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Ministère de L'Enseignement Supérieur et de la Recherche Scientifique
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A thesis submitted in fulfillment of the requirements for the degree of Engineer

In : QHSE-GRI

The Implementation of a Country-Wide Energy Isolation (EI) Program in Compliance with Standard HSE-103 and World Class Guidelines.

HOLCIM Algeria

By:
Ouanis SMAIL

Presented publicly on **01/07/2024**, in front of the jury composed of:

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Dr.	BITCHIKH Karima	Associate Professor A	ENP	Committee Member
Ms.	KEDARI Fadhela	External Contributor	ENP	Committee Member
Ms.	FODIL Marya	Assistant Professor A	ENP	Thesis Supervisor
Mr.	KERTOUS Aboubakr	Assistant Professor A	ENP	Thesis Supervisor
Mr.	BENSBAA Imed Eddine	Country Safety Director	HOLCIM	Thesis Supervisor

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Mémoire de Projet de fin d'Etudes en vue de l'obtention du diplôme d'Ingénieur d'Etat

En : QHSE-GRI

Mise en place d'un programme d'isolation d'énergie (EI) conforme au standard HSE-103 et aux lignes directrices de Wolrd Class.

HOLCIM Algérie

Par :

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Mme	KEDARI Fadhela	Contributeur Externe	ENP	Membre du Jury
Mme	FODIL Marya	Maître Assistant A	ENP	Directrice de thèse
M.	KERTOUS Aboubakr	Maître Assistant A	ENP	Directeur de thèse
M.	BENSBAA Imed Eddine	Directeur Safety	HOLCIM	Directeur de thèse

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ملخص

في البيئة الصناعية المتطورة بانتظام، يعد تحقيق التوازن بين الكفاءة التشغيلية و السلامة أمرًا بالغ الأهمية. تستكشف هذه الأطروحة تنفيذ برنامج شامل لعزل الطاقة في منشآت شركة هولسيم في الجزائر. الهدف الأساسي هو تعزيز السلامة في مكان العمل وتخفيف المخاطر المرتبطة باستخدام الطاقة. يهدف البرنامج، من خلال إجراء تقييمات شاملة، وتوحيد الإجراءات، وتوفير التدريب والتعليم المستمر، ودمج التقنيات المتقدمة، إلى الحد من الحوادث بشكل كبير وضمان الامتثال لمعايير السلامة. وتظهر نتائج البحث تحسينات كبيرة في أداء السلامة والكفاءة التشغيلية، مما يؤكد فعالية التدابير المنفذة.

الكلمات المفتاحية: عزل الطاقة، والكفاءة التشغيلية، والسلامة، وتخفيف المخاطر، والتقييمات، وتوحيد الإجراءات، والتدريب المستمر، والحد من الحوادث، والامتثال.

Résumé

Dans l'environnement industriel en constante évolution, il est crucial de trouver un équilibre entre l'efficacité opérationnelle et la sécurité. Cette thèse explore la mise en œuvre d'un programme complet d'isolation énergétique dans les installations de Holcim en Algérie. L'objectif principal est d'améliorer la sécurité sur le lieu de travail et d'atténuer les risques associés à l'utilisation de l'énergie. En procédant à des évaluations approfondies, en standardisant les procédures, en assurant une formation continue et en intégrant des technologies de pointe, le programme vise à réduire de manière significative les accidents et à garantir le respect des normes de sécurité. Les résultats de la recherche démontrent une amélioration substantielle des performances en matière de sécurité et d'efficacité opérationnelle, ce qui souligne l'efficacité des mesures mises en œuvre.

Mots Clée : Isolation énergétique, Efficacité opérationnelle, Sécurité, Atténuation des risques, Evaluations, Normalisation des procédures, Formation continue, Réduction des accidents, Conformité.

Abstract

In an ever-changing industrial environment, achieving a balance between operational efficiency and safety is crucial. This thesis explores the implementation of a comprehensive Energy Isolation program at Holcim's facilities in Algeria. The primary goal is to enhance workplace safety and mitigate risks associated with energy usage. By conducting thorough assessments, standardizing procedures, providing continuous training and education, and integrating advanced technologies, the program aims to significantly reduce accidents and ensure compliance with safety standards. The research findings demonstrate substantial improvements in safety performance and operational efficiency, underscoring the effectiveness of the implemented measures.

Keywords: Energy Isolation, Operational efficiency, Safety, Risk mitigation, Assessments, Standardizing procedures, Continuous training, Accident reduction, Compliance.

"To my parents, whose dreams and aspirations for me have always been my guiding light. Your relentless efforts, sleepless nights, and countless prayers have not gone unnoticed. Your love has been my sanctuary, your wisdom my compass. I dedicate this work to you with profound gratitude and love.

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From the depths of my heart, thank you. This work, this journey, this success—it's all because of you."

VAYA CON DIOS Friends

S. Ouanis

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First and foremost, I am profoundly grateful to Allah SWT for bestowing upon us the strength, courage, and the mental and physical capacities required to complete this work under the best possible conditions. May this endeavor be a meaningful contribution to our society.

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Nomenclature

Acronymes

AC	Alternating Current
ACC	Algerian Cement Company
AES	Advanced Encryption Standard
API	Application Programming Interface
ATEX	ATmosphère EXplosible (Explosive Atmospheres)
BLEVE	Boiling Liquid Expanding Vapor Explosion
CD	Continuous Deployment
CDL	Construction Development Laboratory
CI	Continuous Integration
CILAS	Cimenterie de l'Atlas
CMA	Ciments et Mortiers d'Algérie
COLPA	Partnership "Lafarge and Cosider"
CSS	Cascading Style Sheets
CV	Computed Vomography
DC	Direct Current
DRR	Disaster Risk Reduction
EI	Energy Isolation
GDPR	General Data Protection Regulation
GICA	Groupe Industriel des Ciments d'Algérie

HSE	Health, Safety, Environment
ILO	International Labor Organization
Js	JavaScript
JSON	JavaScript Object Notation
KPIs	Key Performane indicators
LOTO	Lock-out, Tag-Out
LOTOTO	Lock-out, Tag-Out, Try-Out
MCC	Motor Control Center
MOC	Management Of Change
MVP	Minimum Viable Product
MW	Microwave
OEM	Original Equipment Manufacturer
ORM	Object-Relational Mapping
OWASP	Open Web Application Security Project
PTW	Permit to work
QMS	Quality Management System
RF	Radio Frequency
SaaS	Software as a Service
SCMI	Société des Ciments de Meftah
SEO	Search Engine Optimization
SSG	Static Site Generation
SSL	Secure Sockets Layer
SSR	Server-Side Rendering
TLS	Transport Layer Security
VCS	Visual Cut-Off switches
VPS	Virtual Private Server

Introduction

Failures during the isolation and reinstatement of process plants are one of the main causes of loss-of-containment incidents, often leading to major accidents. High standards of isolation and rigorous management control are essential for plant isolation and reinstatement, especially in major hazard industries. In today's rapidly evolving industrial landscape, ensuring worker safety and managing energy usage efficiently have become critical priorities for businesses worldwide. At Holcim, energy isolation is pivotal in mitigating risks and reducing fatalities, with inadequate energy isolation identified as a leading cause of over 80% of deaths and serious injuries. The International Labor Organization (ILO) estimates that work-related deaths have increased by 5% since 2015. With growing awareness of safety issues and workplace hazards, organizations face increasing pressure to balance resource optimization with employee well-being. In response, Holcim is launching an energy isolation program across all its units in Algeria. This initiative aims to create a safer working environment and promote a culture of safety and well-being among employees through proactive risk management methods, such as training programs, standardized procedures, and state-of-the-art technologies.

This thesis addresses these pressing issues through the implementation of a comprehensive Energy Isolation program at Holcim's operations in Algeria.

In Chapter One, we set the stage by outlining the context, problem statement, and methodology of the project. We explore the significance of energy isolation in industrial settings, particularly within the Holcim facilities in Algeria. This chapter discusses the key challenges faced and the strategic objectives aimed at enhancing safety and compliance with industry standards.

Chapter Two delves into the theoretical aspects of energy isolation. This section defines essential terms and concepts, highlighting the critical control management framework and the importance of robust lockout/tagout (LOTOTO) procedures. We lay the groundwork for understanding the technical and operational standards necessary for a world-class energy isolation program.

In Chapter Three, we transition to the practical implementation of the energy isolation

program. This includes a detailed gap assessment of current practices at Holcim's Msila unit, identifying areas requiring immediate improvement. We present a comprehensive action plan that outlines specific measures to enhance compliance and operational safety. This chapter emphasizes the practical steps needed to translate theoretical principles into effective safety protocols.

Chapter Four is dedicated to the development and implementation of a SaaS solution designed to support the energy isolation program. We discuss the technological choices, software architecture, and data security measures essential for building a robust and user-friendly application. This chapter also includes a SWOT analysis and an action plan for short, medium, and long-term goals.

Finally, in Chapter Five, we present our conclusions and recommendations based on the research findings. We summarize the key achievements of the energy isolation program and propose future directions for continuous improvement. This chapter underscores the importance of maintaining a proactive approach to safety management and highlights the ongoing commitment of Holcim to operational excellence and employee safety.

Through these chapters, this thesis aims to provide a comprehensive understanding of the implementation and impact of a world-class energy isolation program, contributing to the advancement of safety practices in industrial environments.

Chapter 1

Context, Problem Statement, and Methodology

1.1 Context

In this chapter, the broad context of the implementation of an energy isolation program at Holcim Algeria will be covered, along with the importance of energy efficiency in the cement sector, current energy difficulties, and implementation challenges.

1.1.1 HOLCIM Group

The HOLCIM Group, a global leader in innovative and sustainable building solutions, reported net sales of **27.0 billion Swiss Francs in 2023**. Driven by a commitment to advancing progress for both people and the planet, HOLCIM's 63,448 employees are dedicated to decarbonizing building practices while enhancing living standards worldwide.

The company empowers customers across all regions with a diverse array of low-carbon and circular solutions, ranging from ECOPact and ECOPlanet to the circular technology platform ECOCycle.

HOLCIM's innovative systems, including Elevate roofing and PRB insulation, contribute to making buildings more sustainable in use, promoting energy efficiency and green retrofitting. With sustainability as a cornerstone of its strategy, HOLCIM is actively working towards becoming a net-zero company, with targets that have been validated by the Science-Based Targets initiative [2]

1.1.2 HOLCIM Algeria

1.1.2.1 Introduction

An important market for the Holcim Group is Algeria, formerly known as Lafarge and now as Holcim. Since 2000, the construction industry in Algeria has experienced significant growth, leading to a high demand for building supplies and construction solutions. [3] Throughout the entire value chain of building materials, including aggregates, cements, mortars, concrete, gypsum, bags, logistics, and distribution, Holcim is actively present in Algeria. The business has positioned itself to take advantage of the nation's growing construction industry by providing an extensive selection of creative and environmentally friendly building solutions that adapt to the changing demands of the market. [4]

1.1.2.2 Timeline of Events

The following table outlines key milestones in the development of LafargeHolcim's operations in Algeria from 2002 to 2017 [1].These events highlight significant achievements and strategic initiatives, showcasing the company's growth and impact within the construction materials sector in the region :

Year	Event
2002	COLPA "Lafarge & Cosider" partnership, gypsum production plant in Bouira
2003	Construction of the M'Sila cement plant, the largest in Algeria
2007	Construction of 1st white cement line at Oggaz and launch of Concrete & Aggregates activity
2008	Lafarge GICA partnership for the SCMI Meftah plant; Start-up of new gray cement line at Oggaz
2010	Launch of the "Chamil, Matine, Mokaouem, Malaki" product range
2013	Launch of 1st building materials retail chain BATISTORE; Inauguration of Africa's first "CDL" construction laboratory; Start-up of the 5th Cement mill in M'Sila
2014	CILAS partnership: Launch of construction of a new cement plant in Biskra in partnership with Groupe Souakri
2015	Launch of SARIE high-performance cement; Merger of the Lafarge and Holcim Groups to form the new leading building materials Group LafargeHolcim
2016	Start-up of CILAS Biskra; Start-up of cement and mortar business - CMA Meftah; Start-up of aggregates quarry at Kef Azrou; Start-up of 3rd COLPA gypsum kiln; 6 new Batistore
2017	Launch of "MOUKAMIL," a binder for all masonry and finishing works; Launch of a new mortar range: "ciment colle blanc, multi-purpose mortar, single-coat rendering"; Launch of the Ardia 600 road binder solution; 7 new Batistore

Table 1.1: Timeline of Events. [1]

1.1.2.3 Operational Sites

Holcim Algeria has 23 operational sites, including: [5]

- 3 Cement plants
- 12 Concrete batching plants
- 1 Aggregates quarry
- 1 Plaster plant
- 1 Mortar plant
- 1 Bag plant
- 1 Export logistics platform
- 1 Research laboratory
- 2 Distribution Centers

1.1.2.4 Human Resources

Holcim Algeria employs 4200 highly skilled collaborators dedicated to excellence and innovation. [5]

1.1.2.5 Partnerships

Holcim Algeria has established strategic partnerships: [5]

- Private-Public:
  - 35% partnership with GICA Group for SCMI
  - 57% partnership with COSIDER Group for COLPA
- Private-Private:
  - 49% partnership with Souakri Group for CILAS
  - 49% partnership with Souakri Group for CMA
  - 49% partnership with Saidi and Benhamadi families for SAA

1.1.3 Lafarge Cement of Msila

After the Algerian crisis of the 90s and early 2000s, and in order to support the national economy and develop the country, the Algerian government opened up investment in all areas of industry, resulting in the launch of the Cimenterie de M'sila Cimenterie de M'sila (ACC) Algerian Cement Compagny.
ACC is a plant set up in Algeria, particularly in M'sila, by the Egyptian group group ORASCOM in 2002 under the name ALGERIAN CEMENT COMPAGNY (ACC),
In 2008, it was acquired by the French group LAFARGE, and in 2015 a merger with the Swiss group Holcim, to become the Lafarge-Holcim group.

1.1.3.1 Aspect Health and Safety

For Holcim, being a leader in the construction materials sector means initiating new standards in health and safety. Health and safety are at the core of their activities, in their plants, on their clients' construction sites, and in all actions they take with local communities. Their ambition is to aim for zero accidents by creating a safe environment for their employees, subcontractors, clients, and all the communities they work with. Their goal is to make a difference in how they work and act within their sector. [6]

At Holcim, they aim for more than just accident prevention: they aim for zero accidents. To achieve this, they are committed to: [6]

- Creating a genuine safety culture for all our stakeholders (employees, subcontractors, communities, and clients).
- Maintaining a health and safety management system that aims for continuous improvement of our performance and risk management at our sites.
- Aiming for operational excellence by fostering a mindset conducive to safe execution of our operations and performance tracking.
- Openly communicating with all our stakeholders about health and safety issues.

Health and safety are key factors for operational and personal success. At Holcim, their belief is **"if they are good at safety, they will be good at everything else they do"**. Therefore, health and safety are integral to the rest of their activities and are a key factor in their operational performance. For this reason, they consider them as a skill for all their employees and integrate them as an element of personal success. [6]

1.2 Problem statement

Introduction

The implementation of a fully compliant Energy Isolation program represents a pivotal initiative aimed at safeguarding lives and preventing all forms of workplace accidents, including fatalities. This program is designed to establish robust energy isolation protocols that not only enhance safety but also significantly reduce accidents and fatalities in the workplace.
How can we effectively implement and maintain such a critical energy isolation program?

1.2.1 Questions Regarding the Problem Statement

The following inquiries aim to delve further into the core issue and explore it in greater depth

- How to perform a gap assessment and analysis using the world-class Energy Isolation (EI) implementation toolkit?
- How to develop a two-year strategic plan to meet all energy isolation standards and achieve at least a "Gold" rating in the World Class assessment by the end of 2025?
- How to create energy isolation procedures?
- How to assign authors for energy isolation procedures?
- How to develop and approve energy isolation procedures that align with country-specific goals?
- How to write an effective procedure for energy isolation?
- How to conduct training for energy isolation procedures?

1.2.2 Research Objectives

The objectives of this project are:

- Conduct the Gap Assessment
- Achieve the "Gold" level in the World Class requirements
- Train authors for procedure development
- Draft and approve procedures
- Develop and implement a Two-Year Action Plan
- Train employees for the energy isolation program
- Formalize its implementation

1.3 Methodology

The methodology for this research will involve the following steps:

- **Gap Assessment:** The initial step of the research involves utilizing the world-class EI implementation toolkit to conduct a gap assessment. This assessment aims to identify areas requiring improvement in energy lockout/tagout procedures. Careful documentation of the assessment results is necessary as they will form the basis for developing the action plan.
- **Procedure Author Training:** Upon completion of the gap assessment, individuals within the plant will be identified and trained to become authors of energy isolation procedures. This training must be documented and monitored to ensure all personnel involved possess the necessary skills to draft and approve the procedures.
- **Two-Year Action Plan Development:** Building upon the results of the gap assessment and procedure drafting, a detailed two-year action plan will be developed. This plan will outline specific and achievable objectives aimed at closing all energy isolation standard requirements and achieving a minimum "Gold" level in the World Class assessment by the end of 2025.
- **Action Plan Implementation:** Finally, the action plan will be implemented, and progress will be regularly monitored to ensure objectives are met. This may involve holding regular meetings with stakeholders, providing progress reports, and making adjustments to the plan as necessary.
- **Procedures Drafting and Approval:** Trained procedure authors will then be tasked with drafting and approving the energy isolation procedures. Oversight of this process is required to ensure the procedures are written and approved in accordance with specific country objectives.
- **Employee Training on Procedures:** Once procedures are approved, training sessions will be conducted to familiarize employees with the energy isolation procedures and ensure their effective implementation.

Conclusion

This chapter has presented the problem statement of the project, which focuses on the implementation of an Energy Isolation program at Holcim Algeria. We have identified several key research questions and defined a set of objectives for our project. The proposed methodology will allow us to address these questions systematically and rigorously.

In the following chapters, we will detail the research methodology, findings, and recommendations based on the results. Each step of this process will bring us closer to our ultimate goal: improving safety and energy efficiency at the Holcim plants.

Chapter 2

Conceptual Framework

Introduction

At Holcim, inadequate energy isolation is the main cause of over 80% of deaths and serious injuries. When it comes to workplace fatalities, it's also one of the worst factors in any industry. [7]
When discussing safety practices, it's essential to differentiate between a **procedure** and a **program**:

- A **procedure** consists of specific step-by-step instructions outlining how to perform tasks, such as precise protocols for energy isolation before maintenance.
- A **program**, however, encompasses a broader framework of policies, training initiatives, monitoring, and continuous improvement efforts aimed at achieving overarching safety objectives across the organization.

Previously, Holcim had established a single energy isolation procedure. Now, they are advancing towards the implementation of a comprehensive Energy Isolation Program. This initiative integrates enhanced protocols, ongoing training initiatives, and robust safety measures to further mitigate risks and ensure the highest standards of worker safety throughout our operations.

2.1 Terms and Definitions

This section defines key terms to enhance safety and operational standards at Holcim, ensuring a shared understanding across our team and promoting a culture of safety and excellence.

Competent Person: Someone who has sufficient skills, knowledge, and experience to complete the assigned tasks properly. The level of competency required will depend on the complexity of the situation and the particular tasks or responsibilities that they are assigned. [8]

Equipment Lock: A unique, single key padlock used by the Permit Issuer or Isolator where isolation involves more than one person and the work will extend over more than one shift. [8]

Energy Isolation Device: A device that physically prevents the transmission or release of hazardous energy. This includes, but is not limited to the following: manually operated electrical circuit breaker, disconnect switch, line valve, or block/blanking plate. [8]

Formal Approval: A documented, time-limited authority to carry out specific tasks issued by another person who has the authority to give it. The duration (time limit) of formal authorization must be no greater than the planned refresher intervals. [8]

Gang Panel: A device that provides multiple locking points, typically a multi-lock hasp. This device allows a single isolation device to be locked by more than one person. [8]

Hazardous Energy: Energy in various forms (electrical, mechanical, pneumatic, chemical, thermal, gravitational, or other sources) that poses a potential hazard due to its ability to energize equipment, machinery, or plants. [8]

- **Chemical**:
  - Liquids, such as gasoline, diesel, benzene, acids, and caustics.
  - Gases, such as propane, natural gas, and methane.
  - Solids, such as fertilizer, wet and dry cell batteries, and combustible dust.
- **Electrical**:
  - Alternating (AC) and direct currents (DC).
  - Includes equipment and conductors at both household and industrial voltages, photovoltaic systems, circuit breakers, transformers, capacitors, inverters, motors, and hybrid vehicles.
- **Gravitational**: Objects such as hoisted vehicles, raised dumpster lids, objects supported by a crane, and elevated dump truck beds.
- **Hydraulic**: Pressurized hydraulic systems, including hoses, pumps, valves, actuators, and reservoirs such as those on a forklift, in an automotive vehicle hoist, power press equipment, or an injection molding machine.
- **Kinetic**: Sources such as a breeze rotating a wind turbine, water moving a paddle wheel, vehicle/mobile equipment movement. Extreme sound is also a hazardous mechanical energy.
- **Mechanical**: Sources such as a spring under compression.
- **Pneumatic**: Pressurized air or gas systems, including pipes, pumps, valves, actuators, and pressure vessels such as those found in coating or pesticide sprayers, air compressors, and tank and pipe purging systems.

- **Radiant**: Energy that travels by waves or particles, particularly electromagnetic radiation such as heat or x-rays. Ionizing radiation includes alpha and beta particles, Computed Vomography (CT), and X-rays. Non-ionizing radiation includes lasers, Radio Frequency (RF), and microwave (MW).
- **Thermal**: Hot water, heated oil, steam, and equipment need time to cool, while liquefied gases, such as nitrogen, need time to warm to safe thermal levels.
- **Explosive**: The rapid increase in the volume of energy with the generation of high temperatures and the release of gases. Supersonic explosions are called detonations. Subsonic explosions are called deflagration. A boiling liquid vapor expanding explosion is called (BLEVE).

Figure 2.1: Hazardous Energy

Lock Holder: The worker that has been issued with a personal lock for use in the isolation procedure. He/she applies his/her lock to the energy isolation device, or to a gang Lock-Out if one is being used. [8]

Lock-Out: The placement of a personal lock on an energy isolation device in a position that prevents the operation (i.e., movement) of the energy isolation device and the equipment from being energized until the removal of the lock in accordance with established procedures. [8]

Lock-Out Device: A lockout device is usually a lock, valve, or switch cover that holds an energy isolation device in the off or safe position until the lockout device is removed. [8]

Lock-Out Box: Also known as a Lock-Box. A special box within which a Permit Issuer or Isolator places the lock-out device key; other workers then apply their personal locks to the lid of the box, effectively preventing the Permit Issuer or Isolator from gaining access to the lock-out device key until all personal locks are removed. See also Gang Lock-Out. [9]

LOTOTO: Lock-Out Tag-Out Test-Out. In the US, it is known as Lock-Out Tag-Out Try-Out. This is the globally recognized acronym for isolating, securing, and testing to confirm isolation. The term 'Test-Out' is preferred to 'Try-Out' as the latter can be misunderstood to mean trying to operate equipment that is under isolation. [10]

Multiple Lock Hasp: See Gang Lock-Out. [8]

Personal Lock: A unique, single key padlock that is assigned to a 'Lock Holder' for performing the energy isolation sequence in accordance with established procedures. The Personal Lock is attached by the 'Lock Holder' at the point of isolation or at a Lock-Out box. The person who has been issued a Personal Lock/s shall be the only person to place and remove that Personal Lock. The Personal Lock can only be locked and unlocked with the key that was provided with that Personal Lock. [8]

Permit to Work (PTW): Document (paper or electronic record) authorizing certain people to carry out specific work/tasks within a specified time frame, formally approved by the Permit Issuer for the duration of the work/task. [11]

Practicable: the extent to which an action or solution is technically achievable, without considering the associated costs, while also ensuring that the time, effort, and resources required to implement it are not grossly disproportionate to the anticipated benefits. [12]

Program Audit: A process, carried out by competent persons, to systematically obtain evidence about the level of implementation and effectiveness of the program. The program audit helps ascertain whether or not:

a) a specific element of the program has been implemented and is being complied with,

b) the program remains effective under all operational conditions.

The normal process is to examine the documented elements of the program prior to the audit and to design a set of tests that the auditor will use to obtain the necessary evidence to make a proper assessment. Tests must include field observations, questions and discussion with workers involved in the process, and inspection of records. [13]

Tag-Out: Tagouts are usually used to make simple identification of the locations where locks are utilised; if there is no chance of making a lock, the tags must be placed to avoid risks. [14]

Test-Out: the process of attempting to operate the equipment using its normal operating controls, whether from the control room or from a local start point. The purpose of this test is to ensure that the correct equipment or process has been properly identified and isolated. [15]

2.2 Critical Control Management

Energy isolation is a fundamental safety measure that ensures all hazardous energies are effectively disconnected before maintenance or intervention begins. This process is closely linked to Critical Control Measures (CCM) [16] [17] [18], which are essential for managing risks associated with energy sources. The following section will explore how properly implemented energy isolation acts as a pivotal CCM, safeguarding personnel and preventing accidental equipment operation during critical tasks.
The importance of energy isolation in actively avoiding the unwanted events below include:

2.2.1 Contact with hazardous energy sources

Touching hazardous energy sources like electricity, high-pressure fluids or moving machinery may result in severe injuries or even death [19] . Thus, energy isolation is intended to put all the sources of force to be rectified offline 'first'. This very gesture helps cut down accidental touching which might bring about the same disappointing results

2.2.2 Material engulfment

A worker can be at great risk of getting engulfed by materials like grain, sand, or liquids [20]. This endangers the worker's life because the materials can be too much such that they cover the worker completely. For instance this might occur during a maintenance operation where the worker has entered into an emptying drying bin without any protective covers on arms. The only way for protection is through proper use of energy control strategies, which include **switch off, lock out or tagging out** devices. [21]

2.2.3 Mobile Equipment Incident

Mobile equipment incidents occur when such equipment is not properly shut down or isolated resulting in unexpected motion, or operation of the systems. The incidents are of high risk to pedestrians it may cause striking, caught, or crushed incident and even crushed. Energy isolation is key to prevent these incidences. Through the implementation of lockout and tagging procedures. [22]

Figure 2.2: The unwanted events related to Energy Isolation

2.3 LOTOTO

Lockout/tagout, or LOTO, ensures that tools and power sources are switched off during maintenance or repair operations, to prevent unintentional activation. This method addresses a whole range of risks, including thermal, mechanical and electrical. The main objective is to prevent damage or death due to unintentional machine activation or energy release. A comprehensive approach called LOTOTO (Lock-Out, Tag-Out, Try-Out) is becoming increasingly popular in sectors such as waste management and renewable energies. It emphasizes control testing before task completion. By checking isolation efficiency and reducing the possibility of accidents due to unexpected energy release or machine activation, this method improves safety. [23]

2.4 World Class - Energy Isolation

When working with hazardous energy sources, **World Class EI** is a standard that goes above and beyond the minimum requirements in order to achieve the highest level of safety and risk mitigation. **Plant, Process, Procedure, and People** are its four pillars. These pillars serve as the cornerstone of an extensive energy isolation program, guaranteeing that all energy sources are appropriately managed or de-energized prior to work commencing, so reducing the possibility of catastrophic accidents or fatalities. Organizations can go above and beyond the bare minimum by implementing these best practices, which will make the workplace safer and lower the chance of accidents. [24]

2.4.1 Plant

In simple terms, any kind of facility where large machines are used along with other mechanical devices as well chemical processes with specific functions is known as a ‘plant’. The functions may involve production processes through which goods are made complete from raw materials

transformation into worthwhile commodities or power production establishments. This description applies to different types of plants. [25]
This plant is known for numerous operation systems and complex infrastructure. Safe and efficient operation is based on firm safety procedures, such as lock-out/tag-out (LOTO) used to maintain machines safely. For safety reasons, in addition to safety there are new technologies as well as important systems for regulating access in this plant. [25]
Key aspects of "plant" in this context include:

2.4.1.1 Lock-out panels for all equipment

Easy access to the isolation devices ensures success of an Energy Isolation program because personnel can quickly and safely de-energize equipment for maintenance, repairs, or emergencies preventing accidents and improving safety. Suitably tagged and placed isolation devices (A.1) reduce downtime and enhance operational effectiveness by helping quick implementation of lock-out/tag-out (LOTO) practices.
Basically, the efficiency of an Energy Isolation scheme mostly depends on the effortless availability and precise marking of those key isolation areas. [25]

In the field, lock-out panels specifically designed for intricate isolations are fitted. [25]

- **Panels for Equipment/Process Operations**:
  - Conveniently located near the equipment for effortless accessibility.
  - Especially developed for all operations related to the primary equipment/process.
- **Lock-out Devices**:
  - These come with distinct identities for every type of energy source.
- **Lock-out Panel Arrangement**:
  - Clearly labeled in accordance with the 5S methodology.
  - Designed using shadowing techniques.
- **Padlocks for Energy Isolation**:
  - Acquired expressly for this purpose from reliable suppliers.
  - There is only one key per padlock; there isn't a master key.
  - Padlocks have distinct identities and are color-coded.

2.4.1.2 Fit for purpose isolation and lock-out devices

Lockout/tagout (LOTO) procedures and effective isolation of energy sources are essential to ensure safe and efficient industrial operations. Energy isolation and interlocking devices must be installed in a visible and easily accessible manner, with clear labeling, be easily accessible in the workplace, be used by properly trained employees and effectively prevent the unintentional energizing or starting of machines and equipment in order to maintain safe and controlled environments. Industrial facilities can greatly improve workplace safety, reduce the risk of accidents and maximize operational efficiency by following these crucial guidelines. [25]

All energy isolation devices (e.g. VCS(A.3)) and locking devices (e.g. valve lock cover (A.4)) are: [25]

- Designed and engineered for its purpose (e.g. mechanical isolation locks (A.2) for conveyors, wheel chocks, supports)
- Available for all installations and covering all types of energy (when the technology exists)
- Known and used by all workers
- Installed to create exclusion zones (e.g. barriers in loading bays, lockable doors in loading areas, parking areas, maintenance workshops)

2.4.1.3 Identification and distance of energy isolation devices

A field survey is a methodical investigation carried out on site to obtain particular data. In such cases, it is aimed at identifying what isolation devices are required for the location and where they should be placed depending on the activities done there [25], and for that:

- Isolation devices, for example visual cut-off switches (VCS), are used for the purpose of separating energy sources or equipment from the power source. Such devices are important for protection purposes when carrying out repairs or maintenance on them and they can be easily identified because all of them have the same color which is typically code uniformity codes within any field leading to no mix up between different circuits.
- Isolation devices such as Visual Cut-Off switches (VCS) are used to separate power supplies or devices carrying return currents from these electrical terminals. These elements are very important for safety during maintenance. Their nature is such that they cannot be missed because they are the same color throughout the field, reducing the risk of misunderstandings between circuits in the same space domain. In addition, these installations are marked.
- It is necessary to ensure that these isolation devices are always in close proximity to what one is doing. This is the **5S methodology**, a sorting system represented by five

Japanese words representing sort out (**seiri**), set in order (**seiton**), shine (**seiso**), standardize (**seiketsu**), and sustain (**shitsuke**). In other words, they are set in order according to systematic arrangement, and their placement is sustained for easy and quick access, contributing to efficiency and safety.

2.4.1.4 Identification of different types of locks

Different colors for locks and clear labeling facilitate easy identification and help prevent errors : [25]

- Different colors are used for personal, permit issuer, and equipment locks (color coding may be subject to local regulations).
- Personal locks have user picture and contact information.
- All the lock types are ATEX zone rated where applicable .

Personal lock | Permit Issuer lock | Equipment lock

Figure 2.3: Types of locks

2.4.1.5 Advanced Technologies

New technologies are being used to build fail-safe energy isolation systems in order to notice errors, avoid mistakes, reduce the amount of possible harm, and make processes work better in a simpler way suppress our intuitions. [25]
For example :

- **Isolator Checker** (A.5) : The device provides a visual confirmation of the live/isolated status during equipment isolation thereby reducing the probability of arc-flash incidents.
- **Interlocked Trapped Keys** (A.6) : If isolation procedures are incomplete, the interlocked trapped keys keep equipment away from access. They are widely used in systems such as Ready Mix Blenders and Palletizers.

- **Robotic Motor Control Center (MCC) Rack-Out System** (A.7) : This system safeguards against arc-flash exposure.
- **Inherently Safe, Arc-Flash Resistant Electrical Motor Control Center (MCC)** (A.8) : This technology ensures safety and resilience against arc-flash incidents.

2.4.1.6 Key access control for lock management

A formal lock key management system restricts access to the equipment lock padlock keys:

Figure 2.4: Formal lock key management system

- Personnel can physically access only the keys of the equipment for which they have the authority. [25]

2.4.2 Process

Key aspects of "Process" in this context include:

2.4.2.1 Procedure authoring, approval and continuous improvement

Our minimum requirements require a procedure authorizing process, using the Group HSE tool. Becoming world-class comes down to the quality of implementation: [26]

- Procedures are robust, meeting the highest technical standards.
- Address all energy sources, from electrical to mechanical, ensuring thorough isolation.
- Strict discipline, emphasizing the importance of precision and accuracy in implementation.
- Incorporate fail-safes and checks to mitigate potential human errors during execution.
- Shop-floor workers actively provide feedback to improve EI procedures.
- These procedures reflect an organizational commitment to engineering excellence, ensuring a safe operational environment.

2.4.2.2 Document Management

A document management system is essential for controlling, reviewing, and approving authorized procedures to ensure they are up-to-date and consistently followed [26]. The key components of an effective document management system include: [27]

- **Document Approval:** There must be a defined process for approving new documents and procedures before they can be used. This ensures consistency and that documents are properly reviewed and approved by relevant personnel with a full audit .
- **Document Updating and Re-approval:** Documents need to be regularly reviewed to verify they are current, suitable, and reflect actual practices and legislation. If operations change, relevant documents must be updated and re-approved.
- **Centralized Access:** All authorized procedures should be accessed through the centralized document management system to ensure the latest approved version is always used. This improves transparency and efficiency.
- **Automated Workflows:** Automated workflows can streamline the document review and approval process by routing documents to the proper reviewers based on content, setting deadlines, and tracking the approval process.
- **Audit Trails:** The system should maintain a complete audit trail of all document access, changes, and approvals to demonstrate compliance and support continuous improvement.

By implementing these key components, organizations can effectively control, review, and maintain authorized procedures to ensure consistency, compliance, and efficiency across the organization.

2.4.2.3 Permit to work system

It's important to have a strong permit-to-work system which helps control dangerous operations and protect people lives. A permit-to-work system that is unparalleled in the world is one that establishes specific steps for authorising, monitoring and controlling work activities.

A World Class permit to work ensures:
citeprocess

- Only authorized personnel create and approve permits.
- There is a defined approval process for the permit-to-work system without shortcuts.
- All permits are fully verified in the field by the permit approver.

Major digitization projects are expected to accelerate the adoption of digital work permit systems **by 2025**. Support from other players, including the improved collaboration, compliance and workflow optimization that digital systems foster, will also help.

2.4.2.4 Communication, coordination and planning

All critical activities requiring permit to work are identified, communicated and coordinated during regular meetings (e.g. daily morning meeting): [26]

- All relevant stakeholders participate.
- There is a visual map of the plant with the location of critical jobs (e.g. site map with pins).
- Overlaps and potential conflicts between activities are identified.
- Potential risks and supervision needs are discussed.

2.4.2.5 Cross-functional committee

A quarterly review of the Energy Isolation (EI) program by a cross-functional committee identifies areas for improvement. The review considers: [26]

- Incidents and near-misses.
- Variance permits and compliance.
- Shop-floor worker feedback.
- Error-prone procedures.
- Deviations from EI procedures.
- Upcoming projects and changes.
- New technologies and best practices.
- Conflict prevention between humans and machines.

This review aims to continuously improve the EI program and eliminate potential conflicts between humans and machines in work areas.

2.4.3 Procedure

Key aspects of "Procedure" in this context include:

2.4.3.1 World-Class procedure

An effective procedure is the cornerstone of operational excellence, ensuring tasks are carried out efficiently, safely, and consistently, To achieve this, procedures must [28] :

- Be clear and concise

- Be periodically updated and reviewed
- Be Illustrative
- Include expert personnel in its preparation
- Be thorough and minimize risks

2.4.3.2 Unit level written EI program

In a world-class unit, the written unit-level EI program is fully understood and implemented by all workers, management, and senior managers (e.g., clear rules, leaders' understanding, and compliance procedures) and everyone knows where to find the resources. [28]

2.4.3.3 Management of Change

Changes not well managed often lead to serious injuries or fatalities. Therefore, a robust management of change system must: [28]

- Be systematic and exhaustive
- Activate team reviews when necessary
- Involve all required stakeholders
- Track the implementation of actions until their completion
- Cover all types of changes that could affect the EI program, including new or modified equipment, new personnel, changes to energy isolation devices, etc.

2.4.3.4 Live work

All live work has been completely eliminated through engineering solutions (e.g. fully guarded belt alignment, automatic sampling, inspection drones).
In the rare cases where technology is not available and live work is still performed, there is a real-time tracking system to monitor the work and notify relevant stakeholders in the facility. [28]

2.4.4 People

Key aspects of "People" in this context include:

2.4.4.1 Competency Management

A world-class energy isolation training system covers comprehensive understanding of the Energy Isolation Program including how to control electrical, mechanical, and diverse hazardous energy sources. Key elements include meticulous procedure comprehension, practical application exercises, and emphasis on disciplined execution. The program integrates real-world scenarios, human factor considerations, and continuous assessment to ensure mastery. Incorporating cutting-edge technology and fostering a safety-centric mindset, it equips personnel with the expertise to flawlessly implement lock-out, tag-out, try-out procedures, fostering a culture where safety is paramount. [29]

- Onboarding of new workers with coaching by experienced workers
- Shopfloor workers and managers are knowledgeable about identifying gaps in EI procedures and devices
- Contractors acquire the same level of competency as employees
- All workers are proactively suggesting improvements to EI procedures, practices, and installations
- All workers are refreshed on annual basis with their required Energy Isolation training

2.4.4.2 Energy isolation expertise

Three roles are fundamental to a world-class energy isolation: **Permit Issuer, Procedure Author and Critical Control Owner.**
Every effort should be made to enhance their expertise on a continuous basis. In addition to Holcim minimum training requirements, this personnel should be part of cross-audits, peer to peer coaching and benchmarking and receive third-party training to attain in-depth expertise. [29]

- Knowledge of national regulations and Holcim minimum requirements
- A solid operational experience and technical knowledge
- Interpersonal skills to train colleagues and drive continuous improvement
- In-depth knowledge about critical controls
- In addition, Procedure Authors should have an engineering background

2.4.4.3 Training center

The physical school provides practical training covering the following: [29]

- Using EI devices, locks, and tags for different types of energies

- Performing complex energy isolation with multiple energies and multiple workers
- Issuing an EI permit (e.g. verify workers' competency, ensure all controls are in place) and managing the handover process with simulated scenarios
- Strict pass/fail exams

Training centers can be established to cover several sites/units and/or by partnerships with external organizations.

2.4.4.4 Engagement, coaching and feedback

The training and engagement plans are executed yearly to increase awareness of energy isolation and incorporate feedback to continuously improve systems and processes. [29]

Stop unsafe work: Workers are fully empowered to stop their work and peers' activities if they identify unsafe behaviors, uncontrolled hazardous energies or if they have to deviate from Energy Isolation procedures.

Coaching and feedback: Interaction in the field, examining gaps between energy insulation procedures and actual work (i.e. identifying labor problems and opportunities for improvement).

Workforce mobilization:

- Campaigns and mobilization activities (e.g., Treasure Hunts) have active workforce participation
- Shop Floor workers are involved in the preparation of the EI procedures

Consequence management: Adherence to the controls of the permit to work and LOTOTO practices shall be strictly enforced in accordance with Holcim HSE consequence management framework.

Conclusion

The Energy Isolation Program at Holcim enhances workplace safety and reduces serious injuries by establishing a comprehensive framework for energy isolation, including training, monitoring, and continuous improvement. This program ensures systematic handling of hazardous energy sources and strict enforcement of lock-out/tag-out practices.

Clear communication of safety terms and a focus on critical control management prevent incidents with hazardous energy, material engulfment, and mobile equipment. The LOTOTO

approach deactivates all tools and power sources during maintenance, minimizing accident risks.

Holcim's adoption of world-class energy isolation standards exceeds safety requirements and sets industry benchmarks. Continuous improvement of safety protocols ensures a safe working environment, protecting Holcim's workforce.

Chapter 3

Operational Implementation

Introduction

The effectiveness of Quality, Health, Safety, and Environment (QHSE) management relies on the practical application of robust theories and proven practices. This chapter specifically emphasizes translating gap assessments into actionable steps and developing tools that align with the implementation of QHSE Energy Isolation programs, ensuring adherence to standards and guidelines such as Standard HSE-103 and the "World Class" framework at HOLCIM Algeria.

We begin by examining the Gap Assessment carried out, highlighting the methodologies used and the key findings. This assessment is crucial for identifying areas requiring immediate improvement, and for drawing up a corrective action plan.

The development of a specific country program for energy isolation and the creation of an Authoring toolkit for drafting procedures will also be addressed. These elements are essential to ensure that QHSE standards, and more specifically HOLCIM's standard related to Energy Isolation, are adapted and effectively integrated into daily operations, while taking into account the varied cultural and regulatory contexts.

Finally, we will discuss the importance of the training and these tools in the continuous improvement of QHSE management systems, and their role in promoting an organizational culture focused on safety and quality.

3.1 Gap Assessment

Energy isolation is a critical safety practice in industrial settings, designed to prevent the inadvertent release of energy that can lead to accidents and fatalities. However, the current generalized

procedures often lack the specificity needed to address the unique requirements of various tasks, thereby posing a significant risk to worker safety.

3.1.1 Objectives and Context

The gap assessment, or gap analysis, seeks to identify discrepancies between the current state of an organization and its desired state, particularly in relation to strategic, operational, or regulatory objectives. This analysis is crucial for understanding the gaps in achieving these goals, especially when implementing new standards, pursuing continuous improvement, or preparing for external audits. In the context of energy isolation, the assessment aims to pinpoint deficiencies across multiple plants, with the ultimate goal of developing a comprehensive program that eliminates fatalities.

3.1.2 Scope and Limitations

This assessment critically evaluates energy isolation procedures in multiple industrial settings, concentrating on safety-related aspects. It reviews current practices and measures their effectiveness. However, limitations include incomplete data and the reluctance of staff to share sensitive information, which could affect the analysis and recommendations. Despite these challenges, the assessment is vital for identifying safety gaps and improving industrial practices to reduce accidents and fatalities.

3.1.3 Specific Standards and Requirements

Effective energy isolation is important in industrial environments to protect workers and prevent accidents resulting from uncontrolled energy release. This section outlines the implementation of the energy isolation program at HOLCIM Algeria, adhering to Standard HSE-103 and the "World Class" guidelines.

Standard HSE-103 ENERGY ISOLATION:

Standard HSE-103 ENERGY ISOLATION outlines the procedures and protocols for safely isolating energy sources in industrial settings. This standard is critical for ensuring worker safety and preventing accidents related to uncontrolled energy release. [30]

Application in Assessment: In the gap assessment, Standard HSE-103 is used as a baseline to evaluate the current practices of energy isolation at the site. The checklist items are derived directly from the clauses of this standard, ensuring compliance and operational safety.

World Class Requirements for Energy Isolation:

Philosophy: The "World Class Requirements" document serves as a dynamic guide that continuously evolves to incorporate the best practices in energy isolation. It emphasizes the ongoing journey towards excellence, encouraging continuous improvement and innovation. [31]

Four Pillars: The document is structured around four key pillars: Plant, Process, Procedure, and People. Each pillar represents a critical area where improvements can be made to achieve world-class standards in energy isolation. [32]

Application in Assessment: The World Class Requirements are used to benchmark current practices against the highest industry standards. The assessment checklist includes elements from this document to identify areas where the site can elevate its practices to a world-class level.

3.1.4 Significance

By identifying and addressing the gaps in energy isolation procedures, this assessment is pivotal in enhancing workplace safety and advancing towards the ambitious target of zero fatalities in industrial operations.

3.1.5 Methodology

The methodology for gap assessment involves a systematic comparison between current practices and the **minimum requirements** and **world-class standards**. Compliance criteria are defined based on legal, regulatory, and relevant HOLCIM standards. World-class standards serve as a benchmark to evaluate the organization's performance and compliance.

- **Data Collection** : A combination of structured interviews with plant managers, safety officers, and frontline workers, along with on-site field visits (sortie sur terrain), will be conducted to gather comprehensive data on current energy isolation practices.
- **Data Analysis and Evaluation** : The collected data will be meticulously analyzed to identify specific procedural gaps that could lead to hazardous energy releases and fatalities.

3.1.6 Gap Evaluation

The results of the gap assessment are presented using a compliance level matrix against minimum requirements:

Compliance Level	Compliance Status	Color Code
Level 1	Does not meet the minimum requirements	RED
Level 2	Partially meets the minimum requirements	ORANGE
Level 3	Fully meets the minimum requirements	GREEN

Table 3.1: Compliance Level Matrix Against Minimum Requirements

World Class Compliance Level	Compliance Status	Color Code
Level 1	Not started	RED
Level 2	Partially achieved	ORANGE
Level 3	Fully achieved	GREEN

Table 3.2: World Class Compliance Score Levels

Detailed descriptions of compliance evidence and world-class standards are included for each evaluated area.

The results of the gap assessment, **Appendix** Figure B.1, are presented in the form of a detailed analysis comparing current energy isolation practices with the minimum requirements set by the standards and the World Class.

The results reveal the specific areas where compliance is deficient, giving a clear idea of the improvements needed to strengthen safety protocols. By articulating these results, the gap assessment provides a strategic perspective on the steps each industrial facility needs to take to achieve higher levels of compliance and, ultimately, a safer working environment.

Conclusion

The gap assessment of energy isolation procedures identified improvements needed to enhance safety and reduce the risk of accidents and fatalities. Despite obstacles such as incomplete data and staff reluctance to share sensitive information, it revealed significant gaps and proposed specific corrective actions.

By incorporating HSE-103 standards and world-class criteria, the assessment encourages not only mandatory compliance but also a culture of innovation and continuous improvement. This is crucial to eliminating industrial accidents and establishing world-class safety practices. Assessment is an essential step in creating a safer working environment in industrial facilities.

3.2 Action Plan

To achieve our goals and address our shortcomings, our strategy involves implementing a two-year action plan.

3.2.1 Current and Projected Scores:

The current **Minimum Requirement Compliance Score** stands at 60%, indicating that the organization meets 60% of the essential standards required. Projections for 2024 show a significant improvement, with the score expected to rise to 86%, and by 2025, the organization aims to achieve full compliance at 100%.

In terms of achieving a **World Class Score**, which is measured on a scale of 0 to 100%, the current score is relatively low at 16%. However, projections indicate a substantial improvement, with the score expected to reach 50% in 2024 and attain the full 100% by 2025.

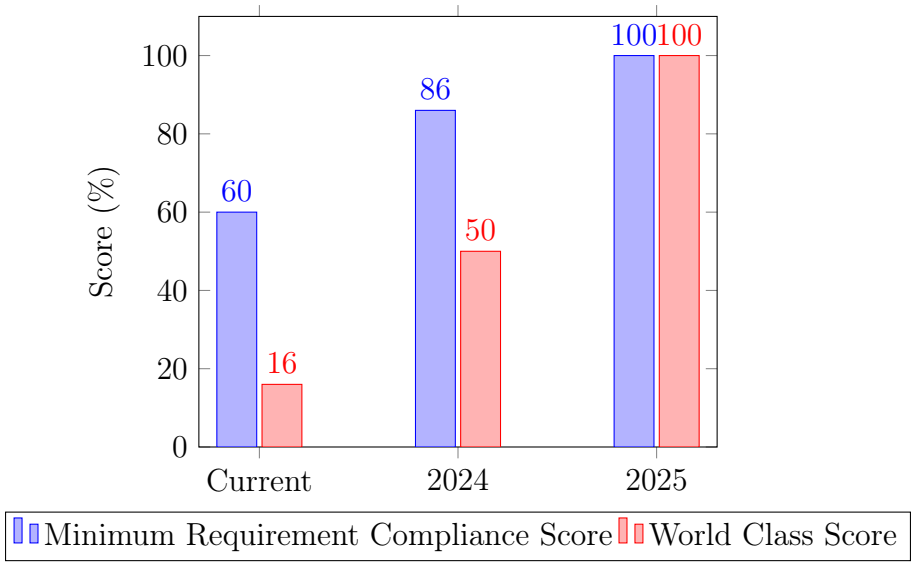

Figure 3.1: Current and Projected Scores

These projections reflect a strategic commitment to not only meeting but exceeding industry standards and positioning the organization as a leader in compliance and operational excellence over the next two years.

This detailed action plan, **Appendix C.1**, outlines a comprehensive approach to addressing gaps identified in our energy isolation procedures. It focuses on enhancing safety, compliance, and operational efficiency through systematic reviews, updated training programs, and robust verification systems. By implementing these targeted actions over the next 24 months (2024 - 2025), we aim to ensure that our practices meet industry standards and regulatory requirements, thereby fostering a safer and more accountable work environment :

- **Review and Update Procedures:**
  - Conduct a thorough review of existing energy isolation procedures to meet industry standards and regulatory requirements.
  - Update roles and responsibilities in IE procedures for clarity and accountability.
  - Implement a procurement process with health and safety specifications.
  - Revise the training matrix to include leadership training for plant management and supervisors.

- **Training and Competency:**
  - Develop a training program for supervisors on energy source identification and hazard recognition.
  - Train plant management in energy isolation and field inspection operations.
  - Enhance training modules and practical competency evaluations.
  - Enforce a progressive discipline policy for adherence to hazardous work stoppage protocols.
- **Systematic Review and Compliance:**
  - Establish regular reviews of records for accuracy and regulatory compliance.
  - Update IE procedures to cover all energy sources and include specific device locations.
  - Develop Safe Working Instructions (SWI) for energy release methods and energy restoration procedures.
  - Enhance procedural illustrations for clarity and understanding.
- **Control and Verification:**
  - Ensure strict adherence to permit approval cycles and consistent test-out procedures.
  - Formalize handover procedures and verification systems for energy isolation operations.
  - Identify and document critical tasks requiring energy isolation with specific procedures.
  - Implement systematic verification and control systems for isolation devices.
- **Documentation and Maintenance:**
  - Document and maintain pressurized system drainage and isolation devices.
  - Install gauges on relevant equipment as per procedure requirements.
  - Conduct regular audits for compliance with recording and signaling of out-of-service equipment.
  - Implement measures to prevent and rectify issues with locking devices.
- **Safety and Identification:**
  - Color-code and label all locks, ensuring compliance with standards.
  - Enforce single-key padlock requirements for all employees and subcontractors.
  - Develop management of change procedures for effective change management.

  - Ensure proper design and identification of isolation devices for each case.

- **Digitalization and Efficiency:**
  - Digitalize permit issuance and archiving to improve efficiency and accuracy.
  - Verify compliance status and take corrective actions as necessary.
  - Ensure systematic application of management of change procedures.
  - Verify and update archiving durations during inspections for regulatory compliance.

Conclusion

The Practical Implementation Plan outlines a clear and actionable path to enhance safety and compliance in energy isolation procedures. By focusing on targeted actions such as updating procedures, enhancing training programs, and implementing rigorous control measures, the organization is well-positioned to achieve its ambitious compliance goals. The projected improvements in safety scores demonstrate a steadfast commitment to operational excellence and worker safety, paving the way for a safer work environment and a leadership position in industry standards. As we move forward with these initiatives, we reaffirm our dedication to continuous improvement and the pursuit of world-class safety practices. This commitment not only ensures compliance but also fosters a culture of innovation and excellence, essential for the long-term success and safety of our operations.

3.3 Program Implementation

Introduction

This section provides an overview of the Country Energy Isolation (EI) Program, outlining its purpose, scope, and the importance of establishing a formalized approach to managing energy-related risks.

3.3.1 Objectives of the Country Program

The primary objectives of the Energy Isolation (EI) Program at Holcim are to ensure the health and safety of all personnel involved in operations and plants, including employees, contractors, suppliers, customers, and visitors. This is achieved by eliminating the risk of incidents caused by unexpected energization or the release of hazardous energy during maintenance and operational tasks. [33]

3.3.2 Scope and Limitations

The EI Program is comprehensive in its application, addressing all forms of potentially hazardous energy, whether from primary sources or stored/residual energy. It is applicable to every piece of equipment that could pose a risk due to hazardous energy, encompassing a wide range of energy types such as chemical, electrical, gravitational, hydraulic, kinetic, mechanical, pneumatic, radiant, thermal, or explosive. The program ensures that energy isolation is effectively achieved, preventing the accumulation of energy to hazardous levels. [33]

The limitations of the program may include the need for continuous training and awareness, the potential for human error, and the challenges associated with the implementation of energy isolation procedures across diverse equipment and operations. The program acknowledges these challenges and seeks to mitigate them through rigorous training, clear procedures, and ongoing evaluation and improvement. [33]

This chapter sets the foundation for understanding the critical nature of the EI Program and its role in maintaining a safe working environment at HOLCIM Plants. It underscores the commitment to safety and the proactive measures taken to protect all individuals present within the plant's premises. [33]

3.3.3 Roles and Responsibilities

3.3.3.1 Purpose

The purpose of this document is to serve as a comprehensive guideline for delineating the Roles and Responsibilities ((RACI) **Appendix Figure D.3 and Figure D.4**) within the Unit-level Energy Isolation Program. The RACI model, **which stands for Responsible, Accountable, Consulted, and Informed**, is a framework designed to clarify and articulate the specific roles of stakeholders involved in energy isolation activities.

By clearly defining these roles, the document ensures that each stakeholder understands their specific duties and the extent of their authority and accountability in the context of energy isolation procedures. This clarity is crucial for the effective execution of the program, as it minimizes confusion, enhances communication, and promotes a coordinated response to energy isolation requirements.

The Responsible parties are those who perform the work to complete the task or activity. They are actively engaged in the execution of the energy isolation procedures and are tasked with ensuring that the necessary steps are carried out correctly. [34]

The Accountable individuals are ultimately answerable for the correct and thorough completion of the energy isolation process. They have the authority to approve or reject the outcomes of the procedures and are responsible for the overall success of the program. [34]

The Consulted stakeholders are those whose opinions are sought; they are typically subject matter experts who provide valuable input and guidance during the planning and implementation phases of the energy isolation activities. [34]

Lastly, **the Informed** parties are kept up-to-date on progress, often only after decisions or actions have been taken. They are the recipients of information who need to be aware of the outcomes but are not directly involved in the decision-making or execution processes. [34]

This document, therefore, plays a pivotal role in establishing a structured and efficient approach to managing the Unit-level Energy Isolation Program, ensuring that all stakeholders are aligned with their respective roles and responsibilities.

3.3.3.2 Scope

Applies to all persons within our Unit (plant/office) or Unit personnel, including employees, contractors, suppliers, customers, and visitors.

3.3.3.3 Positions and Roles

Position	Role
Unit Manager	Overall responsibility for the program
Safety School	Providing education and training on safety protocols and procedures
H&S Manager/Coordinator	Developing and maintaining health and safety standards, and ensuring compliance with regulations
Supervisors & Managers	Overseeing implementation and compliance of safety measures within their teams
Employees	Adherence to safety practices and procedures as part of their daily work activities
Contractors	Compliance with unit policies and safety requirements while working on site
Suppliers, Customers, and Visitors	Awareness and compliance with safety protocols when interacting with the unit or on the premises
LOTOTO Champion	Championing the Lock Out Tag Out (LOTOTO) process to ensure proper energy isolation and safe maintenance procedures

Table 3.3: Table of Positions and Roles

3.3.4 Emergency Preparedness

These procedures are either created specifically for this program or integrated into the **Unit's Emergency Response Plan**. To access these vital details, it is important to **refer back** to the **company's Internal Intervention Plan**, where you will find comprehensive information on emergency preparedness measures.

The company's Internal Intervention Plan is a crucial document that contains comprehensive information on emergency preparedness measures. It is important to review this document to ensure you are well-prepared in the event of an incident related to energy isolation. [35]

3.4 Program Procedures

This chapter explores Holcim Algeria's systematic approach to hazard analysis and comprehensive risk mitigation, ensuring safety during equipment operations. It highlights the EI Isolation Procedure Authoring Tool's role in standardizing procedures and enhancing efficiency. Critical

topics include Permit to Work processes, continuity through Hand-Over Procedures, and protocols for working on live equipment. Safety measures for removing Lock-Out/Tag-Out devices are also outlined, reflecting Holcim's commitment to operational integrity. The chapter concludes by emphasizing rigorous inspection and maintenance of Energy Isolation Devices, aligned with OEM standards for enhanced safety.

3.4.1 Hazard Identification and comprehensive Risk Mitigation

The organization has a well-defined process for conducting hazard analyses and developing energy isolation procedures. This is a crucial step in ensuring the safety of the workers who will be operating the equipment. The hazard analysis, examines the intended uses of the equipment from the perspective of the employees who will be working with it.
The energy isolation procedure outlines all the necessary steps to complete a task, including any potential hazards that could arise from misuse of the equipment. This comprehensive approach helps to identify and mitigate risks before work begins, promoting a safer work environment. [36]
But how should the procedure be written?

3.4.2 EI Isolation Procedure Authoring Tool

3.4.2.1 Overview

The EI Isolation Procedure Authoring Tool is an online application developed to streamline the creation and documentation of energy isolation procedures, ensuring consistency and efficiency across the organization. Designed to be user-friendly and require no coding knowledge, this tool divides the process into four main steps.

Step 1: Preparation

Before starting the procedure, it is essential to gather all necessary information and resources. This step ensures that the procedure is well-documented and that all potential risks are identified and mitigated in advance. [37]

- **Document Identification (ID)** : This field is autogenerated by the system.
- **Country**: Select the country from the dropdown menu.
- **Site Name:** Select the location of the site where this procedure applies. Sites are derived from iCare Level 8.
  Note: The Business Segment and Location Code are autogenerated by the system.
- **Location Category:** Select the location category.

- **Location Description:** Describe where the equipment is located within the site (e.g., Cement mill No 2 by the cement silos).
- **Lockout Procedure ID#**: This field is autogenerated by the system.
- **Activities:** Select all that apply. This field will help to find and narrow the search function. The plant focuses on four main activities: maintenance, troubleshooting, lubrication, and cleaning.
- **Detail**: Describe the activities for which this procedure applies. If the same Lockout/Tagout (LOTO) procedure applies to multiple activities, list all those activities. All activities must share the same hazardous energies. For example, if an activity is to be done on the cement mill internals and the hazardous energies are the same for carrying out refractory repairs, then a single EI procedure can cover both activities.
- **Task Description:** Provide a detailed description of the task.
- **Equipment ID:** Use the equipment ID in the field. Ensure that the maintenance management system equipment ID matches the field ID and that there is no duplication of IDs within the site.
- **Equipment Description(s):** Use the name or description of the equipment used by the workers in the field (e.g., a coal feeding valve can be called "Pfister").
- **Equipment Picture 1 (General):** Upload a general picture of the equipment to help identify the equipment to be isolated.
- **Equipment Picture 2 (Close-up):** Upload a close-up picture of the equipment if the general image leads to confusion.

Special Precautions

This field is intended for special instructions that are uncommon or exceptional for certain equipment. This helps workers take the required precautions to control particular hazards and avoid errors. Some equipment manufacturers specify specific steps to be taken to shut down or isolate equipment.

Review and Approval :

- **Reviewer**: List the email address of anyone you would like to review the draft procedure.
- **Approver**: List the email address of the competent person who approves/validates this procedure before its publication in the document management system (AoDocs).

Step 02: LOTOTO (Lock-Out Tag-Out Try-Out)

The Lock-Out Tag-Out Try-Out (LOTOTO) process is a critical safety procedure designed to ensure that machinery is properly isolated and de-energized before maintenance or repair work begins. This step involves a series of detailed actions to ensure that all energy sources are controlled, preventing accidental activation of equipment during maintenance. The LOTOTO procedure is essential for protecting workers from potential hazards associated with energized equipment. [38]

- **Step Numbering**: The system automatically generates consecutive step numbers for clarity and organization, which can be rearranged later if necessary.
- **Energy Type**: Select the type of energy involved in the operation from a list of 10 options: Chemical, Electrical, Gravitational, Hydraulic, Kinetic, Mechanical, Pneumatic, Radiant, Thermal, and Explosive.
- **Equipment Description**: Enter the name of the equipment subject to lockout and upload a picture for visual confirmation and documentation.
- **Isolation Device Type**: Specify the type of isolation device to be used, such as a Visual Cut-off Switch (VCS), Sliding gate, etc.
- **Isolation Device ID**: Use the unique identification (tag) of the isolation device in the field, ensuring it matches the maintenance management system ID and there is no duplication within the site.
- **Isolation Process & Location**: Provide a detailed description and the general location of the isolation device to be locked.
- **Picture of Isolation Device:** Capture a photograph of the isolation device with the lockout device applied, for visual verification and record-keeping.
- **Device:** Select the type of device involved in the lockout process, with options available through the app.
- **Process to Release of Stored Energy:** Describe the method for releasing any stored energy, or enter "None" if not applicable. This might include supporting a load with a mechanical jack before isolating hydraulic lines.
- **Try Out Instructions:** Detail the testing methodologies to ensure the equipment is in a zero-energy state, such as attempting to start or activate it to confirm it is fully locked out.

3.4.3 Document Management System

Effective document management is crucial for maintaining the integrity and efficiency of energy isolation procedures. We utilize AODocs for this purpose, integrated with our authoring tool to streamline the review and approval process. The following outlines how the document management system works within our organization: [27]

3.4.3.1 Document Review and Approval Process

Once all steps are completed and the document is saved as a draft, In the Authoring Tool, a screen will be displayed showing the document that has been saved.

- **Open the Procedure:** Click on the procedure to open it.
- **Submit for Approval:**
  - A screen will immediately be displayed, showing the document that has been saved.
  - Click on the procedure to open it again.
  - Click on "Submit for approval."
- **Approval Notification:**
  - Once sent for approval, you will receive an email notification that the procedure has been sent for review/approval.
- **Reviewer and Approver Notification:**
  - The person assigned as reviewer and approver will receive a notification via email. The EI procedure is also attached to the email as a PDF.
  - Click on the App link in the email.
- **Review and Approval:**
  - Select the procedure, review, and approve the document.
    Note: Add comments if necessary.
  - To finish the review, click on the approvals icon.
  - The procedure is selected once again, and at the bottom of the document, you will see two icons:
    - **Green color for Approval**
    - **Red color for Rejection**
  - You can capture your comments either when approving or rejecting the procedure.
- **Final Notification:**

- Finally, an email notification is sent indicating that the EI Procedure has been approved and sent to AODocs.

3.4.3.2 Document Version Control

To ensure consistency and accuracy, all documents must undergo version control. This section explains the procedures for maintaining document versions within AODocs:

- **Version Creation:**
  - When a document is edited, a new version is created and saved automatically.
  - Each version is timestamped and includes the editor's details.
- **Version Review:**
  - Reviewers can access previous versions to compare changes.
  - Comments and feedback are documented for each version.
- **Finalization:**
  - Once reviewed, the document is finalized and locked to prevent further edits.
  - The finalized version is then published and made accessible to relevant personnel.

3.4.3.3 Document Archival and Retrieval

Archival and retrieval of documents are essential for maintaining a comprehensive history of procedures. This section outlines the archival process within AODocs:

- **Archiving:**
  - Approved documents are automatically archived in AODocs.
  - Archived documents are categorized and tagged for easy retrieval.
- **Retrieval:**
  - Users can search and retrieve archived documents using keywords, tags, or dates.
  - Retrieved documents can be reviewed but not edited, maintaining the integrity of the archival record.
- **Retention Policy:**
  - Documents are retained according to organizational policies and regulatory requirements.
  - Retention schedules are automated within AODocs to ensure compliance.

Conclusion

In conclusion, the integration of AODocs within our document management system significantly enhances the efficiency and integrity of our energy isolation procedures. By streamlining the review and approval process, implementing rigorous version control, and ensuring comprehensive archival and retrieval capabilities, AODocs supports our commitment to safety and operational excellence. This system not only facilitates compliance with regulatory standards but also ensures that all personnel have access to the most current and accurate procedural information, thereby minimizing risks and optimizing the effectiveness of our operations. Through these robust document management practices, we maintain a high standard of safety and operational efficiency, reinforcing our dedication to the well-being of our workforce and the reliability of our energy systems.

3.4.4 General LOTOTO Requirements

3.4.4.1 Basic Principles

Initiating the General LOTOTO process begins with a thorough identification of hazardous energies and an assessment of the personnel involved. By determining the number of hazardous energy sources that require isolation and the count of workers engaged in the process, organizations can **categorize the isolation procedure accordingly**. This initial step sets the foundation for distinguishing between Simple Isolation and Complex Isolation. [39]

Effective implementation of these basic principles ensures precise adherence to safety protocols, enhancing operational safety and regulatory compliance within industrial settings.

- **Simple Isolation:**
  - If the number of hazardous energies is **1** *and* the number of workers involved is **1**, then it is a **Simple Isolation**.
- **Complex Isolation:**
  - If the number of hazardous energies is **more than 1** *or* the number of workers involved is **more than 1**, then it is a **Complex Isolation**.

Example Scenarios

- **Scenario 1:**
  - **Number of hazardous energies:** 1
  - **Number of workers involved:** 1
  - **Result:** Simple Isolation

- **Scenario 2:**
  - **Number of hazardous energies:** 2
  - **Number of workers involved:** 1
  - **Result:** Complex Isolation
- **Scenario 3:**
  - **Number of hazardous energies:** 1
  - **Number of workers involved:** 2
  - **Result:** Complex Isolation

3.4.4.2 Permit To Work

A Permit to Work (PTW) is a formal, documented process used to authorize and control work activities that might present a hazard, particularly in environments where hazardous energies are present. In the context of energy isolation, a PTW ensures that all potential risks are identified and controlled before any work begins. The permit includes detailed information on the specific hazardous energies to be isolated, the method of isolation, and the personnel involved. It serves as an essential communication tool between all parties, ensuring that isolation procedures are strictly followed to prevent accidental energy release, thereby safeguarding the health and safety of workers. [40]
the PTW can be found in the appendix Figure D.2.

3.4.4.3 Key steps for the complex isolation process

The Lockout/Tagout (LOTO) procedure is a vital safety measure that safeguards workers from hazardous energy releases during maintenance. It involves isolating equipment, applying locks and tags, and testing to ensure energy is controlled, with clear protocols for who can apply and remove these safety measures : [39]

- The Isolator must request equipment shutdown before performing LOTOTO
- In the case of a single isolation device, the Isolator must isolate, Lock-out, Tag-out, and Test-out the hazardous energy by applying an equipment lock and tag to a lock hasp
- In case of multiple isolation devices, the Isolator must isolate, lock-out and test-out all hazardous energies and place all padlock keys into a lock box/lock gang panel and apply an additional equipment lock and tag
- The Permit Issuer must apply a personal lock and tag to the isolation device or lock box

- Each Lock Holder must apply their personal locks and tags to the isolation device or lock box
  ***Note**: depending on the type of task/equipment, the Isolator and Permit Issuer can be the same person*
- The lock box must have a list of the equipment locked-out (e.g. Energy Isolation Procedure)
- The Permit Issuer must only remove his/her personal lock and tag after:
  - ensuring all lock holders have removed their personal locks and tags;
  - confirming all workers have been removed from the area and it is safe to re-energize the equipment (i.e. tools removed from the area and guards back in place)
- The Isolator must inform operations that the equipment is clear for re-energization.

3.4.4.4 Hand-Over Procedure

The Hand-Over Procedure is a structured process designed for activities that extend beyond a single shift, ensuring continuity and safety. This procedure is formalized through the use of the EI Permit Handover Form, which facilitates the seamless transfer of responsibilities. It ensures that all relevant information, including safety measures and work progress, is communicated effectively to the incoming shift. [41]

A form is to be used to record the handing over of Permit and Isolation accountabilities (ownership) from an outgoing shift Permit Issuer to an incoming Permit Issuer. Once signed, the incoming Permit Issuer is accountable for the safety of the job, including the monitoring of the permit conditions. The following details are included in the EI Permit Handover Form: [41]

- **Task Description**: A detailed description of the task.
- **Permit Number**: The unique identifier for the permit.
- **Date Created**: The date the permit was created.
- **Valid From (date/time)**: The starting date and time for the permit's validity.
- **Valid To (date/time)**: The ending date and time for the permit's validity.
- **Specific Details of Instructions for the Permit Handover**: Any additional instructions or details for the handover.
- **Main Hazards and Additional Controls**: Identification of main hazards and any additional controls required to perform the task safely.

Verifications Before Transferring Ownership of Permit

Before the ownership of the permit is transferred, the following verifications must be completed, with YES or NO responses recorded:

- A face-to-face communication between outgoing and incoming Permit Issuers, explaining the job, permit conditions, and isolations before accepting and signing the permit?
- The incoming Permit Issuer applied their personal lock to the lockbox before the outgoing Permit Issuer removed his/hers?
- All outgoing lock holders have removed their personal locks and tags?
- All incoming lock holders have applied their personal locks and tags?
- All incoming lock holders are familiar with the job, permit conditions, and isolations before starting the task?

Incoming Lock Holders Involved in the Task

A section to record the details of all incoming lock holders involved in the task, including:

#	**Name & Company**	**Signature**
1		
2		

3.4.5 Special Isolation Procedures

Special Isolation Procedures are tailored protocols that address unique safety challenges, such as working on live equipment or the removal of another person's lock or tag. These procedures require heightened attention to detail and adherence to strict safety measures to mitigate risks associated with energized systems and to ensure that any tampering with established safety controls is conducted with explicit authorization and oversight.

3.4.5.1 Working on Live Equipment

Introduction

Working on live equipment, without all energy sources isolated, requires a stringent written procedure that confirms there is no practicable way to accomplish the task at a zero energy state. This procedure must include alternative controls identified and approved by the unit manager, ensuring a robust safety framework is in place. [42]

The primary purpose of this procedure is to establish a safe and controlled environment for performing tasks where isolating energy sources is impractical or impossible. This is crucial in

operations where continuous power is essential, or where disconnecting equipment may cause significant disruption or hazards. [42]

Key components of this procedure include:

- **Written Justification and Approval**:
  - A detailed written procedure (Figure D.5) must be developed, explaining why it is not feasible to perform the task at a zero energy state.
  - Alternative safety controls must be identified, documented, and approved by the unit manager before any work begins.
- **Identification of Alternative Controls**:
  - Alternative controls may include barriers, personal protective equipment (PPE), and other safety measures designed to protect workers from live energy sources.
  - These controls must be rigorously tested and verified to ensure they provide adequate protection.
- **Supervision by Qualified Personnel**:
  - All tasks involving live equipment must be supervised by a qualified person who is competent in managing live energy risks.
  - The supervisor is responsible for ensuring that all safety measures are strictly followed and that the work environment remains safe.
- **Training and Competence**:
  - Workers must receive comprehensive training on the specific hazards associated with live equipment and the procedures to mitigate those risks.
  - Continuous education and training are necessary to keep workers updated on best practices and new safety protocols.

Conclusion

The safety procedures for working on live equipment are essential for protecting personnel and ensuring operational continuity. By adhering to these protocols, Holcim Algeria demonstrates its dedication to maintaining a safe working environment. The detailed procedures serve as a vital reference, reinforcing the company's unwavering commitment to safety. [42]

3.4.5.2 Removal of Another Person's Lock or Tag

Introduction

The removal of another person's Lock-Out/Tag-Out (LOTO) device is a critical procedure within Holcim Algeria to ensure safety during maintenance or repair operations when a device has been forgotten. This procedure outlines the necessary steps to safely remove such devices, maintaining safety and operational integrity. [43]
The complete procedure is detailed in **the appendix D.10 and D.11**

Key Roles and Responsibilities

Ensuring the safe removal of forgotten LOTO devices involves clear roles and responsibilities: [43]

- **Management**: Establishes and enforces lock-out procedures, provides resources, and ensures supervision.
- **Workers:** Apply and remove their own LOTO devices, and report any forgotten devices.
- **Supervisors:** Ensure worker training, oversee LOTO application and removal, and manage notifications.
- **Authorized Personnel:** Safely remove abandoned LOTO devices following established procedures and complete necessary documentation.
- **Safety Officers:** Monitor compliance, conduct inspections, and provide training.

Steps for Safe Removal

The procedure for safely removing a forgotten LOTO device involves several critical steps:

- **Documentation:** Complete and submit the Lock Removal/Destruction Form **(see appendix D.12)**.
- **Inspection:** Authorized personnel inspect the work area to ensure safety.
- **Operational Check:** Ensure all parts of the machine are intact.
- **Notification:** Inform affected staff before removal.
- **Device Removal:** Only authorized personnel remove the LOTO device.
- **Reactivation:** Once devices are removed, the machine can be reactivated, and the worker is notified.

Conclusion

The procedure for removing another person's LOTO device is essential for maintaining safety at Holcim Algeria. By following these guidelines, the company ensures the protection of its workers and the integrity of its operations. The complete, detailed procedure is available in the **appendix** for reference and training purposes.

3.4.6 Energy Isolation Devices and their optimal location

In our steadfast commitment to safety and operational integrity, Holcim Algeria adheres strictly to the inspection and maintenance protocols for our energy isolation devices (EI Devices) as recommended by the **Original Equipment Manufacturer (OEM)**. All labels on energy isolation devices conform to a standardized format to ensure clarity and consistency. This section summarizes our practices and strategies regarding the inspection, maintenance, and strategic placement of EI devices to optimize safety and operational efficiency. [44]

3.4.6.1 EI Devices

These examples highlight our ongoing efforts to place EI devices in optimal locations to enhance safety and facilitate maintenance activities. Each device is selected and positioned based on specific operational needs and safety considerations, ensuring maximum protection for personnel and equipment.

- **Circuit Breaker Lockout Devices** (Figure A.9): Ensure that circuit breakers remain in the "off" position, preventing accidental activation.
- **Electrical Lockout Devices** (Figure A.10): Secure electrical switches and controls to prevent unauthorized use.
- **Lockout Stations and Panels** (Figure A.12): Centralized locations for storing and managing lockout devices.
- **Pneumatic and Gas Lockout Devices** (Figure A.13): Secure pneumatic and gas systems to prevent the release of hazardous energy.
- **Portable Lockbox Styles** (Figure A.14): Transportable solutions for lockout/tagout procedures, allowing multiple lockout points to be secured with a single lock.

3.4.6.2 Optimal Location for Safety and Efficiency of EI Devices

To ensure energy isolation is as close as practicable to the activity performed, specific EI devices are installed or relocated based on operational needs. This strategy optimizes safety and operational efficiency. The following table provides examples of recent adjustments: [44]

Equipment	Energy Isolation Device Type	Status	New Location & Purpose
Bucket Elevator	Visual Cut-off Switches	Missing	Bottom of elevator: to allow chain inspection
Conveyor Belt System	Lock-Out Device	Relocation	Near control panel: for immediate shutdown during maintenance
Hydraulic Press	Visual Indicator Lights	Missing	Top of press: to indicate press status and ensure safe access
Pneumatic Valve	Manual Shut-off Valve	Missing	Adjacent to valve: for quick isolation during maintenance
Mixing Tank	Electrical Disconnect Switch	Relocation	Next to tank entrance: to ensure safe deactivation before entry

Table 3.4: Examples of EI Device Adjustments

Conclusion

The meticulous inspection, maintenance, and strategic placement of energy isolation devices are critical components of Holcim Algeria's safety and operational protocols. By adhering to OEM recommendations and optimizing the location of EI devices, we ensure both the safety of our personnel and the integrity of our operations. For the list of EI devices, **please refer to the appendix A**

3.4.7 Locks and Tags

In industrial settings, the use of lockout/tagout (LOTO) devices plays a crucial role in ensuring the safety of personnel working on equipment and machinery. These devices, collectively referred to as lockout devices, provide a reliable method to isolate energy sources, thereby preventing accidental energization during maintenance or repair activities. This section outlines various types of lockout devices utilized at Holcim Algeria, emphasizing their specifications and applications to maintain a safe working environment. [45]

3.4.7.1 Lockout Device Types and Specifications :

Below is an overview of commonly used lockout device types along with their descriptions, specifications, or drawings where applicable: [45]

Lockout Device Type	Description
Lock Hasp	Allows multiple locks to secure a single energy isolating device, facilitating group lockout procedures.
Valve Lock	Secures valves (e.g., ball valves, gate valves) in the off position to prevent inadvertent activation.
Pipe Flange Lock	Prevents the accidental opening of pipe flanges by securely locking them.
Circuit Breaker Lockout	Fits over circuit breakers to keep them in the off position, preventing electrical hazards.
Plug Lockout	Covers electrical plugs to prevent them from being plugged in, ensuring electrical safety.
Cable Lockout	Uses a flexible cable to lock out multiple devices or larger equipment, enhancing versatility.
Electrical Panel Lockout	Secures electrical panels to prevent unauthorized access and accidental energization.
Ball Valve Lockout	Specifically designed to lock out ball valves, ensuring they remain in the off position.
Pneumatic Lockout	Locks out pneumatic energy sources by securing compressed air connections.
Adjustable Gate Valve Lockout	Fits various sizes of gate valves to lock them in the off position securely.
Group Lockout Box	Provides a secure enclosure for multiple lockout tags, facilitating group lockout/tagout procedures.
Steering Wheel Lockout	Secures vehicle steering wheels to prevent unauthorized use, ensuring workplace safety.

Table 3.5: Overview of Lockout Device Types

3.4.7.2 Tags :

In addition to lockout devices, tags are used to provide supplementary information during lockout/tagout procedures, indicating the status of isolation and the presence of personnel working on equipment. Examples of tag stages can be found **in the appendix A.15** These tags are standardized across all Holcim plants in Algeria, ensuring uniformity and clarity in lockout/tagout procedures across different locations.

3.4.7.3 Color-Coded Padlocks :

Padlocks used in conjunction with lockout devices at Holcim Algeria are color-coded based on their purpose:

- **Red Padlock (Personal Lock)**: Used by individual workers to secure their personal lockout devices.

- **Green Padlock (Permit Issuer Lock)**: Designated for use by authorized personnel issuing work permits or overseeing lockout procedures.
- **Yellow Padlock (Equipment Lock)**: Applied to equipment or machinery during lockout procedures to indicate isolation status.

This color-coded system (Figure 2.3) enhances safety and communication within the workplace, allowing personnel to quickly identify the purpose and ownership of each lockout device.

Conclusion

The comprehensive use of lockout devices at Holcim Algeria underscores our commitment to maintaining a safe working environment. By implementing stringent lockout/tagout procedures and utilizing a variety of specialized lockout devices, we mitigate the risk of energy-related accidents and ensure the safety of our workforce. The color-coded padlock system further enhances safety and operational efficiency, promoting clear communication and effective lockout/tagout practices across all operational areas.

This section provides an overview of our approach to lockout devices and serves as a reference for understanding their types, specifications, and the color-coded system implemented at Holcim Algeria. For detailed specifications and further information, please refer to the appendix.

3.5 Prohibited Behaviors

Introduction

In our unwavering commitment to safety, **the Unit's Consequence Management policy** explicitly outlines prohibited behaviors in relation to energy isolation tasks. This policy is designed to ensure that all personnel are aware of and adhere to the strict protocols necessary to maintain a safe working environment. [46]
(Check the policy for more information)

3.5.1 Dissemination of Information on Prohibited Behaviors

To maximize visibility and accessibility, the details of these prohibited behaviors have been communicated and prominently posted in various locations across our facility, including the canteen.

This strategic dissemination of information is aimed at fostering a culture of safety awareness and compliance, ensuring that all employees are well-informed and accountable for their actions in relation to energy isolation tasks. [46]

3.5.2 Compliance with Safety Protocols

In our operations, strict adherence to safety protocols is paramount, conforming to the standard HSE 103 related to energy isolation.

Therefore, within our energy isolation procedures **(in section 5.2 of the standard)**, clear prohibitions are delineated. [46]

These prohibited behaviors include:

- Working on equipment without proper isolation and locking out.
- Skipping or ignoring energy isolation procedures.
- Abusing, tampering with, or bypassing isolation devices.
- Entering an isolation area without the Permit Issuer's authorization.
- Allowing unauthorized personnel into isolated areas.
- Failing to report isolation-related incidents to a supervisor.
- Delegating or unauthorized removal of personal locks.

These prohibitions play a crucial role in safeguarding the safety of all personnel and upholding the integrity of our processes. They underscore the significance of compliance and accountability in fostering a secure working environment.

Conclusion

These clear and comprehensive prohibitions regarding energy isolation tasks are essential elements of our commitment to maintaining a safe and compliant workplace. By actively disseminating this information and ensuring adherence to these protocols, we can uphold the highest standards of safety and protect the wellbeing of all our employees.

3.6 Management Of Change

Introduction

The Management of Change (MOC) procedure is essential for ensuring that any changes within a project are systematically managed to minimize their impact on project objectives and deliverables. The document, detailed in the appendix, outlines the key elements of the MOC process, which is applicable across all Algerian HOLCIM plants. [47]

3.6.1 Overview

The MOC procedure ensures a structured approach to managing changes within a project, focusing on maintaining alignment with project goals and minimizing disruptions. This procedure is applicable to changes in organizational structure, key personnel, suppliers, and management system procedures that could affect product quality. The process involves defining, evaluating, and approving changes before implementation, ensuring effective communication, documentation, and training. [47]

3.6.2 Roles and Responsibilities

- **All Employees**: Recognize the need for MOC, use appropriate documents, and escalate issues to the Plant/Project Manager.
- **Initiator**: Start the MOC process, ensure comprehensive coverage, communicate requests, and implement changes with controls.
- **Plant/Project Manager**: Review and approve changes, ensure proper handover/signoff, and maintain procedure adherence.
- **Health and Safety Representative**: Review health and safety amendments, conduct risk assessments, and verify change effectiveness.
- **Quality Department**: Identify required changes, apply the MOC process, and ensure documentation is adequate.

3.6.3 Procedure

In today's fast-paced and ever-evolving environment, effective change management is crucial for ensuring that transitions are smooth and successful. This document outlines a structured approach to managing changes within our organization, divided into three key phases: Preparing for Change, Managing the Change, and Reinforcing the Change. Each phase includes specific steps and actions designed to ensure that changes are well-planned, implemented efficiently, and reinforced through continuous feedback and improvement. [47]

Phase 1: Preparing for Change

- **Define the Change**: Identify subject, reason, impact, affected parties, target date, and risks.
- **Plan the Change**: Outline stages, eventualities, required personnel, training, timeline, and communication.

Phase 2: Managing the Change

- **Implement Changes**: Revise and approve documents, prepare training, make physical changes, and manage new equipment.
- **Train Personnel**: Communicate changes, deliver training, and support personnel.

Phase 3: Reinforcing the Change

- **Collect and Analyze Feedback**: Request feedback, assess gaps, and identify corrective actions.
- **Correct Deficiencies**: Implement corrective actions, update documents, and communicate changes.

NOTE: For a comprehensive step-by-step guide, please refer to the detailed procedure in Appendix D.13.

3.6.4 Decision Tree for Management of Change Requirement

This decision tree (Figure D.17) helps determine whether a Management of Change (MOC) process is required based on the type and impact of the change.

Key Nodes

- **Organizational Structure**:
  - Impact on QMS?
    - Large Impact: MoC Applies
    - Slight or No Impact: No MoC
- **Personal**:
  - Critical to the QMS?
    - Yes: MoC Applies
    - No: No MoC
- **Supplier**:
  - For Raw Material?
    - Yes: MoC Applies
  - Parts or Labor:
    - Direct Impact on Quality or Reliability?

Yes: MoC Applies

No: No MoC

- **QMS Procedure**:
  - Change to Manual:
    - Verbiage, Format, Typo: No MoC
    - Content Impact on QMS:

      DRR?

      No: Use MoC Exclusively

      Yes: Use MoC and DRR can be Added

Conclusion

The Management of Change procedure is an important aspect of project management, ensuring that changes are systematically managed to minimize their impact on project objectives and deliverables. By following a structured approach to defining, evaluating, and implementing changes, organizations can maintain alignment with their goals, minimize disruptions, and ensure the continued quality of their products and processes. This procedure, supported by clear roles and responsibilities and a robust decision-making framework, helps facilitate smooth transitions and effective change management.

3.7 Training, Competency, and Authorization

Introduction

Training, competency, and authorization are fundamental aspects of our energy isolation program. This chapter outlines our approach to ensuring personnel are adequately trained, competent, and continuously improving in energy isolation procedures. [48]

3.7.1 Unit and Matrix Training

We maintain a comprehensive Unit competency and training matrix, accessible in Appendix E, which outlines the required training and competency levels for personnel involved in energy isolation. Regular updates ensure alignment with evolving job roles and safety standards. [48]

3.7.2 Training Material

Approved training and competency materials will soon be available, covering all aspects of energy isolation procedures, including regulations, equipment guidelines, and best practices. These resources empower personnel to enhance their knowledge and skills effectively. [48]

3.7.2.1 Quick Tips for Well-Written Procedures

- Start with a clear purpose: Define the objective of the procedure.
- Identify the target audience: Ensure the procedure is tailored to the user's knowledge and skill level.
- Organize steps logically: Present steps in a sequence that flows naturally.
- Use clear and concise language: Avoid jargon and complex sentences.
- Incorporate visuals: Use diagrams and charts to clarify instructions.
- Include warnings: Highlight critical safety warnings and precautions.
- Review and test: Validate the procedure through practical testing.
- Establish feedback and improvement process: Continuously refine the procedure based on user feedback.

3.7.2.2 Benefits of Well-Written Procedures

- Reduce Errors and Defects: Clear procedures minimize the risk of mistakes.
- Improve Efficiency: Streamlined steps save time and resources.
- Enhance Communication: Consistent procedures ensure everyone is on the same page.
- Improve Productivity: Efficient procedures lead to higher overall productivity.

3.7.2.3 Factors Influencing Procedure Usage

- Availability: Ensure procedures are easily accessible.
- Specificity: Procedures should be detailed and specific to tasks.
- Accuracy: Regularly update procedures to reflect current practices.
- Knowledge: Train personnel thoroughly on procedure usage.
- Up-to-date: Keep procedures current with the latest standards and practices.

3.7.2.4 Writing Effective Procedures

- Empathize with the end user: Understand the user's perspective and needs.
- Clarify processes and steps: Ensure every step is easy to follow.
- Identify required energy isolation devices: Clearly specify necessary tools and equipment.
- Avoid repetition and unnecessary information: Keep the procedure concise and relevant.
- Maintain consistent terminology: Use the same terms throughout to avoid confusion.
- Use active voice and action words: Make instructions direct and actionable.

3.7.3 Training Records

Detailed training records are maintained for each individual, documenting completed training sessions, competency assessments, and certification renewals. These records serve as evidence of personnel readiness and compliance with training requirements.

3.7.4 Regular Assessment

Regular assessments are conducted to evaluate the effectiveness of our training program and gauge personnel competency in energy isolation procedures. Utilizing quizzes, practical evaluations, and scenario-based exercises ensures continuous improvement in skill proficiency.

3.7.5 Continuous Improvement

A structured feedback mechanism is in place to gather input from participants regarding training sessions and materials. This feedback loop facilitates the identification of improvement opportunities and addresses personnel concerns, fostering a culture of collaboration and continuous learning. We are committed to ongoing improvement in our training program. Feedback, assessment results, and emerging best practices are utilized to refine training methods and materials, ensuring that our personnel remain equipped to execute energy isolation procedures safely and effectively.

Conclusion

Training, competency, and authorization are critical to ensuring the safety and efficiency of our energy isolation procedures. By maintaining comprehensive training materials, detailed records, regular assessments, and a commitment to continuous improvement, we equip our personnel with the knowledge and skills necessary to perform their duties safely and effectively. Through structured feedback and well-crafted procedures, we foster a culture of continuous learning and collaboration, ultimately enhancing our overall safety performance.

Chapter 4

The key achievements of the implementation of the EI program and recommendations

4.1 The key Achievements

The implementation of the Energy Isolation program at Holcim facilities has resulted in several key achievements:

- **Improved Safety Standards:**
  - Risk Reduction: Significant reduction in the risk of accidents and injuries due to rigorous assessment and enhancement of safety practices.
  - Consistent Procedures: Implementation of standardized procedures ensuring uniform safety protocols across all units.
- **Enhanced Compliance:**
  - Regulatory Adherence: Improved compliance with energy safety regulations through the development and execution of a comprehensive action plan.
  - Reinforced Importance: Regular audits and training sessions reinforcing the critical importance of compliance among employees.
- **Operational Efficiency:**
  - Streamlined Processes: Integration of advanced technologies and streamlined processes resulting in enhanced operational efficiency.

  - Reduced Downtime: Use of digital platforms for monitoring and reporting reducing downtime and improving response times.

- **Employee Engagement:**
  - Increased Involvement: Higher levels of employee involvement in safety initiatives fostering a culture of safety and accountability.
  - Empowered Feedback: Implementation of feedback mechanisms empowering employees to contribute to the continuous improvement of safety procedures.

- **Sustainable Practices:**
  - Proactive Management: Establishment of a foundation for sustainable safety practices through proactive risk management and continuous improvement.
  - Commitment to Excellence: Holcim's reinforced commitment to safety and operational excellence through successful program implementation.

4.2 Recommendations

Based on the research findings and the practical implementation of the Energy Isolation program at Holcim's facilities, the following comprehensive recommendations are proposed:

- **Continuous Training and Development:**
  - **Implementation:** Establish a regular schedule for training programs that cover:
    * The latest safety protocols and energy isolation techniques
    * Legal and regulatory requirements training
  - **Workshops:** Conduct hands-on workshops and simulations to reinforce theoretical knowledge.
  - **Refresher Courses:** Periodically hold refresher courses to keep all employees updated on any changes in safety procedures.

- **Enhanced Monitoring and Evaluation:**
  - **Robust Monitoring System:** Develop and deploy a comprehensive system to monitor the effectiveness of energy isolation procedures in real-time.
  - **Regular Audits:** Conduct quarterly audits to ensure compliance with safety standards and identify areas needing improvement.
  - **Feedback Mechanism:** Implement a structured feedback system where employees can report issues or suggest improvements.

- **Technology Integration:**
  - **Advanced Tools:** Invest in the latest energy isolation technologies, such as digital lockout/tagout systems and real-time monitoring tools.
  - **Digital Platforms:** Use software solutions for real-time tracking and reporting of energy isolation activities, ensuring immediate response to any discrepancies.
  - **Data Analytics:** Leverage data analytics to predict potential risks and proactively address them.
- **Stakeholder Engagement:**
  - **Safety Culture:** Foster a culture of safety through regular safety meetings and workshops involving all stakeholders.
  - **Employee Involvement:** Encourage employees to actively participate in safety initiatives and provide their insights and feedback.
  - **Community Involvement:** Engage with local communities to raise awareness about safety practices and Holcim's commitment to safety.
- **Policy and Procedure Updates:**
  - **Regular Reviews:** Schedule bi-annual reviews of all safety policies and procedures to ensure they remain current and effective.
  - **Clear Documentation:** Develop clear, concise, and accessible documentation for all safety procedures.
  - **Compliance Checks:** Perform regular compliance checks to ensure all policies and procedures are being followed correctly.
- **Promoting a Safety Culture:**
  - **Awareness Campaigns:** Launch ongoing safety awareness campaigns to highlight the importance of energy isolation and safe work practices.
  - **Recognition Programs:** Establish recognition programs to reward employees who consistently adhere to safety protocols and contribute to safety improvements.
  - **Incident Reporting:** Encourage transparent reporting of all incidents and near-misses to learn from them and prevent future occurrences.

Chapter 5

Procedure Management Software

Introduction to SaaS

Software as a Service (SaaS) is a software distribution model where applications are hosted by a service provider and made available to customers over the Internet. Unlike traditional software that requires installation on each user's machine, SaaS allows remote access via the cloud, offering increased flexibility and accessibility.

5.1 Importance and Advantages of SaaS in the Current Context

The importance of SaaS in the current context lies in its ability to reduce infrastructure costs, offer dynamic scalability, and facilitate automatic updates. For businesses, this translates into reduced maintenance needs and increased productivity through instant access to the latest features.

5.2 Market Study and Needs Analysis

The market study for our procedure management SaaS was conducted in a non-comprehensive manner but has highlighted key trends and primary needs of potential users.

5.2.1 Target Market Identification

Description: Our target market includes small and medium-sized enterprises (SMEs) requiring efficient procedure management. The main sectors include:

- **Manufacturing:** Need to optimize production processes and inventory management.
- **Services:** Need to efficiently manage administrative tasks and client interactions.

- **Health:** Rigorous management of medical and administrative procedures, compliance with strict regulations.
- **Education:** Organization and monitoring of educational processes, management of administrative tasks, and continuous staff training.

5.2.2 Analysis of User Needs and Expectations

To ensure the success of our SaaS for procedure management, it is crucial to understand the specific needs and expectations of our target users. By conducting a market study and engaging directly with potential users, we have identified several key areas where businesses seek improvements and solutions. These insights allow us to tailor our SaaS to effectively address the most pressing challenges faced by our target market.

Identified Needs:

- **Simplification of Operational Processes:** Businesses seek to simplify and automate their processes to gain efficiency and reduce administrative complexity.
- **Digitization and Paper Reduction:** Transitioning to paperless processes is a priority to reduce costs, improve information access, and minimize environmental impact.
- **Optimization of Task Planning and Execution:** Businesses need tools to plan, track, and optimize the execution of daily tasks to improve productivity and minimize errors.
- **Continuous Staff Training:** An integrated training management system ensures that staff remains competent and up-to-date with procedures and best practices.

Methodology: To identify these needs, we used the following methods:

- **Informal Interviews:** Discussions were held with process managers and company executives to gain qualitative insights into specific needs and pain points.
- **Online Surveys:** Questionnaires will be sent to a small sample of companies in the target sectors. The questions will focus on current challenges in procedure management and expectations for a SaaS solution.

5.2.3 Competition Study and Differentiation

General Observation: The competition analysis revealed the presence of several existing procedure management solutions in the market. However, these solutions often have notable limitations:

- **Lack of Flexibility:** Many solutions are rigid and do not adapt well to the specific needs of different companies.
- **Limited Customization:** Companies are looking for solutions that can be customized to better fit their unique processes.

Differentiation: Our SaaS stands out with several unique aspects:

- **Objective of Zero Paper, Zero Time Loss, Zero Delay, Zero Error:** Our solution aims to eliminate paperwork, optimize working time, ensure punctuality of tasks, and minimize human errors.
- **Adaptability to Specific Needs of Each Company:** Our SaaS is designed to be flexible and customizable, allowing companies to configure procedures and training according to their specific needs.

This differentiation allows our SaaS to more precisely and effectively meet the expectations of SMEs in the targeted sectors by offering a solution that evolves with their needs and performance goals.

5.3 SaaS Design and Architecture

here we present the technologies and the global architecture of our software

5.3.1 Technologies

The choice of technologies for our SaaS focused on modern frameworks and development environments, ensuring exceptional performance and a smooth user experience.

- **Front-end and Back-end:** We used Nextjs, a full stack React framework, to build the first version of our platform. It will handle user interaction and all connections. For styling, we utilized Shadcn and Tailwind.
- **Database:** we selected MongoDB for its flexibility and ability to handle various data structures, facilitating the rapid evolution of application features.
- **Hosting :** The source code is in a GitHub repository that uses CI/CD pipelines for continuous integration and deployment. This enables for more regular and consistent upgrades, which reduces time to market and improves product quality.
- **Deployment:** The application is deployed on a private virtual private server (VPS) managed with Coolify, providing full control over the infrastructure and simplified deployment management.

We can sum it all up in :
The architecture of the application is designed to provide a robust and scalable solution, hosted on a private VPS. Below is a detailed description of the components and their interactions, showcasing how each part contributes to the overall functionality and efficiency of the application.

5.3.2 The Components and Their Interactions

At the heart of any system lies its components and their intricate interactions, and in our Software we have:

- **Private VPS** virtual private server (VPS) is an isolated virtual environment on a physical server that is owned and maintained by a cloud or web hosting company.
- **Coolify** Coolify is an open-source self-hostable application , It helps manage your servers, applications, and databases on your own hardware
- **nextjs** nextjs is a React framework for developing web applications. In this context, it is used to manage both the front-end (UI) and the back-end (API).
- **API** The API (Application Programming Interface) handles business logic and communications between the front-end (UI) and other services or databases. It is also built with Next.js.
- **Prisma** Prisma is an ORM (Object-Relational Mapping) that facilitates interactions between the API and the database. It is represented as a separate component that interacts with the API to handle database operations.

Data Flow

- Users interact with the UI.
- The front-end sends requests to the API to fetch or send data.
- The server processes these requests and can make changes in the database , upload files or load file
- The back-end end uses Prisma to interact with the database, reading or writing data.
- Responses are sent back from the back-end to the front-end, which then presents them to the user.

The diagram below shows the architecture of the application using the technologies mentioned above, This setup allows for separation of concerns and facilitates the management and scalability of the application.

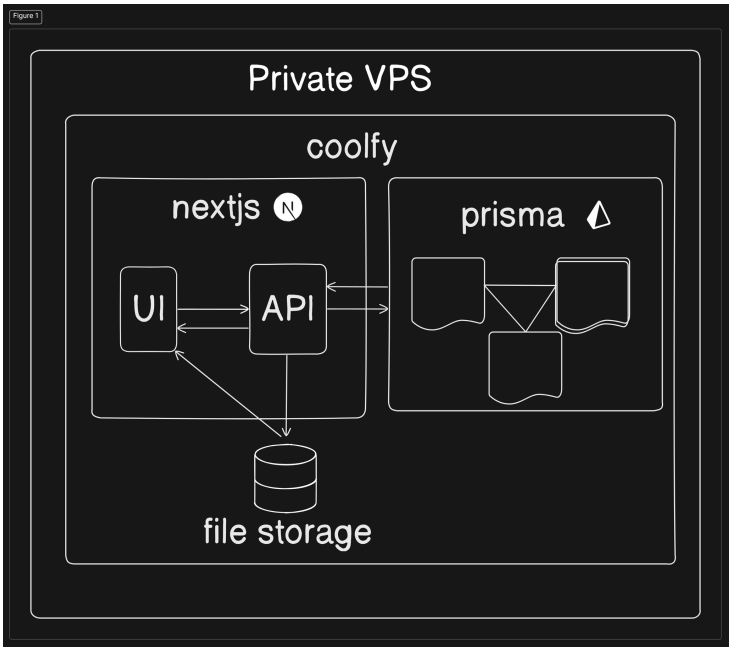

Figure 5.1: First Version Architecture

5.3.3 Data Model and User Management

Design of a Flexible and Scalable Data Model: The data model is designed to be adaptable, meeting the varied needs of procedure, training, and user management.

Roles and Permissions:

- Each user is assigned a specific role (Employee, Trainer, Manager, Admin) with permissions and features tailored to their responsibilities.
- Use middleware to secure session and permission management, ensuring that each user can only access permitted features and data.

5.3.4 Data Security and Confidentiality

Prioritizing Security, Regulatory Compliance and Protecting user data are at the heart of our design, with robust measures to ensure security and compliance.

We have opted, in Data Encryption, for the use of SSL/TLS to secure all communications between the client and server. This approach ensures that data transmitted is protected against interceptions and man-in-the-middle attacks.
Implementation of data retention and deletion policies to respect users' rights to data erasure and portability.

This detailed development of the sections allows for a more interesting presentation of the security aspects of our SaaS, highlighting the importance given to security and compliance.

5.3.5 Users Roles and Responsibilities

In order to ensure the efficient functioning and management of the application, various user roles have been defined, each with specific responsibilities. This section outlines the roles and responsibilities of the different types of users within the application.

Employee (User 01):

- Access the user interface to select training modules and application processes.

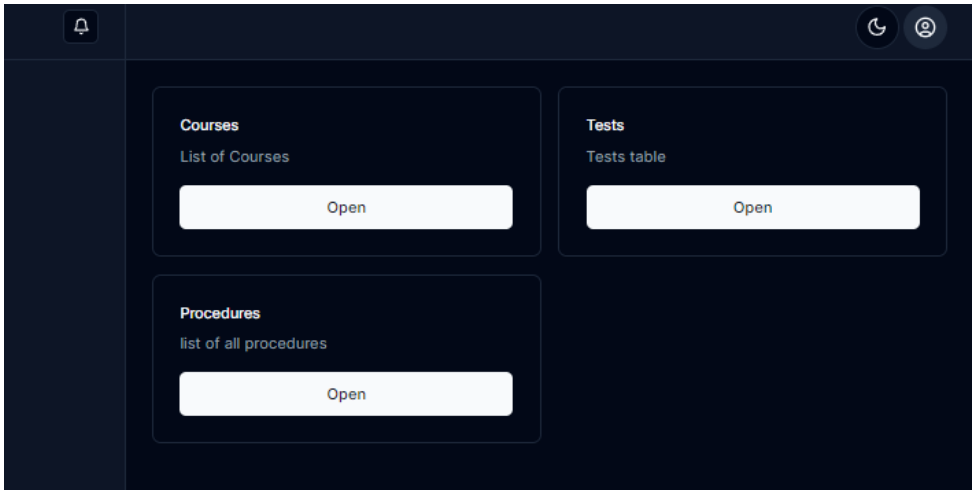

Figure 5.2: User Interface

- Follow step-by-step procedures via a task list.

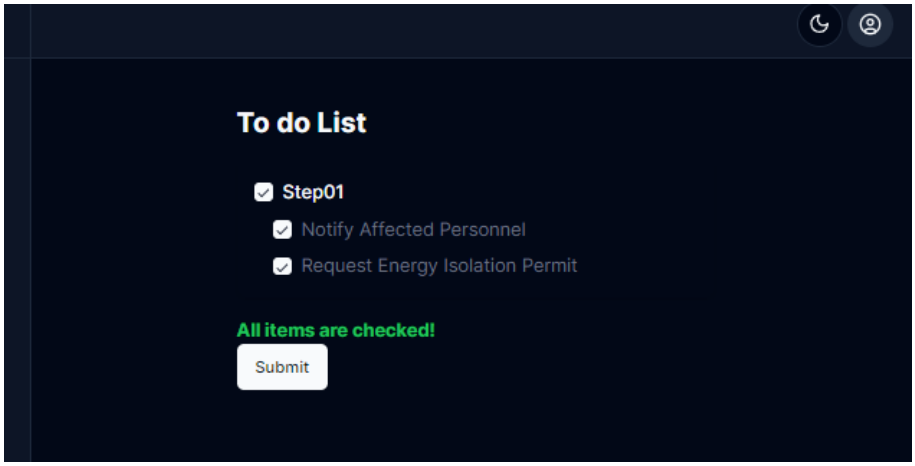

Figure 5.3: Task List

- Engage in self-training.

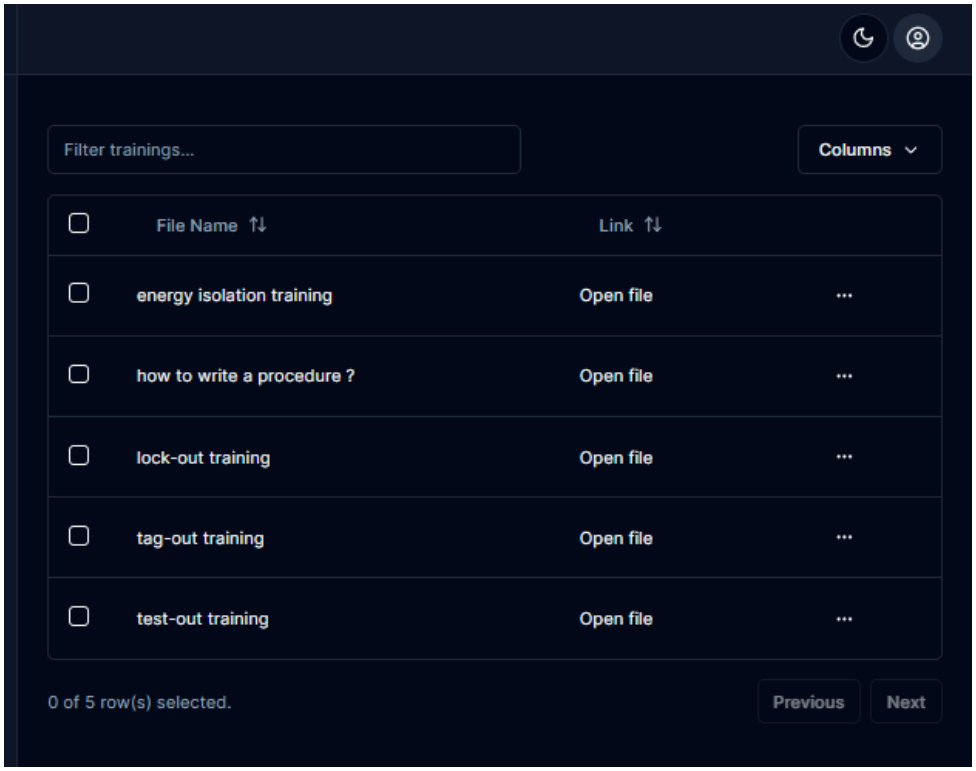

Figure 5.4: List of trainings

- Access procedures and training only once approved by the Responsable.

5.3.5.1 Trainer (User 02)

- Add specific training modules for employees.

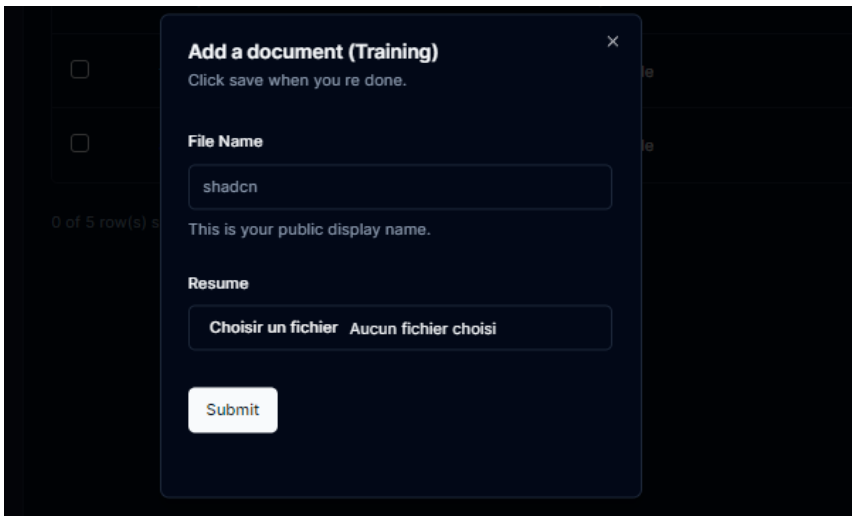

Figure 5.5: Adding training module

- Add tests associated with the training modules.

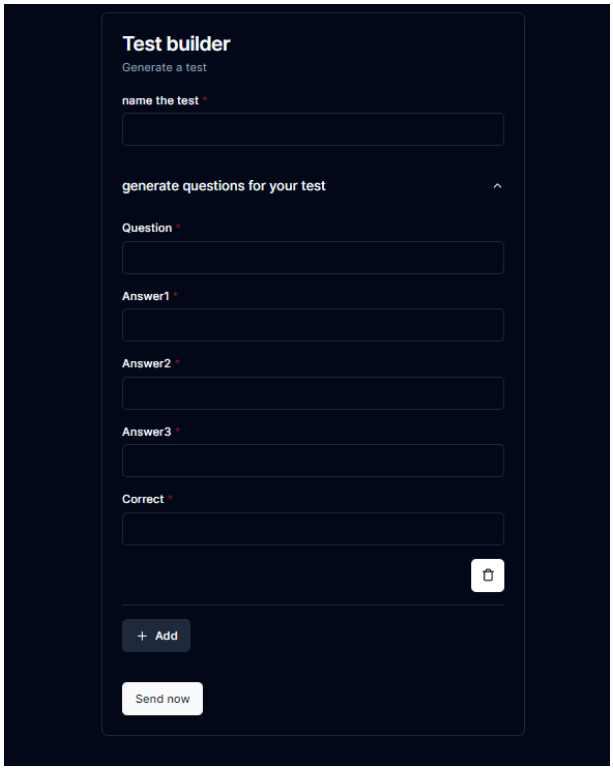

Figure 5.6: Building tests

- Add procedures in the software.

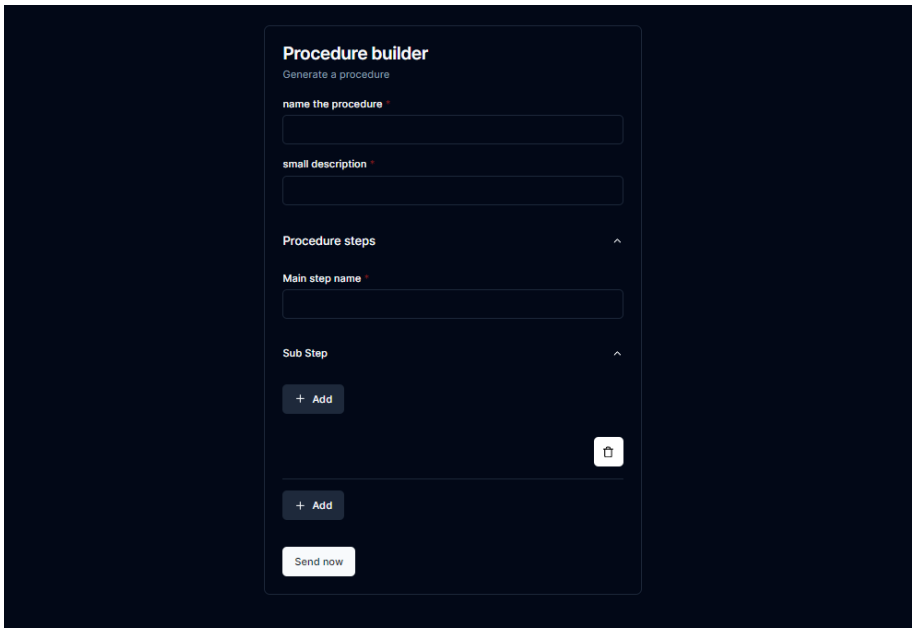

Figure 5.7: Making the procedure

Responsible (User 03)

- Approve or reject procedures submitted by employees.

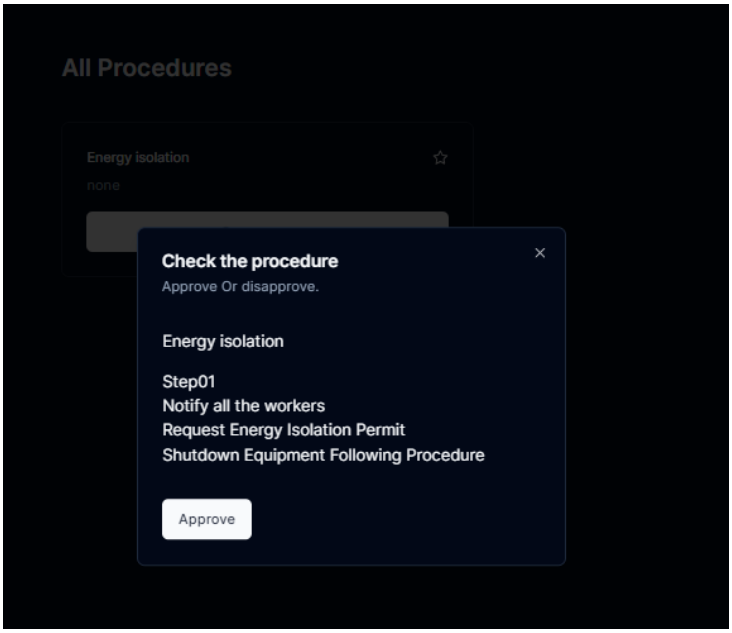

Figure 5.8: Approval of the procedure

- Receive notifications upon completion of tasks related to procedures **(not yet developed).**

Admin (User 04)

- Perform account management functions such as adding, deleting, and modifying accounts.

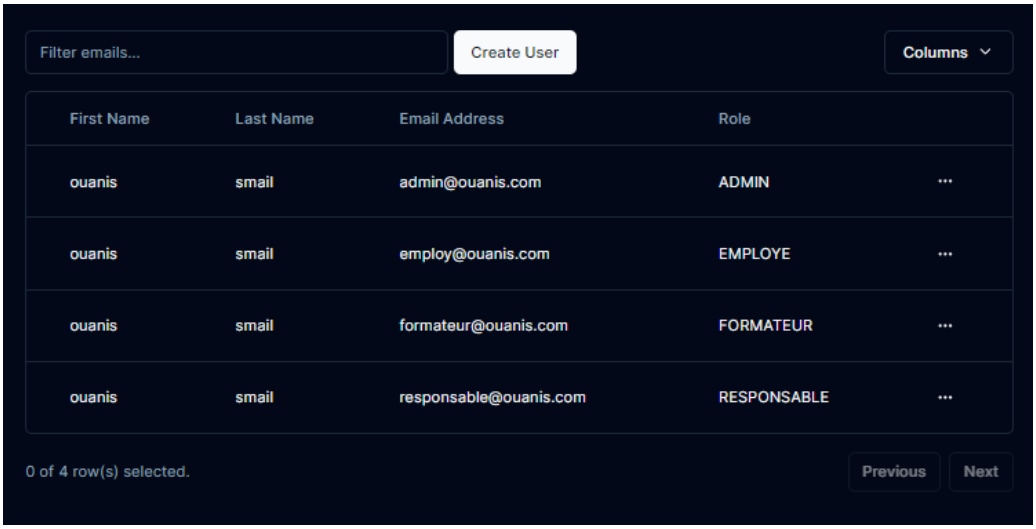

Figure 5.9: Managing Accounts

5.4 SWOT Analysis

The following SWOT analysis provides a comprehensive overview related to our project. This analysis aims to identify key factors that contribute to the project's current and future success, as well as potential challenges that may need to be addressed.

Strengths	**Weaknesses**
• Modern Technology: Next.js (powerful framework for server-side rendered React applications), Tailwind CSS (rapid UI development with utility-first approach), MongoDB (flexible, schema-less database for large unstructured data) Flexible Architecture • Enhanced Security: SSL/TLS Encryption (secure data transmission), AES-256 (robust data encryption) • Efficient Deployment: CI/CD via GitHub (streamlines development process), Management by Coolify (user-friendly interface for complex setups) • Adaptability: Customizable Solutions	• Technological Dependence: Dependence on Open-Source Technologies can and may pose risks • Initial Cost: High investment required for development and infrastructure setup
Opportunities	**Threats**
• SaaS Market Growth: Rising Demand for Cloud Solutions • Business Digitization • Geographical Expansion: International Markets • Continuous Innovation: New Features and Technologies	• Increased Competition: Established Competitors • Security Risks: Cyberattacks • Regulatory Changes: Data Protection Laws • Market Saturation: Saturated SaaS Market

5.5 Action Plan: Short, Medium, and Long Term

By understanding SWOT elements, we can strategically plan to leverage our strengths and opportunities while mitigating weaknesses and threats. This action plan outlines the specific steps required to achieve our goals. It details the tasks, timelines, and resources needed for successful implementation.

Objective	**Short Term (0-6 months)**	**Medium Term (6-18 months)**	**Long Term (18+ months)**
Technology	Finalize MVP development.	Improve and optimize existing features.	Integrate Artificial Intelligence and new technologies and advanced features. Rewrite backend in other technologies like "Go"
Market	Launch initial marketing campaign to attract first users. Conduct thorough market research and competitive analysis. Develop visual identity and logo.	Expand marketing campaign to reach new market segments.	Enter new geographical and vertical markets.
Customer Support	Set up basic customer support (live chat, FAQ).	Develop a dedicated support team and offer training.	Create a comprehensive help center with online resources and user communities. Integrate chatbot for small interactions
Security	Implement basic security protocols (SSL/TLS, AES-256).	Conduct regular security audits and penetration tests. Ask bounty hunters to perform security tests	Develop advanced incident response plans and implement proactive security solutions.
Compliance	Ensure initial compliance with major regulations (GDPR).	Maintain compliance with new regulations and standards.	Obtain security and compliance certifications (ISO 27001, etc.).

Table 5.1: Action Plan: Short, Medium, and Long Term

5.6 Business Model Canvas

The Business Model Canvas is a strategic management tool that allows us to visualize and assess our business model. It helps us understand the key components of our business and how they interact. Below is our Business Model Canvas, outlining the essential elements of our business strategy.

Key Activities	**Key Partners**	**Value Propositions**	**Customer Relation-ships**	**Customer Segments**
- Development and Continuous Improvement - System Performance Optimization - Advanced Technology Integration (like AI)	- Sponsors (Maintenance Service Providers, Customer Support Services) - Suppliers (Amazon Web Services (AWS)) - Legal Services Providers	- Automation of Internal Processes - Administrative Friction Reduction - Ongoing Training	- Proactive and personalized customer support - Personal Assistance	- Companies in a wide range of sectors (Manu-facturing, services, etc.) requiring optimized management of internal procedures. - Small and medium-sized companies.

Key Resources	Channels	Revenue Streams	Cost Structure
Human Resources: - QHSE Manager - 2 Software Developers - 1 UI/UX Designer **Immaterial Resources:** - Reliable Cloud Infrastructure (2 vCPU, 4g RAM, 40g storage) **Material Resources:** - PCs and a local server in mid-term	- Online Platform - Web/Mobile - Social Media - Email Campaigns - Relationship Marketing - Webinars	- Monthly or annual subscriptions - Training - Paid additional modules (extensions)	- Development for 3 months (630,000 DZD) - Maintenance (42,000 DZD/month) - Storage - Material Resources Incube by ENP - Server iconsent (Algerian) (6,500 DZD)

Table 5.2: Business Model Canvas

Conclusion

The development of our SaaS for procedure management represents a significant opportunity to optimize the operational processes of SMEs in various sectors. By adopting modern technologies and a flexible architecture, we ensure the delivery of a high-performing and secure solution.
The SWOT analysis revealed important strengths such as cutting-edge technology and enhanced security, but also challenges like management complexity and increased competition.

To maximize our chances of success, we must focus on implementing short, medium, and long-term strategies that support our objectives for technological development, market expansion, customer support, security, and compliance.

Additionally, our business model canvas serves as a crucial tool, outlining the strategic framework that guides our value proposition, customer segments, channels, and revenue streams, thereby reinforcing the overall importance and robustness of our business strategy.

In conclusion, our SaaS is well-positioned to capture a significant market share by meeting the growing needs of business digitization and procedure management. By remaining agile and continuing to innovate, we will not only meet the current expectations of our clients but also anticipate and adapt to future market and technological evolutions.

Conclusion

In the rapidly evolving industrial landscape, ensuring worker safety and efficient energy management is crucial for organizational success. This thesis has demonstrated the critical importance of a comprehensive Energy Isolation program in achieving these goals within Holcim's facilities. Through meticulous assessment, identification of gaps, and implementation of a robust action plan, significant strides have been made in enhancing workplace safety and operational efficiency.

The research and practical implementation outlined in this thesis highlight the effectiveness of standardized procedures, advanced technologies, and continuous training in fostering a safe and productive work environment. The successful reduction in workplace accidents and enhanced compliance with safety standards are testaments to the program's impact.

Moving forward, it is essential to maintain the momentum by continuously updating safety protocols, integrating new technologies, and engaging all stakeholders in safety initiatives. The recommendations provided aim to ensure the sustainability of these achievements and promote a culture of safety and excellence at Holcim.

Holcim's dedication to proactive risk management, continuous improvement, and stakeholder engagement has paved the way for a safer and more sustainable industrial future. The Energy Isolation program at Holcim's facilities serves as a model for other industrial operations seeking to enhance safety and operational efficiency. The ongoing commitment to safety and operational excellence will not only protect employees but also ensure the long-term success and sustainability of Holcim's operations.

In conclusion, this thesis underscores the critical role of comprehensive safety programs in the industrial sector. By prioritizing safety, compliance, and continuous improvement, organizations can achieve operational excellence and create a safer working environment for all employees. Our data highlights significant improvements in compliance: adherence to the HSE 103 Safety Standard has increased from 60% to 83%, and compliance with World-Class Guidelines has risen from 16% to 45%. The journey towards a zero-accident workplace is ongoing, but with dedicated efforts and strategic investments, it is an attainable goal.

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Appendix A

Illustrations

A.1 Energy Isolation Devices

Figure A.1: Lock-Out Station

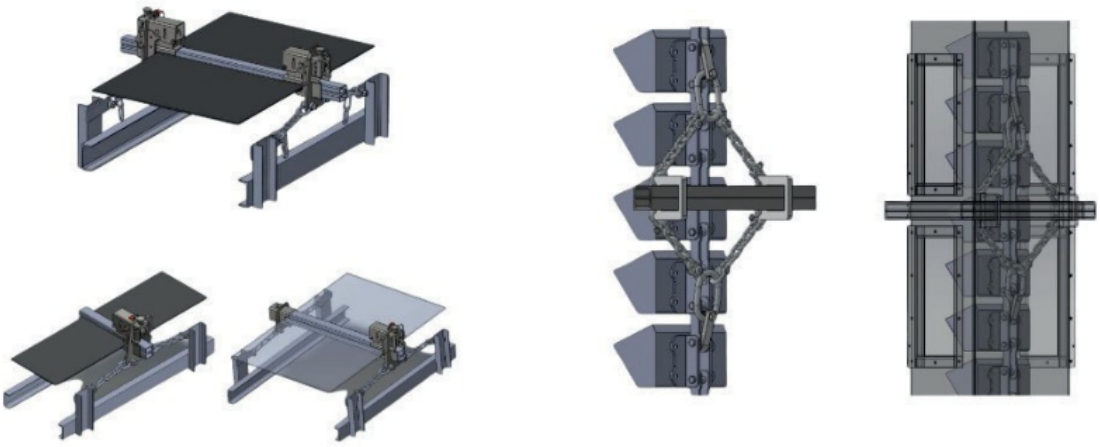

Figure A.2: Mechanical isolation devices

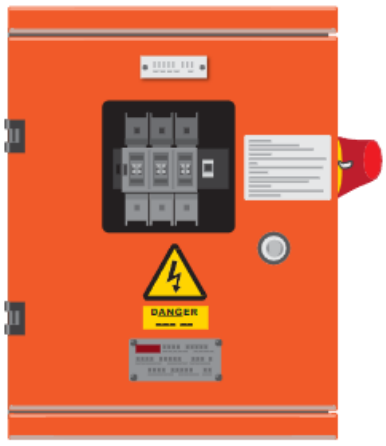

Figure A.3: Visual Cut-off Switch (VCS)

Figure A.4: Valve lock

Figure A.5: Isolator Check

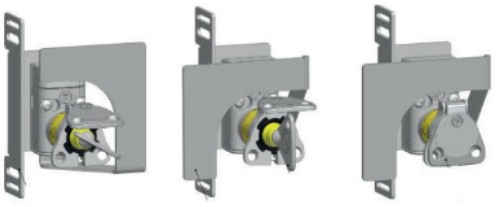

Figure A.6: Interlocked trapped keys

Figure A.7: The robotic Motor Control Center (MCC)

Figure A.8: Motor Control Center (MCC)

Figure A.9: Circuit breaker lockout devices

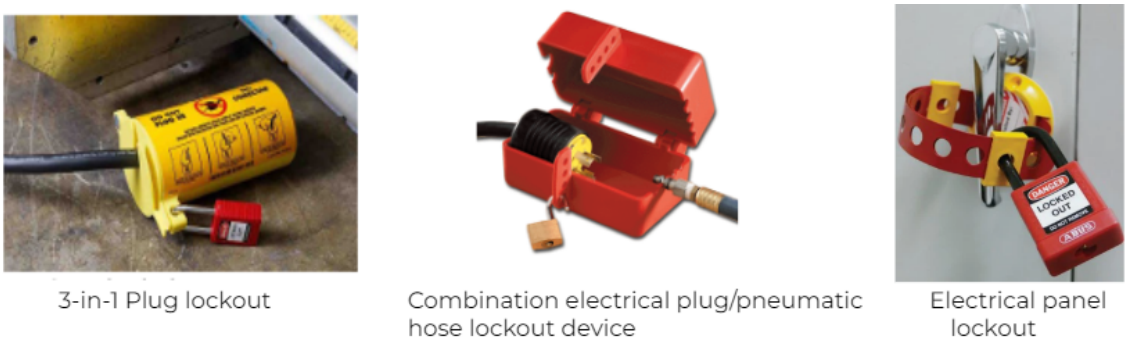

Figure A.10: Electrical lockout devices

Figure A.11: Lock and key management

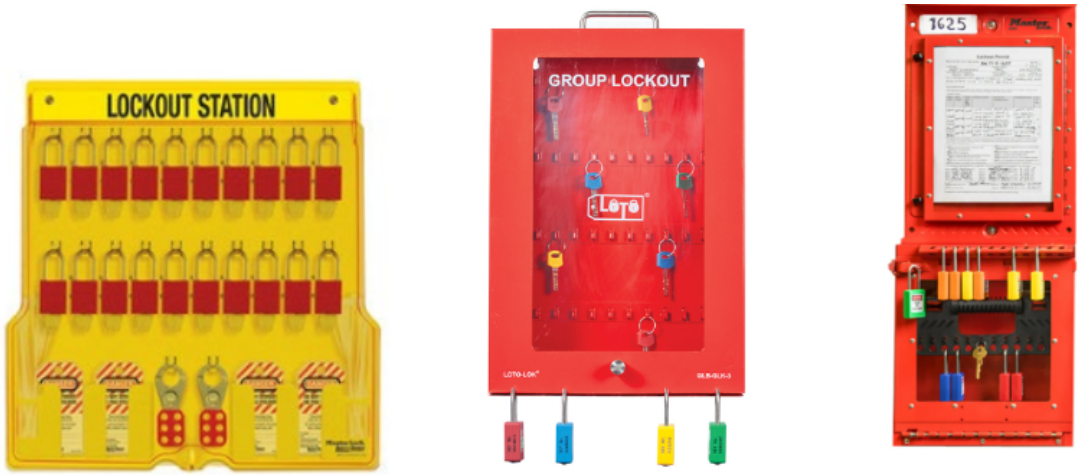

Figure A.12: Lockout stations and panels

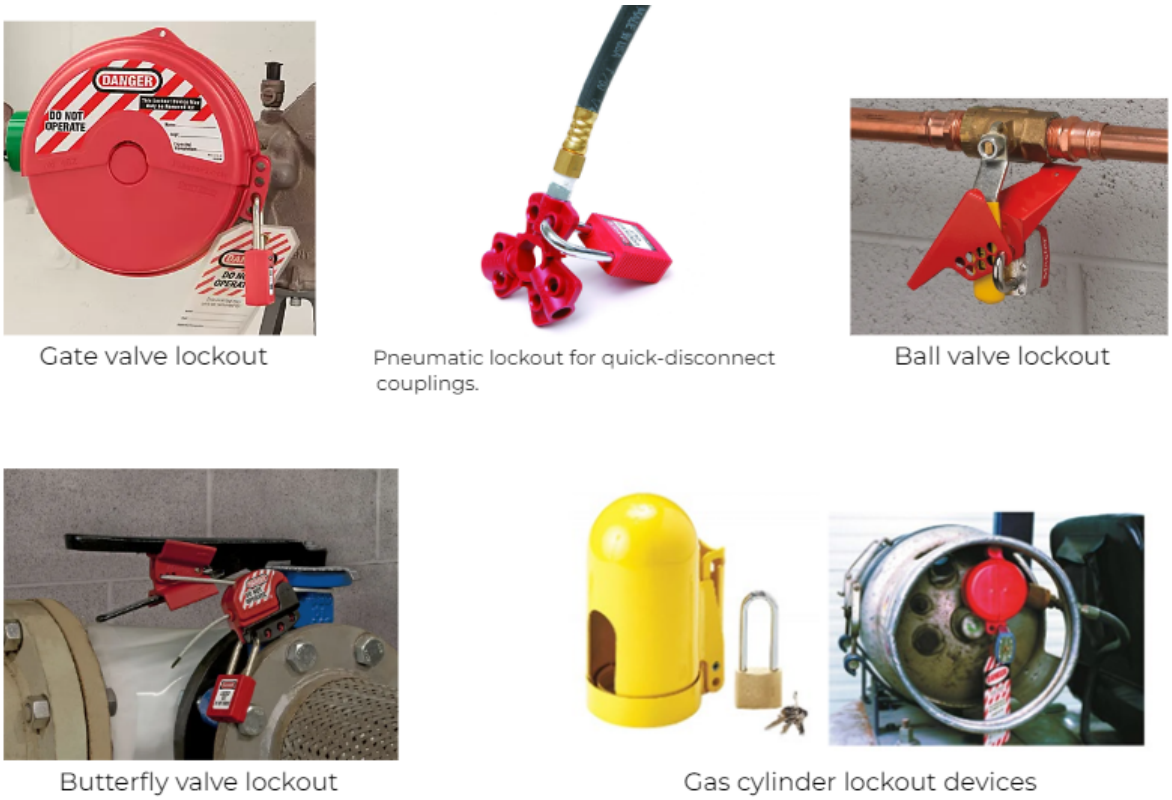

Figure A.13: Pneumatic and gas lockout devices

Figure A.14: Portable lockbox styles

Figure A.15: Lockout tag styles for different applications

Appendix B

Gap Assessment

B.1 Gap Assessment

		HSE-103 ENERGY ISOLATION - WORLD-CLASS UNIT SELF-ASSESSMENT Unit Name: M'sila plant Date of Assessment: 18/19-03-2024 Assessment Completed By: Ouanis SMAIL / Khalil DJAIDJA			3- Enter Detailed Action Plan		
	Ref	Prompt Questions - Energy Isolation	1- Evaluate Compliance	2- Describe evidence that supports compliance & world-class	ACTIONS	DUE DATE	Action Status
		3 PROGRAM MANAGEMENT					
1	3	Is there a written program established for energy isolation at the unit-level?	3 - Fully Meets	A validated energy isolation procedure exists	Conduct a thorough review of the existing energy isolation procedure to ensure it meets industry standards and regulatory requirements.	02-Jan-2024	Completed
2	3.a	Does the program include documented roles and responsibilities (including authorizations and authorities)?	3 - Fully Meets	Roles and responsibilities are defined in the IE procedure	Conduct a review of roles and responsibilities outlined in the IE procedure to ensure clarity and accountability. Update as necessary.	10-Jan-2024	Completed
3	3.e	Is there a process for ensuring equipment procurement and commissioning comply with the requirements of the standard?	3 - Fully Meets	All purchases are made with standard specifications, and all services are associated with a health and safety appendix	Implement a procurement process that strictly adheres to standard specifications and ensure all services include a health and safety appendix.	1-Sep-2024	Not Started
4	World Class 3.2	Is the written EI program fully understood and implemented by all the workers, management and senior leadership? (e.g. rules are very clear, leadership understand and follows EI procedures, everyone knows where to find the resources)	Partially achieved	All IE stakeholders are trained, leadership training needs completion	Revise the training matrix to include leadership training. Train plant management in the energy isolation procedure and field inspection and verification operations.	1-May-2024	Ongoing

		4.1 GENERAL REQUIREMENTS: HAZARD IDENTIFICATION AND PROCEDURE CREATION					
5	4.1.a	Are there competent persons trained that identify the hazardous energies associated with any job task to assess the risks, and define the required controls in a job-specific procedure?	3 - Fully Meets	Work supervisors are trained to identify energy sources	Develop a training program to ensure work supervisors are adequately trained to identify energy sources and potential hazards.	Apr 10, 2024	Completed
6	4.1.b	Are there templates for EI procedures and any associated checklists and record forms, with periodic review, including version control and easy access to updated records??	2 - Partially Meets	Records exist, periodic review is absent	Establish a system for regular periodic reviews of records to ensure accuracy and compliance with regulations.	10-Sep-2024	Ongoing
7	4.1.b.1	Do the LOTOTO control procedures address all types of energy sources (i.e. electrical, hydraulic, pneumatic, etc.)?	3 - Fully Meets	IE procedure and permit format cover all energy sources	Review and update the IE procedure and permit format to ensure comprehensive coverage of all energy sources.	20-Jan-2024	Completed
8	4.1.b.2	Do the LOTOTO control procedures include the identification and location of the isolation device (s) for each identified energy source (ie: electrical breakers, disconnects, air valves, etc.) ?	2 - Partially Meets	Identification exists, device locations not mentioned in the procedure	Update the procedure to include specific device locations for proper identification and isolation.	1-Feb-2024	Ongoing
9	4.1.b.4	Where multiple energy sources exist, is the identification of the correct sequence for isolation been recorded in the EI procedure?	1 - Does Not Meet	Isolation sequence not included in the IE procedure	Update the procedure to include a clear isolation sequence to ensure safe energy isolation procedures.	10-Feb-2024	Ongoing
10	4.1.b.6	Do the EI procedures define specific methods for the release of stored or residual energy?	2 - Partially Meets	Some cases lack residual energy release method mention	Develop safe working instructions (SWI) to determine appropriate residual energy release methods for all cases.	1-Jul-2024	Not Started
11	4.1.b.8	Do the EI procedures identify the method(s) for restoring the energy after task completion?	1 - Does Not Meet	IE procedure does not define how to restore energy	Develop safe working instructions (SWI) to determine proper procedures for restoring energy after isolation.	10-Jul-2024	Not Started
12	World Class 2.1	Evaluate the quality of EI procedure authoring, approval and continuous improvement to ensure: - Procedures are robust, meeting the highest technical standards - Address all energy sources, from electrical to mechanical, ensuring thorough isolation - Strict discipline, emphasizing the importance of precision and accuracy in implementation - Incorporate fail-safes and checks to mitigate potential human errors during execution. - Shop-floor workers actively provide feedback to improve EI procedures - These procedures reflect an organizational commitment to engineering excellence, ensuring a safe operational environment	Not started	Procedure is periodically reviewed, but revision points are not exhaustively detailed	Enhance the review process to include a more comprehensive analysis of revision points in the IE procedure.	20-Feb-2024	Completed
13	World Class 3.1	Are the EI procedures: (1) clear and precise, (2) updated promply whenever required, (3) illustrative, (4) include expert personnel in its preparation, and (5) thorough and minimize risks?	Not started	IE procedure is clear, illustrative, with expert involvement in revision, but improvements needed in illustrations	Improve illustrations in the IE procedure to enhance clarity and understanding.	1-Mar-2024	Completed
		4.2 GENERAL REQUIREMENTS: GENERAL LOTOTO REQUIREMENTS					
14	4.2.1	Do all complex EI procedures require a permit to work, with the appropriate authorizations?	3 - Fully Meets	Yes, permit with approval cycle is mandated in the procedure	Ensure strict adherence to the permit approval cycle outlined in the procedure.	10-Mar-2024	Ongoing

15	4.2.3	Are all key steps for complex isolation identified and achieved (i.e. use of lock box, hasp, or gang panel)?	2 - Partially Meets	All steps are mentioned and completed, but test-out is not consistently applied	Implement consistent test-out procedures as outlined in the updated procedure.	20-Jul-2024	Ongoing
16	4.2.3.2	Are there handover formal processes when EI activities last more than one shift?	2 - Partially Meets	Handovers exist but are not formalized in the procedure	Formalize handover procedures for energy insulation instructions and include them in the procedure.	1-Aug-2024	Ongoing
17	World Class 2.3	Is there a formal permit to work system that ensures: (1) only authorized personnel create and approve permits, (2) a defined approval process for the permit to work system without shortcuts, and (3) all permits fully verified in the field by the permit issuer?	Not started	Verification by the issuer is not consistently applied	Implement a systematic verification and control system for energy isolation operations, including verification by the issuer.	10-Aug-2024	Ongoing
18	World Class 2.4	Are all critical activities requiring permit to work identified, communicated and coordinated during regular meetings (e.g. daily morning meeting): - All relevant stakeholders participate - There is a visual map of the plant with the location of critical jobs (e.g. site map with pins) - Overlaps and potential conflicts between activities are identified - Potential risks and supervision needs are discussed	Not started	Critical tasks are not identified separately, treated like all other tasks	Identify critical tasks requiring energy isolation separately and provide specific procedures for each in the IE procedure.	20-Aug-2024	Ongoing
		4.3 SPECIAL ISOLATION PROCEDURES					
19	4.3.1	For working on live equipment, is there a written procedure for each task, identifying the reason why the isolation methods have been discounted and the alternative controls to reduce the likelihood of injury, with formal approval by the Unit manager?	2 - Partially Meets	IE procedure includes interventions on live equipment, but the enumeration of these cases is not exhaustive	Ensure all interventions on live equipment are exhaustively enumerated in the IE procedure.	20-Sep-2024	Ongoing
20	4.3.1b	Is there a documented list of tasks that require working on live equipment identified in a register, and reviewed annually, and approved by the Unit manager to evaluate the possibility of changing to dead-work (non-energized)?	1 - Does Not Meet	The list does not exist	Develop a comprehensive list of considerations for work on live equipment and include it in the procedure.	1-Oct-2024	Ongoing
21	4.3.2	Is the isolation or rack-in/out of any circuit breaker, motor control center (MCC), or switchgear rated equal or greater than 110 V DC/AC carried out by a person who is electrically competent (e.g. a qualified electrician) and holds documented authorization?	2 - Partially Meets	A system for authorizing participants exists but is not explicit	Clearly define and document the system for authorizing participants in the IE procedure.	10-Oct-2024	Ongoing
22	4.3.3	When the equipment is capable of moving or repositioning, are the risks minimized by using appropriate isolation devices (e.g. wheel chocks, physical berms, mechanical isolation locks, locking pins, and backstops)?	2 - Partially Meets	Devices for limiting movement exist, but there is no listing of the equipment concerned	Develop a listing of equipment concerned and include it in the procedure.	20-Oct-2024	Ongoing
23	4.3.4a	Do stored pressure systems have the ability to be fully drained or bled off (to atmospheric pressure), valves closed and locked out, and the delivering pipes or tubes positively blocked or blanked?	3 - Fully Meets	Drainage systems for pressurized systems and isolation devices exist	Ensure proper documentation and maintenance of drainage systems for pressurized systems and isolation devices as outlined in the procedure.	1-Nov-2024	Ongoing
24	4.3.4b	Are pressure gauges installed and used whenever practicable to verify that the equipment or system has been brought to a zero-energy state?	2 - Partially Meets	Gauges installed on some equipment, not on others	Install gauges on all relevant equipment as outlined in the procedure.	10-Nov-2024	Not Started
25	4.3.5	Does out-of-service equipment, either temporarily or indefinitely, have an equipment lock applied to the isolation device(s), and the device(s) clearly marked or tagged with the words 'Out of Service' with the date that the equipment was taken out of service?	2 - Partially Meets	The procedure requires recording and signaling out-of-service equipment, but this is not fully applied on the ground	Conduct regular audits to ensure full compliance with recording and signaling of out-of-service equipment as per the procedure.	20-Nov-2024	Ongoing

26	4.3.6a	Is the unauthorized removal of another person's lock and tag device prohibited and communicated?	3 - Fully Meets	Yes, this practice is prohibited, communicated in the IE procedure	Enforce strict adherence to the prohibition of unsafe practices as communicated in the IE procedure.	1-Dec-2024	Ongoing
27	4.3.6b	Is there a formal procedure documented to manage the abandonment of Lock-Out devices, and its authorized removal?	3 - Fully Meets	Procedures exist for cases of forgetting locking devices in the IE procedure	Implement procedures to prevent and rectify cases of forgetting locking devices as outlined in the IE procedure.	10-Dec-2024	Not Started
28	World Class 3.4	Has live work been completely eliminated through engineering solutions, except if where there's no technology available (e.g. fully guarded belt alignment, automatic sampling, drones)? In the rare cases live work is still performed, is there a real-time tracking system to monitor the work and notify relevant stakeholders in the facility?	Not started	Not yet started	Initiate the necessary actions outlined in the IE procedure.	20-Dec-2024	Ongoing
		4.4 ENERGY ISOLATION DEVICES					
29	4.4.a	Are energy isolation devices physically capable of preventing the equipment from being energized?	2 - Partially Meets	For some energy types, it is still insufficient (mechanical energy isolation)	Conduct re-testing of locking devices, assess compliance, and correct any deviations to ensure sufficient mechanical energy isolation.	1-Jan-2025	Not Started
30	4.4.b	Are energy isolation devices located as close as practicable to the activity being performed?	3 - Fully Meets	Locking devices are close to equipment, mobile boxes are used when needed	Ensure locking devices are adequately positioned and utilize mobile boxes as necessary for effective energy isolation.	10-Jan-2025	Ongoing
31	4.4.c	Are energy isolation devices designed to protect from contact with energized electrical components, arc flash hazards, and other energy hazards?	2 - Partially Meets	Isolation devices are initially compliant, compliance status verification needed	Verify compliance status of isolation devices and take necessary corrective actions as per the procedure.	20-Jan-2025	Not Started
32	4.4.d	Are energy isolation devices capable of being securely locked out both individually or through a multi-hasp?	3 - Fully Meets	Locking devices are adequately designed for safe locking	Ensure locking devices are properly designed to facilitate safe locking procedures.	1-Feb-2025	Ongoing
33	4.4.e	Are mechanical blocking devices engineered and verified (certified laboratory test) to withstand the energy force to be blocked?	1 - Does Not Meet	Locally manufactured devices are used	Ensure locally manufactured devices meet safety standards and are approved for use as per the procedure.	10-Feb-2025	Not Started
34	4.4.f	Are devices conspicuous and indelibly labeled (e. g. unique Isolation device ID, what it isolates, energy type and quantitative description)?	2 - Partially Meets	Isolation devices are specific to each case but not explicitly identified for use	Clearly identify and document isolation devices for each specific case in the procedure.	20-Feb-2025	Ongoing
35	4.4.g	Are formal inspection and maintenance of energy isolation devices done in accordance with the manufacturer's recommendations?	2 - Partially Meets	Visual inspections are done but not recorded	Establish a system for recording visual inspections conducted as per the procedure.	1-Mar-2025	Ongoing
36	World Class 1.2	Are all energy isolation devices (e.g. VCS) and lock-out devices (e.g. valve lock-out cover): 1- "fit for purpose" and engineered (e.g. mechanical isolation locks for conveyors, wheel chocks, supporting stands), 2- available for all the facility and covering all energy types (when the technology exists), 3- well-known and used by all workers? Is there area protection (e.g. lockable barriers or gates) installed to control the movement of pedestrians and mobile equipment? Have parking areas and maintenance workshops for mobile equipment been designed to eliminate human vs machine conflict?	Not started	This exists partially but not systematically	Implement a systematic approach to ensure full compliance with existing procedures.	10-Mar-2025	Ongoing
37	World Class 1.3	Are all energy isolation devices identified with clear labeled and color-coded and in all cases available within a short distance from the activity to be performed (i.e. 5S methodology)?	Partially achieved	Some devices are well identified, others are not	Re-locate and color-code all locking devices for consistent identification and use.	20-Mar-2025	Ongoing

38	World Class 1.5	Are new technologies used create failproof EI systems (e.g. detect deviations, prevent errors, reduce exposure, create intuitive processes)?	Not started	No, this is not yet implemented	Initiate the necessary actions outlined in the IE procedure.	1-Apr-2025	Ongoing
		4.5 LOCKS AND TAGS					
39	4.5.a	Are locks color-coded to allow easier identification (e.g. personal, permit issuer, equipment)?	3 - Fully Meets	Locks are identified (color-coded), owner information is affixed to the padlocks	Ensure locks are properly identified with color-coding and owner information as per the procedure.	10-Apr-2025	Ongoing
40	4.5.b	Are all padlocks robust and uniquely keyed (e.g. one lock / one key)?	2 - Partially Meets	Employee locks are compliant (robust, single-key), subcontractor locks are not	Ensure all locks, including subcontractor locks, meet compliance standards as outlined in the procedure.	20-Apr-2025	Ongoing
41	4.5.c	Are all authorized workers issued personal locks that are uniquely keyed?	2 - Partially Meets	All employees (Holcim) have single-key padlocks,	Enforce the requirement for single-key padlocks for all employees and	1-May-2024	Ongoing
42	4.5.f	Do all personal locks have individual tags attached to identify the lock holder and contact details?	3 - Fully Meets	All worker padlocks are labeled	Ensure all worker padlocks are properly labeled for identification as per the procedure.	1-Sep-2024	Ongoing
43	World Class 1.1	Are there dedicated lock out panels for all main equipment available in the field with: 1- standardized set of devices and tags, 2- placeholder for equipment locks with shadowing, 3- clear labelling (i.e. 5S methodology).	Not started	Not yet started	Initiate the necessary actions outlined in the IE procedure.	10-Sep-2024	Ongoing
44	World Class 1.4	Are all lock types (e.g. personal lock, permit issuer lock & equipment lock) distinguished by color for instant visual recognition in the field? Do personal locks include picture and contact information? Are they fit for ATEX when applicable?	Partially achieved	There is a color-coding for some locks, but it is not systematic	Implement a systematic color-coding system for all locks as outlined in the procedure.	27-Nov-2024	Ongoing
45	World Class 1.6	Is there a formal lock-out key management system, restricting access to the equipment lock-out padlock keys (i.e. only authorized personel can physically access the LOTOTO keys for the equipment he has the competence to isolate)?	Not started	Not yet implemented	Initiate the necessary actions outlined in the IE procedure.	10-Jun-2025	Ongoing
		5 PROHIBITED BEHAVIORS					
46	5.2	Are all prohibited behaviors related to energy isolation communicated and enforced?	2 - Partially Meets	Some behaviors are formally prohibited, but this requires an update	Update and reinforce the prohibition of unsafe behaviors as necessary in the IE procedure.	20-Jun-2025	Ongoing
		6 MANAGEMENT of CHANGE					
47	6.a	Does the unit have a formal management of change (MOC) process for any installations, modifications or relocation of equipment or its isolation devices? Does this include changes to procedures or working methods?	2 - Partially Meets	A management of change procedure exists, but the application is not systematic	Implement a systematic approach to the application of the management of change procedure as outlined.	1-Jul-2025	Ongoing
48	World Class 2.5	Is there a cross-functional committee in place, on a quarterly-basis, to identify and lead EI improvement opportunities? Does the program performance analysis include incidents, VPCs and cVPCs, feeback from workers, procedure improvements, upcoming changes and opportunities to implement new technologies and good practices?	Not started	No, this does not exist	Develop and implement a management of change procedure to address necessary changes effectively.	10-Jul-2025	Ongoing

49	World Class 3.3	Is there a robust MoC process in place, which is systematically and thouroughly followed, triggers team-based reviews when needed, involves all required stakeholders and tracks action implementation to completion?	Not started	The management of change procedure exists, but the application is not systematic	Implement a systematic approach to the application of the existing management of change procedure.	20-Jul-2025	Ongoing
		7 TRAINING, COMPETENCY, and AUTHORIZATION					
50	7.a	Is there a competency and training matrix that explicitly states the requirements for all roles involved with energy isolation, per the Group Standard?	2 - Partially Meets	A training matrix exists, all positions requiring IE training are identified, requires updating	Update the training matrix to ensure all positions requiring IE training are accurately identified.	1-Apr-2024	Ongoing
51	7.b	Are procedures in place to ensure that workers who carry out energy isolation activities are formally authorized for those activities?	2 - Partially Meets	There is a list of trained persons, but there is no control over who is authorized to issue IE permits	Establish a control mechanism to regulate authorization for issuing IE permits as per the procedure.	1-Aug-2025	Ongoing
52	7.c	Is there a regularly updated registry of workers formally authorized to carry out energy isolation activities?	2 - Partially Meets	The list exists (list of trained persons) but needs to be formalized more explicitly	Formalize and document the list of trained persons more explicitly in accordance with the procedure.	20-Apr-2024	Ongoing
53	7.d	Is the competency and proficiency of each worker assigned to carry out EI activities periodically evaluated and documented (e.g. initial and refresher training)?	2 - Partially Meets	Training is conducted, but in the absence of evaluation and follow-up system	Implement an evaluation and follow-up system to assess the effectiveness of training conducted.	1-May-2024	Ongoing
54	7.1	Is the competency of specific EI roles (e.g. EI procedure author, lock holder, isolator, permit issuer) confirmed through the training and competency program?	2 - Partially Meets	Training is conducted, immediate evaluation is done, but field evaluations are not	Implement field evaluations as part of the training process to ensure practical competency.	10-May-2024	Ongoing
55	7.1	Are the training delivery requirements of the Group/Unit (i.e. theoretical & practical) met, at the appropriate frequency and duration, and with a competency test (i.e. pass/fail exams)?	2 - Partially Meets	Training (modules, trainers, evaluation, staging) needs improvement	Enhance training modules, trainers, evaluation methods, and staging to improve the effectiveness of training programs.	20-May-2024	Ongoing
56	World Class 4.1	Does the training system cover a comprehensive understanding of the Energy Isolation Program including: - how to control electrical, mechanical, and diverse hazardous energy sources - meticulous procedure comprehension, practical application exercises, and emphasis on disciplined execution - real-world scenarios, human factor considerations, cutting-edge technology and continuous assessment to ensure mastery? Does the training system ensure: 1- onboarding of new workers with coaching by experienced workers, 2- shopfloor workers and managers are knowledgeable on identifying gaps, 3- contractors acquire the same level of competency than employees, 4- all workers are proactively suggesting improvements to EI procedures, practices and installations, and 5- all workers are refreshed on annual basis with their required Energy Isolation training?	Partially achieved	Existing training programs need a profound update, especially in the practical aspects of IE operations	Update existing training programs to include practical aspects of IE operations for comprehensive training.	1-Jun-2024	Ongoing

57	World Class 4.4	Stop unsafe work: Are workers fully empowered to stop their own work and the activities from peers if they identify unsafe behaviors, uncontrolled hazardous energies or if they have to deviate from EI procedures? Coaching and feedback: Do field interactions (e. g. VPC, cVPC) achieve in-depth analysis of EI procedures (i.e. capturing workforce challenges and improvement opportunities) and covering all locations and types of energies? Workforce mobilization: Do campaings and mobilization activities (e.g. Treasure Hunts) have active workforce participation? Are shopfloor workers involved in the preparation of the EI procedures? Consequence management: Is adherance to the controls of the permit to work and LOTOTO practices (Rule #3) strictly enforced in accordance with Holcim HSE consequence management framework?	Partially achieved	All employees are authorized to stop hazardous work, including IE-related work, lack of rigor in progressive discipline (management consequences)	Enforce a rigorous progressive discipline policy to ensure all employees are held accountable for stopping hazardous work.	10-Aug-2025	Ongoing
58	World Class 4.3	Is there a physical school to provide practical training covering: 1- using EI devices, locks and tags for different types of energies, 2- performing a complex energy isolation with multiple energies and multiple workers, 3- issuing an EI permit (e.g. verify workers competency, ensure all controls are in place) and managing the handover process with simulated scenarios, 4- strict pass/fail exams?	Not started	There is IE isolation training but not as developed practically	Enhance IE isolation training to include practical components for improved competency.	10-Jun-2024	Ongoing
59	World Class 4.2	Is every effort made to enhance the expertise of Permit Issuer, Procedure Author and Critical Control Owner on a continuous basis? In addition to Holcim minimum training requirements, are they part of cross-audits, peer to peer coaching and benchmarking and receive third-party training to attain in-depth expertise? Do Permit Issuer, Procedure Author and Critical Control Owner have: 1- knowledge in country regulations and Holcim minimum requirements, 2- a sound operational experience and technical knowledge, 3- soft skills to coach peers and drive continuous improvement, 4- in-depth knowledge about the critical controls, 5- an engineering background (Procedure Authors)?	Not started	No other actions beyond IE isolation training are conducted for supervisors	Implement additional actions for supervisors beyond IE isolation training to enhance their competency and effectiveness.	20-Jun-2024	Ongoing
		8 RECORD RETENTION and DOCUMENT CONTROL					
60	8	Are records retained for a minimum of 60 months for inspection and maintenance of energy isolation devices, initial installation and the modification of energy isolation devices, and workers energy isolation competency and training?	2 - Partially Meets	Inspections are conducted, archiving durations are not verified	Verify archiving durations during inspections to ensure compliance with regulatory requirements.	20-Aug-2025	Ongoing
61	8	Are EI permit to work records retained for at least 6 months?	2 - Partially Meets	Records are kept, durations are not well verified	Establish a verification process to ensure accurate verification of record durations.	1-Sep-2025	Not Started

62	World Class 2.2	Is there a document management system (e.g. AODocs) to control, review, and approve authorized procedures and keep the procedures up to date? Are all procedures are accessed through the document management system, ensuring the latest approved procedure is used?	Partially achieved	The procedure and permit formats are managed in an electronic database (IMS Integrated Management System), but the issuance and archiving of permits are not yet digitalized	Digitalize the issuance and archiving of permits as per the IMS Integrated Management System for improved efficiency and accuracy.	10-Sep-2025	Not Started

QUESTIONNAIRE COMPLETION	100%

MINIMUM REQUIREMENT COMPLIANCE SCORE [0-100%]	60%
PROJECTED SCORE 2024	86%
PROJECTED SCORE 2025	100%

WORLD CLASS SCORE [0-100%]	16%
PROJECTED SCORE 2024	50%
PROJECTED SCORE 2025	100%
World Class Rank	Silver (55% +)
	Gold (75% +)
	Platimum (95%+)

Figure B.1: Gap Assessment

Appendix C

Action Plans

C.1 Action plan 2024

ACTION PLAN FOR 2024						
Ref	Prompt Questions - Energy Isolation Program	Compliance	Evidence that support compliance & world class	ACTIONS	DUE DATE	Action Status
3	Is there a written program established for energy isolation at the unit-level?	3 - Fully Meets	A validated energy isolation procedure exists	Conduct a thorough review of the existing energy isolation procedure to ensure it meets industry standards and regulatory requirements.	2-Jan-2024	Completed
3.a	Does the program include documented roles and responsibilities (including authorizations and authorities)?	3 - Fully Meets	Roles and responsibilities are defined in the IE procedure	Conduct a review of roles and responsibilities outlined in the IE procedure to ensure clarity and accountability. Update as necessary.	10-Jan-2024	Completed
4.1.b.1	Do the LOTOTO control procedures address all types of energy sources (i. e. electrical, hydraulic, pneumatic, etc.)?	3 - Fully Meets	IE procedure and permit format cover all energy sources	Review and update the IE procedure and permit format to ensure comprehensive coverage of all energy sources.	20-Jan-2024	Completed
4.1.b.2	Do the LOTOTO control procedures include the identification and location of the isolation device(s) for each identified energy source (ie: electrical breakers, disconnects, air valves, etc.) ?	2 - Partially Meets	Identification exists, device locations not mentioned in the procedure	Update the procedure to include specific device locations for proper identification and isolation.	1-Feb-2024	Ongoing
4.1.b.4	Where multiple energy sources exist, is the identification of the correct sequence for isolation been recorded in the EI procedure?	1 - Does Not Meet	Isolation sequence not included in the IE procedure	Update the procedure to include a clear isolation sequence to ensure safe energy isolation procedures.	10-Feb-2024	Ongoing
World Class 2.1	Evaluate the quality of EI procedure authoring, approval and continuous improvement to ensure: - Procedures are robust, meeting the highest technical standards - Address all energy sources, from electrical to mechanical, ensuring thorough isolation - Strict discipline, emphasizing the importance of precision and accuracy in implementation - Incorporate fail-safes and checks to mitigate potential human errors during execution. - Shop-floor workers actively provide feedback to improve EI procedures - These procedures reflect an organizational commitment to engineering excellence, ensuring a safe operational environment	Not started	Procedure is periodically reviewed, but revision points are not exhaustively detailed	Enhance the review process to include a more comprehensive analysis of revision points in the IE procedure.	20-Feb-2024	Completed

ACTION PLAN FOR 2024						
Ref	Prompt Questions - Energy Isolation Program	Compliance	Evidence that support compliance & world class	ACTIONS	DUE DATE	Action Status
World Class 3.1	Are the EI procedures: (1) clear and precise, (2) updated promply whenever required, (3) illustrative, (4) include expert personnel in its preparation, and (5) thorough and minimize risks?	Not started	IE procedure is clear, illustrative, with expert involvement in revision, but improvements needed in illustrations	Improve illustrations in the IE procedure to enhance clarity and understanding.	1-Mar-2024	Completed
4.2.1	Do all complex EI procedures require a permit to work, with the appropriate authorizations?	3 - Fully Meets	Yes, permit with approval cycle is mandated in the procedure	Ensure strict adherence to the permit approval cycle outlined in the procedure.	10-Mar-2024	Ongoing
7.a	Is there a competency and training matrix that explicitly states the requirements for all roles involved with energy isolation, per the Group Standard?	2 - Partially Meets	A training matrix exists, all positions requiring IE training are identified, requires updating	Update the training matrix to ensure all positions requiring IE training are accurately identified.	1-Apr-2024	Ongoing
4.1.a	Are there competent persons trained that identify the hazardous energies associated with any job task to assess the risks, and define the required controls in a job-specific procedure?	3 - Fully Meets	Work supervisors are trained to identify energy sources	Develop a training program to ensure work supervisors are adequately trained to identify energy sources and potential hazards.	10-Apr-2024	Completed
7.c	Is there a regularly updated registry of workers formally authorized to carry out energy isolation activities?	2 - Partially Meets	The list exists (list of trained persons) but needs to be formalized more explicitly	Formalize and document the list of trained persons more explicitly in accordance with the procedure.	20-Apr-2024	Ongoing
World Class 3.2	Is the written EI program fully understood and implemented by all the workers, management and senior leadership? (e.g. rules are very clear, leadership understand and follows EI procedures, everyone knows where to find the resources)	Partially achieved	All IE stakeholders are trained, leadership training needs completion	Revise the training matrix to include leadership training. Train plant management in the energy isolation procedure and field inspection and verification operations.	1-May-2024	Ongoing
4.5.c	Are all authorized workers issued personal locks that are uniquely keyed?	2 - Partially Meets	All employees (Holcim) have single-key padlocks, subcontractors have regular padlocks	Enforce the requirement for single-key padlocks for all employees and subcontractors as per the procedure.	1-May-2024	Ongoing
7.d	Is the competency and proficiency of each worker assigned to carry out EI activities periodically evaluated and documented (e.g. initial and refresher training)?	2 - Partially Meets	Training is conducted, but in the absence of evaluation and follow-up system	Implement an evaluation and follow-up system to assess the effectiveness of training conducted.	1-May-2024	Ongoing
7.1	Is the competency of specific EI roles (e.g. EI procedure author, lock holder, isolator, permit issuer) confirmed through the training and competency program?	2 - Partially Meets	Training is conducted, immediate evaluation is done, but field evaluations are not	Implement field evaluations as part of the training process to ensure practical competency.	10-May-2024	Ongoing
7.1	Are the training delivery requirements of the Group/Unit (i.e. theoretical & practical) met, at the appropriate frequency and duration, and with a competency test (i.e. pass/fail exams)?	2 - Partially Meets	Training (modules, trainers, evaluation, staging) needs improvement	Enhance training modules, trainers, evaluation methods, and staging to improve the effectiveness of training programs.	20-May-2024	Ongoing

ACTION PLAN FOR 2024						
Ref	Prompt Questions - Energy Isolation Program	Compliance	Evidence that support compliance & world class	ACTIONS	DUE DATE	Action Status
World Class 4.1	Does the training system cover a comprehensive understanding of the Energy Isolation Program including: - how to control electrical, mechanical, and diverse hazardous energy sources - meticulous procedure comprehension, practical application exercises, and emphasis on disciplined execution - real-world scenarios, human factor considerations, cutting-edge technology and continuous assessment to ensure mastery? Does the training system ensure: 1- onboarding of new workers with coaching by experienced workers, 2- shopfloor workers and managers are knowledgeable on identifying gaps, 3- contractors acquire the same level of competency than employees, 4- all workers are proactively suggesting improvements to EI procedures, practices and installations, and 5- all workers are refreshed on annual basis with their required Energy Isolation training?	Partially achieved	Existing training programs need a profound update, especially in the practical aspects of IE operations	Update existing training programs to include practical aspects of IE operations for comprehensive training.	1-Jun-2024	Ongoing
World Class 4.3	Is there a physical school to provide practical training covering: 1- using EI devices, locks and tags for different types of energies, 2- performing a complex energy isolation with multiple energies and multiple workers, 3- issuing an EI permit (e.g. verify workers competency, ensure all controls are in place) and managing the handover process with simulated scenarios, 4- strict pass/fail exams?	Not started	There is IE isolation training but not as developed practically	Enhance IE isolation training to include practical components for improved competency.	10-Jun-2024	Ongoing
World Class 4.2	Is every effort made to enhance the expertise of Permit Issuer, Procedure Author and Critical Control Owner on a continuous basis? In addition to Holcim minimum training requirements, are they part of cross-audits, peer to peer coaching and benchmarking and receive third-party training to attain in-depth expertise? Do Permit Issuer, Procedure Author and Critical Control Owner have: 1- knowledge in country regulations and Holcim minimum requirements, 2- a sound operational experience and technical knowledge, 3- soft skills to coach peers and drive continuous improvement, 4- in-depth knowledge about the critical controls, 5- an engineering background (Procedure Authors)?	Not started	No other actions beyond IE isolation training are conducted for supervisors	Implement additional actions for supervisors beyond IE isolation training to enhance their competency and effectiveness.	20-Jun-2024	Ongoing
4.1.b.6	Do the EI procedures define specific methods for the release of stored or residual energy?	2 - Partially Meets	Some cases lack residual energy release method mention	Develop safe working instructions (SWI) to determine appropriate residual energy release methods for all cases.	1-Jul-2024	Not Started
4.1.b.8	Do the EI procedures identify the method(s) for restoring the energy after task completion?	1 - Does Not Meet	IE procedure does not define how to restore energy	Develop safe working instructions (SWI) to determine proper procedures for restoring energy after isolation.	10-Jul-2024	Not Started

ACTION PLAN FOR 2024						
Ref	Prompt Questions - Energy Isolation Program	Compliance	Evidence that support compliance & world class	ACTIONS	DUE DATE	Action Status
4.2.3	Are all key steps for complex isolation identified and achieved (i.e. use of lock box, hasp, or gang panel)?	2 - Partially Meets	All steps are mentioned and completed, but test-out is not consistently applied	Implement consistent test-out procedures as outlined in the updated procedure.	20-Jul-2024	Ongoing
4.2.3.2	Are there handover formal processes when EI activities last more than one shift?	2 - Partially Meets	Handovers exist but are not formalized in the procedure	Formalize handover procedures for energy insulation instructions and include them in the procedure.	1-Aug-2024	Ongoing
World Class 2.3	Is there a formal permit to work system that ensures: (1) only authorized personnel create and approve permits, (2) a defined approval process for the permit to work system without shortcuts, and (3) all permits fully verified in the field by the permit issuer?	Not started	Verification by the issuer is not consistently applied	Implement a systematic verification and control system for energy isolation operations, including verification by the issuer.	10-Aug-2024	Ongoing
World Class 2.4	Are all critical activities requiring permit to work identified, communicated and coordinated during regular meetings (e. g. daily morning meeting): - All relevant stakeholders participate - There is a visual map of the plant with the location of critical jobs (e.g. site map with pins) - Overlaps and potential conflicts between activities are identified - Potential risks and supervision needs are discussed	Not started	Critical tasks are not identified separately, treated like all other tasks	Identify critical tasks requiring energy isolation separately and provide specific procedures for each in the IE procedure.	20-Aug-2024	Ongoing
3.e	Is there a process for ensuring equipment procurement and commissioning comply with the requirements of the standard?	3 - Fully Meets	All purchases are made with standard specifications, and all services are associated with a health and safety appendix	Implement a procurement process that strictly adheres to standard specifications and ensure all services include a health and safety appendix.	1-Sep-2024	Not Started
4.5.f	Do all personal locks have individual tags attached to identify the lock holder and contact details?	3 - Fully Meets	All worker padlocks are labeled	Ensure all worker padlocks are properly labeled for identification as per the procedure.	1-Sep-2024	Ongoing
4.1.b	Are there templates for EI procedures and any associated checklists and record forms, with periodic review, including version control and easy access to updated records??	2 - Partially Meets	Records exist, periodic review is absent	Establish a system for regular periodic reviews of records to ensure accuracy and compliance with regulations.	10-Sep-2024	Ongoing
World Class 1.1	Are there dedicated lock out panels for all main equipment available in the field with: 1- standardized set of devices and tags, 2- placeholder for equipment locks with shadowing, 3- clear labelling (i.e. 5S methodology).	Not started	Not yet started	Initiate the necessary actions outlined in the IE procedure.	10-Sep-2024	Ongoing
4.3.1	For working on live equipment, is there a written procedure for each task, identifying the reason why the isolation methods have been discounted and the alternative controls to reduce the likelihood of injury, with formal approval by the Unit manager?	2 - Partially Meets	IE procedure includes interventions on live equipment, but the enumeration of these cases is not exhaustive	Ensure all interventions on live equipment are exhaustively enumerated in the IE procedure.	20-Sep-2024	Ongoing
4.3.1b	Is there a documented list of tasks that require working on live equipment identified in a register, and reviewed annually, and approved by the Unit manager to evaluate the possibility of changing to dead-work (non-energized)?	1 - Does Not Meet	The list does not exist	Develop a comprehensive list of considerations for work on live equipment and include it in the procedure.	1-Oct-2024	Ongoing

ACTION PLAN FOR 2024						
Ref	Prompt Questions - Energy Isolation Program	Compliance	Evidence that support compliance & world class	ACTIONS	DUE DATE	Action Status
4.3.2	Is the isolation or rack-in/out of any circuit breaker, motor control center (MCC), or switchgear rated equal or greater than 110 V DC/AC carried out by a person who is electrically competent (e.g. a qualified electrician) and holds documented authorization?	2 - Partially Meets	A system for authorizing participants exists but is not explicit	Clearly define and document the system for authorizing participants in the IE procedure.	10-Oct-2024	Ongoing
4.3.3	When the equipment is capable of moving or repositioning, are the risks minimized by using appropriate isolation devices (e.g. wheel chocks, physical berms, mechanical isolation locks, locking pins, and backstops)?	2 - Partially Meets	Devices for limiting movement exist, but there is no listing of the equipment concerned	Develop a listing of equipment concerned and include it in the procedure.	20-Oct-2024	Ongoing
4.3.4a	Do stored pressure systems have the ability to be fully drained or bled off (to atmospheric pressure), valves closed and locked out, and the delivering pipes or tubes positively blocked or blanked?	3 - Fully Meets	Drainage systems for pressurized systems and isolation devices exist	Ensure proper documentation and maintenance of drainage systems for pressurized systems and isolation devices as outlined in the procedure.	1-Nov-2024	Ongoing
4.3.4b	Are pressure gauges installed and used whenever practicable to verify that the equipment or system has been brought to a zero-energy state?	2 - Partially Meets	Gauges installed on some equipment, not on others	Install gauges on all relevant equipment as outlined in the procedure.	10-Nov-2024	Not Started
4.3.5	Does out-of-service equipment, either temporarily or indefinitely, have an equipment lock applied to the isolation device(s), and the device(s) clearly marked or tagged with the words 'Out of Service' with the date that the equipment was taken out of service?	2 - Partially Meets	The procedure requires recording and signaling out-of-service equipment, but this is not fully applied on the ground	Conduct regular audits to ensure full compliance with recording and signaling of out-of-service equipment as per the procedure.	20-Nov-2024	Ongoing
World Class 1.4	Are all lock types (e.g. personal lock, permit issuer lock & equipment lock) distinguished by color for instant visual recognition in the field? Do personal locks include picture and contact information? Are they fit for ATEX when applicable?	Partially achieved	There is a color-coding for some locks, but it is not systematic	Implement a systematic color-coding system for all locks as outlined in the procedure.	27-Nov-2024	Ongoing
4.3.6a	Is the unauthorized removal of another person's lock and tag device prohibited and communicated?	3 - Fully Meets	Yes, this practice is prohibited, communicated in the IE procedure	Enforce strict adherence to the prohibition of unsafe practices as communicated in the IE procedure.	1-Dec-2024	Ongoing
4.3.6b	Is there a formal procedure documented to manage the abandonment of Lock-Out devices, and its authorized removal?	3 - Fully Meets	Procedures exist for cases of forgetting locking devices in the IE procedure	Implement procedures to prevent and rectify cases of forgetting locking devices as outlined in the IE procedure.	10-Dec-2024	Not Started
World Class 3.4	Has live work been completely eliminated through engineering solutions, except if where there's no technology available (e.g. fully guarded belt alignment, automatic sampling, drones)? In the rare cases live work is still performed, is there a real-time tracking system to monitor the work and notify relevant stakeholders in the facility?	Not started	Not yet started	Initiate the necessary actions outlined in the IE procedure.	20-Dec-2024	Ongoing

Figure C.1: Action Plan - 2024

Appendix D

Documentation

D.1 Energy Isolation Procedure Template

HOLCIM

Energy Isolation Procedure

Plant Name Msila Plant	Procedure id: Type reference id# or URL link.	
Equipment/Technical Location Description Type equipment description here	Asset Code System # Type ACS number here	Date created Click to enter date
EI Procedure Author Name/Title Name/Title	Approved By Name/Title Date Approved:	
Specific PPE Required: Type here specific PPE required to perform this task		
Hazardous Energies Involved (check all that apply) ☐ Electrical ☐ Pneumatic ☐ Gravitational ☐ Hydraulic ☐ Kinetic ☐ Chemical ☐ Other: Describe here the "other" hazardous energy or energies involved		
WARNING: Type here the main hazards and any additional controls required to perform this task		
Notes and other requirements: Type here any other notes or requirements needed (i.e. training required) .		

Lock Out/ Tag Out Procedure Steps				
Step #	Energy type	Step Description	Equipment	Isolation Point Description / ref.#
1	Elect…	Type the step description here	Type ACS# here (equipment code).	Type IP description here
2	Select one	Type the step description here	Type ACS# here (equipment code).	Type IP description here

Figure D.1: EI Procedure Template

D.2 Energy Isolation Permit To Work

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Energy Isolation Permit

Task Description	Energy Isolation Procedure Ref #	Date created
Task description here	Type reference number here	Click to enter date
Valid From (date / time):	**Valid To (date / time):**	**Permit Number:**
Description of task to be performed:		
Specific details of instructions for the permit: Type here the main hazards and any additional controls required to perform this task		

Name of workers involved in the task					
#	Name & Company	Signature	#	Name & Company	Signature
1			6		
2			7		
3			8		
4			9		
5			10		

Verifications before issuing the permit	YES / NO
All hazardous energies have been clearly identified?	
All potentially hazardous energies (i.e. electrical, pneumatic, gravitational, hydraulic, kinetic, thermal, chemical, and other (specify in comments) have been locked-out and tagged out?	
All potentially hazardous energies have been tried out?	
All personnel involved in the activity are trained in Energy Isolation?	
All steps identified in the energy isolation procedure have been implemented?	

Approval	Name & Company	Signature
Permit Issuer		
Isolator (if different)		
Work Supervisor *(requester)*		

Verifications before re-energization	YES / NO
Have all personnel left affected areas and personal locks and tags removed?	
Are machine guarding and safety devices back in place? Are access doors closed and secured?	
Has all required personnel been informed before re-energization?	
Any improvement to the EI Procedure? Comment:	

Work closure	Name & Company	Signature	Date	Hour
Permit Issuer *(issuer)*			dd-mm-yy	hh:mm

Contact your supervisor if you have any questions or concerns about the accuracy or effectiveness of this procedure.
Failure to follow safe instructions may result in disciplinary action up to and including termination.
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Figure D.2: EI Permit To Work

Energy Isolation Program
Roles & Responsibilities (RACI Matrix)
Guidance document*

Purpose	Guideline for defining Roles and Responsibilities (RACI) for Unit-level Energy Isolation Program This document is to define stakeholder assignments affected by energy isolation activities (e.g. responsible, accountable, consulted, and informed).
Scope	Applies to all persons within our Unit (plant/office) or Unit personnel, including employees, contractors, suppliers, customers, and visitors.
Additional information	Additional energy isolation information can also be found on the Health & Safety intranet

Position	Role
Director	**-Responsible for providing necessary resources and overseeing implementation. -Controls application through Energy Isolation standard. -Responsible for authorizing training and certification for isolation roles.**
Safety School	**-Responsible for energy isolation training for all stakeholders. -Provides refresher training as per LafargeHolcim standard.**
Consignment Manager	**-Ensures implementation of isolation procedures. -Responsible for equipment lockout and tagout. -For single-person isolation, the Work Supervisor is responsible for lockout. -For multi-person isolation, Area Supervisor is responsible for lockout.**

Creation date : Jan 2024
Revision version & date: May 2024
The latest and only controlled version of this document is available soon

Energy Isolation Program
Roles & Responsibilities (RACI Matrix)
Guidance document

LOTOTO Champion	**-Develops, implements, and maintains the Lock Out Tag Out Try Out (LOTOTO) procedures.** **-Ensures compliance with regulatory standards and company policies.** **-Leads investigations into any LOTOTO-related incidents or near misses.** **-Continuously improves LOTOTO procedures based on feedback, incidents, and best practices.** **-Maintains detailed records of LOTOTO procedures, training, audits, and incidents.**
Works Supervisor	**-Executes assigned tasks either individually or by subcontractor team.** **-Responsible for lockout in single-person isolation scenarios.**
Consignment Supervisor	**-Responsibilities may vary based on specialization:** **Electrical Lockout Specialist: Authorizes electrical lockout in designated areas.** **Process Lockout Specialist: Authorizes lockout for air, gas, mechanical, thermal systems.**
Subcontractor	**-Performs assigned tasks under Work Supervisor's supervision.** **-Qualification and certification required for task safety.** **-Responsible for personal lock placement as instructed.** **-Removal of personal lock upon task completion or change of shift.**
Safety Manager	**-Develop and implement the overarching HSE strategy.** **-Ensure compliance with HSE regulations, industry standards, and company policies.** **-Collaborate with the LOTOTO Champion to review and update safety procedures.** **-Monitor program effectiveness through regular audits and investigations.** **-Promote proactive safety culture and employee engagement in HSE initiatives.**

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Energy Isolation Program
Roles & Responsibilities (RACI Matrix)
Guidance document

RACI (R = Responsible, A = Accountable, C = Consulted, I = Informed)								
Key tasks	Who							
	Unit Manager	Safety School	H&S Manager/ Coord.	Supervisors & Managers	Employees	Contractors	Suppliers, customers, and visitors	LOTOTO Champion
Formalize Unit´s program to implement energy isolation minimum requirements	A	I	C	I	I	I	I	R
Align program with Country regulatory requirements when exceeding Corporate requirements	A	I	C	I	I	I	I	R
Appoint Unit PUE Owner (Contact with Hazardous Energy)	R	I	I	I	I	I	I	I
Perform Unit Self-Assessment and track actions based on the results	A	I	C	I	I	I	I	R
Creation of energy isolation procedures	A	I	C	I	I	I	I	R
Formal inspection and maintenance program of energy isolation devices done in accordance with manufacturer's requirements	A	I	C	I	I	I	I	R

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Figure D.3: RACI Matrix - Part 01

Energy Isolation Program
Roles & Responsibilities (RACI Matrix)
Guidance document

Ensure all EI implementation, communication, and compliance in their respective areas	A	I	R	I	I	I	I	R
Safe working practices for those aspects of EI over which they have control	A	I	C	I	I	I	I	R
Provide training (theoretical and practical) for those responsible for EI tasks	A	R	C	I	I	I	I	C
Annual review process to manage changes relating to energy isolation processes or installations	A	I	C	I	I	I	I	R
Periodic review of EI procedures and programs (e.g., program elements, training, etc.)	A	I	C	I	I	I	I	R
Periodic review of changes outside the Unit that need to be incorporated into the program	A	I	C	I	I	I	I	R

Note: Only one person "Accountable" per task. If unclear, split tasks into subtasks to make sure only one person is accountable

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Figure D.4: RACI Matrix - Part 02

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Live work Procedure

Owner : Ouanis SMAIL
Approved by : Imed Eddine BENSBAA
Version : 0

01- PURPOSE

The purpose of this procedure is to prescribe a safe framework for performing work in situations where energy sources cannot be isolated or are too difficult to disconnect. The operations are carried out with the view of making sure that no harm comes to those who execute them or anyone else they could affect, thus making tidiness a key component. A qualified person must supervise live tasks under his or her area of competence.

02- SCOPE

All Holcim Algeria has authorized employees and contractors who are doing live work including tasks on either electrical or non-electrical systems where there are live conditions.

This procedure governs the following specifically:
Electrical Work Covered:

- All MCC busbar sections (up to, and including 400V).
- All activities on MV cubicles, busbars, and shutters (up to, and including 6 600V).
- All high-risk switching activities (excluding resets and normal switching on of MV breakers).

Exemptions:

- Day-to-day troubleshooting on electrical panels not exceeding 400V, conducted by an accredited person.
- Day-to-day troubleshooting on hydraulic and pneumatic systems performed by an accredited person.

Note: Exempted tasks will adhere to the energy isolation procedure, with isolation applied where applicable.

This scope extends to all employees, subcontractors and authorized personnel within Holcim Algeria, ensuring complete coverage of live working activities while maintaining safety standards**.**

03- DEFINITION

Live working : Live working can be defined as the practice of working on live electrical/mechanical systems while the part in question is in motion, or when it is impossible to isolate the energy source.

Energized Work Permit : Part of the permit book section that authorizes an employee to perform energized work with the approval of the permit issuer.

Energized Work Permit Issuer : The person authorized to issue an Energized Work Perm

Figure D.5: Live Work Procedure.

Energy Isolation Procedure

04- ROLE AND RESPONSIBILITIES

The maintenance manager / maintenance supervisor must ensure that

- All facilities, equipment and tools required to work on live equipment are available at all times.
- Assess whether live working is absolutely necessary.
- Task-related risk assessments are carried out before live working begins.
- A responsible/competent person is available to ensure that all live working activities are carried out safely.

The permit holder must ensure this:

- All personnel carrying out live working activities must be competent to do so.
- A live working risk assessment is carried out/consulted before live working begins.
- Appropriate tools and equipment are used during live working.
- Live working procedures are understood by all personnel involved in live working.

All employees and contractors carrying out live working must:

- Ensure their own health and safety, and that of the people with whom they work.
- They must not use defective equipment or tools.
- Wear the correct PPE.
- Immediately report any defects in tools and equipment, as well as any incidents, to their supervisor.

05- SAFETY PRECAUTIONS

In all cases, avoid working on equipment that can be energized, if this is not possible, then work should only be permitted when :

- All isolation and control methods have been updated and implemented to reduce the likelihood of injury as low as possible.
- A procedure must be drawn up and approved by the manager responsible for the task, and a work permit issued.

Note: The list of tasks **(appendix B page 5)** requiring work on a "system that can be energized" without isolation must be identified. The list must be reviewed annually and approved by the unit manager to assess the possibility of switching to non-energy work.

06- PROCEDURE

The list of tasks is as follows:

- **Conduct a Risk Assessment:** Before any live work begins, a thorough risk assessment must be performed to identify and mitigate all potential hazards and risks associated with the work.
- **Document the Risk Assessment:** The findings of the risk assessment must be documented and made available for review to ensure transparency and accountability.
- **Obtain a Valid Work Permit:** Only proceed with live work if a valid work permit has been issued by the designated permit issuer. This permit is crucial for ensuring that all safety protocols are in place.

Figure D.6: Live Work Procedure - continuation.

- **Ensure Competency and Training:** The permit issuer must verify that the employee(s) are competent and have received the necessary training for the specific live work tasks they will be performing.
- **Complete and Sign the Live Working Section of the Permit:** Before any work commences, the permit issuer must thoroughly complete and sign the live working section of the work permit.
- **Implement Safety Measures and Controls:** The work permit must include all necessary safety measures and controls to ensure the safety of the workers.
- **Review the Live Working Permit at the Start of Each Work Period**: At the beginning of each work period, the live working permit must be reviewed to confirm that all required safety controls are in place and effective.
- **Communicate Changes in Conditions or Risks**: If there are any changes in conditions or risks during the work, these must be immediately communicated and reflected in the permit to maintain safety standards.
- **Implement the Buddy System:** Ensure that no employee performs live work alone. Implement a buddy system where at least two qualified individuals are present at all times during the live work.

07- Training Requirements

All personnel engaged in live work activities must undergo training on this procedure to ensure competency and adherence to safety protocols.

08- Record Keeping

A copy of the procedure will be securely stored in a designated file. Additionally, training records will be scanned and archived for future reference.
Documentation of competency and training records must be maintained and available for inspection.

09- Measurement of Compliance

Compliance with the procedure will be assessed during both internal and external audits to ensure adherence to safety standards.

Figure D.7: Live Work Procedure - continuation.

Appendix A :

List of systems that can be energized :

Electrical Systems:

- High-voltage power lines
- Electrical panels and circuit breakers
- Transformers
- Motors and generators
- Electrical control systems
- Battery banks and UPS

Mechanical Systems:

- Rotating equipment (pumps, compressors, turbines)
- Conveyor belts
- Hydraulic presses
- Mechanical arms and robotics

Pneumatic Systems:

- Air compressors
- Pneumatic tools and machinery
- Air-operated valves and actuators

Hydraulic Systems:

- Hydraulic presses and lifts
- Hydraulic motors and pumps
- Hydraulic cylinders and actuators

Thermal Systems:

- Boilers and steam systems
- Heat exchangers
- Furnaces and kilns

Fluid Systems:

- Pressurized piping systems (water, gas, oil)
- Fuel supply systems
- Chemical feed systems

Figure D.8: Live Work Procedure - continuation.

Energy Isolation Procedure

Appendix B

List of Tasks :

Electrical Systems:

- Troubleshooting electrical faults.
- Testing circuits for continuity and voltage.
- Installing or replacing electrical components.
- Performing maintenance on live electrical panels and circuit breakers.
- Energizing and de-energizing electrical control systems.
- Conducting load testing on battery banks and UPS.

Mechanical Systems:

- Conducting maintenance on rotating equipment while it's in operation.
- Adjusting conveyor belt tension.
- Calibrating hydraulic presses.
- Fine-tuning mechanical arms and robotics while in use.

Pneumatic Systems:

- Checking for leaks in air compressors.
- Adjusting pressure settings on pneumatic tools and machinery.
- Inspecting and maintaining air-operated valves and actuators.

Hydraulic Systems:

- Conducting maintenance on hydraulic presses and lifts while they're operational.
- Monitoring hydraulic motors and pumps for performance.
- Testing and adjusting hydraulic cylinders and actuators under pressure.

Thermal Systems:

- Inspecting boilers and steam systems during operation.
- Conducting heat exchanger cleaning and maintenance.
- Adjusting furnace and kiln temperatures while in use.

Fluid Systems:

- Checking pressurized piping systems for leaks under operating conditions.
- Conducting maintenance on fuel supply systems while operational.
- Adjusting chemical feed systems during operation.

Figure D.9: Live Work Procedure - continuation.

Lock Removal Procedure

Owner : Ouanis SMAIL
Approved by : Imed Eddine BENSBAA
Version : 0

01- PURPOSE

The purpose of this procedure is to establish a protocol for the safe removal of Lock-Out/Tag-Out devices in situations where a worker forgets theirs in the workplace and also safeguarding continued safety during maintenance or repair operations.

02- SCOPE

This is the process that all Holcim Algeria authorized employees and subcontractors engage in for maintenance, repair or servicing activities using Lock-Out or Tag-Out devices which control hazardous energy. When a Lock-Out or Tag-Out has been left by its owner is what this procedure addresses in terms of figuring out what steps should be done exactly.

03- DEFINITION

1. Lock-Out Device: A physical lock or tag used to prevent machinery activation during maintenance.
2. Tag-Out Device: A warning tag indicating machinery isolation for maintenance.
3. Abandoned Lock Removal: Procedure for safe removal of forgotten lock-out devices.

04- ROLE AND RESPONSIBILITIES

1- Management:
- Responsible for establishing and enforcing lock-out procedures in the workplace.
- Provides necessary resources, training, and support to ensure the effective implementation of lock-out protocols.
- Ensures that adequate supervision and oversight are maintained to prevent safety breaches related to lock-out procedures.

2- Worker:
- Responsible for applying their own lock-out device when performing maintenance or servicing tasks.
- Must ensure the removal of their lock-out device upon completion of work.
- Promptly inform their supervisor if they forget to remove their lock-out device and are unable to return to the workplace.

3- Supervisor:
-Responsible for ensuring that workers are trained on lock-out procedures and their responsibilities.
- Must oversee the proper application and removal of lock-out devices by workers.
- Informs workers of their responsibilities regarding lock-out device removal and adherence to procedures.

Figure D.10: Lock Removal Procedure

Lock Removal Procedure

04- Authorized Personnel:

- Designated individuals with the authority to remove abandoned lock-out devices.
- Responsible for following the established procedure for removing forgotten lock-out devices safely.
- Must ensure that proper documentation, such as the Lock Removal/Destruction Form, is completed and filed accordingly.

5- Safety Officer:

- Monitors compliance with lock-out procedures and identifies areas for improvement.
- Conducts regular inspections to ensure lock-out devices are applied and removed correctly.
- Provides guidance and training to workers and supervisors on lock-out safety protocols.

NOTE : The unauthorized removal of another person's Lock-Out or Tag-Out device is strictly prohibited, except in cases outlined in this procedure.

05- PROCEDURE

Procedure for Forgotten Lock-Out Devices:

- **Completion and Submission of the Lock Removal/Destruction Form:** Complete the Lock Removal/Destruction Form **(refer to Annex A)** detailing the abandoned Lock-Out or Tag-Out device, including its location, date, and time.
- **Inspection of the Work Area:** Authorized personnel must inspect the area to confirm that non-essential tools are removed and that all personnel are clear of the machine or installation.
- **Operational Check of the Machine or Installation:** Conduct an inspection to ensure that all parts of the machine or installation are operationally intact.
- **Notification to Affected Staff:** Inform all affected staff that Lock-Out or Tag-Out devices are to be removed and that the machine or installation will be prepared for reactivation.
- **Removal of Lock-Out/Tag-Out Devices:** Each authorized employee must remove their own Lock-Out or Tag-Out device. It is strictly prohibited for employees to remove devices placed by others.
- **Reactivation of the Machine or Installation:** Once all Lock-Out or Tag-Out devices are removed, the machine or installation can be reactivated.

Note : The worker whose Lock-Out or Tag-Out device has been removed must be promptly notified by their supervisor or designated personnel.

06- Training Requirements

All personnel engaged in Lock Removal activities must undergo training on this procedure to ensure competency and adherence to safety protocols.

07- Record Keeping

A copy of the procedure will be securely stored in a designated file. Additionally, training records will be scanned and archived for future reference.

08- Measurement of Compliance

Compliance with the procedure will be assessed during both internal and external audits to ensure adherence to safety standards.

Figure D.11: Lock Removal Procedure - Continuation

Lock Removal Procedure

09- Annex A

Lock Removal Form

Date: _____ Location: _____ Time: _____

Equipment Identification #: _____ Owner of Lockout Device: _____

Supervisor/Permit Issuer Authorizing Removal/Completing Report:_____

Attempted Communication: ☐ Radio ☐ Phone ☐ Other _____

Contact Communication: First Attempt (Time): _____AM/PM Second Attempt (Time):_____AM/PM

☐ Verified – No Communication/Contact to lock owner successful, and lock holder no longer on-site.
Proceed with lock removal.
Verified by:

_____ _____ _____
Print Name Signature Title

REQUIRED STEPS FOR EMERGENCY ISOLATION (LOCKOUT) DEVICE REMOVAL

1. The Supervisor/Permit Issuer shall inspect the equipment ensuring all work is complete
   - This should include the work crew members available.
2. The Supervisor/Permit Issuer will confirm that it is safe to remove the Lockout Device
   - The Supervisor/Permit Issuer will provide authorization to remove the Lockout Device and will remove it or cause it to be removed under his/her supervision.
3. Any lock(s) or tag(s) removed shall be retained by the supervisor, who will submit the removed equipment to the site's Safety Representative upon request or discard (as instructed)

☐ Method Used to Remove Lockout Device: _____ **or**
☐ Lockout Device Not Removed (Unsafe)

☐ Verify that lock owner has been informed of lock removal prior to beginning the next shift.

_____ _____
Lock owner signature Date

INCIDENT REVIEW

Review and discuss the incident with all affected employees and identify any corrective actions

CORRECTIVE ACTIONS	EMPLOYEES AFFECTED

Comments/Additional Information:

Safety Representative / Unit Manager Approval of Incident Review:

_____
Signature Time Date

Contact your supervisor if you have any questions or concerns about the accuracy or effectiveness of this procedure.
Failure to follow energy isolation procedures may result in disciplinary action up to and including termination.

Figure D.12: Lock Removal Form

HOLCIM

Management of Change Procedure

Owner : Ouanis SMAIL
Approved by : Imed Eddine BENSBAA
Version : 0

01- PURPOSE

This procedure outlines the systematic process for managing changes within the project to ensure minimal impact on project objectives and deliverables. A management of change process serves as a formal method by which changes to the project site, such as scope, deliverables, timescales, or resources, are defined, evaluated, and approved prior to implementation. It encompasses a series of control procedures aimed at guaranteeing that each change is effectively :

communicated, documented, reviewed, approved, and implemented.

Throughout the execution phase of the project, the Management of Change process continues. It ensures that all changes we detect are properly managed so as to keep the project in line with its objectives. However, without due consideration to this process, it may be difficult/not easy for a project to achieve its goals within given time frames as planned, as well as within budget and quality standards expected. At the end of the execution phase, right before we close off the project, the Management of Change process is concluded. This ensures that all changes are managed well and included in the final project results.

02- SCOPE

This procedure applies at the M'Sila Plant, and it may be in all Lafarge operations, and is designed to address any situation that may negatively affect the quality of the product. This encompasses various scenarios such as : **changes in organizational structure, key personnel, suppliers of critical products or components, and alterations to management system procedures resulting from corrective and preventive actions**.

The procedure specifically focuses on the management of change models utilized across all operations to ensure comprehensive consideration of all aspects before implementing any change.

03- DEFINITION

Management of Change (MOC): is the structured process organizations use to plan, evaluate, and implement changes to their systems or operations. It aims to minimize disruption and ensure smooth transitions while achieving desired outcomes.

Stakeholders: are individuals or groups with an interest in the activities or outcomes of an organization. They may include employees, customers, suppliers, and the local community, and their involvement and support are crucial for the success of organizational initiatives.

Change Impact Assessment : evaluates how proposed changes may affect stakeholders' interests, needs, and relationships with the organization. It helps identify potential risks and opportunities and guides effective communication and engagement strategies.

Figure D.13: Management Of Change Procedure

Stakeholder Engagement : involves involving stakeholders throughout the change process, gathering feedback, and addressing concerns. It fosters collaboration and ensures stakeholders' needs are considered and addressed in organizational decision-making.

04- ROLE AND RESPONSIBILITIES

The effective management of change involves various roles and responsibilities to ensure the successful initiation, implementation, and tracking of change requests.

1. All Employees:
- Recognize triggers for applying the management of change procedures.
- Utilize appropriate documents for managing changes.
- Escalate the need for implementing the management of change procedure to the Plant/Project Manager.

2. Initiator:
- Initiate the Management of Change (MOC) process using the Management of Change Checklist Form.
- Ensure all aspects of the change process, including work plans, risk assessments, procedures, training, and competencies, are covered.
- Communicate the management of change requests to the Plant Manager/Project Manager and all stakeholders.
- Implement change with prescribed controls and coordinate change projects, ensuring adherence to requirements.

3. Plant Manager/Project Manager:
- Review and approve all changes.
- Implement change with prescribed controls.
- Ensure proper handover/signoff of all changes and adherence to this procedure.

4. Health and Safety Department Representative:
- Review all health and safety-related amendments.
- Review risk assessments related to the change/s when applicable.
- Assist in verifying the effectiveness of the change, record lessons learned, and communicate them countrywide.

5. Quality Department:
- Identify changes requiring management.
- Apply the management of change process.
- Ensure documentation adequacy for all managed changes.

05- PROCEDURE

05.01 Overview

The Management of Change Process is undertaken to ensure that each change introduced to the site environment is appropriately defined, evaluated and approved prior to implementation. A decision tree has been developed to aid in determining whether a MOC is required in a given situation. *See Appendix A within this procedure.*

Figure D.14: Management Of Change Procedure - continuation

05.02 Implementation

Management of change can be done in three phases: preparing for change, managing the change and reinforcing the change. As records need to be kept for all management of change activities, start documenting all steps right from the start.

Phase 1: Preparing for change.

1.1 Define the change:

a) What is the subject?
b) Why are we changing?
c) What are we changing?
d) Who will it affect?
e) When is the target date?
f) What are the risks?

1.2 Plan the change:

a) What are the stages required for this change?
b) What are the contingencies to mitigate the identified risks?
c) Who are the people required for this change?
d) What will be the training required for this change?
e) What is the timeline?
f) What is the communication needed and when?

Phase 2: Managing the change.

2.1 Doing / Implementing

a) Documents revised, approved and published
b) Prepare any training/communication required
c) Physical changes are made
d) Is there any new equipment that requires calibration? This should be managed through Intelex, see Quality.

2.2 Training / Preparing personnel

a) Communicate the change
b) Deliver any training necessary
c) Support people during the change

Phase 3: Reinforcing the change.

3.1 Collect and analyze feedback

a) Request feedback
b) Assess gaps
c) Identify corrective actions required

3.2 Correct Deficiencies

a) Implement identified corrective actions
b) Update / revise documents if necessary
c) Communicate changes if necessary

3.3 Finish the management of change records

Figure D.15: Management Of Change Procedure - continuation

06- Training Requirements

All personnel engaged in Lock Removal activities must undergo training on this procedure to ensure competency and adherence to safety protocols.
So, the Requirements for management of changes, as outlined, are:

- **Coaching**: Developing coaching skills to guide individuals and teams through the change process.
- **Leadership**: Enhancing leadership abilities to effectively lead and manage change initiatives within an organization.
- **Change management**: Acquiring knowledge and skills in change management methodologies and practices to facilitate successful change implementation.
- **Change mapping**: Understanding how to map out changes within an organization to visualize the impact and implementation process.
- **Intervention strategy**: Learning strategies to intervene effectively during the change process to address challenges and ensure successful outcomes.
- **Business reengineering**: Gaining expertise in business reengineering techniques to optimize processes and systems during periods of change.

These training requirements are essential for individuals involved in managing changes within organizations to ensure smooth transitions, effective leadership, and successful implementation of change initiatives

07- Record Keeping

A copy of the procedure will be securely stored in a designated file. Additionally, training records will be scanned and archived for future reference.

08- Measurement of Compliance

Compliance with the procedure will be assessed during both internal and external audits to ensure adherence to safety standards.

Figure D.16: Management Of Change Procedure - continuation

09- Appendix

Appendix A : decision tree

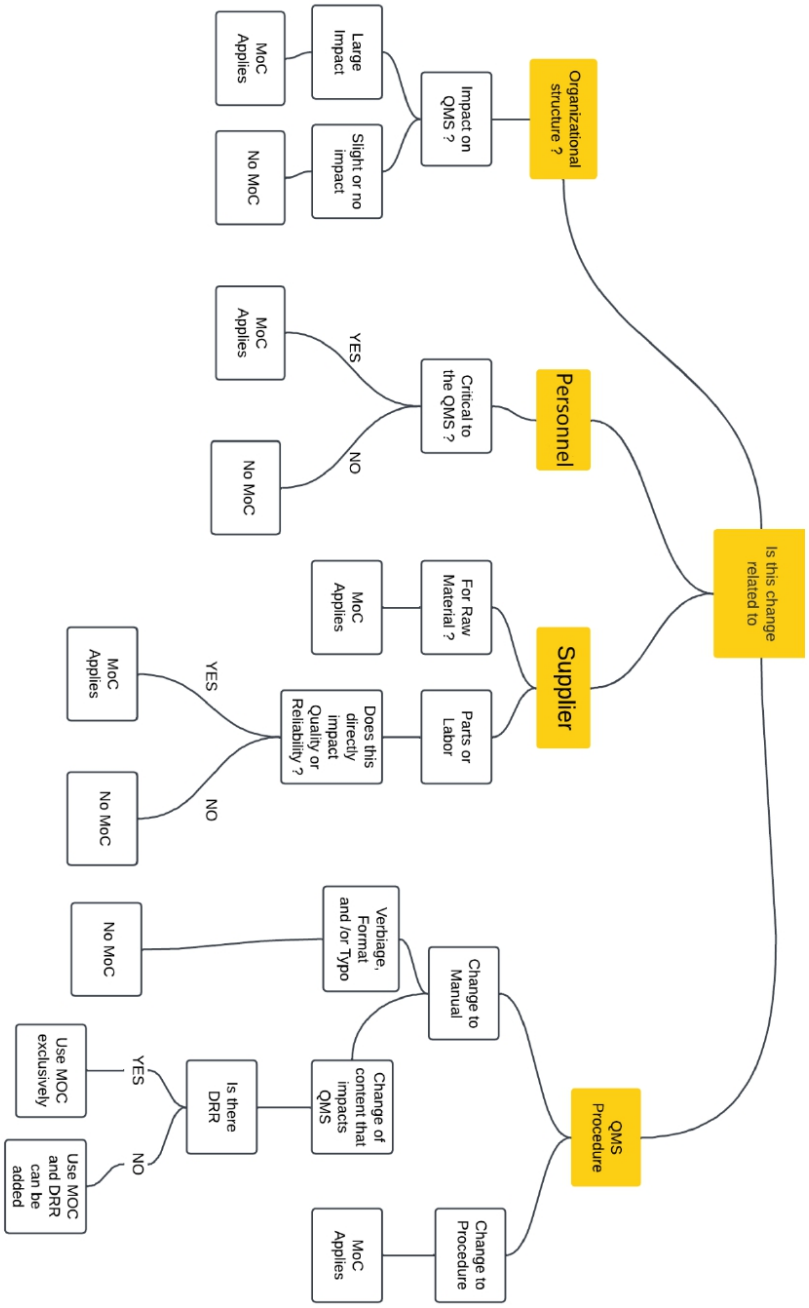

Figure 01 : Decision Tree

Figure D.17: Decision tree (MoC)

Appendix E

Training Matrix

Table E.1: Training Matrix

Personnel	Training Type	Duration	Refresher Frequency
All Employees and Contractors	Hazardous Energies Identification and Energy Isolation Basics	1 hour	Every year
Lock Holder	Isolation Working Competency (Theory)	1 hour	Every 2 years
	Isolation Working Competency (Practical)	1 hour	Every 2 years
Isolator	Energy Isolation Competency (Theory)	1 hour	Every 2 years
	Energy Isolation Competency (Practical)	1 hour	Every 2 years
	Special Risks Identification (Coaching)	1 hour	Every 2 years
Permit Issuer	Energy Isolation & Control Monitoring (Theory)	Isolator Training + 1 hour	Every year
	Energy Isolation & Control Monitoring (Practical)	1 hour	Every year
	Lock-Out/Tag-Out/Test-Out Procedure Oversight (Coaching)	2 hours	Every year
Procedure Author	Energy Isolation & Procedure Creation (Theory)	Isolator Training + 1 hour	Every year
	Energy Isolation & Procedure Creation (Practical)	2 hours	Every year
	Procedure Review and Update (Coaching)	2 hours	Every year