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## Abstract

A new elevator will be installed in the materials handling building of Lilly del Caribe. For it, a facility commissioning will be carried out, since where the stairs of the building are, it will be installed there. It will validate a protocol that has to comply with the regulations and specifications established by the industry and has 14 activities that must be completed. The existing elevator is only for material handling and can only exert a force capacity of 4,000 pounds. With the installation of the new freight elevator, the material can be handled and disposed of by the operator. Therefore, this elevator will improve the utilization and efficiency of such material handling. The new elevator can exert a force capacity of 10,000 pounds and being a new piece of equipment, it meets a 95% reliability. To execute the validation, DMAIC was used.

**Key Terms** — DMAIC, facility commissioning, regulations, validate.

## Problem Statement

Currently, the existing material elevator is used to move material between floors in the material handling building. This equipment can only be operated from the first floor, requiring an operator to access the second and third floors via a building ladder to complete tasks in the area. Also, the computer has had multiple instances, in the near past, where it had stopped working while it was running; therefore, resulting in the implementation of a Business Continuity Plan (BCP) with administrative control measures as an alternative to continue activities in the building.

## Objectives

- Identify what type of elevator will be implemented in the area, so that it meets the client's demands.
- Improve the efficiency of elevator operation.
- Obtain the related Equipment documentation and specifications such as Manuals (installation, operation, and maintenance), and Equipment Data Sheets (As-Built) (as applicable).

## Methodology

During the project, the DMAIC methodology will be used, it has a five-phase method, Define, Measure, Analyze, Improve, and Control, according to its acronym in English. DMAIC is a simple yet powerful tool focusing on process improvement, helps explore possible solutions, and implements process controls.

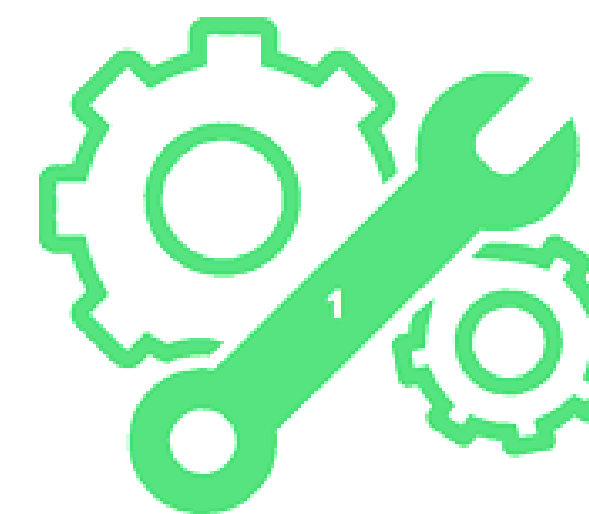


Figure 1 Cycle DMAIC

Table 1 Phases Methodology

Phases	Methodology
1. Define	How the project will be working and define the problem and the objectives.
2. Measure	The regulations established by OSHA.
3. Analyze	Analyzing and executing the sections of the protocol based on this commissioning facility governed by Lilly del Caribe.
4. Improve	The improvement of efficiency in this installation and the increased capacity to carry out the tasks in the material handling building.
5. Control	The control through preventive maintenance for the said installed elevator.

## Results and Discussion



Phase: Define



Figure 1 Communication/Escalation

Table 2 Protocol Activities

Activities	Reviewed (Yes/No)	Completed (Yes/No)	Pending Items
Mechanical Completion	No	No	
EHS Commissioning release	No	No	
Any design modifications, prior FC test protocol execution	No	No	
Drawings Walk-down Verification	No	No	
Standard Operating Procedure Verification	No	No	
Engineering Documentation Verification	No	No	
Certificates and Reports Verification	No	No	
Features Verification	No	No	
Safety Devices Verification	No	No	
Doors Verification	No	No	
Doors Access Verification	No	No	
Automatic Doors Operating Verification	No	No	
DAIS Verification	No	No	
General Facility Verification	No	No	
<b>Percentage completed</b>		<b>0/14</b>	



Phase: Measure

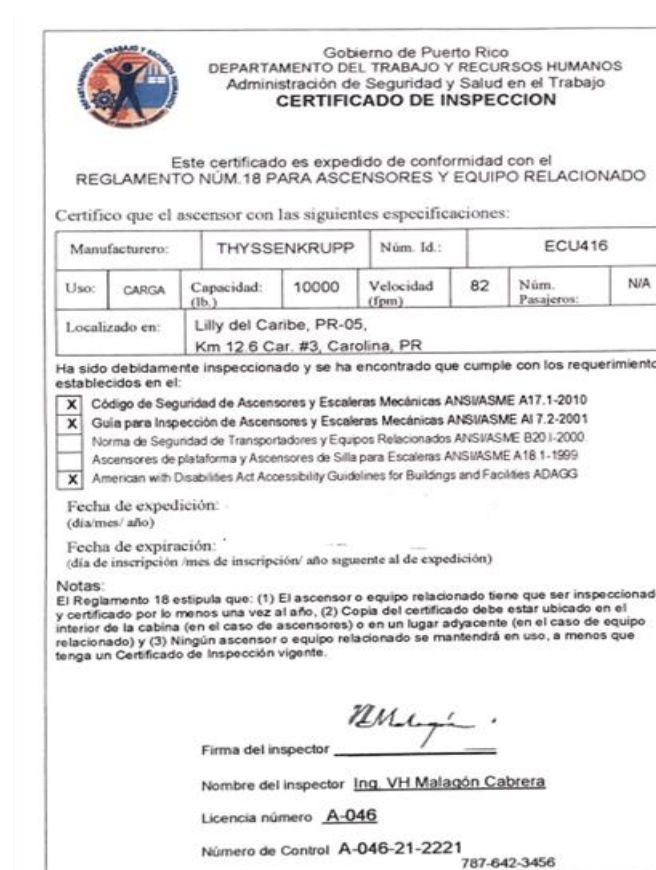


Figure 3 Elevator Inspection Certification

Figure 3 In the inspection sheet made by the OSHA Certifying Engineer, the elevator must be duly inspected and must comply with the established requirements (Refer to Figure #1):

- Safety Code for Elevators and Escalators ANSI/ASME A17.1-2000.
- ANSI/ASME A17.2-2001 Elevator and Escalator Inspection Code.
- American with Disabilities Act Accessibility Guidelines for Buildings and Facilities ADAGG.

In additional regulations :

- OSHA regulation 18.
- Regulations for Elevators and Related Equipment.



Phase: Analyze

Before doing the installation, we must know that the facilities have to comply with the design specifications of the Caribbean. When the installation is carried out, the "Facility Commissioning" protocol will be executed to meet customer expectations. The parts of the protocol in ascending order are the following:

- Mechanical completion:** document where it establishes that the area has already been completed, does not present any risk, and can be validated.
- EHS Release:** Document specifies that the area meets the security standards and regulations governed by Lilly del Caribe.
- Drawings Walk-down Verification:** project plans, where you walk in the area verifying and validating which are correct. If the walking area is not like the plane, it is made into a redline. The plane is marked where it is on the way, and it is signed by validations and the owner of the area.
- Standard Operational Procedure Verification:** Where it is verified that in effect the owner of the area included in the SOP the new area and the functions of the same. The date on which this procedure was updated is also included.
- Engineering Documentation Verification:** In this part of the protocol is where the documentation of said installation is included, specifically submittals.
- Certificates and Reports Verification:** Where the elevator certificate (Figure 3), electrical inspections, and security are included.
- Feature Verification:** If the elevator floors contain the bumper finishes and lighting finishes, and the results found when they go to the area are executed.
- Safety devices verification:** If the additional installed components, such as fire alarms, paging systems, and emergency lights, are duly identified (Figure 4).
- Door verification:** Where the material, model dimensions, and type of installed doors that give the elevator and that are as specified in the plane are verified.
- Door Access Verification:** The different access to the doors is verified, either by the Pushbutton Press Emergency or the Access/Exit Interlock.
- Automatic Doors Verification:** They are verified if the doors to the elevator, which apply the push button (green), card reader, and door sensor verification works.
- Dais Verification:** For this protocol, it is not necessary since there are no emergency doors.
- General Facility Verification:** It is that all parts of the protocol were completely completed.

After completing all these parts of the protocol, it is reviewed so that there are no GMP errors. Then, a report is made that specifies that the executions, quality control, and owner of the area review the protocol and sign the report.

### Acceptance Criteria:

1. The results comply and meet expected results and Lilly del Caribe, Inc. specifications.

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Description	Specification	Actual Results (Yes / No / N/A)	Procedure (F/IDV)	Acceptable? (Yes/No)	Performed By/Date
Emergency Exits	Properly Identified and Installed?				
Emergency Lights	Properly Identified and Installed?				
	Properly Operation?				
Fire System Alarms, Indicator, and Sensors	Properly Identified and Installed?				
	Properly Operation?				
Other Alarms	Properly Identified and Installed?				
	Properly Operation?				
Paging System	Properly Identified and Installed?				
	Properly Operation?				
Fire Extinguisher Pest Control (Glue Board)	Properly Identified and Installed?				
	Properly Identified and Installed?				

Note 1: Make a copy as necessary

Note 2: FV= Field Verification and DV = Document Verification

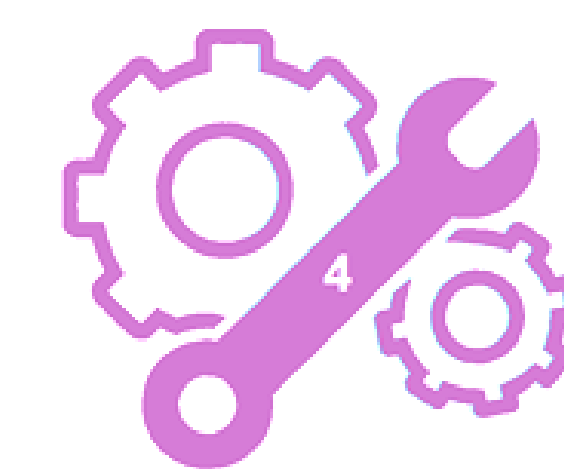
Acceptance Criteria Met? (Yes/No):

If no, refer to Discrepancy Report Form:

Initials/Date:

Initials/Date:

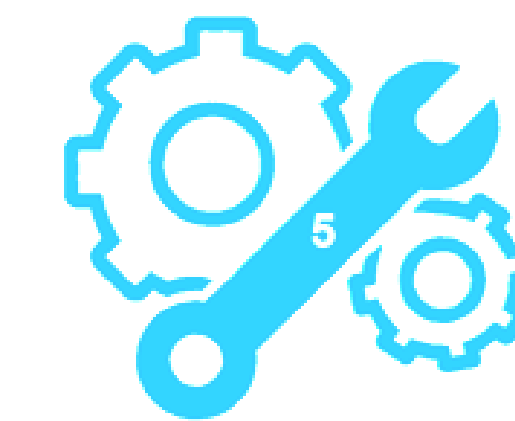
Figure 4 Safety Device Verification



Phase: Improve

To meet the improvements in the material management building, the protocol could be installed and executed in accordance with the established standards. For this reason, that helps improve the efficiency in the part of what to make of the operator and in the part of the Business continuity plan. Here we have the administrative controls of the area to be more efficient when the material management process.

It should be noted that our problem was solved given that the existing elevator could only exercise a load capacity of 4,000 pounds. This elevator only met 80% reliability in the process since it fulfilled its useful life. Install a new elevator in the area, it can exert a capacity force of 10,000 pounds. Therefore, there is more space to handle more material in a matter of time, speed, and money in the management of material in the building. Being a new team, it meets a 95% reliability for improvements in that process. Finally, when making this installation of greater capacity and reliability we have an additional 15% available time for our process.



Phase: Control

This process of controlling our equipment with new ease can be controlled through preventive maintenance. The preventive maintenance of this equipment must be carried out each quarter. Whenever preventive maintenance is on the team, it must have a Lock-Out Tag-Out card.

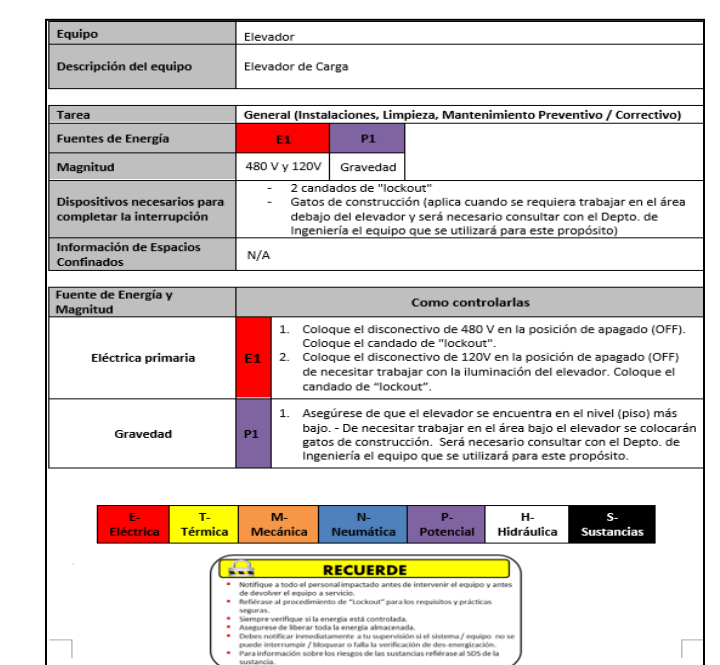


Figure 5 LOTO

## Conclusions

It was identified which type of elevator was going to be installed in the Materials Handling building, which was a freight elevator with an increased capacity of 10,000 pounds. As mentioned in our methodology, the issue was resolved as the previous lift could only exert a 4,000-pound capacity force and no person could be mounted. The old elevator only met 80% reliability in the process part, it met its useful life. By installing and validating a new lift in the area, it can exert a force capacity of 10,000 pounds. For this reason, there is more space to handle a larger amount of material in a matter of time, speed, and money in handling material in the building. Being new equipment, it meets reliability of 95% for improvements in said process. Therefore, by making such a higher capacity and more reliable installation, we have an additional 15% of the time available for our process. In the validation of said installation, different types of tables and required documentation were included and executed. Finally, this validation complied with the standards, regulations, and specifications governed by Lilly del Caribe.

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