In order to reduce the risk, it is possible to evaluate the adoption of hammers with a rubber head.	2	2	4
Cuts: Following incorrect use of tools with cutting surfaces such as scissors, cutters, saws, etc.	Manual tools are equipped with a handle that allows a firm grip of the tool; the handle itself is designed so that at least the hand holding the tool is safe from the risk of cuts. The cutters used have a retractable blade equipped with devices that prevent unintentional extraction of the blade. For the removal of notches of blades that are no longer usable, a special tool is used, placed on the handle of the tool itself, which reduces the risk of cuts at the time of removal.	Accidents cannot be completely excluded following errors in the use of these tools. Having tools in good condition, sharp scissors and cutters, etc., helps to reduce the risk by reducing the force that the worker must apply to the tool to perform the intervention. In this way, the worker can hold the tool with a secure grip. Considering that the correct use of tools is an essential measure to reduce the risk, it is necessary to provide information to workers about the risks associated with the use of tools and how to use them.	2	2	4
Chemical Risk: Related to the use of chemical agents such as oils, Svitol, threadlocker, etc.	Exposure to the products is extremely reduced considering the low frequency with which interventions of this type are performed. Considering the above and the fact that workers operate in adequately ventilated premises, the possibility of inhaling significant quantities of products can be excluded. Contact, although not	Considering the reduced danger of the products used, the risk is to be considered contained.	2	1	2

	excludable, is reduced as workers use protective gloves.				

Table 113 - Minor maintenance interventions risks list

PPE	
Gloves	Protective gloves against mechanical risks with knurled rubber palm
Shoes	Safety shoes with reinforced toe cap and rubber sole with non-slip profile
Glasses	Polycarbonate protective glasses with side shields
Ear protection	Earmuffs or earplugs

Table 114 - Minor maintenance interventions PPE list

Work Activity: Preparation of packages and shipping

The job involves the preparation and shipping of goods stored in the warehouse.

Hazard Identification	Measures Adopted	Residual Risk Assessment	P	D	R
Impacts: in case of impacts against structures or furniture against the material itself in the warehouse.	Presence of spaces suitable for the types of handling to be performed, training and information of personnel on the correct execution of work.	Although the risk cannot be excluded in consideration of the measures implemented under normal working conditions, the damage is reduced.	2	2	4
Crushing: during handling, damage to the feet cannot be excluded in the event of material slipping. There is also a risk of crushing hands in case of contact with fixed structures and the material.	Workers wear safety shoes with reinforced toe caps, which reduce damage in the event of impact.	Although crushing risks cannot be excluded, the resulting damage should be reduced also in consideration of the use of the identified personal protective equipment.	2	3	6
Punctures, cuts, abrasions: depending on the material handled, it cannot be excluded that this may cause cuts, punctures and abrasions to the worker's skin.	The use of appropriate personal protective equipment further reduces the risk.	The risk cannot be considered totally excluded.	1	2	2
Manual handling of loads: the weight of the material determines the presence of the risk. Depending on the type of handling, a specific assessment may be necessary.	Handling procedures, by reducing the load transported, contain this type of risk.	The risk cannot be excluded. The actual weight transported by the worker remains to be verified.	2	3	6

Table 115 - Preparation of packages and shipping risks list

PPE	
Shoes	Safety shoes with reinforced toe cap and rubber sole with non-slip profile

Table 116 - Preparation of packages and shipping PPE list

Work Activity: Replacement of toner and ink

Following the use of printers and fax machines, it is necessary to periodically replace the toner and ink of these devices. Both the toner and the ink are contained within specific containers, cartridges, and cylinders, which are completely replaced. The operation is performed manually.

Hazard Identification	Measures Taken	Residual Risk Assessment	P	D	R
Chemical risk: related to possible exposure to toner dust during cartridge replacement. To date, no serious health effects have been reported for those exposed to toner dust.	The toner is not handled directly as it is contained within cartridges or cylinders that are completely replaced. Workers have been instructed to use damp cloths to remove any toner residue that may have leaked from the cylinder.	The way the operation is performed means that the risk of exposure to the chemical agent is considered very low. Similarly, the frequency and duration of the operation are extremely limited. Furthermore, the agent itself has a very low level of danger.	1	1	1

Table 117 - Replacement of toner and ink risks list

PPE	
Shoes	Safety shoes with reinforced toe cap and rubber sole with non-slip profile

Table 118 - Replacement of toner and ink PPE list

4. General emergency management procedures

The definition of emergency procedures is an essential element for the protection of personnel and business continuity in an aerospace company. This process is based on a rigorous risk analysis carried out in the previous section, in which the work environment, the equipment used and the specific work activities were examined in depth. On the basis of this assessment, the measures to be adopted to deal with the main emergencies were outlined, identifying the most relevant sources of risk: fire, natural events, structural damage, health emergencies and emergencies, malicious acts, chemical emergencies and electrical blackouts.

For each of these critical issues, a targeted management procedure was defined to minimise damage and ensure timely and coordinated intervention. Particular attention was paid to the plant's clean room, a working environment that, due to its peculiarity and the specific highly specialised activities carried out within it, requires an assessment and dedicated emergency measures. The logic adopted involves the identification of potential sources of emergency, and for each one the definition of operational management procedures.

This integrated and systemic approach makes it possible to effectively coordinate human and technical resources, ensuring an appropriate response to critical situations and promoting the constant updating of security measures. The accurate definition of emergency procedures, therefore, not only ensures compliance with the regulations in force, but also helps to establish a culture of prevention and readiness, fundamental elements for the success and resilience of the company.

4.1. Sources of emergencies

In view of the highly specialised nature of the activities carried out within the company, it is crucial to proceed with an accurate identification of potential sources of risk that may arise in emergency situations. Considering the complexity of the operations carried out and taking into account the specific use of the site, the following possible emergency situations are hypothesised:

- Fire: caused by malfunctioning electrical systems, use of flammable materials or overloading of machinery, it represents a major threat to facilities and personnel safety; in addition, the handling of lithium batteries makes fire risk management more complex as it cannot be managed by 'conventional' methods.
- Natural events: such as earthquakes, floods or storms, which could affect the stability of company facilities and cause significant damage, disrupting operations.
- Structural damage: resulting from infrastructure failures or subsidence, potentially triggered by maintenance problems or external phenomena, capable of compromising the safety of buildings and operational areas.
- Health emergencies and medical emergencies: these include accidents at work, sudden illness or exposure to harmful substances, requiring the immediate activation of emergency response protocols.
- Chemical emergency: resulting from the use, storage or handling of hazardous substances, which could cause toxic gas leaks, environmental contamination or accidents involving explosive or flammable materials.
- Malicious acts or sabotage: including terrorist threats, theft of sensitive technology or intentional tampering that could endanger the safety of people, compromise infrastructure and disrupt production.
- Blackout: the sudden interruption of the electricity supply, which could paralyse production activities, damage security systems and block critical machinery, with consequences for the safety and efficiency of the company.

An accurate and thorough assessment of all these potential threats is the basis for the drafting of a comprehensive emergency and evacuation plan, capable of guaranteeing not only the protection and safety of the people on the company site, but also the safeguarding of the infrastructure, the protection of sensitive data and the business continuity of the company. A well-structured plan must include clear procedures and detailed instructions personnel, as well as constant training and periodic simulations in order to be ready to deal efficiently and quickly with any type of emergency.

4.1.1. Fire

A 'fire' is defined as the 'uncontrolled' combustion reaction of solids, liquids or gases in a place not prepared for purpose, following ignition by a thermal, mechanical, electrical or human energy source. In more technical terms, combustion is an exothermic oxidation-reduction reaction in which a 'fuel' undergoes oxidation while an 'oxidiser' is reduced, all triggered by an ignition source. For combustion to occur, thus closing the so-called 'fire triangle', the following elements must be present in the right quantities:

1) Fuels are substances capable of reacting with oxygen (or another oxidiser). According to their physical state, they are classified into solid, liquid and gaseous fuels, each of which gives rise to different types of fires: Class A fires arise from solid fuels, Class B fires from liquid fuels, and Class C fires from gaseous fuels. fundamental characteristic of each fuel is its calorific value, i.e. the maximum amount of energy that can be obtained from the complete combustion of a unit quantity of fuel under standard conditions. When dealing with a fuel it is essential to know its ignition temperature, i.e. the minimum temperature at which the fuel begins to emit sufficient vapours to sustain combustion, the ignition temperature, i.e. the temperature at which the fuel spontaneously ignites, and the flammability range, which is the concentration interval in which the ratio of fuel to oxidiser is such that combustion can take place. If the fuel to oxidiser ratio is outside this range,i.e. if is too much oxidiser (above the upper limit) or too much fuel (below the lower limit), combustion cannot take place.
2) Oxidising agents are all those substances capable of oxidising combustible materials, with oxygen in the air being the most common. Other oxidising agents, which may be liquid, solid or gaseous and which promote combustion, include potassium nitrate, potassium permanganate, hydrogen peroxide, potassium chromate and nitrous oxide.
3) Ignition sources are those heat sources necessary to raise the temperature of the fuel to the point where combustion starts. These can be classified into three categories: frictional ignition, direct ignition and indirect ignition. Frictional

ignition occurs when heat is generated by rubbing between two surfaces. Direct ignition occurs when a flame, spark or glowing material comes into contact with a fuel in the presence of oxygen. Indirect initiation, on the other hand, occurs when heat is transmitted through convection (transport heat accompanied by the movement of matter), conduction (transmission of heat through solid materials) or radiation (when heat energy spreads in the form of electromagnetic waves).

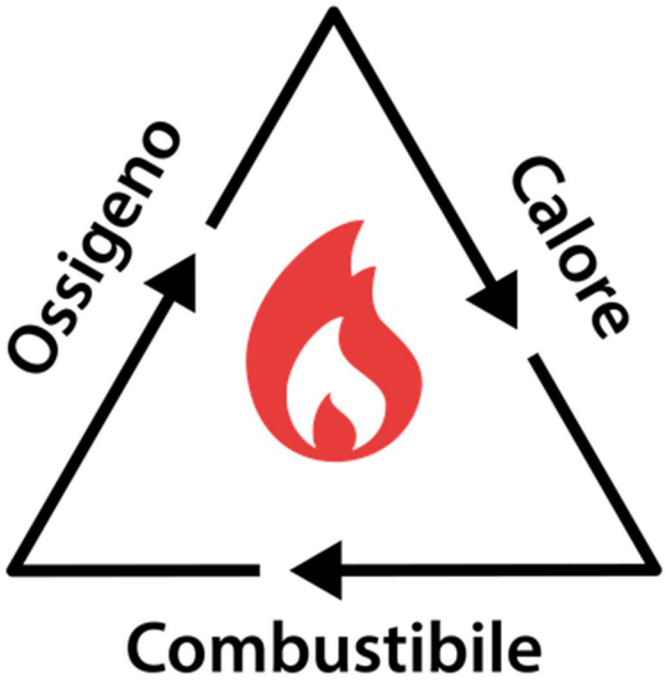


Figure 3 - Fire Triangle

Each fire is characterised by four distinct phases:

1) **Ignition:** in this phase, the combustion process begins as result of a heat source heating the fuel its ignition temperature. The propagation of this phenomenon necessarily requires the simultaneous presence of the three elements described above and defined as the sides of a hypothetical fire 'triangle'. In the absence of even one of the factors, ignition, and therefore the fire, cannot occur. Acting on one of the sides of the fire triangle involves extinguishing the fire. This operation takes on different names depending on the component involved: separation (if the fuel is removed from the fire),

smothering (if contact between the air or oxygen and the fuel is prevented), cooling (if the temperature is lowered below the ignition temperature of the substances). At this stage, if the burning fuel is isolated from other flammable materials, the fire cannot spread and combustion stops once the fuel is exhausted. Conversely, if the burning material comes into contact with other flammable substances in its path, it can trigger the spread of fire.

2) **Propagation:** in this phase, the fire, transmitted by conduction, convection and radiation, spreads, progressively involving new combustible materials. During this phase, the heat generated by the flames increases the temperature of the surrounding materials, causing the phenomenon of pyrolysis, which consists of the decomposition of combustible materials under the effect of heat. Pyrolysis generates highly flammable gases and vapours, which mix with oxygen in the air, creating ideal conditions for the flames to expand.
3) **Flashover:** in this stage the rate of combustion increases, the temperature rises and large volumes of smoke and gases are produced with sudden flame propagation through unburned gases and vapours. It represents the transition stage from a growing fire to a fully developed one where all combustible materials are involved in the fire simultaneously. Generally, this stage involves a temperature rise of up to 500/600° in a short time (5 to 25 min). Evacuation and rescue operations must take place before the onset of this phase because once flashover is reached, firefighters will not be able to intervene.
4) **Generalised fire:** above flashover temperature, most common materials become flammable and actively contribute to combustion. At this stage, heat transmission within buildings becomes significant and can seriously compromise the structural strength of elements such as walls, ceilings, pillars and beams. The deterioration and possible failure of load-bearing structures, together with the rapidity of fire propagation, make this stage particularly dangerous and difficult to manage.
5) **Extinction:** In this phase, the progressive exhaustion of the fuel begins a process extinction with gradual reduction of the generated heat flow. However, this cooling is slow and equally dangerous as apparently cold areas

may conceal latent fire that can give rise to a new ignition. This phase conventionally ends when the temperature falls below about 300°C.

Among the main effects fire on humans are several factors, including intoxication caused by combustion gases such as carbon dioxide (CO_2), carbon monoxide (CO), hydrogen cyanide (HCN) and hydrochloric acid (HCl), which are highly noxious substances that are the main cause of death during fires. In addition to intoxication, another relevant aspect is the intense heat generated by the combustion reaction, which can cause burns of varying severity and further impair the survival of those exposed. In addition, the human body responds to these extreme conditions with a series physiological reaction, including the release of adrenalin, which part of the stress response mechanism, an increase in heart rate, which puts strain on the cardiovascular system, and an increase in the body's capacity to absorb toxins, which makes intoxication even more rapid and dangerous.

Fire Prevention and Protection

Fire Prevention', in the broadest sense of the term, is the discipline that studies and implements all measures aimed at preventing, reporting and reducing the probability of a fire occurring and limiting its consequences for people, property, production activities and the environment. As can be deduced from this definition, the scope of prevention includes not only fire protection measures, but also all training activities on risks and behaviour when planning a fire-fighting strategy.

Fire protection' is based on a complex of measures aimed at reducing the risks and damage caused by a fire (damage to people, structures, activities and the environment) by acting on the damage of the fire event (risk = probability x damage). In order to minimise fire risk, there must be adequate knowledge of the risks connected with the use of certain materials (e.g. specific calorific power), of the possibilities of physical separation of environments at high fire risk (also taking into account the possibility of relocation of rooms in the design phase), of the standards and systems available to obtain a certain degree of protection.

In a workplace, it is of fundamental importance to understand level of fire risk by defining, according to DM 2/09/2021:

- Level 3 activities (formerly high risk): working environments in which the presence of combustible materials is significant and/or in which hazardous work is carried out that significantly increases the risk of fire. In these environments, the rate of fire propagation is also very high. Examples are chemical industries, laboratories with highly combustible materials or places with difficult access for rescue teams. In these cases, the risk to people and structures is very high, and very strict protection and prevention measures are required. Some examples of activities that, according to the decree, fall into this level are:
    a) factories and explosives depots;
    b) thermal power plants;
    c) mineral oil and fuel gas extraction plants;
    d) indoor storage of combustible materials having a surface area greater than 20.000 m2;
    e) hotels with over 200 beds;
- Level 2 activities (formerly medium risk): these include environments where there is a greater presence of combustible materials, however, propagation is always low. Some examples of activities that, according to the decree, fall into this level are:
    a) workplaces included Annex I to Presidential Decree No. 151 of 1 August 2011 (i.e. activities subject to control by the Fire Brigade), excluding level 3 activities;
    b) temporary and mobile construction sites where flammable substances are held and used and open flames are used, excluding those that are entirely outdoors.
- Level 1 activities (formerly low risk): places where the probability of a fire developing is very low. In these environments, few combustible materials are present and propagation is low; they are also characterised by low occupancy density making evacuation quick and safe. These activities include all those that cannot be classified as level 2 and level 3.

Alarm and evacuation mode

The analysed facility is equipped an advanced fire safety system, which includes:

- EVAC system: dedicated to managing evacuation in the event of an emergency.
- Alarm buttons: Strategically placed to ensure rapid warning of possible dangers.
- Smoke and heat detectors: System designed for early detection of anomalies and potential fires.
- Emergency lights: Installed to ensure visibility and orientation even in the event of a blackout.
- Active extinguishing systems:
  - Manual: Includes fire extinguishers and flame blankets for rapid intervention.
  - Automatic: Includes an argon extinguishing system, specifically designed for particular working environments, such as the server room, ensuring effective extinguishing without compromising sensitive equipment.

Smoke detectors were installed in each room of the facility to ensure optimal coverage of the entire area. These devices are organised in loops, a configuration that allows more efficient and systematic management of smoke detection. Each loop is associated with one of the four detection areas into which the facility is divided, which are further distinguished by floor. This approach allows precise and immediate localisation of the signal source, improving the speed and effectiveness of interventions.

The overall management of the detection system is entrusted to a control unit, connected to the detectors via the loop system. The control unit receives real- time information and promptly reports any anomalies or alarms through advanced monitoring software. This software, installed on dedicated computers, allows constant and detailed supervision of the system, providing an intuitive interface for the identification and analysis of collected data.

In addition to digital alerting via the control platform, the system is designed to enable direct telephone forwarding of notifications to the Emergency Management Manager. This dual alerting mode, digital and telephone, guarantees a rapid and effective response in the event of an emergency, improving the timeliness of intervention operations and ensuring an optimal level of safety for people and property within the facility.

System programming includes:

➢ **a detector in alarm (first degree alarm):**

i. the evacuation and emergency voice alarm system (EVAC) emits an initial voice signal, informing the building occupants of the emergency situation, thus placing the entire building in a state of early warning. In this context, operators in the clean rooms are asked to secure equipment and prepare for evacuation;
ii. fire-fighters go to the sensor activation site to check the status of the emergency:
    - in the event of a false alarm, the employees communicate the outcome to the master control centre, and the EVAC announces the end of the state of emergency, allowing normal work activities to resume;
    - if the emergency turns out to be true, the fire-fighters may decide to
        - intervene using active extinguishing systems, such as fire extinguishers or fire blankets. If the intervention is successful, the situation is communicated to the master control unit and the alarm status is deactivated;
        - close the compartment door and activate the nearest emergency button. This activation results in the automatic closure of the compartments throughout the building, the activation of the automatic extinguishing systems in the affected area, and the emission by the EVAC of a second voice tone, signaling the general evacuation of the building;

➢ **two detectors in alarm in the same compartment (second degree alarm):**

- The activation of two sensors within the same compartment necessarily indicates a real emergency situation. In this case, the system automatically closes all compartments, activates the extinguishing systems in the affected area and the EVAC emits the second voice signal indicating the general evacuation of the building.

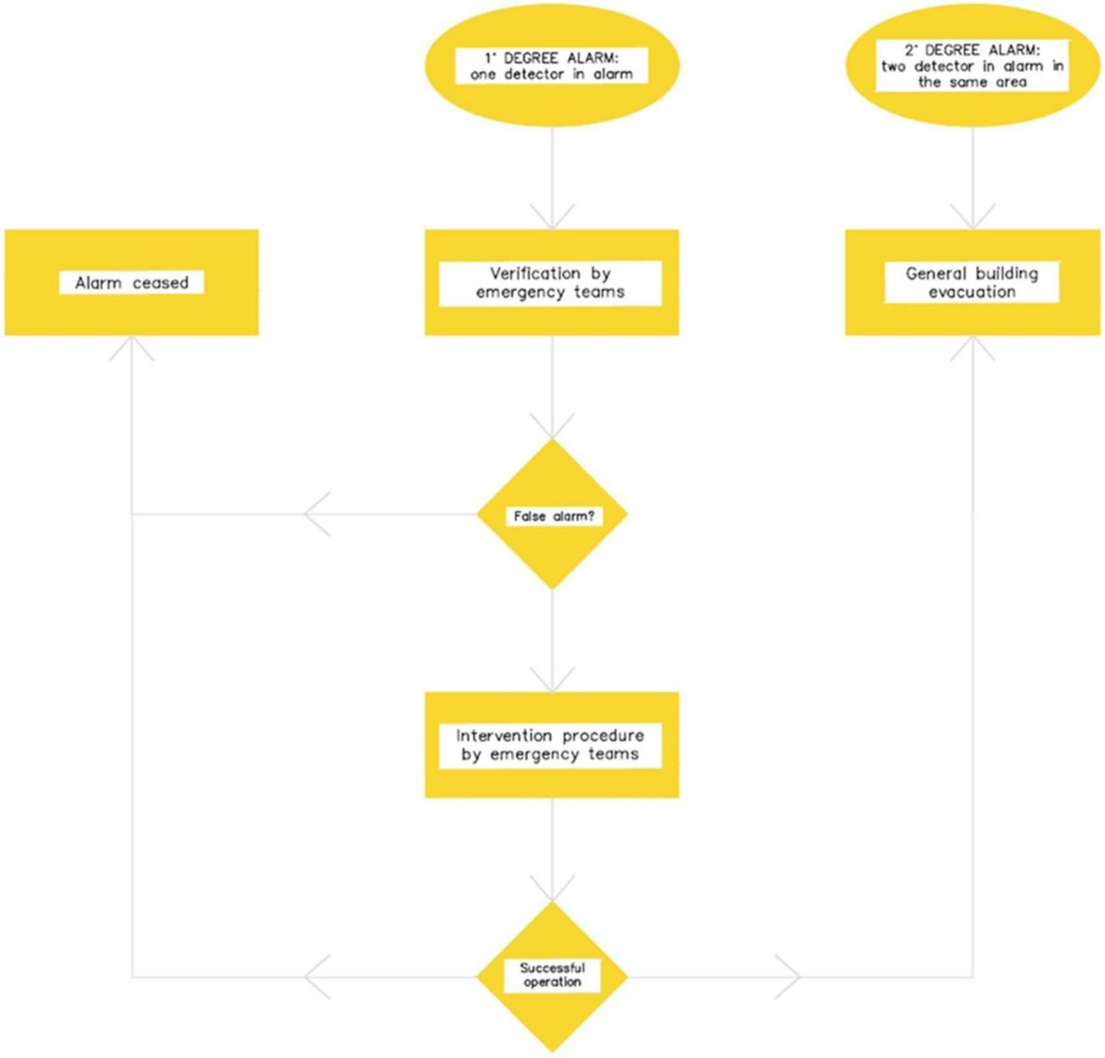


Figure 4 - Alarm pattern

Emergency management procedure

In the event that a person detects the start of a fire, they should:

1. alert one of the fire and evacuation marshals, giving details of the location of the event and its extent;
2. from this moment on, refrain from carrying out any intervention unless specifically requested to do so by those in charge or by the fire-fighting officers.

Once one of the fire marshals has been informed of the event he/she shall:

1. based on the information obtained, make an initial assessment;
2. if the preventive assessment or on the scene of the fire should reveal that it is impossible to initiate an effective intervention, alert the RGE or his deputy (person in charge);
3. if the assessment shows that there is still a possibility of intervening to contain or eliminate the event, go to the area in question for a more precise assessment and, if necessary, intervene on the basis of your knowledge and without your own or other people's health, always keeping your back to the escape route so as not to risk getting stuck;
4. place themselves at the disposal of the RGE, carrying out only the required interventions.

When the Emergency Response Officer is alerted to the situation, he/she shall:

1. on the basis of the information received, in consultation with the fire-fighting officials, assess the actions necessary to secure the people present, in particular the evacuation from the premises, giving priority to the areas closest to the place where the event is taking place;
2. inform the fire brigade of the emergency and take the necessary action to facilitate it;
3. if injured persons are present, together with the first-aid officers alert the first-aid station and provide the required information;
4. while waiting for help to arrive, identify the procedures to be implemented to reduce the effects of the accident, such as shutting

down the power supply, etc;

5. ensure that the evacuation is successful and, in the presence of missing persons, identify measures to search for them;
6. if there is a risk that the emergency may also affect neighbouring buildings, take the necessary action to warn those responsible for the situation;
7. upon arrival of the rescuers, provide them with the necessary information and the floor plan of the premises, a copy of which will be left at the guardhouse;
8. if necessary, operate the general electrical release (Cabin);
9. make themselves available for rescue;
10. at the end of rescue operation, check the state of the working premises and, if necessary, decree the end of the emergency;
11. Notify the Employer, the RLS and the RSPP of the incident.

4.1.2. Natural events

A natural event is any situation originating from non-man-made causes, but resulting from meteorological, hydrological, hydrogeological, and similar conditions. The main natural events relevant to the safety of the structure include:

- **floods:** events caused by intense rainfall, resulting in overflowing of watercourses and inundation of surrounding areas. Damage associated with floods may include soil erosion, damage to infrastructure and contamination of water resources. Although the flood risk is classified as LOW for the analysed structure, it is important to monitor local meteorological and hydrological conditions, as continuous heavy rainfall events may temporarily increase the risk;
- **avalanches:** rapid slides of snow and ice down slopes, often caused by excessive accumulation of unstable snow. These events can have a devastating impact as they carry materials at high speed, with the potential to severely damage buildings, vegetation and people along the route. In this case, the

structure is in a location and terrain conformation that excludes the presence this risk;

- **landslides:** are mass movements of earth, rocks or debris along a slope, triggered by natural phenomena such as heavy rain, earthquakes or erosion. Landslides can cause disruptions in infrastructure, obstruct communication routes and, in some cases, lead to severe structural damage. Again, the geological assessment indicates that the probability of landslides is non-existent for reference area, so this risk is considered absent;
- **strong winds / whirlwinds:** intense atmospheric phenomena that can cause significant damage to buildings, vegetation and power grids. Whirlwinds, in particular, are characterised by violent, localised whirlwinds capable of generating large- scale structural damage. Although the risk to the structure is assessed as LOW, the presence of such weather phenomena is possible, especially during thunderstorms or adverse weather conditions;
- **earthquakes/earthquakes:** these are ground vibrations caused by the sudden release of energy stored in tectonic plates. Their intensity varies according to magnitude and proximity to the epicentre and can cause significant structural damage, ranging from the collapse of buildings to the creation of cracks in the ground. Landslides, often the result of seismic tremors or intense weather phenomena, consist of displacements of material along a slope and can compromise the stability of surrounding structures. Although the risk of earthquakes and landslides to the structure is classified as LOW, it is advisable to provide emergency procedures to ensure safety in the event of seismic events.

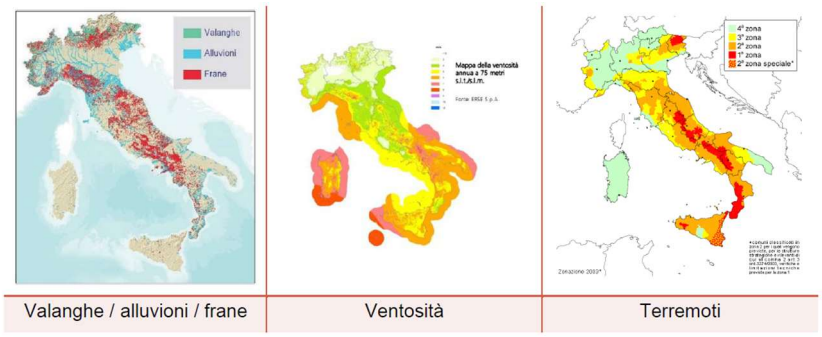


Figure 5 - Map of natural events National (from Istituto nazionale di geofisica e vulcanologia)

NATURAL EVENT	RISK
Floods	LOW
Avalanches	ABSENT
Landslides	ABSENT
Strong winds and whirlwinds	LOW
Earthquakes/quakes	LOW

Table 119 - Summary table of natural hazard risks

Dangers to people

The main dangers for workers are related to the strength of the structure and, therefore, to the possibility of event-related structure failure. Depending on the severity of the event, these can occur:

- minor damage: in the event of low or medium magnitude earthquakes, or in the presence of floods of moderate intensity, material may fall from above, such as plaster, furnishing elements, lighting fixtures and other structural components, which may pose an immediate danger to workers. In conditions of strong winds or whirlwinds, windows may be damaged or shattered by the impact of debris thrown against building, posing a direct safety risk to occupants;
- weakening of the structure: this situation may occur following medium-sized earthquakes that, while not causing an immediate collapse, seriously compromise the stability of the structure. Floods can also cause significant damage, especially in the case of prolonged seepage or stagnation, which may deteriorate the materials and threaten the structural stability. In the event of a , lifting large objects, such as cars, can cause considerable damage to the building. In these scenarios, workers are exposed to both immediate risks, such as falling debris from above, and medium-term hazards resulting from possible partial failure or progressive collapse of the structure;
- catastrophic collapse of the structure: a total structural collapse can occur instantly, following high magnitude earthquakes, representing the maximum

risk to the safety of workers. However, collapses may also occur after a period of time, if the structure is not properly inspected after critical events such as earthquakes or floods, or if the anomalies detected are not promptly resolved through consolidation works. In such situations, the risk of progressive failure remains high, making it essential to quickly inspect and secure the structure to minimise exposure to the risk of delayed collapse.

Environmental hazards

In the event of a flood, it is important to consider that floodwaters can wash away hazardous materials, transferring them to environmental matrices. A seismic event, such as an earthquake, can generate large amounts of inert waste and lead to the release of high quantities of dust into the air, with potential negative effects on air quality and public health. In the event of a tornado, hazardous materials carried by the winds, including chemicals and industrial waste, can be dispersed into the environment, contaminating air, water and soil.

Emergency management procedure

In the event of natural events, the main priority is to ensure the safety of people, possibly by evacuating the premises. Before resuming work activities, it is essential that the person in charge checks the damage caused by the event and ascertains that there is no risk of accidents.

- Earthquake: during an earthquake, workers should take shelter under desks, workbenches, beds or near load-bearing structures, where there is less risk of collapse. Evacuation can only be carried out at the end of the seismic event.
- Flooding: in the event of conditions that may presage a flooding emergency, the Emergency Response Officer (RGE) may decide to implement a preventive closure of the facility, informing the workers not to go to work until the emergency is over. Workers present in the building at the time of the emergency are asked to remain inside, awaiting the arrival of help.
- Strong winds / Whirlwind: in situations of strong wind or whirlwind, workers should seek shelter in a safe indoor location away from windows and doors,

such as a windowless room, corridor or basement. Evacuation is only permitted after the event has ended.

In the event that a person identifies an emergency scenario as mentioned above, he or she must promptly notify the RGE, who will endeavour to:

1. assess the extent of the event and the effects it has had or may have on structures and work premises and its possible developments;
2. together with those in charge of evacuation, provide for the evacuation of persons exposed to immediate risks and alert those in adjacent rooms or, if necessary, evacuate the entire facility;
3. assessing the actions to be taken for the protection of workers, possibly deciding to call in the fire brigade to facilitate their task;
4. if injured persons are present, together with the first-aid officers alert the first-aid station and provide the required information;
5. Coordinate interventions taking into account the skills and training of each of the workers so as to minimise damage and possible developments in the emergency;
6. ensure that the evacuation is successful and, in the presence of missing persons, identify measures to search for them;
7. if necessary, operate the general electrical release (Cabin);
8. upon arrival of help, provide them with the necessary information and the floor plan of the premises;
9. make themselves available for rescue;
10. at the end of the emergency, check the state of the facilities, premises, etc. and assess whether is possible to return to the company and which activities can be resumed, taking into account the protection of workers' health and safety.
11. Notify the Employer, the RLS and the RSPP of the incident.

4.1.3. Structural damage

In this analysis, this category includes all cases where damage to structures is evident, regardless of its origin. It is crucial to recognise that structural damage can result from a variety of factors, which can affect not only the stability of buildings,

but also the safety of people working or residing in them. The origins of such damage can be manifold and include natural events, accidental events and the progressive degradation of the structures themselves.

Origins of structural damage

Natural events are one of the main causes of damage to structures. Phenomena such as earthquakes, floods, hurricanes and storms can significantly compromise the integrity of buildings. For example, an earthquake can generate torsion and compression forces that exceed the load-bearing capacity of structures, leading to partial or total collapse. Similarly, floods can cause water infiltration that weakens foundations and building materials, promoting degradation. In addition, extreme weather conditions, such as high winds and heavy rain, can cause direct and indirect damage to structures.

In parallel, accidental events, such as fires, explosions or industrial accidents, can suddenly and devastatingly compromise the structural integrity of a building. Such events can generate unexpected loads on structures and adversely affect their ability to withstand the expected forces. Furthermore, the degradation of structures, often attributable to environmental factors, wear and tear and lack of maintenance, can lead to a progressive loss of strength and stability over time. Degradation can manifest itself through cracking, corrosion of materials and deterioration of structural components.

Event development scenarios

The scenarios for the development of damage events depend largely on the extent and nature of the damage suffered. In less severe cases, is possible to witness phenomena such as falling materials from above, such as plaster or hanging objects. Although these events do not pose an immediate risk to structural stability, they can pose a safety hazard to people in the vicinity, causing injury or damage to property.

In situations of advanced decay, however, significant structural failure can occur, with potentially catastrophic consequences. Failure may occur gradually, manifesting itself with early warnings such as cracks in walls or deformations in floors, or suddenly, leading to a total collapse of the building. This type of damage

requires careful assessment by experts in the field in order to determine the extent of the risk and the necessary intervention measures.

In addition, the possibility of accidental events causing materials to fall, even in the absence of pre-existing degradation, cannot be excluded. These events, linked to malfunctions or human error, can occur at any time and in any context, making it crucial to implement preventive measures and safety procedures to minimise the risk of accidents.

Dangers to people

As a result of damage to structures, significant dangers to the safety of persons may occur, including falling materials. These events may result in injuries or, in more serious situations, partial or total collapse of the entire structure. Such scenarios not only put the lives and safety of the individuals present at risk, but can also generate states of panic and confusion, further complicating evacuation and rescue operations.

Environmental hazard

In addition to risks to human health, structural damage can have significant environmental repercussions. In particular, it is important to consider the possibility of compromising gas supply systems, which can lead to dangerous gas emissions the surrounding environment. not only increases the risk of fires and explosions, but can also contribute to air pollution, creating additional risks for public health and the ecosystem.

Emergency management procedure

The modalities of intervention in the event of structural damage vary depending on the extent and severity of the damage. Depending on the circumstances, it may be necessary to temporarily evacuate certain rooms or, in extreme cases, the entire structure. Before restoring the use of the premises for work, it is imperative to ensure that the safety conditions and good condition of the structure are fully restored. This implies a thorough assessment by experienced technicians, followed by any repair and maintenance work. Only once it has been ascertained that the

safety conditions have been restored and that there is no longer any risk to the occupants, can the premises be reopened and used for normal working activities.

In the event that a person detects damage to the facilities, he or she must:

1. Notify the Emergency response officer, giving details of the location of the damage and the extent of the damage;
2. from this moment, refrain from carrying out any intervention unless specifically requested by those responsible.

Once informed of the emergency situation, the Emergency response officer should:

1. assess the extent of the event and the effects it has had or may have on the stability of the structures and its possible developments;
2. together with those in charge of evacuation, provide for the evacuation of persons exposed to immediate risks and alert those in adjacent rooms or, if necessary, evacuate the entire facility;
3. assessing the actions to be taken for the protection of workers, possibly deciding to call in the fire brigade to facilitate their task;
4. if injured persons are present, together with the first-aid officers alert the first-aid station and provide the required information;
5. Coordinate interventions taking into account the skills and training of each of the workers so as to minimize damage and possible developments in the emergency;
6. if there is a risk that the emergency may also affect neighboring buildings, take the necessary action to warn those responsible for the situation;
7. ensure that the evacuation is successful and, in the presence of missing persons, identify measures to search for them;
8. if necessary, operate the general electrical release (Cabin);
9. upon arrival of help, provide them with the necessary information and the floor plan of the premises;
10. make themselves available for rescue;

11. at the end of the emergency, check the state of facilities, premises, etc. and assess whether is possible to return to the company and which activities can be resumed, taking into account the protection of workers' health and safety;
12. Notify the Employer, the RLS and the RSPP of the incident

4.1.4. Medical emergencies and urgency

A medical emergency is defined as a sudden and unforeseen situation involving an imminent and concrete risk to the life of one or more persons, requiring prompt intervention to avoid fatal outcomes or irreversible damage. Situations such as cardiocirculatory arrest, haemodynamic alterations (severe impairment of blood flow), states of asphyxia, conditions of severe respiratory instability and polytrauma are typical examples of medical emergencies. These conditions usually occur without warning and progress rapidly, requiring an immediate and targeted response to ensure survival and limit the physical and psychological consequences. addition to such critical events, health emergencies also include less common but equally serious situations that drastically compromise patient's psychophysical integrity. For example, amputation of a limb, deep facial injuries and injuries spinal cord injuries are traumatic events that, while not life-threatening in the immediate future, cause a serious impact on physical and psychological well- being, requiring highly specialised and urgent medical intervention.

Medical urgency on the other hand refer to clinical conditions that, while not posing an immediate danger to the patient's life, involve state of significant or potentially evolving distress. Health emergencies must be identified and treated quickly to alleviate distress and prevent possible complications. Even in these cases, the primary objective of healthcare intervention is to ensure rapid control and resolution of symptoms, reducing the risk of aggravation of the clinical condition. Typical examples include a flu syndrome or a hysterical crisis.

Event Development Scenarios

Normally, injuries and illnesses have an immediate effect on one or more persons; in fact, in addition to the persons directly involved in the emergency, a chain of accidents may be generated due to the intervention of untrained persons injured

while trying to help a colleague. In a work context, the main sources of danger often derive from the use of specific machinery and equipment, which can be particularly dangerous in the event of malfunction or misuse. Consequently, it is essential that all employees are adequately trained not only on the risks associated with the use of equipment, but also on the correct procedures to follow in the event of an emergency. This implies, for example, the ability to identify and competently use the safety devices built into the machinery, such as emergency stop buttons, master switches and locking mechanisms, as well as being able to disconnect the power supply or other energy sources to prevent the risk from continuing. Only once these operations have been completed and the environment made safe, can workers intervene directly on the injured person, using appropriate first aid techniques.

Emergency management procedure

In the event of an accident or illness, trained workers must intervene who know how to stop the source of the damage and only then intervene on the injured person. Once the source of the damage has been stopped, and if possible, the injured person has been secured, help must be called and the necessary instructions given.

Intervention on the person must be carried out exclusively by first aiders: they will assess the person's condition, define any interventions to mitigate the effects and make the call for help. The activities carried out by the first-aid officers may require the use of first-aid equipment present in the company which, at the end of its use, must be disposed of in a specific manner in order to avoid environmental damage.

In the event that a person witnesses an injury or illness, he/she must:

1. act, to the best of his or her knowledge and without endangering his or her own or others' safety, to remove the cause of the event if it can continue to cause harm to the injured person;
2. ascertain the state of the injured person;
3. alert one of the first-aid officers, giving details of location of accident and extent of the accident;

4. from this moment on, refrain from carrying out any intervention unless specifically requested to do so by those responsible or appointed.

Once informed of the emergency situation, the Emergency response officer should:

1. assess extent of the event and that the initial cause of the event cannot cause further damage;
2. together with the first-aid officers, stabilise the injured person's condition;
3. immediately call for medical assistance and provide them with the required information;
4. when help arrives, provide them with the necessary information;
5. make themselves available for rescue;
6. at the end of the emergency, check that the cause of the accident is no longer present and, only when there is no longer any risk to people, allow people to re-enter the premises;
7. all dressing material must be collected in special bags and disposed of
8. Notify the Employer, the RLS and the RSPP of the incident.

4.1.5. Malicious act

A malicious act is an action performed intentionally and knowingly with the aim of causing harm or violating a rule. In the legal context, it refers to wilful conduct in which the perpetrator is fully aware of the potentially harmful consequences of his actions and acts with the intention of causing that harm or with the acceptance of the risk of causing it. It contrasts with fault, which occurs when damage is caused by recklessness, negligence or inexperience, without the intention causing damage. In other words, a wilful act requires an intention to cause harm, whereas a negligent act results from negligence or carelessness.

Terrorist attacks and cyber-attacks also fall into this category.

Event development scenarios

In an aerospace company, the risk of a terrorist attack is a real and extremely significant threat, especially considering the sophisticated technologies that are developed and the strategic value that the company holds internationally. The

infrastructures and systems produced in the aerospace sector, as well as the technical skills that are guarded, constitute not only assets of high economic value, but also important elements for national security and global technological competitiveness. Consequently, the company can be a target for extremist groups or organisations interested striking symbols of technological progress, destabilising the industry and undermining confidence in the security capabilities of advanced technologies. The main causes of a potential terrorist attack on a site such as the one under assessment may therefore lie in various motivations: from the desire to cause significant material damage, even to the point of creating social and economic instability. Terrorist attacks aimed at the aerospace sector can generate strong media impact and attract the attention of international public opinion, amplifying the intimidating effect. This type of attack is not only aimed at the physical destruction of corporate assets, but also at the compromise of human resources and the disruption of financial resources; it can significantly affect the stability of the company, requiring huge investments to recover and secure operations. In addition, the negative reputational impact of a terrorist attack could result in a reduction of trust from business partners, customers and public institutions, compromising the company's opportunities for growth and development in the long term. To mitigate the risk of a terrorist attack, the company must necessarily implement a set of multi-layered security strategies that encompass both the physical security of facilities and the protection of personnel and sensitive data. This includes the adoption of strict access controls, the use of advanced surveillance technology, the presence of personnel trained to handle emergencies and critical situations, and the establishment detailed incident response protocols. Ongoing security training of staff and collaboration with government and local security agencies can also help make the company more resilient and prepared for such threats. These interventions enable a reduction in the risk of a potential attack.

Parallel, the risk of cyber-attack is particularly high within the aerospace sector, due to the reliance on advanced and interconnected digital systems, making such organisations vulnerable to targeted and sophisticated cyber intrusions. The root causes of a potential cyber-attack can be many and varied, including attempts at industrial espionage, where malicious actors seek to acquire confidential

information to gain a competitive advantage, sabotage of business operations, or extortion to obtain sensitive data related to aerospace projects, prototypes, or business strategies. Given the devastating effects these attacks can have, advanced and integrated cybersecurity strategies are crucial. These strategies should include data encryption, to protect sensitive information both during its transfer and when it is stored. The implementation of robust firewalls and intrusion detection systems is equally crucial, as these tools can identify and block suspicious activity before it can cause significant damage. In addition, continuous training of staff in computer security plays a key role in preventing attacks. Employees must be aware of the threats and social engineering techniques that can be used to compromise corporate security. Finally, the preparation of incident response plans is essential to ensure that the company is ready to respond promptly and effectively to an attack. These plans should include clear procedures for internal and external communication, damage assessment and restoration of normal operations, in order to minimise downtime and damage resulting from cyber-attacks. Only by taking a proactive and multi-dimensional approach to cybersecurity management can a company improve its resilience and protect its critical assets from cyber threats.

Emergency management procedure

Considering the different ways in which a malicious act can manifest itself, emergency plan must include specific and differentiated procedures according to the type of attack on the structure.

- In the event of a terrorist attack with the presence of armed hostiles, there no plans to evacuate the building and workers are required to comply with the following behavioral rules:
  - do not leave workplaces and do not face the doors of premises;
  - remain at your post with your head bowed if the threat is direct;
  - not to counter the actions of the bomber with their own behavior;
  - remain calm and in control of one's actions due to offences received and do not mock any deranged behavior of the attacker;

- avoid sudden movements or 'stealth actions' that could in any way appear as escape attempts or defensive reactions;
- if threat is not direct and you are certain of active enforcement action, sit or lie down on the ground and await further instructions from the officer in charge.

➢ In the event that a suspicious package is detected or an external call is received warning of the presence of an explosive device (bomb threat), workers are required to comply with the following rules of conduct:

- remain calm and refrain from personal initiatives (such as opening or moving the package, etc.). If the report comes from a telephone call, it is important to try to gather as much information as possible about the threat (type of explosive device, location, method of implementation, etc.) and about the caller (voice, accent, etc.).
- immediately transmit the information to the emergency workers or the persons in charge, who will in turn communicate it to the RGE.

Once the notification has been made, the RGE shall:

1. give instructions to the emergency teams to notify the police;
2. communicate ongoing emergency to the other companies in the building, directly or through fire safety or first aid personnel.
3. order the evacuation of the premises surrounding the one where the event was reported following the instructions provided by the competent authorities and, if the situation requires it, extend the process to the entire building;
4. remain at the disposal of the intervening authorities.

The emergency teams, having received the evacuation order, must:

1. evacuate the premises indicated by the RGE, ensuring that calm is maintained on the rest of the floor;
2. in the event of a general evacuation, they must stand at the floor exit;
3. after ensuring that no one is left on the premises, go to the assembly point to allow for roll-call operations.

➢ In the event of a cyber-attack, given the low risk to workers' safety, there no provision for evacuating the building, except in the case of particular attacks that may in some way generate panic within the company (e.g. tampering with automatic extinguishing systems). If a worker detects an event that could be attributable to a cyber-attack, he/she must immediately notify a supervisor or a member of the emergency teams. The latter will be responsible for promptly communicating the information to the Emergency Response Officer (RGE). Once informed of the emergency situation, the RGE will communicate the situation the IT team who will:

   1. Immediately disconnect affected systems from the network to prevent the spread of the malware or attack;
   2. identify the nature of the attack and which systems were compromised;
   3. collect data and evidence related to attack to understand impact and vulnerabilities exploited;
   4. check whether sensitive or confidential data have been compromised and assess need inform users or the competent authorities;
   5. use security tools to remove viruses, Trojans or other malicious software from infected systems;
   6. restore systems from recent backups, ensuring that they are completely clean before reconnecting them to the network;
   7. perform post-reset security checks to ensure there no further vulnerabilities;
   8. Notify the Employer, the RLS and the RSPP of the incident.

4.1.6. Chemical emergency

Chemical emergencies encompass all events that may result in harm to workers from the presence of chemical materials within working environment. These can originate from causes as diverse as:

- the spillage of hazardous materials from process plants or storage facilities (both fixed and mobile);
- malfunctions of gaseous and liquid effluent treatment plants;
- leakage of harmful gases, such as methane, from installations.

In emergency situations, these circumstances can cause damage to both structures and people, with an impact that can extend beyond the perimeter of the plant, affecting the surrounding areas. In particular, spills of materials from facilities or storage areas can cause direct harm to exposed workers, with varying degrees of severity depending on the hazard class of the substances involved. Moreover, in the event of combustion, the release of toxic gases may result in serious risks to workers' health. Finally, with regard to air emissions and discharges of hazardous materials, the consequences may be indirect and manifest themselves over time, making continuous monitoring and careful management of chemicals in the workplace essential.

Event development scenarios

In an aerospace companychemical emergency is closely linked to the use of special materials and advanced chemical compounds, which are essential to ensure the performance and reliability of equipment intended for the space environment. The use of such substances involves potential risk scenarios, including fires, explosions, accidental releases of toxic or hazardous substances, and air and surface contaminationThe main chemical emergency scenarios that can occur include:

- overheating and degradation of lithium batteries: the use of lithium batteries involves specific risks of overheating and combustion. A short circuit or physical damage can lead to the phenomenon of thermal runaway, an autocatalytic process that occurs when the temperature increase in an electric battery cell leads to an out-of-control exothermic reaction. This phenomenon

can lead to the release of harmful gases such as carbon monoxide and hydrogen fluoride, fires, or even explosions;

- spillage of hazardous chemicals during production or storage processes: various special materials and chemical compounds such as strong acids, organic solvents and heavy metals are used during production and surface treatment processes. Accidental spillage, due to storage system malfunctions or operational errors, can lead to direct contamination and exposure risks for workers, especially in confined spaces. The dispersion of these compounds can generate vapours or contaminate surfaces, creating a prolonged exposure hazard;
- release of toxic gases and uncontrolled chemical reactions: assembly, testing or maintenance operations, unintentional releases of toxic gases or unwanted chemical reactions may occur. For example, the contact of reactive materials with moisture or oxidising agents can generate toxic gases such as ammonia, chlorine or fluorine compounds, which quickly disperse into the environment. In poorly ventilated areas, these releases pose an acute exposure risk to workers, with potential respiratory damage and skin irritation.

Emergency management procedure

Chemical emergency management varies depending on the root cause. In the event of a chemical emergency, regardless of the type of substance involved, the evacuation and emergency voice alarm system (EVAC) emits a voice signal, informing the building occupants of the emergency situation, thus placing the entire building in a state of early warning. At this point, the management procedure continues in a specific manner depending on the type of substance that caused the emergency.

- **Lithium batteries:** in the event of damage with smoke escaping from the batteries, the sensor located above the workstations sends a signal to the master control unit. The master control unit immediately activates the fume hoods in the work area and seals the laboratory compartments to prevent the smoke dispersion. Once the sensor detects the absence of smoke, the environment is

considered safe again and work activities can resume. In the event of battery damage, workers in the laboratory must:

1) immediately stop any activities in progress, evacuate the laboratory and close the door;
2) inform the supervisor of the emergency situation;
3) wait for the notification of the Emergency response officer (RGE) of the cessation of the emergency.

- **Spillage of hazardous chemicals:** in the event of a spillage of hazardous chemicals, mainly production or storage processes, workers must:
  1) move away from the contaminated area immediately;
  2) report the incident to the supervisor who will in turn report it to the RGE;
  3) Immediately close accesses to the contaminated area to prevent the transit and spread of the chemical;
  4) all workers not directly involved in the management of the emergency must evacuate the area and make their way to the assembly points;
  5) emergency management personnel must remain in the vicinity of the contaminated area, ready to intervene using appropriate personal protective equipment (PPE);
  6) in the event of a toxic vapour release, sensors located within contaminated work area automatically activate the fume hoods;
  7) if the emergency is serious and cannot be managed with in-house resources, immediately contact the emergency services (fire brigade, first aid) giving details of the substance involved and the ongoing situation.
  8) before allowing personnel to return, verify that the area is safe and free of contaminants, with toxicity levels within safe limits.

4.1.7. Electrical blackout

A power blackout is defined as a sudden and total interruption of the power supply in a given area. In the event of a power outage, for whatever reason, emergency risk conditions are created within the premises related to the lack of visibility of the working areas and, in particular, the escape routes. Possible origins of the event include:

- voluntary power disconnection for reasons related to ongoing emergencies: a solution adopted in response to serious situations such as fire, flood, earthquake or other natural disasters. In such cases, disconnection from the power grid may be part of a safety procedure aimed at reducing risks to occupants and preventing damage to structures and installations;
- voluntary interruption of the power supply due to a decision by parties outside the company and not communicated in good time: electricity suppliers or network operators may decide to suspend the supply for technical or maintenance reasons. This type of interruption can catch company safety officers and workers themselves unprepared, increasing the risk of emergencies on company premises;
- unintentional power failure: caused by unforeseen technical faults involving the electricity distribution network or installations inside the building. These faults may result a variety of factors, including overloading of the power grid, deterioration of infrastructure, short circuits, or malfunctioning of protective devices such as circuit breakers and fuses.

Event development scenarios

In the event of a power outage, all equipment and appliances connected to the grid come to an immediate halt and lights go out, except for those with battery back-up or emergency power. This sudden interruption of the power supply can cause numerous problems in working environments, not only interrupting the continuity of production activities, but also creating potential risk situations for personnel.

The main dangers to which workers may be exposed during a blackout include:

- failure of machinery safety systems: safety systems installed in machinery and industrial plants often depend on the power supply to function properly. When this fails, protective devices may not activate, leaving workers exposed to significant risks, such as accidental contact with moving parts of machinery or hazardous materials. In the absence of power, in fact, machines not only shut down, but can sometimes suffer sudden and unplanned stoppages, making even otherwise safe operations potentially dangerous. In addition, the safety systems that control the controlled shutdown of equipment may not activate properly, preventing machinery from shutting down in an orderly and controlled manner.
- interruption of the operation of surveillance, alarm and security lighting systems: the interruption of the power supply can cause these systems to malfunction, exposing workers to the risk of accidents due to disorganisation.

To cope with these risk scenarios, the company has emergency generators and UPSs (Uninterruptible Power Supply), to which all safety systems (emergency lighting, fume hoods, etc.) are connected, to temporarily compensate for the power failure and ensure proper management of the emergency situation.

Emergency management procedure

In the event of power failure, proceed as follows.

The maintenance technician, without endangering his own and others' safety, must:

1) search for the cause of the event and, if possible, remedy it as soon as possible;
2) the emergency cannot be managed directly and fully by the emergency responders, report the situation to the RGE;
3) place themselves at the disposal of the RGE, carrying out only the required interventions.

When the Emergency response officer is alerted to the situation, he/she shall:

1) on the basis of the information received, in consultation with the fire-fighting officials, assess the actions necessary to secure the people present, in particular evacuation from the premises, giving priority to areas where the absence of power supply may lead to immediate risks;

2) inform the fire brigade of the emergency and take the necessary action to facilitate it;
3) if injured persons are present, together with the first-aid officers alert the first-aid station and provide the required information;
4) while waiting for help to arrive, also alert the managers of neighbouring facilities;
5) ensure that the evacuation is successful and, in the presence of missing persons, identify measures to search for them;
6) upon arrival of help, provide them with the necessary information and the floor plan of the premises;
7) make themselves available for rescue;
8) at the end of rescue operation, check the state of the working premises and, if necessary, decree the end of the emergency;
9) Notify the Employer, the RLS and the RSPP of the incident.

4.2. Assistance for the disabled

Assisting people with disabilities in an emergency and evacuation plan is a fundamentally important element in ensuring their safety in crisis situations. The need to support or transport people with disabilities, in the event of a fire or other emergency, requires specific and appropriate methods and behaviour on the part of rescuers. Within the company analysed, the presence disabled people may be colleagues at work or people who are occasionally present (external professionals, visitors, etc.). In addition to these persons, we must add workers who, even for short periods, are in a state of even partial disability (e.g. pregnant women, people with fractured limbs, etc.). It will be the responsibility of these persons to communicate their situation to members of the emergency teams, thus enabling them to intervene more effectively and manage the situation better in the event of an evacuation. In addition, people who, despite not being identifiable as disabled in normal conditions, if involved in a crisis situation, adopt behaviours attributable to transient conditions of disability may also fall into this category.

In an emergency situation, the conditions that can cause criticality for a rescuer during intervention depend on:

- architectural barriers present in the building structure (stairs, steps, narrow passages, perception barriers, etc.) that limit or eliminate the possibility of reaching a safe place independently;
- by the lack of appropriate knowledge on the part of rescuers and members of emergency teams on how to perceive, orient and use spaces.

Since these conditions can occur simultaneously, they must be addressed and resolved together. The first step is to identify, both through familiarity with the working environment and during periodic evacuation tests, the motor, sensory or cognitive difficulties that the environment may cause. Once familiar with the spaces and potential obstacles, it is possible to adopt appropriate organisational measures and specifically train the personnel in charge, thus guaranteeing a more effective and safer response in the event of an emergency.

The evacuation procedure varies according to the type of disability of the person involved, which may be motor, sensory or cognitive; however, in general, these steps are followed:

1) wait until other people have evacuated the building;
2) Accompanying or arranging for persons with mobility or sensory difficulties to be guided outside safely;
3) if it is not possible to reach outside, transport the disabled person to a safe area, preferably a room with a window, where they can wait help;
4) notify the emergency switchboard or a fire marshal that the evacuation of the disabled person or, if not, the impossibility of proceeding with the evacuation.

4.2.1. Motor disabilities

A motor disability is a limitation that impairs the ability to move and physical coordination, hindering the independent performance of actions such as walking, stairs, balance, grasping objects or making precise movements. This type of disability can be due to several causes, including congenital diseases,

neuromuscular diseases, spinal injuries, amputations, fractures or degenerative conditions. People with this type of disability may use aids such as wheelchairs, walkers, crutches or prostheses to carry out their daily activities and move around safely.

The main critical issue in these cases concerns evacuation from the premises. Motor difficulties can reduce the subject's speed of escape and, by extension, that other people. These include temporarily disabled persons such as those who have suffered broken legs or pregnant women.

Emergency management

Once the evacuation has been ordered, at least one member of the emergency team reaches the person, reassures him/her about the situation, waits for other people in the facility to be evacuated, and then assists the person until a safe place or assembly point is reached. In the case of particularly severe disabilities, it may be necessary for several operators to intervene so that the person can reach a safe place. In the case of wheelchair users, it is necessary to work in teams of two to four operators in order to enable the person to get down to the ground floor.

4.2.2. Sensory disabilities

Sensory impairment refers to limitations that affect senses, particularly sight and hearing, and that may hinder perception of one's surroundings and the ability to react quickly to external stimuli, such as visual or acoustic alarm signals. People with visual impairments may have difficulty orienting themselves in new or complex spaces, especially in low-light or emergency conditions. People with hearing disabilities, on the other hand, may not perceive acoustic warning signals, making alternative solutions such as light signals or visual warning systems necessary.

Emergency management

Once the evacuation has been ordered, at least one member of the emergency team reaches the person, informs him/her, in case he/she had not realised, of the emergency condition, reassures him/her about the situation, waits for the other

persons in the facility to be evacuated; then, assists him/her until a safe place or the assembly point is reached.

Assisting the hearing impaired/deaf: in the case of the deaf, the optimal distance lip-reading is 1.5 metres; ensure that the rescuer's face is adequately illuminated; do not move the head and speak while looking at the subject; speak slowly, articulating the words well, but without emphasising lip movements; use short, simple sentences, stated in a normal tone of voice; if the subject shows that he has not understood the sentence, write it down for him.

Assisting the visually impaired: announce your presence, speaking in a calm voice, at a normal pace, articulating the words well; avoid shouting, but speak facing the subject; ask for the subject's help and ask if he/she has specific needs; describe the actions to be taken; take the subject's arm, letting him/her lightly grasp the arm or shoulder to be guided, and accompany him/her, taking care not to pull or push the person, giving useful directions by voice to avoid obstacles, stairs and furniture; to make him/her sit down, guide his/her hand until he/she touches the seat or backrest.

4.2.3. Cognitive disabilities

Cognitive disability refers to limitations in the mental ability to process information, make decisions, or understand instructions, affecting memory, attention and reasoning. People with cognitive disabilities may have difficulty orienting themselves in complex environments, recognising warning signs or following evacuation procedures in an emergency. These disabilities may be present from birth or result from head trauma, degenerative diseases or conditions such as autism spectrum disorder and Down syndrome. Such individuals may respond in an overly calm manner to high-risk conditions, refusing to cooperate, or they may behave in an overly alarmed manner, making it difficult or refusing to evacuate from the premises, again resulting in a complete refusal to cooperate, up to and including aggressive behaviour towards the rescuer.

Emergency management

Once the evacuation has been ordered, at least one member of the emergency team, reaches the person, informs him/her, if he/she was not aware of the emergency condition, reassures him/her about the situation, keeping calm even if he/she is verbally or physically attacked by the person, waits for the other people in the facility to be evacuated; then, he/she assists the person until he/she reaches a safe place or the gathering point. In the event that the subject absolutely refuses to cooperate, the rescuer may take coercive measures to safeguard the subject's safety. Always speak calmly, articulating words well and avoiding complex sentences. Use simple and easily understood graphic signs or universal symbols.

4.3. Worker training and information

Training and information on safety at work, especially on evacuation procedures and emergency management, are essential to protect workers. To this end, a system of recording activities is used, through the drawing up of minutes that the employer periodically checks. This process makes it possible to ensure that the safety measures are implemented correctly and that the planned interventions are carried out effectively.

Workers designated as fire-fighters receive appropriate training in accordance with current legislation. This training is essential to ensure that these workers are able to intervene promptly and effectively in the event of a fire outbreak. Timely intervention is a key factor in emergency management, as an appropriate initial response can help contain the fire and prevent more serious damage.

First aiders also attend specific courses that prepare them to manage rescue operations and to communicate clearly and comprehensively with the emergency services. This training includes both theory and practical exercises, which improve the ability to apply knowledge in simulated situations, increasing safety and confidence in interventions.

Fire and first aid officers also receive updates and practical instruction during evacuation drills. These sessions focus on evacuation methods, rescue protocols and interventions to minimise the effects of crisis situations. Through these simulations,

workers become familiar with the procedures to be followed, helping to build a safer working environment that is prepared for emergencies.

It is also important to ensure that all workers are adequately informed of the correct procedures for reporting emergency situations and evacuating the premises. To this end, various information strategies are implemented, including the distribution of information leaflets and specific brochures on fire risk. During the annual evacuation test, timely updates are provided on the use of portable fire extinguishers, a fundamental element proper fire risk management.

5. Emergency procedures for the Clean Room

In an industrial context, the clean room represents a unique and highly controlled working environment, designed to guarantee precise environmental conditions necessary to preserve the integrity of the production processes and products manufactured within it. In this specific case, the company analysed uses the clean room for the assembly of satellites, a sector that requires extremely rigorous quality and cleanliness standards, capable of ensuring the absence of contamination that could compromise functionality and reliability of critical components. In addition to the design and operational management aspects, it is crucial to consider that the particular nature of the clean room makes the definition of a specific and targeted emergency management plan indispensable. Extraordinary events such as fires, technical failures, microbiological or chemical contamination, malfunctions of the air-conditioning and ventilation system, or situations involving the evacuation of personnel, require dedicated protocols capable of guaranteeing the safety of the operators while preserving the integrity of the controlled environment and the manufactured products being processed. In the previous chapter, the general principles and methodologies applicable emergency management in the industrial environment were analysed. In this chapter, we will proceed a specific in-depth examination of the measures to be taken in the event of an emergency within a clean room. This in-depth study will include:

- a description of the clean room work environment;
- the main reference standards;
- the list of work carried out inside;
- the definition of the main sources of emergency and their management protocols.

This chapter, therefore, aims to provide a comprehensive and detailed overview of an emergency management plan tailored to the specific needs of the cleanroom.

5.1. Clean room

The clean room, also known as a clean room' or 'integration room', is an environment designed to maintain strict control over particle contamination. Its main objective is to create a work space that minimises the presence of particles, ensuring air that is 10,000 to 50,000 times cleaner than in normal environments. Critical parameters such as temperature, humidity and pressure are constantly monitored and can vary depending on the specific use of the chamber. A key aspect is the air treatment system, which uses a sophisticated filtration system to prevent the entry of particulate matter, keeping the environment completely clean. The air passes through a pre-filtration in the air handling unit (AHU), while intensified filtration takes place in diffusers equipped with absolute filters. Operation is based on the forced recirculation of filtered air within a sealed environment. The supply ducts, located on the ceiling, feed the purified air at low speed, while the air is drawn in through grilles located on the floor. The clean room must meet specific structural requirements: materials must not release particles, surfaces must be smooth and easy to clean, fittings must have rounded edges, sockets and fixtures must be coplanar, and pipes must run outside the premises. The main sources of contamination come from internal production processes, machinery and operators. It is crucial to pay attention to the handling of products and the maintenance of the chamber itself. In addition, personnel must wear sterilised or disposable clothing following a strict sequence and use a changing room with air characteristics similar to those of the cleanroom to avoid external contamination. To ensure high standards of purity and prevent contamination risks, it is essential to keep the aeraulic system clean through constant and thorough maintenance. Poor cleanliness can lead to the introduction of microorganisms or dust into the controlled environment, thus compromising the functionality of filter systems and accelerating their deterioration. Industries such as microelectronics, semiconductors, optics and aerospace mainly use the clean room to control the amount of airborne dust, rather than for specific microbiological needs.

A particular type of clean room is the clean room. The adjective 'sterile' refers, in the medical and biological field, but also in the industrial production of food and

pharmaceutical products, to a state 'free of germs and microorganisms, whether pathogenic or not', generally achieved through a sterilisation process. Sterility represents the absence of life, hence of germs and bacteria. Therefore, sterilisation is the method, both chemical and physical, used to eliminate all organisms and bacterial spores present on any surface; in other words, the sterile chamber represents a microbiologically controlled working environment to prevent the presence of bacteria, viruses or parasites.

To ensure a sterile environment, not only is high air filtration through air conditioning systems necessary, but operators must also implement chemical sterilisation strategies for surfaces and the production line. Through various sampling techniques, microbiological tests are carried out to assess the bacterial load in the environment. These tests are essential in places where the proliferation of pathogenic bacteria can pose significant health risks. The Clean Room finds application in critical areas where the presence of germs can be harmful, such as:

- in pharmaceutical environments where bacteria can compromise drugs;
- in the medical and hospital sector, where patients are cared for;
- in the food and beverage sector, where food and beverages are handled.

In contrast, sectors that do not specifically need a Clean Room but rather a Clean Room include:

- those in microelectronics;
- of semiconductors;
- of optics;
- aerospace.

These areas use the Clean Room to mainly control the amount of dust suspended in the air.

5.2. References

When designing and operating cleanrooms, it is essential to refer to specific regulations that ensure quality and safety standards are met. These standards offer detailed guidelines on structural requirements, air filtration systems, monitoring of environmental parameters and operating practices required to prevent contamination. Among the most relevant regulations is EN ISO 14644, which establishes air cleanliness classes based on particle concentration and has replaced the US federal standards. In addition, Good Manufacturing Practice (GMP) provides crucial guidance for the pharmaceutical and food industries. In the following section, these key regulations and their impact on cleanroom operations will be examined in detail.

The regulations analysed are:

- UNI EN ISO 14644-1:2016;
- GMP (Good Manufacturing Practice);
- Linee guida EU- GMP Annex 1;
- UNI EN ISO 14698-1:2004.

5.2.1. UNI EN ISO 14644-1:2016 – Cleanrooms and associated controlled environments

The UNI EN ISO 14644 standard, which replaced the American Federal Standards in Europe, together with Good Manufacturing Practices (GMP), regulates various aspects of clean rooms and controlled environments. It deals with the definition of spaces, degree of air cleanliness, the monitoring air quality over time and the design of the rooms themselves. The first section of the standard, EN ISO 14644- 1, establishes cleanliness classes for clean rooms based on the size and number of particles in the air volume (in cubic metres). Clean rooms are classified from ISO class 1, which represents the highest degree of cleanliness, up to ISO class 9. The standard also specifies that the cleanliness class can be assessed under three operating conditions:

- As built: measurements taken in the completed environment but without machinery and personnel.
- At rest: measurements with the machines running but no personnel present.
- Operational: measurements with active machines and operating personnel during normal activities.

The maximum permissible particle concentration for each contamination class is given in the following table.

ISO 14644-1 Cleanroom Standards							
Classification	Maximum Particles/m^3						FED STD 209E Equivalent
	≥0.1µm	≥0.2µm	≥0.3µm	≥0.5µm	≥1µm	≥5µm	
ISO 1	10	2.37	1.02	0.35	0.083	0.0029	
ISO 2	100	23.7	10.2	3.5	0.83	0.029	
ISO 3	1,000	237	102	35	8.3	0.029	Class 1
ISO 4	10,000	2,370	1,020	352	83	2.9	Class 10
ISO 5	100,000	23,700	10,200	3,520	832	29	Class 100
ISO 6	1.0×10^6	237,000	102,000	35,200	8,320	293	Class 1,000
ISO 7	1.0×10^7	2.37×10^6	1,020,000	352,000	83,200	2,930	Class 10,000
ISO 8	1.0×10^8	2.37×10^7	1.02×10^7	3,520,000	832,000	29,300	Class 100,000
ISO 9	1.0×10^9	2.37×10^8	1.02×10^8	35,200,000	8,320,000	293,000	Room Air

Table 120 - Contamination classes: maximum permissible cumulative particle concentration as a function of particle size

In order to classify a clean room at a given ISO level, it is necessary to check that the number of particles of various sizes (0.1 µm, 0.2 µm, etc.) does not exceed the maximum values indicated in the corresponding table; for example, to classify a room as ISO 2, it is necessary that in one cubic metre of air there are a maximum of: 100 particles with a diameter greater than 0.1 micron, 24 greater than 0.2 microns, 10 0.3 microns and only 4 0.5 microns.

Cleanrooms with contamination classes between ISO 1 and ISO 4 are typically used in the electronics industry, where contamination must be minimised in relation to the increasingly small size of electronic components. In the life science and biotechnology sectors, the most common classes are between ISO 5 and ISO 8, used for activities ranging from sterile production to aseptic filling and operating theatres. Classes ISO 6 to ISO 9 are used for precision mechanical components, such as optical sensors and parts sensitive in the automotive sector, where adequate environmental protection is required.

5.2.2. GMP (Good Manufacturing Practice) - Minimum standards that every manufacturer must follow during the production process

Good Manufacturing Practices (GMP) are a set of rules that establish the minimum standards that every manufacturer must follow during the production process. They operate on two main fronts:

- Internal standards: ensure safety, quality and hygiene requirements within the company.
- External standards: ensure the quality of products and solutions for end customers.

These standards support companies in improving production processes while maintaining high levels of product quality and safety. The main objective of their establishment is to ensure, on a global level, the production of essential human goods, such as medicines and foodstuffs, while minimising health risks. Quality must be ensured at every stage of the production process; therefore, it is essential to control not only the finished product, but also each stage of its production. GMP focuses on several activities that go beyond the simple production process. In order to obtain a safe and high-quality product, specific practices must be adopted that involve various areas.

1. **Staff training**

It is essential to use properly trained personnel to comply with GMP regulations. Operators must be prepared for the activities of production, control and storage of products. Training courses must be customised according to individual skills and experience.

2. **Documentation**

Every aspect of the process, every activity and operation must be documented through appropriate records. The preservation of documentation must take place in a secure environment with adequate security measures. The storage period for

documents must be limited and the filing system must be simple, to ensure easy access to information during all stages of production and in the event of inspections.

3. **Regular inspection tools and machinery**

Equipment must be well maintained and designed to prevent product contamination. In addition, they must be strategically placed to avoid hazards during the handling of materials, mobile equipment and personnel.

4. **Ceaning and sanitising**

Maintaining contamination within the limits set by GMP procedures is highly dependent on the effectiveness of cleaning operations.

5. **Control and self-control of the production process**

It is crucial to know and monitor processes through internal audits so that raw materials and packaging materials meet the acceptance criteria defined in relation to product quality.

6. **Complaint and Withdrawal Management**

All product complaints must be examined, investigated and handled appropriately. If a product recall is necessary, it is essential to take appropriate corrective action.

5.2.3. Linee guida EU- GMP Allegato 1 - Production of Sterile Medicines

Annex 1 of GMP, entitled 'Manufacture of Sterile Medicinal Products', provides a set of guidelines concerning the means, methods, equipment and management of production in order to achieve specific quality standards. According to these guidelines, controlled contamination environments are divided into four categories, labelled A to D, according to the concentration of airborne particles and the risk level of microbiological contamination. Category A has the lowest particle concentration levels, while category D has the highest levels. The classification takes place in two clean-room occupational states: 'at-rest' and 'operational', and

considers two particle sizes, ≥0.5 µm and ≥5 µm. The maximum permissible airborne particle concentration for each grade is given in the following table.

Grade	Maximum limits for total particle ≥ 0.5 µm/m³		Maximum limits for total particle ≥ 5 µm/m³	
	at rest	in operation	at rest	in operation
A	3 520	3 520	Not specified [a]	Not specified [a]
B	3 520	352 000	Not specified [a]	2 930
C	352 000	3 520 000	2 930	29 300
D	3 520 000	Not predetermined [b]	29 300	Not predetermined [b]

Table 121 - Maximum total particle concentration allowed for classification

[a] Classification with 5µm particles may be considered if indicated by the CCS or historical trends.

[b] For Grade D, the in-service limits are not predetermined. The manufacturer must establish the in-service limits on the basis of a risk assessment and routine data, where applicable.

As can be seen, there are some equivalences between the contamination classes and the type of particles to be sampled (with diameters between 0.5 and 5 µm) given in Annex 1 and those of EN ISO 14644-1 and 2. For example, for grade B, the classification of airborne particles is ISO 5 in the 'at- rest' state and ISO 7 in the 'operational' state for both particle sizes considered. For grade C, the classification of airborne particles is ISO 7 in 'at-rest' state and ISO 8 in 'operational' state. Finally, for grade D, the classification in 'at-rest' state is ISO 8. addition, Annex 1 also contains the limit values for microbiological contamination resulting from airborne biological contaminants in controlled environments during 'operational' conditions as shown in the following table.

Grade	Air sample CFU /m³	Settle plates (diam. 90 mm) CFU /4 hours[a]	Contact plates (diam. 55mm), CFU / plate[b]	Glove print, Including 5 fingers on both hands CFU / glove
A	No growth[c]			
B	10	5	5	5
C	100	50	25	-
D	200	100	50	-

Table 122 - Maximum action limits contamination viable particles

[a] - Settling plates must be exposed in grade A and B areas for the duration of operations (including equipment set-up) and must be changed if necessary after a maximum of 4 hours (the exposure time must be based on validation, including recovery studies, and must not have any negative effect on the suitability of the soils used).

- For grade C and D areas, exposure time (with a maximum of 4 hours) and frequency must be based on the QRM.

- Individual sedimentation plates can be exposed for less than four hours.

[b] Contact plate limits apply to the surfaces equipment, rooms and clothing within Grade A and B areas. Routine monitoring of gowns is not normally required for Grade C and D areas, depending on their function.

[c] Note that for grade A, any growth should involve an investigation.

In class A environments, the concentration of microorganisms in the air or on surfaces is always less than 1 Colony Forming Unit (CFU) per unit volume of air or surface area considered. Therefore, the four classes relating to the production of sterile products can be described as follows:

- Class A: Area dedicated to high-risk operations, such as filling and opening and closing vials, which require aseptic conditions, i.e. the use of sterilised instruments and materials. These conditions are generally ensured by a laminar air flow over the workstation, the maintenance of which must be demonstrated and validated.

- Class B: Used for aseptic preparation and filling; includes all areas surrounding zone A.
- Classes C and D: Clean areas intended for less critical phases of sterile production.

The latest update of the EU-GMP guidelines introduces the principles of Quality Risk Management into the process of monitoring, analysing and correcting particle and microbiological levels. The use of 'alert limits' and 'action limits' is recommended, depending on the nature of the activities performed. The first limit acts as an early warning that conditions are deviating from the norm, requiring investigation of the causes, but not immediate corrective action. Converselyexceeding the action limit requires immediate corrective action.

5.2.4. UNI EN ISO 14698-1:2004 - Clean rooms and associated controlled environments - Control of biocontamination - Part 1: General principles and methods

The first part of UNI EN ISO 14698:2004 outlines the basic principles and methodologies intended to promote appropriate hygiene practices. Biocontamination monitoring clean rooms is essential to ensure the safety and stability of hygiene-sensitive products and processes. This standard offers useful technical guidelines for creation and implementation of environmental monitoring plans, covering both air and surfaces, including the following points:

- Sampling should be carried out when the area is in peak operating and utilised condition, such as at the end of a work shift or during peak activity times. However, sampling during idle conditions can also provide useful data on design and effectiveness of the system under investigation.
- The sampling plan must take into account the level of cleanliness, areas at risk and the degree of biocontamination control required for the activities performed.
- It is essential to identify 'control points', i.e. areas where a risk can be prevented, eliminated or reduced to acceptable levels, and 'risk zones', defined spaces where a vulnerability to contamination exists. These zones can be classified

according to the level of airborne and surface biocontamination. The monitoring of risk zones must be carried out both after installation and during operation.

- It is advisable to establish in advance an 'action level', which represents a limit of biocontamination beyond which immediate action must be taken to identify the cause and take corrective measures, and an 'alert level', which signals a deviation from normal conditions, requiring increased attention to the process in order to identify any problems at an early stage.
- The results of the monitoring should be reviewed regularly to ensure that the system is operating according to established procedures.

Appendix C of the standard focuses specifically on measuring the biocontamination of surfaces. In this regard:

- It is crucial that biocontamination control takes place in risk areas by collecting representative samples to detect viable microflora.
- The count of micro-organisms on a surface can be carried out using contact devices such as contact plates or swabs. The resulting colonies provide a representation of the original amount of viable units (CFU). The deposition count of microorganisms on the surface is obtained by exposing a nutrient surface for a known period, which is then incubated; the colonies provide the deposition rate per area over a given period.
- The use of moist sterile swabs, sponges or similar instruments is particularly effective for sampling large, non-absorbent, irregular or hidden surfaces that are difficult to access with contact devices.
- Sedimentation plates are suitable for qualitative and quantitative evaluations.
- The number of viable particles on contact plates must be reported in UFC/100 cm^2, while for sedimentation plates UFC/100 cm^2 sedimented in one hour is used.

5.3. List of work carried out

Within the company under evaluation, the clean room represents a highly specialised working environment designed to meet the stringent technical and environmental requirements during the assembly and testing phase satellites. This space is divided into two main areas, each designed for specific operations. The first is the assembly area, intended for the integration and assembly of satellite components, while the second is the test area, where functional checks and experimental tests are carried out using advanced equipment, including a UV room, shakers and thermo-vacuum machines.

The clean room conforms to the ISO 5 classification, which imposes strict standards in terms of air purity. As stated in section 5.2.1, the maximum permitted level of particles per cubic metre is 100,000 with a diameter greater than 0.1 micron, 23,700 with a diameter greater than 0.2 micron, 10,200

greater than 0.3 microns, 3,520 greater than 0.5 microns, 832 greater than 1 micron and 29 greater than 5 microns. These parameters ensure an extremely clean environment, essential to prevent any contamination that could compromise the reliability, functionality or lifetime of the satellite in orbit. Even a single foreign particle could damage critical electronic components or optical surfaces, compromising the entire design.

The clean room is designed to provide a sterile and controlled environment, free contaminants, and uses state-of-the-art technology to ensure precision and quality at all stages of operation. The main equipment used includes:

- Thermo-vacuum machines: designed to simulate space vacuum conditions and subject satellites to extreme temperature variations, replicating the orbital environment and testing the strength of materials and integrated systems;
- robots for automated assembly: these advanced systems ensure high precision in assembly operations, minimising the risk of human error and limiting direct contact with components, which is essential to prevent contamination;

- shakers: used to test the satellite's resistance to the vibrations and mechanical stresses that occur during launch. These instruments allow the structural integrity and stability of the internal systems to be verified;
- UV room: used for surface treatments and ultraviolet radiation resistance tests, essential for validating the protection materials in space environments;
- electrically powered equipment: including advanced optical microscopes for precision inspection, soldering stations for micro-component assembly and high-sensitivity measuring instruments for quality control.

Inside the clean room, a series of processes are carried out relating to the assembly and testing of the fully assembled satellite in order to simulate the conditions that can develop in space; these activities require strict control of the environment and the use of advanced technologies. The main operations performed are described in detail below:

1. Assembly of satellite components

The assembly of satellite components is a crucial step in the satellite construction process, during which the different subsystems, modules and structures are integrated to form a complete and functional system. This operation is conducted within the assembly area of the clean room, which is equipped to perform the task correctly. The entire assembly process requires a high level of precision and makes use of advanced technology and highly qualified personnel. The main operations fall into three basic categories: automated assembly, precision manual assembly and installation of critical sub-systems, each of which plays an essential role in ensuring the success of the project.

- Automated assembly

The use of robots for module handling and assembly is a fundamental pillar of the satellite assembly process. These robots are designed to ensure:

- high precision: thanks to advanced control systems, robots can perform operations with minimal tolerances, ensuring that each component is positioned exactly according to design specifications;

- Reducing the risk of contamination: by operating under extremely clean conditions, robots minimise direct contact with components, thus minimising the risk of transferring contaminating particles;
- efficiency in repetitive processes: robots are particularly suitable for the assembly of standardised subsystems, such as solar panels, scientific payloads and electronic components, where repeatability and speed are critical factors.

During this phase, robots mechanically integrate and fix the main components of the satellite, preparing the structure for the next steps of assembly.

- Precision manual assembly

Despite the central role of automation, many operations require human intervention, especially when it comes to handling delicate components or complex operations that require direct supervision. Precision manual assembly focuses on:

- Structural assembly: using electrically powered tools, such as torque-controlled screwdrivers and torque spanners, operators assemble the mechanical parts of the satellite, ensuring proper integration and secure fastening.
- Handling sensitive components: many parts of the satellite, such as printed circuit boards or optical materials, require manual operations to avoid damage during installation.
- Immediate quality control: operators constantly check that each assembled component meets design specifications, making real-time adjustments to ensure an optimal result.

Manual assembly is a phase that combines technical expertise and attention to detail, which is indispensable to guarantee the reliability of the integrated system.

- Installation critical subsystems

The installation of subsystems is one of the most complex and strategic operations in satellite assembly, as it includes the assembly and wiring of components that are critical to the operation of the satellite. Among the main subsystems installed are:

- Sensors: essential tools for collecting scientific data, measuring environmental conditions or monitoring the performance of the satellite itself. Their installation requires extremely precise positioning and verification of functionality in real time.
- Antennas and communication systems: these devices are essential to ensure the connection between the satellite and the ground control stations. During installation, tests are carried out to verify connectivity and signal strength.
- Navigation and control units: include gyroscopes, magnetometers and propulsion systems, which are installed and calibrated to ensure control of the satellite's orientation and trajectory in orbit.

This phase also involves the electrical and mechanical connection between the different modules and the verification of the interaction between the integrated systems, to ensure that the satellite is ready for the subsequent test phases.

2. Testing under vacuum and extreme temperature conditions

Tests under vacuum and extreme temperature conditions are a critical phase in the qualification of the satellite, simulating the environmental conditions it will be subjected to in space. These tests are conducted using thermo-specially designed vacuums, which make it possible to recreate a space-like environment.

- Space vacuum simulation
  - Air : the thermo-vacuum machine reduces the internal pressure to levels approaching absolute vacuum, replicating deep space conditions.
  - Leakage analysis: components and systems are tested for leakage and maintenance of functionality in an atmosphere-free environment.

- Thermal testing under extreme conditions
  - Thermal excursion: the thermo-vacuum machines subject the satellite to significant temperature variations, alternating between extreme hot and cold cycles. This process exposure direct solar radiation and orbital shadows in space.

- Endurance testing: materials, connections and electronic systems are monitored for their ability to function properly despite thermal stress.

This phase ensures that the satellite is able to operate without anomalies during the entire orbital mission.

3. Vibration and mechanical stress testing

The launch of a satellite involves enormous mechanical stresses due to the vibrations and shocks generated by carrier rockets. Vibration tests simulate these conditions to ensure the structural integrity of the satellite and the tightness of its internal systems.

- Launch vibration simulation
  - Using shakers: the satellite is fixed on a vibrating platform that reproduces the typical frequencies and amplitudes of the vibrations that occur during launch.
  - Deformation monitoring: specific sensors record the satellite's responses, highlighting any stress points or structural weaknesses.

- Impact resistance tests
  - Impact tests: in addition to vibrations, sudden stresses, such as rocket stage detachments, are simulated to test the robustness of the satellite.
  - Post-test verification: each component is inspected for damage or misalignment.

These tests ensure that the satellite can withstand mechanical stress without compromising its functionality.

4. Control and calibration electronic systems

Checking and calibrating the electronic systems is essential to ensure that the satellite operates correctly and responds to instructions from ground control stations. This work is carried out using advanced measuring instruments and rigorous calibration methods.

- Verification of electronic operation
  - Testing with oscilloscopes and multimeters: electrical signals and circuits are monitored for anomalies or signal losses.
  - Inspection of power systems: power units are tested to ensure that they can supply power to all systems without interruption.

- Calibration of control systems
  - Processor programming: on-board computers are configured to manage satellite operations, including navigation and communication.
  - Sensor adjustment: gyroscopes, magnetometers and other on-board instruments are calibrated to ensure accurate measurements.

This phase ensures that every electronic system is fully functional and ready for the mission.

5. Inspections and quality control

Inspection and quality control are cross-functional activities, carried out throughout the assembly and testing process to ensure that the satellite meets the required standards.

- Visual and instrumental control
  - Visual inspection: qualified operators check each component for defects, contamination or surface anomalies.
  - Microscope analysis: advanced optical instruments are used to examine micro- components and critical details such as welds or connections.

- Final functional tests
  - Integrated testing: once assembled, the satellite undergoes global testing to verify interaction between systems and adherence to design specifications.

This phase ensures that the satellite meets all technical and operational requirements prior to launch.

5.4. Emergency scenarios and management procedures

Emergencies in a highly controlled environment such as the clean room require specific procedures, as many processes cannot simply be stopped without taking adequate safety measures. Previously, sources of emergencies have been dealt with in a general way, but in this section, the management of such events in relation to the particular activities carried out in the clean room is discussed in more detail.

Operations within this environment include automated assembly, precision manual assembly, testing under extreme conditions and calibration of electronic systems, each of which presents critical issues that must be addressed with specific protocols. For instance, during a thermo-vacuum test or an assembly operation, it is not always possible to stop immediately without risking irreversible damage to satellite components.

The emergency procedures differentiated for each source risk are described below, including general actions to be taken and specific measures for each work phase.

It is also emphasised that, as previously defined within the general emergency management procedures, any pre-alarm within the company, translates into clean room as an alarm situation, therefore, work must be stopped and the asset secured.

5.4.1. Fire

In event of a fire inside the clean room, before evacuating the room, the operators must take specific measures to protect the equipment and components being worked on. In particular, materials must be covered with special fireproof blankets in order to limit the damage caused by heat, flames and residues resulting from the extinguishing operations.

Event reporting and management

In the event that a fire is detected, the person detecting the fire must comply with the following provisions:

1. promptly inform one of the fire and evacuation officers, who is always present inside the Clean Room, indicating precisely the location and extent of the event;

2. refrain from any autonomous intervention, unless explicitly requested by safety officers or fire-fighting officers.

Interruption of operational activities

Following the report of a fire, all workers present in the Clean Room must immediately stop the activities in progress and take specific measures according to the type of work:

- automated assembly:
    1. stop robot operations using the emergency button;
    2. switch off power supplies to prevent short circuits;
    3. protect components during assembly with fireproof blankets;

- manual assembly:
    1. Carefully place the instruments used;
    2. cover the assembled parts and walk away safely.

- TVAC test:
    1. stop the system using the emergency button;
    2. Seal the test chamber to prevent gas leakage or damage to internal components.

- vibration test:
    1. deactivate the shakers via the buttons;
    2. cover the satellite

Evacuation procedures

Once these operations have been completed, the operators must follow the indicated escape routes, without using lifts, and assemble at the designated assembly point so that the presence of all personnel can be verified.

Duties of the fire officer

Once all personnel have left the work area, the fire marshal shall:

1. carry out a preliminary assessment of fire site.
2. if the fire turns out not to be safely manageable, alert the control room, which in turn will notify the emergency situation to the emergency manager or his deputy.
3. if it is possible to intervene without endangering personal safety and the safety of others, go to the affected area for a more accurate assessment and, if necessary, take appropriate measures.
4. always keep clear escape route to avoid being trapped.
5. place themselves at the disposal of the RGE and perform only the required work.

Tasks of the RGE

When the Emergency Response Officer is alerted to the situation, he/she shall:

1. Analysing the information received and, in cooperation with the fire- fighting officers, assessing the actions necessary for the safety of the people present;
2. immediately contact the fire brigade and set the necessary support measures to facilitate their intervention;
3. if there are casualties, alert the medical emergency services in coordination with first-aid officers, providing all the information requested;
4. Identify possible damage mitigation procedures pending the arrival of help (e.g. shutting off power supplies and technical gases);
5. verify that the evacuation was successful and, in case of missing persons, prepare the necessary activities for their tracing;
6. if the fire poses a potential threat to adjacent buildings, inform those responsible for neighbouring structures;
7. provide the rescue services with all necessary information, including floor plans of the premises, a copy of which will be available at the guardhouse;
8. if required, activate the general electrical release from the main power supply cabinet;

9. make themselves available to the competent authorities to facilitate rescue operations;
10. at the end of the intervention, check the state of the premises and declare the end of the emergency, if appropriate;
11. inform the Employer, the Workers' Safety Representative (RLS) and the Prevention and Protection Service Manager (RSPP) of the incident.

5.4.2. Natural events

In the event of natural events, such as earthquakes, floods and whirlwinds (according section 4.4.2, landslides and avalanches are not contemplated given the location of the site under investigation), the first priority is to ensure the safety of people, including through the timely evacuation of premises, if necessary. Since such events occur suddenly and can cause significant damage, workers are not required to carry out specific operations to safeguard equipment or materials, giving priority instead to their own safety.

Earthquake

During an earthquake, workers should take shelter under desks, workbenches, beds or near load-bearing structures, where there is less risk of collapse. Evacuation can only be carried out at the end of the earthquake event.

The only work that requires specific action on the part of the operator before taking cover concerns the tests conducted with the thermo-vacuum machine. During operation, this machine generates extreme conditions of temperature and pressure inside it; consequently, any structural damage caused by an earthquake could compromise its integrity, with the risk of an explosion due to the sudden compensation of the pressure difference between the internal and external environment. To prevent this danger, operators, before taking cover, must press the emergency stop button on the machinery, immediately stopping its operation and reducing the risk of catastrophic damage.

Flood

In the event of conditions preannouncing a flooding emergency, the Emergency Management Manager (RGE) has the authority to order the preventive closure of the facility, notifying workers not to go to work until the emergency is over.

For personnel already present within the clean room, it is requested that they immediately cease ongoing activities and leave the clean room via the units decontamination and changing rooms, so as to preserve the controlled conditions of the environment.

Strong winds/ whirlwinds

In the event of a strong wind or whirlwinds, workers should immediately seek shelter in a safe indoor area away from windows and doors, preferably in a room without openings, in a protected corridor or in a basement. Evacuation may only take place once it has been ascertained that the event has ended and the surrounding area is safe.

Similar to flooding emergency, the personnel present in the clean room must interrupt their ongoing activities and leave the workplace via the changing rooms. Since, for the protection of trade secrets, clean rooms are designed without windows facing the outside of the building, the risk of damage caused by windblown debris is reduced.

Tasks of the RGE

In the event that a person identifies an emergency scenario as mentioned above, he or she must promptly notify the RGE, who will endeavour to:

1. valutare assess the extent of the event and the effects it has had or may have on structures and work premises and its possible developments;
2. together with those in charge of evacuation, provide for the evacuation of persons exposed to immediate risks and alert in adjacent rooms or, if necessary, evacuate the entire facility;
3. assessing the actions to be taken for the protection of workers, possibly deciding to call in the fire brigade to facilitate their task;

4. if injured persons are present, together with the first-aid officers alert the first-aid team and provide them with the required information;
5. coordinate interventions taking into account the skills and training of each of the workers so as to minimise damage and possible developments in the emergency;
6. ensure that the evacuation is successful and, in the presence of missing persons, identify measures to search for them;
7. if necessary, operate the general electrical release (Cabin);
8. upon arrival of help, provide them with the necessary information and the floor plan of the premises;
9. make themselves available for rescue;
10. at the end of the emergency, check the state of facilities, premises, etc. and assess whether it is possible to return to the company and which activities can be resumed, taking into account the protection of workers' health and safety.
11. Notify the Employer, the RLS and the RSPP of the incident.

5.4.3. Structural damage

The term 'structural damage' refers to any impairment of a building's structures, regardless of the cause. Such damage may result from natural events such as earthquakes, accidents such as fires or explosions, or from the progressive degradation of structures over time. In addition to compromising the stability of buildings, these phenomena pose a serious risk to the safety of people working or residing in them.

Emergency management varies depending on whether the structural damage occurs inside the clean room or in an area outside the clean room. In the event that the damage affects working environments outside the clean room, operators, alerted by the EVAC public address system, must immediately stop activities, operate the emergency stop buttons on the machinery, and, if possible, transfer the satellite to storage inside the clean room before proceeding with evacuation.

If, on the other hand, structural damage occurs inside the clean room, specific procedures will be adopted to ensure safety of personnel and the protection of equipment, as described below.

Event reporting and management

In the event that a clean room operator detects damage to the facilities, he or she must:

1. notify the Emergency response officer, giving details of the location of the damage and the extent of the damage;
2. from this moment, refrain from carrying out any intervention unless specifically requested by those responsible.

Tasks of the RGE

Once informed of the emergency situation, the Emergency Response Officer should:

1. assess the extent of the event and its effects on the stability of the structures, analysing the possible developments of the situation;
2. in cooperation with the evacuation officers, arrange for the immediate evacuation of persons exposed to direct danger and alert those in adjacent rooms; if necessary, arrange for the evacuation of the entire building;
3. determine the protective measures necessary for the safety of workers and, if appropriate, alert the fire brigade, arranging for them to facilitate their action;
4. in the presence of injured people, coordinate with first-aid responders to contact the emergency health services, providing all necessary information;
5. managing and coordinating interventions according to the skills and training workers, minimising risks and damage resulting from the emergency;
6. if the emergency could spread to neighbouring buildings, take prompt action to inform those responsible for adjacent facilities;
7. check that the evacuation has been properly completed and, in the case of missing persons, prepare search operations;
8. if necessary, switch off the general power supply by disconnecting the electrical cabinet;

9. upon arrival of the rescue teams, provide them with all useful information, including the floor plan of the premises concerned;
10. remain at disposal of rescuers for guidance and assistance;
11. once the emergency is over, assess the state of the facilities and environments to determine whether it is possible to return to the company and which activities can be safely resumed;
12. Notify the Employer, the RLS and the RSPP of the incident.

5.4.4. Medical emergencies and urgency

In the event of an accident or illness, it is necessary that trained workers intervene who know how to stop the source of the damage and only then intervene on the injured person.

If a medical emergency occur within the clean room, the management procedure is as follows.

Event reporting and management

In the event that a person witnesses an injury or illness, he/she must:

1. act, to the of his or her knowledge and without endangering his or her own or others' safety, to remove the cause of the event if it can continue to cause harm to the injured person;
2. ascertain the state of the injured person;
3. alert one of the first-aid officers, giving details of the location of the accident and the extent of the accident;
4. from this moment on, refrain from carrying out any intervention unless specifically requested to do so by those responsible or appointed.

Tasks of the first-aid officer

The first-aid officer, who must always be present in every work team working in a clean room, like the fire-fighting officer, has the task of:

1. promptly inform the workers present in the control room of the emergency situation, so that they can contact the emergency services and alert the Emergency Management Manager (RGE);

2. accompany the casualty outside the clean room through the decontamination unit, ensuring a safe and protocol-compliant exit;
3. Assess the condition of the person involved, taking any first aid measures to mitigate the effects of the accident, following the instructions given by the rescuers.

Tasks of the RGE

Once informed of the emergency situation, the Emergency Response Officer should:

1. assess extent of the event and that the initial cause of the event cannot cause further damage;
2. together with the first-aid officers, stabilise the injured person's condition;
3. immediately call for medical assistance and provide them with the required information;
4. when help arrives, provide them with the necessary information;
5. make themselves available for rescue;
6. at the end of the emergency, check that the cause of the accident is no longer present and, only when there is no longer any risk to people, allow people to re-enter the premises;
7. notify the Employer, the RLS and the RSPP of the incident.

5.4.4. Malicious acts

Malicious acts, such as terrorist attacks, bomb scares and cyber attacks, pose a real operational risk, particularly in a place like the clean room, where critical activities of high strategic value are carried out.

A terrorist attack could compromise the integrity of infrastructure, national security and the stability of the technology sector, thus requiring the implementation of specific physical protection measures and emergency protocols. Similarly, cyber attacks pose a significant threat, with potential impacts on IT security, business continuity and intellectual property protection, through espionage, sabotage or extortion.

Given the highly controlled nature of clean rooms, it is essential to adopt targeted emergency management procedures to ensure the safety of personnel and the protection of company assets. The operational measures to be implemented in the event of such events are described below.

Terrorist attack

In the event of a terrorist attack with the presence of armed hostiles inside the room, there is no evacuation of the workplace:

1. if conditions permit, interrupt critical machinery by pressing the emergency stop buttons;
2. remain at their post by not counteracting the bomber's actions;
3. remain calm and in control of one's actions due to offences received and do not mock any deranged behaviour of the attacker;
4. avoid sudden movements or 'stealth actions' that could in any way appear as escape attempts or defensive reactions;
5. if the threat is not direct and you are certain of active law enforcement action, sit or lie down on the ground and await further instructions from the officer in charge.

Once the notification has been made, the RGE shall:

1. give instructions to the emergency teams to notify the police;
2. communicate the ongoing emergency to the other companies in the building, either directly or through fire safety or first aid personnel.
3. order the evacuation of the premises surrounding the one where the event was reported following the instructions provided by the competent authorities and, if the situation requires it, extend the process to the entire building;
4. remain at the disposal of the intervening authorities.

The emergency teams should, if possible, coordinate the evacuation of other company premises.

If the attack does not directly target the clean room, the RGE will notify the Control Room of the emergency, which in turn will immediately alert the operators in the integration room.

At this point, the workers, under the coordination of the departmental supervisors and fire-fighting officers, should:

1. protect satellites by adequately covering them to reduce the risk of contamination;
2. Leave the premises using the external emergency exits, avoiding transit through internal areas of the building to reduce the risk of coming into contact with attackers.

Although this procedure temporarily compromises the condition of the clean room, it ensures a faster and safer evacuation for staff.

Bomb threat

In the event that a suspicious package is spotted or an external call is received warning of the presence of an explosive device (bomb threat), workers inside the clean room must:

1. interrupt critical work;
2. cover the satellites with the appropriate blankets;
3. remain calm and refrain from personal initiatives (such as opening or moving the package, etc.);
4. immediately transmit the information to the control room, which in turn will contact the RGE.

The RGE at this point must:

1. give instructions to the emergency teams to notify the police;
2. communicate the ongoing emergency to the other companies in the building, either directly or through fire safety or first aid personnel.

3. order the evacuation of the premises surrounding the one where the event was reported following the instructions provided by the competent authorities and, if the situation requires it, extend the process to the entire building;
4. remain at the disposal of the intervening authorities.

In the event that the bomb threat is in a room other than the clean room, workers inside must:

1. protect satellites by adequately covering them to reduce the risk of contamination;
2. leave the premises using the changing rooms as an escape route.

Cyberattack

In the event of a cyber attack, there no evacuation of the clean room, as the safety risk to workers is minimal. Furthermore, since is no video terminal inside the room, the chances of a direct attack on the operating systems of the clean room are extremely low.

Should the facility suffer a cyber attack, the staff in the control room will promptly inform the operators in the clean room about the ongoing emergency. However, if there is no direct impact on operations, work can continue as normal.

5.4.5. Chemical emergency

In a highly controlled environment such as the clean room, a chemical emergency is a rare occurrence, as activities focus on assembly and testing, with minimal use of chemical agents.

The main risk in this context stems from the handling of the lithium battery packs, which are essential for powering the satellite. Any damage during the assembly phase could cause the release of toxic fumes, posing a threat to the safety of the operators.

To handle this eventuality, detection sensors positioned above the workstations constantly monitor the environment. In case of smoke release, the system sends a signal to the master control unit, which immediately activates the fume hoods in the

affected area. Once the absence of contaminants is detected, the environment is considered safe again and activities can resume.

In this case, operators must:

1. stop all work;
2. move quickly away from the damaged battery to reduce exposure to smoke.
3. whether it is possible to stop the robot, the shakers and the thermo-vacuum machine by pressing the emergency button;
4. whether it is possible to cover satellites.

Duties of the fire officer

The fire marshal present in the clean room will be responsible for managing the emergency, effectively coordinating the evacuation of personnel. Due to the high toxicity of the fumes released by lithium batteries, the officer should only leave the room after ensuring the safe exit of all operators.

5.4.6. Electrical blackout

In the event of a power failure, all equipment and appliances connected to the mains supply are immediately shut down and the lights go out, except for those with battery back-up or emergency power supply. This sudden interruption of the power supply, within the clean room, can cause:

- sudden shutdown of manual electrical equipment, with risk of injury if in use at the time of the interruption;
- blockage of the robotic arm, which could in an unstable or moving position, increasing the risk of collision or crushing;
- interruption of the shaker, with possible abnormal oscillations or load instability;
- shutdown of the thermo-vacuum chamber, with possible thermal or pressure inside;
- lack of lighting, which could hinder movement and increase the risk of accidents.

Interruption of operational activities

Following a blackout, depending on the work performed, the operators in the Clean Room will have to:

- immediately using electrically powered equipment and place it in a safe position.
- move away from the working area of the robot, avoiding possible uncontrolled movements during resetting;
- when using the shaker, if the satellite is placed on the test platform, they must check for any abnormal movement and avoid approaching it until power is restored;
- when using the thermo-vacuum machine, they must check the status of the closure and await instructions before performing any manoeuvres.

Tasks of the maintenance technician

The maintenance technician, working outside the clean room, without endangering his own and others' safety, must:

1. search for the cause of the event and, if possible, remedy it as soon as possible;
2. if the emergency cannot be managed directly and fully by the emergency responders, report the situation to the RGE;
3. place themselves at the disposal of the RGE, carrying out only the required interventions.

Tasks of the RGE

When the Emergency Response Officer is alerted to the situation, he/she shall:

1. in on the basis of the information received, in consultation with fire-fighting officials, assess the actions necessary to secure the people present, in particular, evacuation from the premises, giving priority to areas where the absence of power supply may lead to immediate risks;
2. inform the fire brigade of the emergency and take the necessary action to facilitate it;

3. if injured persons are present, together with the officers alert the first-aid station and provide the required information;
4. while waiting for help to arrive, also alert the managers of neighbouring facilities;
5. ensure that the evacuation is successful and, in the presence of missing persons, identify measures to search for them;
6. upon arrival of help, provide them with the necessary information and the floor plan of the premises;
7. make themselves available for rescue;
8. at the end of rescue operation, check the state of the working premises and, if necessary, decree the end of the emergency;
9. Notify the Employer, the RLS and the RSPP of the incident.

Conclusions

The analysis conducted in this thesis has highlighted the importance of integrating risk assessment and emergency management in the aerospace manufacturing sector, with a particular focus on controlled contamination environments such as clean rooms. The complexity of manufacturing processes, coupled with the need to meet high safety standards, requires a structured methodological approach capable of combining established best practices with innovative solutions specific to the aerospace context.

The adoption of advanced risk assessment methodologies, combined with detailed planning of emergency procedures, has proven to significantly reduce risks to personnel and the integrity of working environments. The model developed in this study offers a replicable framework that can support companies in the sector in defining effective and customised prevention strategies. A key aspect that emerged was the need for an integrated approach that considers not only the physical safety of operators, but also the protection of critical processes and the quality of the end product. The management of emergencies in contamination-controlled environments requires tailor-made solutions, capable of balancing the needs for rapid evacuation with those for the protection of high-technology artefacts.

Finally, the results emphasise the crucial role of staff training and awareness. The creation of a safety culture, supported by specific training programmes and periodic simulations, is a key element in ensuring the effectiveness of prevention and response measures.

This study represents a starting point for further research and development in the field of aerospace security. Future research could focus on the implementation of emerging technologies, such as artificial intelligence and the Internet of Things (IoT), to improve real-time risk monitoring and management, thus contributing to making the industry increasingly safe and efficient.

Bibliography

D.lgs. 9 aprile 2008, n. 81 – "*Testo unico sulla salute e sicurezza sul lavoro*"

DM 01/09/2021 – "*Criteri generali per il controllo e la manutenzione degli impianti, attrezzature ed altri sistemi di sicurezza antincendio, ai sensi dell'articolo 46, comma 3, lettera a), punto 3, del decreto legislativo 9 aprile 2008, n. 81.*"

DM 02/09/2021 – "*Criteri per la gestione dei luoghi di lavoro in esercizio ed in emergenza e caratteristiche dello specifico servizio di prevenzione e protezione antincendio, ai sensi dell'articolo 46, comma 3, lettera a), punto 4 e lettera b) del decreto legislativo 9 aprile 2008, n. 81.*"

DM 03/09/2021 – "*Criteri generali di progettazione, realizzazione ed esercizio della sicurezza antincendio per luoghi di lavoro, ai sensi dell'articolo 46, comma 3, lettera a), punti 1 e 2, del decreto legislativo 9 aprile 2008, n. 81.*"

ISO 45001:2018 – "*Occupational health and safety management systems – Requirements with guidance for use.*"

UNI EN ISO 14644-1:2016 – "*Cleanrooms and associated controlled environments - Part 1: Classification of air cleanliness by particle concentration.*"

EU-GMP Annex 1 – "*Manufacturing of Sterile Medicinal Products.*"

UNI EN ISO 14698-1:2004 – "*Cleanrooms and associated controlled environments - Biocontamination control - Part 1: General principles and methods.*"

Sitography

https://www.adlabor.it/schemi/poteri-del-datore-di-lavoro/poteri-del-datore-di-lavoro-quadro-generale/ (accessed September 2024)

https://www.corsisicurezza.it/blog/coordinatore-emergenze-81-08-definizione-nomina-compiti.htm (accessed September 2024)

https://www.innovaformazione.it/nomina-preposto/ (accessed September 2024)

https://www.corsisicurezzaitalia.it/qualita-corsi/quale-formazione/addetto-primo-soccorso/ (accessed September 2024)

https://biblus.acca.it/scadenza-dvr-durata-ed-elenco-dei-casi-di-aggiornamento/ (accessed September 2024)

https://www.scuolasicurezza.it/piano-di-emergenza-ed-evacuazione/ (accessed October 2024)

https://www.studioessepi.it/magazine/sicurezza-sul-lavoro/cose-piano-emergenza-ed-evacuazione-pee (accessed October 2024)

https://www.sls.polito.it/organizzazione/quadro_normativo/d_lgs_81_08_e_s_m_i (accessed October 2024)

https://www.af-systems.com/it/compartimentazione-antincendio (accessed November 2024)

https://www.fiamma-antincendio.it/protezione-attiva-e-protezione-passiva-antincendio/ (accessed November 2024)

https://www.asur.marche.it/emergenza-urgenza (accessed November 2024)

https://www.laborsecurity.it/classificazione-delle-urgenze/ (accessed November 2024)

https://studiolegaleballai.it/2022/10/04/quali-sono-reati-non-colposi-differenza-tra-doloso-e-colposo/ (accessed November 2024)

https://mascherpa.it/blog/thermal-runaway-cose-e-le-conseguenze-per-la-sicurezza-delle-batterie-ev/ (accessed December 2024)

https://www.mecalux.it/blog/camera-bianca-clean-room (accessed January 2025)

https://galvani.com/blog/camere-bianche-cosa-sono-quali-sono-le-linee-guida/ (accessed January 2025)

https://midposi.com/it/tips-for-beginners-in-the-cleanroom/ (accessed January 2025)

https://genelab.eu/camere-bianche-e-normativa-uni-en-iso-14644/ (accessed January 2025)

https://www.labelprint24.com/it/magazine/norme-di-buona-fabbricazione-linee-guida-492 (accessed January 2025)

https://www.puntosicuro.it/view-pdf/le-norme-tecniche-per-il-controllo-microbiologico-delle-superfici-AR-17209/ (accessed January 2025)

List of tables

List of figures