



COMPREHENSIVE APPROACH TO MAINTENANCE STARTING FROM THE DESIGN OF THE WORK AREA

(Award case in the European Campaign on Safe Maintenance 2010/2011)

1. Case metadata

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2. Organisations involved

STIB-MIVB (Société des Transports Intercommunaux de Bruxelles Maatschappij voor het Intercommunale Vervoer te Brussel)

3. Description of the case

3.1. Introduction

The Brussels public transport company STIB designed its Jacques Brel maintenance site for trams and buses aiming to guarantee maximum safety for the maintenance staff. It is equipped with modern technologies and features that enable maintenance work to be performed in safe conditions. The concept of safe maintenance encompasses the safety and well-being of passengers and drivers, as well as maintenance workers.

The J. Brel site of STIB at Anderlecht covers an area of 6 hectares of which 1.5 are reserved to the metro part which contains an underground workshop, a depot and the equivalent of 3 km of railways. This can accommodate 100 vehicles and has about 70 employees on day and night shifts. J. Brel metro depot was opened in 2007. It was planned using the experience of Delta's depot, the first underground repository built in the 1970s.

The design of the depot, the equipments and materials used at workplace, the selection of staff and the working procedures or organizational rules and other facilities adopted were planned to create a modern depot and to ensure the safety and welfare of the staff.

3.2. Aims

The aim was to build and run a maintenance depot for public transport that guarantees maximum staff safety and welfare, by thorough planning and consideration of all aspects of the work organisation,, including: building design, workplace design and layout, choice and design of equipments, working procedures, recruitment and training of staff.

3.3. What was done, and how?

The buildings' design, the choice of work equipment including the latest technologies, and work processes but also organizational and individual training has been taken into account in order to guarantee maximum security for employees and welfare at work.

The forethought and consideration of all aspects of the organization, individuals, equipment and work environment have led to the design and implementation of a metro deposit which guarantees a maximum of safety and staff welfare.

3.3.1 The Risk Management

To ensure maximum safety and welfare staff, first of all risks at workplace were identified. The risk management is based on the following principles:

- Through good design and planning of activities, risks can be avoided even before starting work.
- By choosing the right equipment and materials through their work on site planning, risks can be reduced to a minimum.

Risk management takes into account feedback from the field. The Department Rolling Stock Business Unit Metro has established an organization to make decisions locally in consultation with employees. A safety engineer and an assistant, both electrical engineers specialized in equipment analysed work in the field while maintaining close collaboration with the Internal Service for Prevention and Protection at Work and Prevention Consultants. Regular meetings with trade unions allow dialogue and consultation, including matters concerning safety.

The major risks identified within depots (warehouse) are the electrical hazards (900 V presence), the risk of accidents when using work equipment, the risk from moving vehicles and the risk of falling from high platforms.

3.3.2 Building Design

The various components of the depot have been designed to ensure safety:

Openings and outlets on the roof but also on the side of buildings substantially improve lighting through the natural light, ventilation, fresh air change and heat and smoke's evacuation.



Figure 1 - Openings and outlets on the roof and on the side of buildings

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Platforms are protected by removable railings and the platform's floors are at the vehicle's height (no stairs and no gaps between the platform and the train);



Figure 2 - Protected platforms

The reference level is the pits. Thanks to sufficient height and good lighting employees can move safely under the vehicle do inspections very fast.

Finally, connecting corridors (an underground corridor and metal walkways) allow rapid movement of staff without any risk because these areas are entirely isolated from those where 900 V is present.

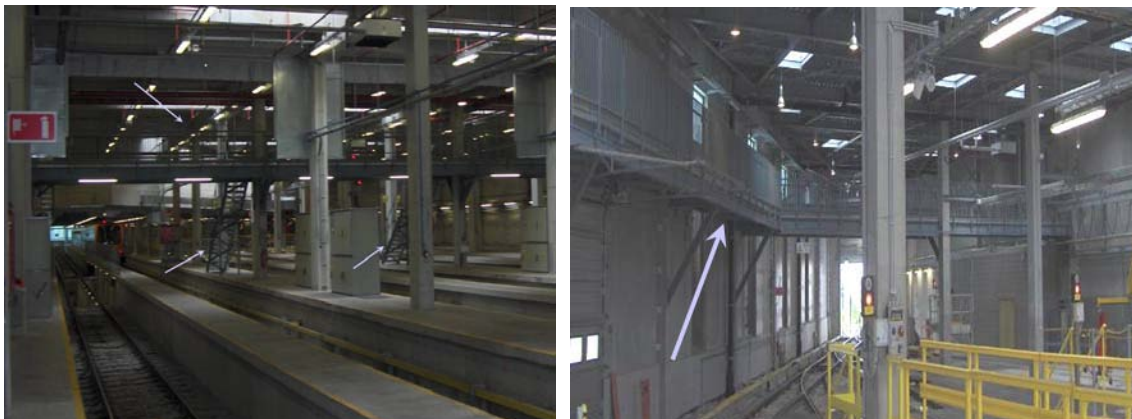


Figure 3 - Connecting corridors

3.3.3 Equipment

Equipment / machinery available to workers were chosen to ensure the greatest possible safety, particularly electrical safety.

A completely isolated pit was designed for **dust extraction** from chests. The employee, working under the vehicle, is wearing a suit with supplied air and just blows it with compressed air. The dust is then sucked by a powerful suction system located at the pit's bottom. In this way, other employees and the rest of the workshop are well preserved.

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Figure 4 – Dust-extractors

A path for **car wash** is also completely isolated. This automatic operation is realized free from the electric voltage.

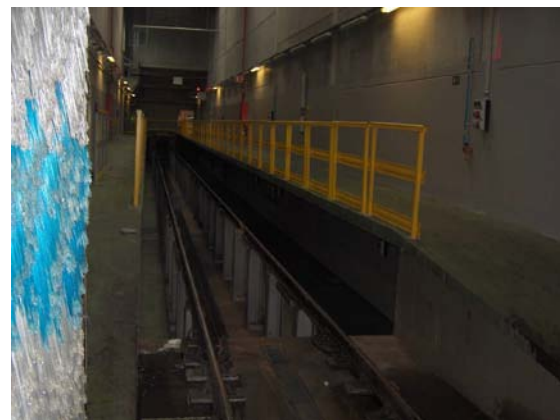
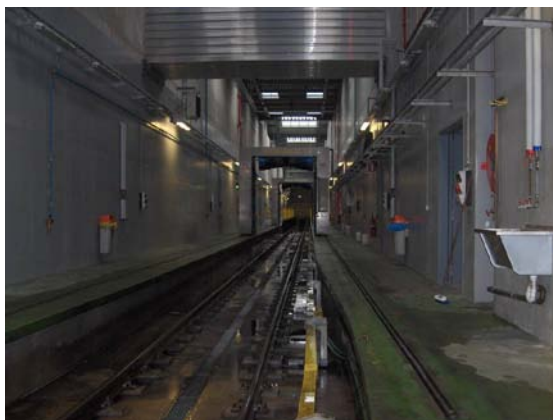


Figure 5 - Car-wash path

A particular system of lifting columns was developed. In order to avoid any accident, the operation of raising or lowering the vehicle is realized by two operators located on both sides of the vehicle. Their control units are in series and to lift a vehicle, it is necessary that the two employees operate at the same time their control units.

The lathe which enables the readjustment of wheels is placed on a particular and isolated track. When an employee enters voluntarily or involuntarily into the pit, not only the equipment, but also the voltage is automatically turned off.

Particular equipment allows a quick, easy and ergonomic handling and replacement of the vehicle's front windscreens.

A command and control centre has been designed: a dispatching located in the building allows to track the train's movements or to switch on or off some parts of the depot's voltage, to know the location of the pulled emergency buttons and also of the "dead-man" reset buttons (see below).

Electrically hazardous areas are separated from access corridors or gateways through interlocks: in case of unlocking, the voltage is automatically cut off. The presence of 900 V in an area is marked by a light system. Finally, it should be noted that the high voltage supply for the train's movement is completely separate from the power needed to work in the workshop.



Figure 6 - Access corridor

3.3.4 Working procedures

Apart from the safety instructions related to each workstation, there are also general work procedures such as:

- The "red disc" rule is a procedure according to which only the employee who placed on the equipment a advertising sign, the "red disc", can remove it and reactivate it;
- Emergency calls and "dead-man" reset buttons: call buttons for emergencies but also "dead-man" reset buttons are distributed throughout the depot. They need to be activated regularly (every 5 minutes) by employees who are working alone in the workshop. All alarms are connected to the depot's control centre that can quickly send help if an emergency call is activated or if an employee does not activate the "dead-man" reset button in the allowed time;
- Procedure to access 900 V: the entire workshop and depot are considered as a 900 V area. This procedure involves a mandatory training as well as a successful test from all the staff present on site. The access to the depot is determined by the wearing of a badge whose validity is limited in time;
- Visitors and subcontractors are routinely recorded.

3.3.5 Co-workers

The staff's recruitment is not only based on technical skills but also on behaviour. Prospective employees must demonstrate a strong attention to security related issues. In addition to the 900V access training, on their first day, they are accompanied by the security engineer or his assistant for an in-depth visit of the workshop during which their attention is drawn to all the risks on the site and the procedures to be observed to avoid accidents.

Throughout his career, the employee will receive continuous training for driving and technical training through the training centre of the BU Metro, certified ISO 9000. Up to present, the company estimates the volume of undertaken training by staff at 80 hours per year per employee.

Another risk identified is the routine which can be developed by some people and lead the employee to the poor estimation of risks in his environment. Therefore, a versatile staffs for the various workstations is required and a rotation between different workstations was established.

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For the well-being of staff, cafeteria and parking (148 car parking spaces, 4 covered spaces for motorcycles and bikes and 1 covered space for bikes) are planned.



Figure 7 - Parkings

3.4. What was achieved?

- Workers' safety increased during the maintenance activities in the depot due to an integrated approach of building design, equipment, working procedures, employees' recruitment and training based on risk assessment and appropriate management.
- The main risks, such as those involving falls, interventions to electrical equipment, moving vehicles or dust, have been considerably minimized either by the design of workplaces or by particular work equipment and new procedures.
- Staff recruitment was improved taking into account both the technical skills and the safety behaviour.
- Employees' training was also improved given an initial training, a test related to safety issues, inspection visits of the workshop in the presence of the safety engineer, ongoing technical and driving training.
- Routine and absenteeism are expected to decrease, due to the particularly adopted measures, such as the selection of staff for the workstations and staff rotation among different workstations.
- The number and severity of accidents decreased: within the three years since the site opening, 16 'minor' accidents only were notified at J. Brel Subway's site (superficial injuries, minor body traumas at climbing, falling, slipping on wet ground at the carwash or due to mishandling of tools).
- The recurrence of accidents is minimized as long as corrective and preventive measures are established after analyzing each accident.
- The comprehensive approach and consideration of all the aspects related to work organisation, individuals, equipment and work environment have resulted in the construction of a metro depot where staff safety and wellbeing are ensured.

3.5. Success factors

Using an integrated approach starting from the design of the working area in the planning phase, using acquired experience and knowhow from the field and overall risk management covering the choice of work equipment, including the latest technologies and work processes but also organizational and individual training, led to maximum security and welfare for employees at work.

3.6. Further information

STIB-MIVB (Société des Transports Intercommunaux de Bruxelles Maatschappij voor het Intercommunaal Vervoer te Brussel)



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3.7. *Transferability*

This good practice can be applied in Member States, particularly in subway transport services and /or railway transport maintenance depots.

4. References, resources:

- Information provided by the organisation in the framework of the Good Practice Award Competition 2010/2011