# EGEA WG 6 Meeting

# Brake Testing Security
# French Standard NF R 63-706

**20th November 2013 - Brussels**

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# brief history

In 2010, two fatal accidents were caused in France, in garages, by automatic brake testers.

Inquiries are conducted by Police and some agencies accredited for the testing of the safety of work equipment.

Inspectors have observed that the risk analysis and the technical dossier, required by the machine directive, were conform in the time where no fatal or grave accident had occurred.

That, due to these two accidents, it was necessary to re-examine the assumptions of the risk analysis and to take in account the consequences

Very quickly, the information is reported to the head of the Ministry of Labour who immediately decided to implement curative and corrective actions.

# Curative action

- The French Ministry of Labour decided that, in the time of one year, all manufacturers or importers of HGV brake testers have to improve all existing benches in France with safety solutions which will prevent that the same dangerous conditions can be reproduced:
  - It cannot any more be possible to access to the testing rollers, and to the tested axle, in being in the inspection pit
  - It cannot any more be possible to approach the wheels of the vehicle while they are rotating

# Corrective action

The French Ministry of Labour decided, regarding the future, to :

create a working group composed of :

- representatives of French ministries (labour and transport),
- national agencies responsible for regulating the working safety,
- agencies accredited for testing safety of working equipment,
- all types of users of these machines,
- manufacturers and importers of these machines
- Manufacturers of safety devices

- Working group whose missions are :
  - Conduct a comprehensive risk analysis of the HGV brake tester.
  - Write from this analysis a French safety standard type C, only dedicated to HGV brake testers. This standard has to respect the Machine Directive, and to specify, where necessary, adjustments of the safety standards of type A and B in regard to the specificities of the design and the use of brake testers
- The French standard should be submitted to CEN (ECS) to become a harmonized European standard

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# Risk Analysis

The main reference documents taken in account for the analysis are

- The Machine Directive 2006/42/CE
- EN ISO 13849 Safety of machinery - Safety-related parts of control systems
- EN ISO 12100 Safety of machinery - General principles for design - Risk assessment and risk reduction

The most important risks evaluated are :

- accident by being hooked by the rolls and wheels in rotation affected to mechanical hazards
- accident due to the surprise of the unexpected starting of the machine affected to hazards related to the failure of the control system

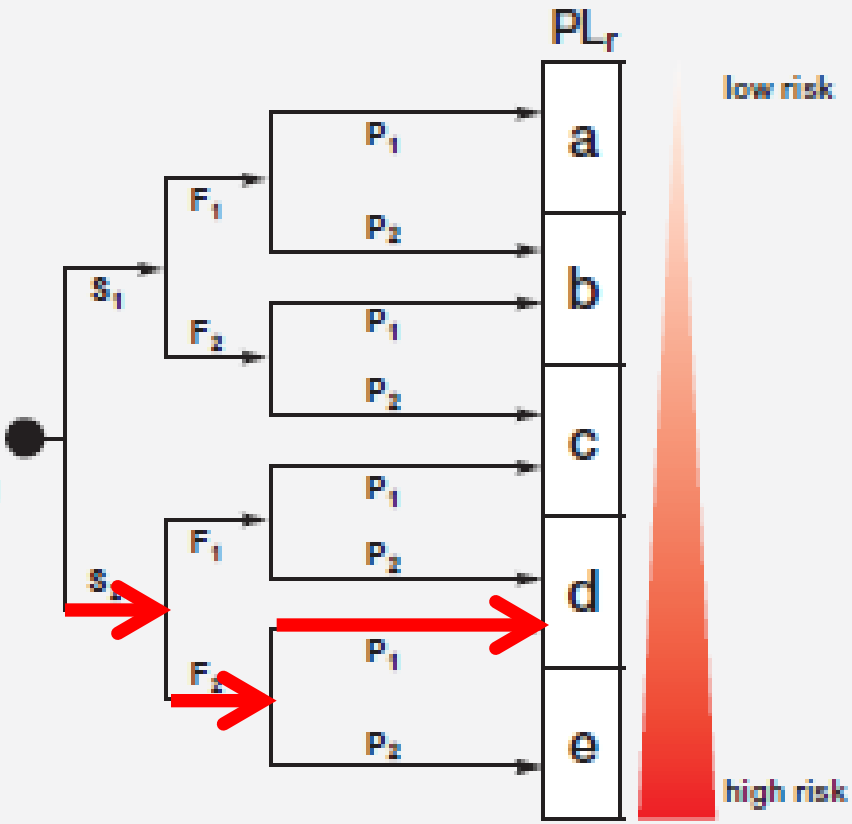
Which are the two main causes of the real accidents.

# Risk Estimation EN ISO 13849-1

**Risk estimation**

To calculate the performance level required ($PL_r$).

| | |
|---|---|
| **S** | **Severity of injury** |
| S1 | slight (normally reversible injury) |
| S2 | serious (normally irreversible injury or death) |
| **F** | **Frequency and/or exposure to hazard** |
| F1 | seldom to less often and/or exposure time is short |
| F2 | frequent to continuous and/or exposure time is long |
| **P** | **Possibility of avoiding hazard or limiting harm** |
| P1 | possible under specific conditions |
| P2 | scarcely possible |




Performance Level required = d

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# Why a specific standard ?

The brake tester has to be conform to :

- Machine Directive
- European standards of level A and B.

Some times, the specifications of certain standards are not adapted to the specificities and real use of the HGV brake tester. For example :

- EN ISO 13855 Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body

In this case the type B standard is set aside in favor of the specification of the type C standard,

# AOPD Protection distance EN 13855

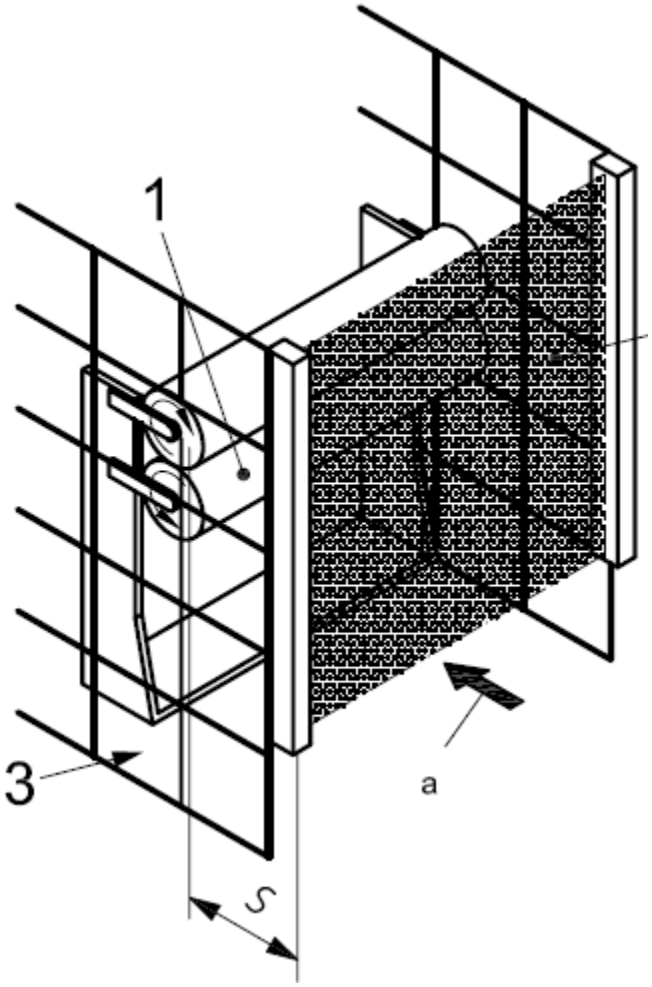
Formula determining the time passing between the moment the man is detected by the system and the effective stop of the machine.

The standard formula is T = T1 (activation) + T2 (effective stop)

The distance to protect from the dangerous point is define as :

$$S = (K \times T) + C$$

Where K is the speed of a man walking 1600 mm/s
C is function of the type of AOPD (active opto electronic protective device)

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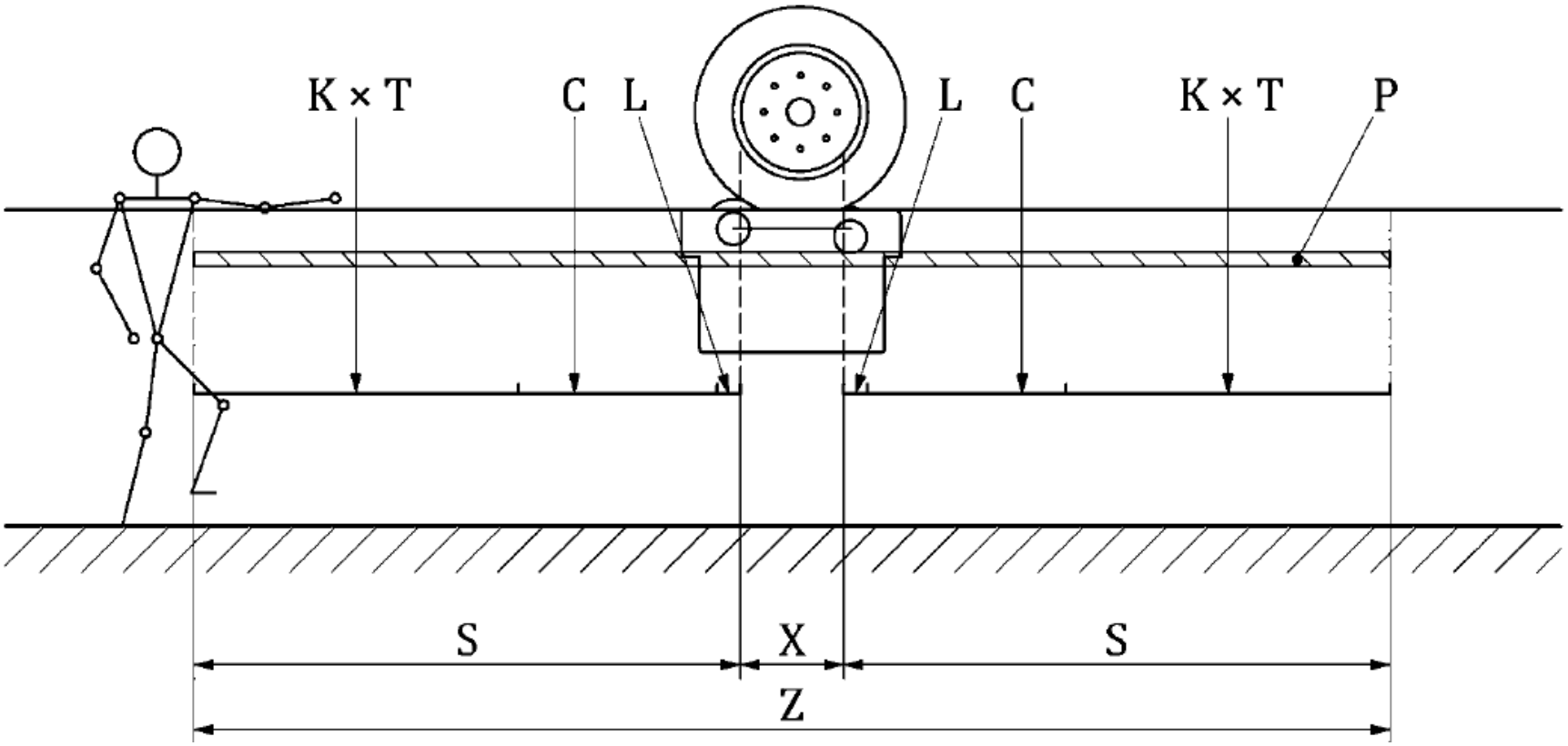
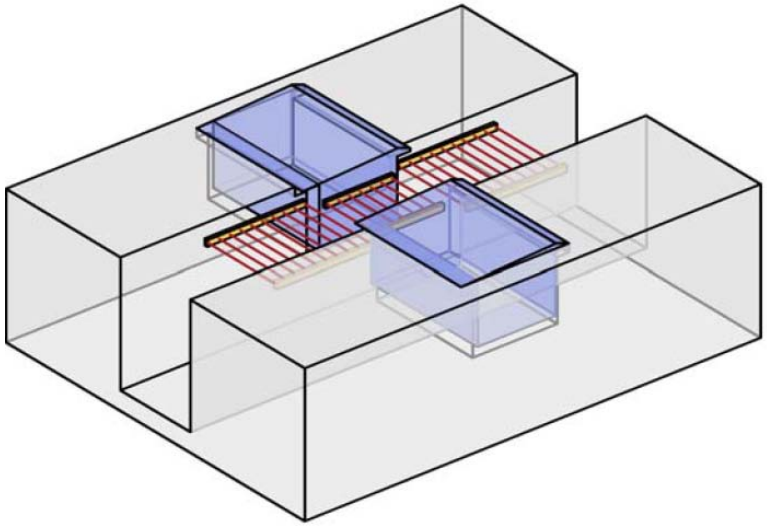
# AOPD Protection distance in the pit

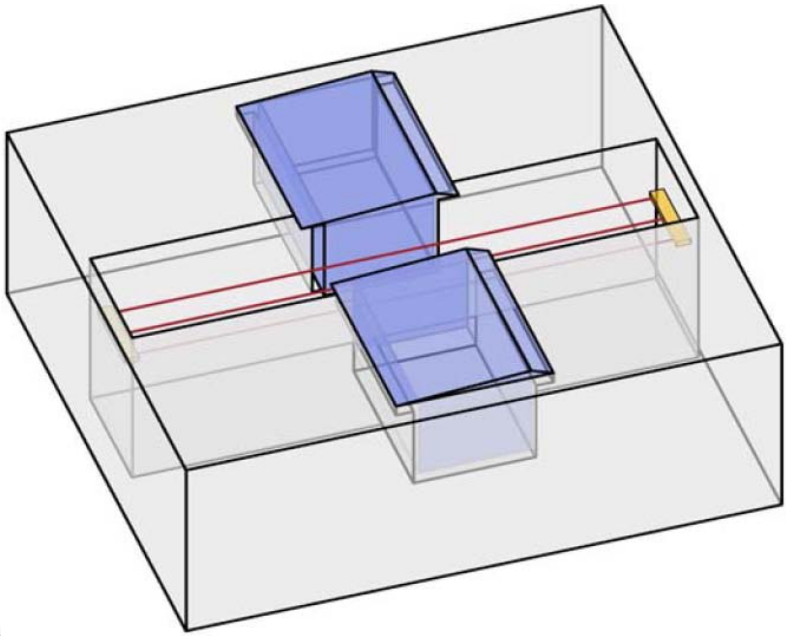


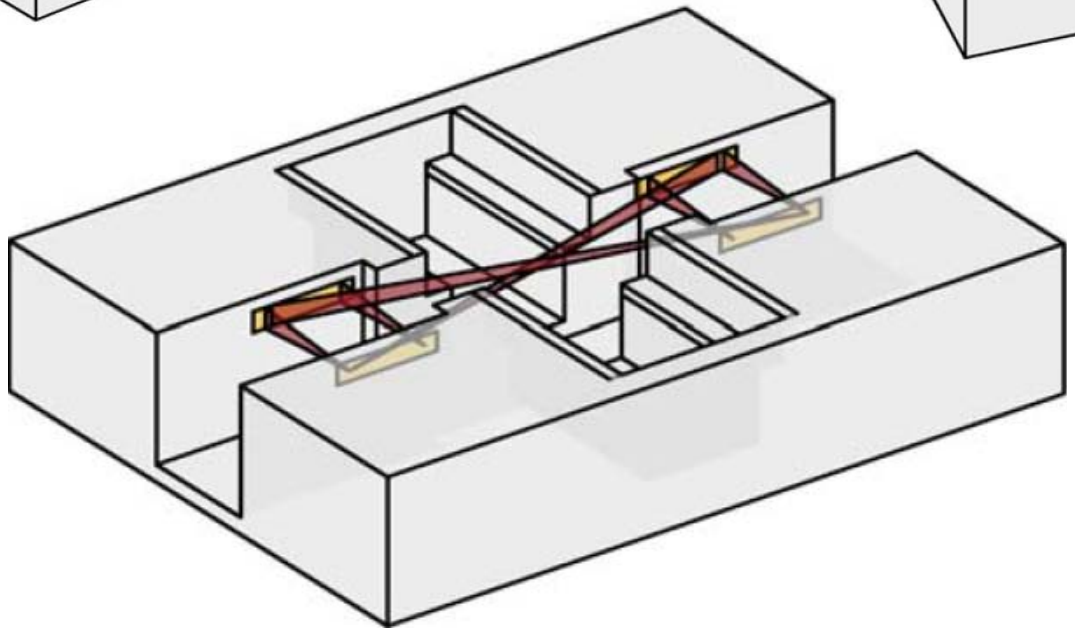

K = 1600 mm/s
C = 850 mm length of the arm
L = 100 mm convergence distance

The calculation is the same with Pressure sensitive protective devices

# Different concepts of AOPD Protection of the pit







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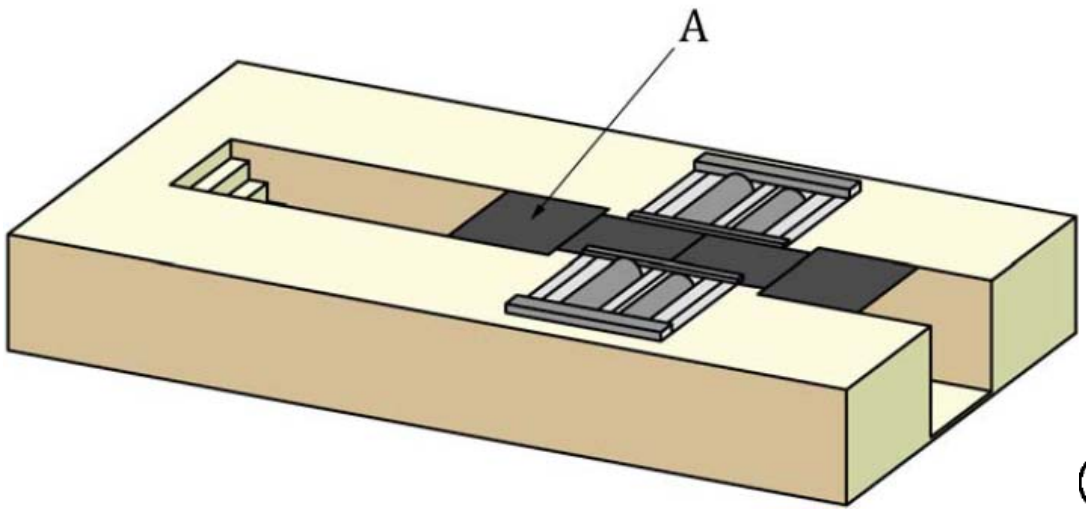
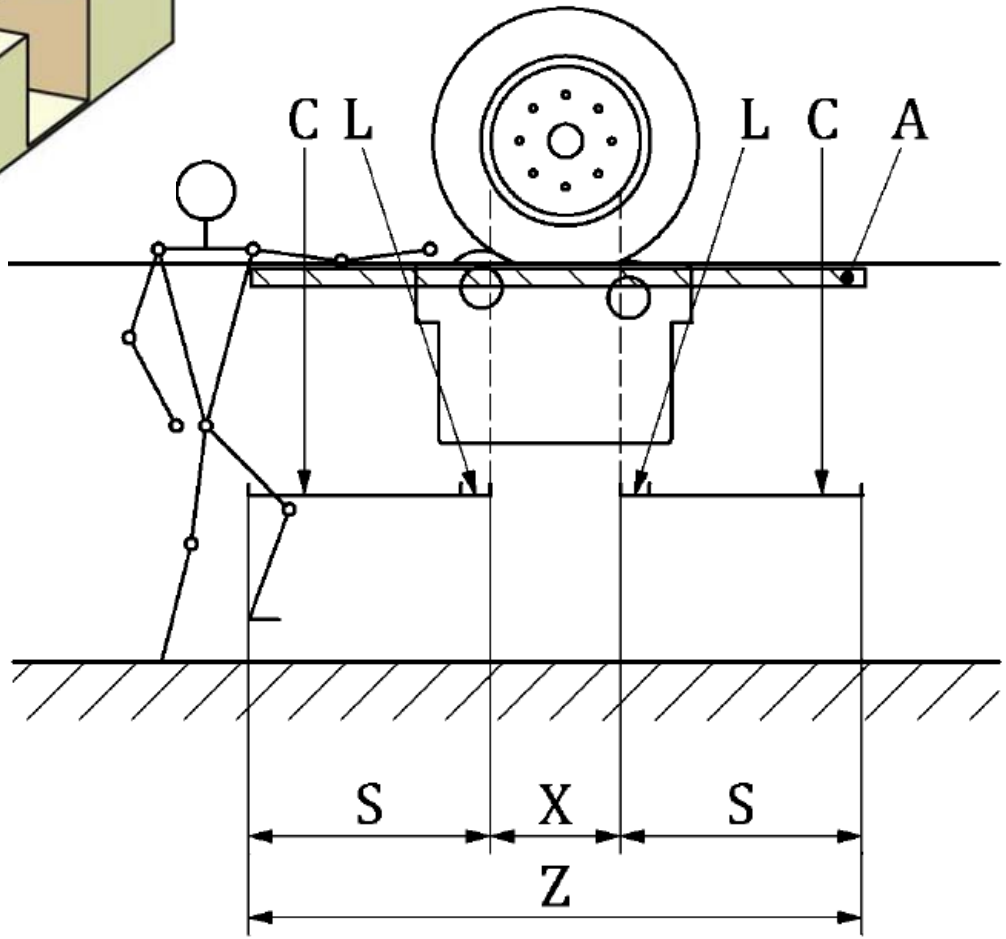
# Physical obstacle protection in the pit




C = 850 mm length of the arm
L = 100 mm convergence distance

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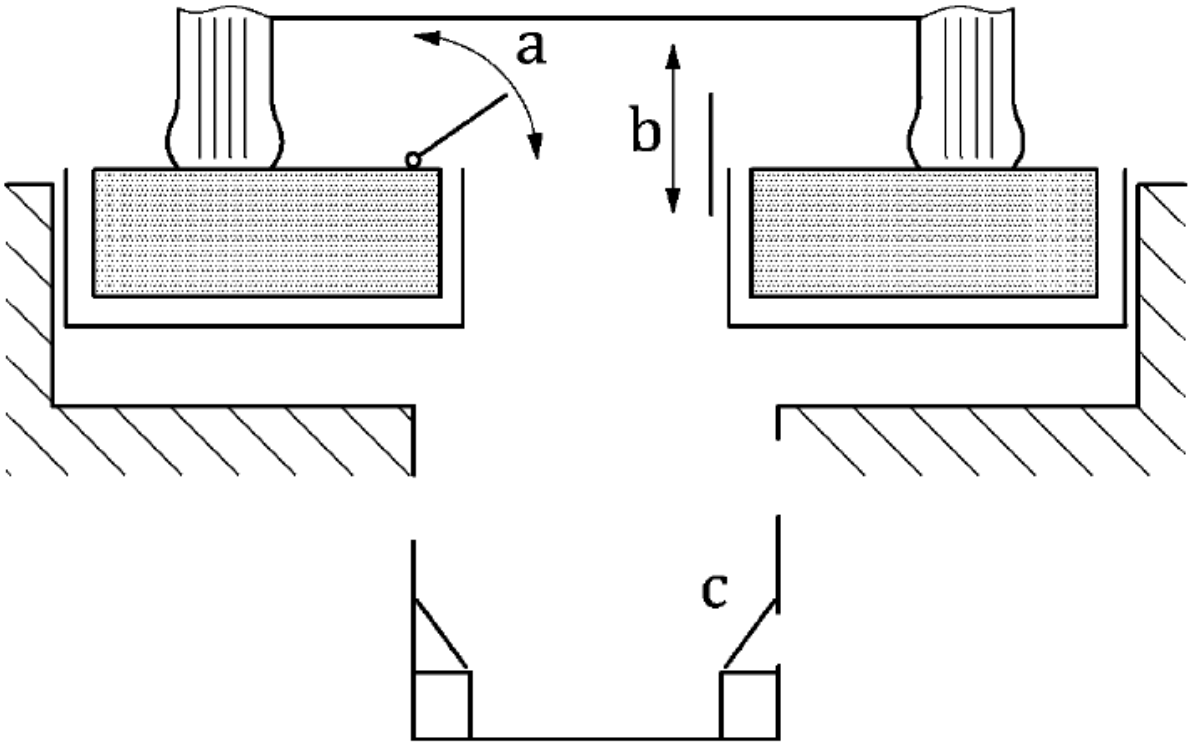
# Other protection in the pit

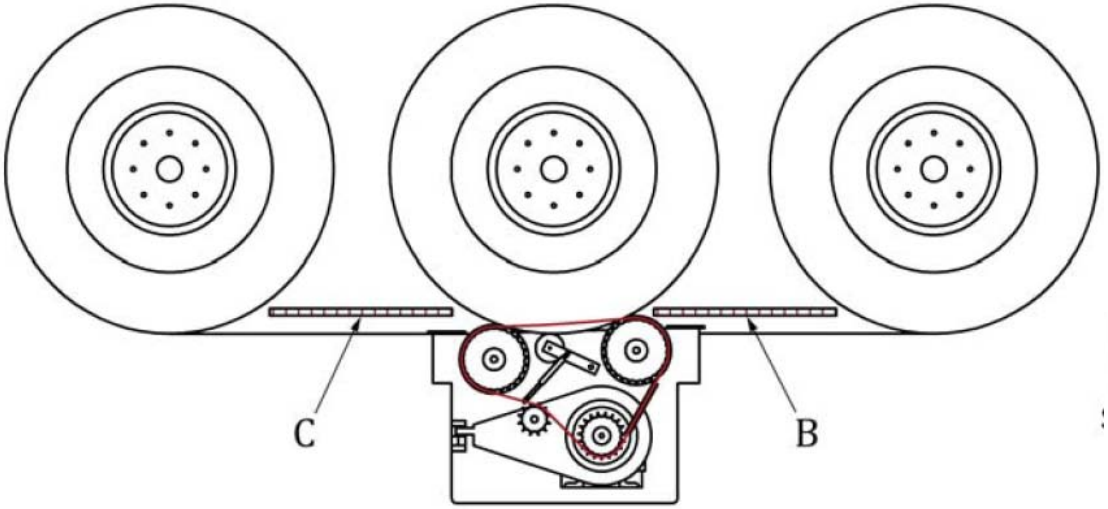


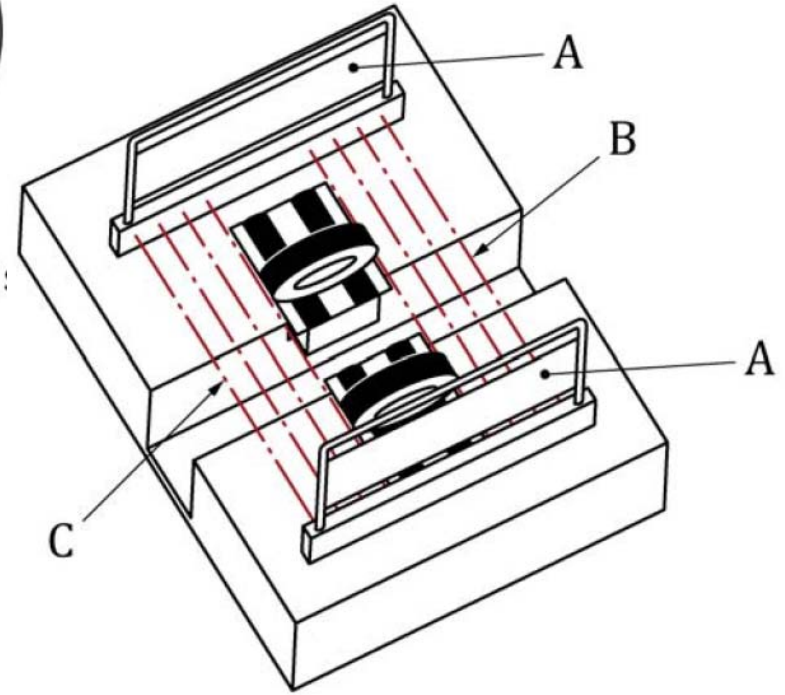

Protection with automatic rotating flaps

# AOPD Protection on the floor

The formula for the distance to be protected is the same than in the pit. But the presence of tandem and tridem axles makes it impossible to respect the value because the optical planes are detecting the wheels.

The protectable surfaces are reduced.

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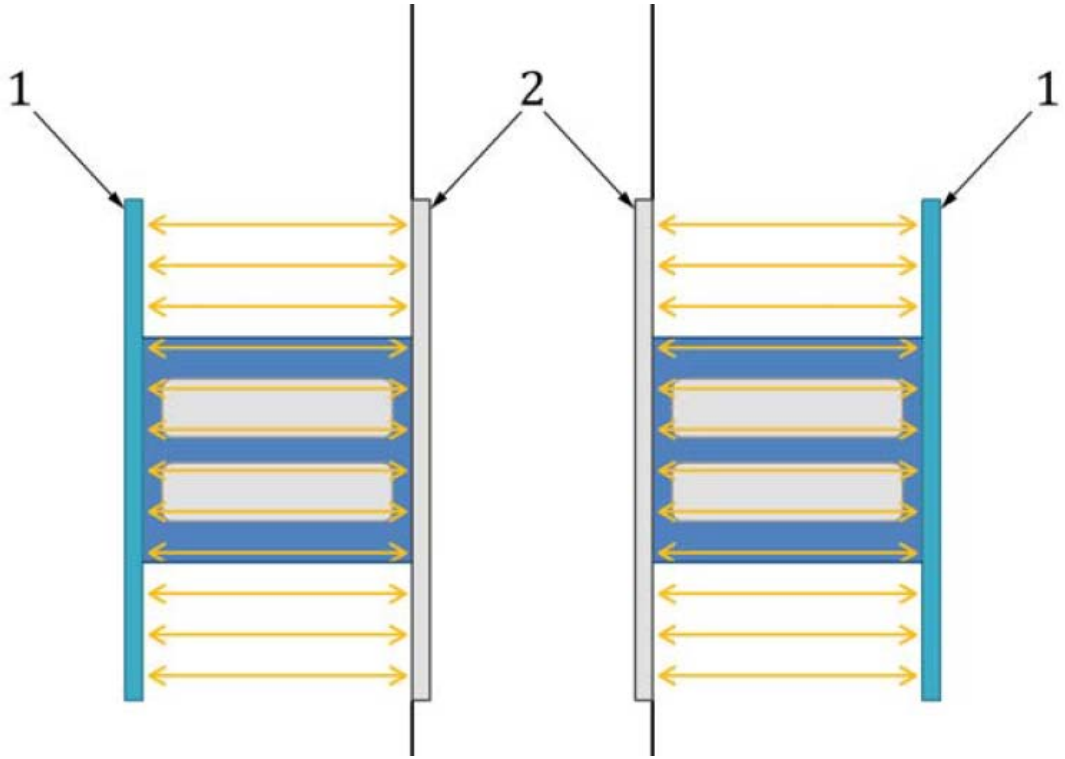
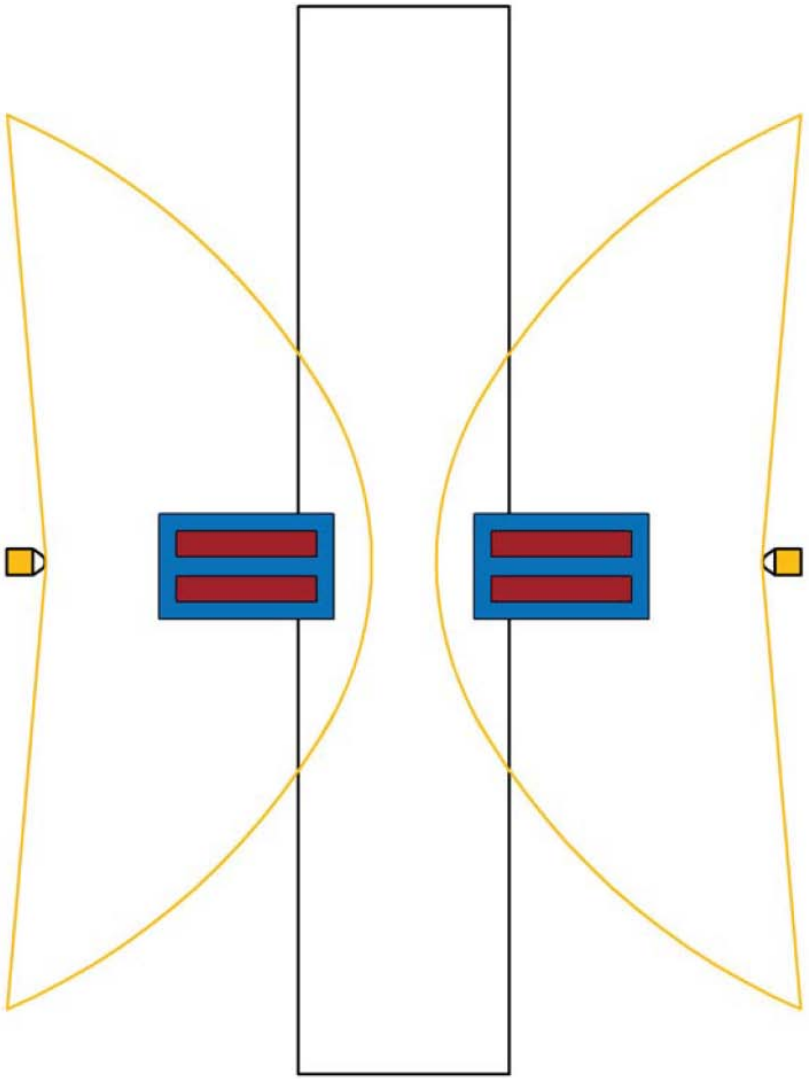
# Other protection on the floor

Protection with distance sensors

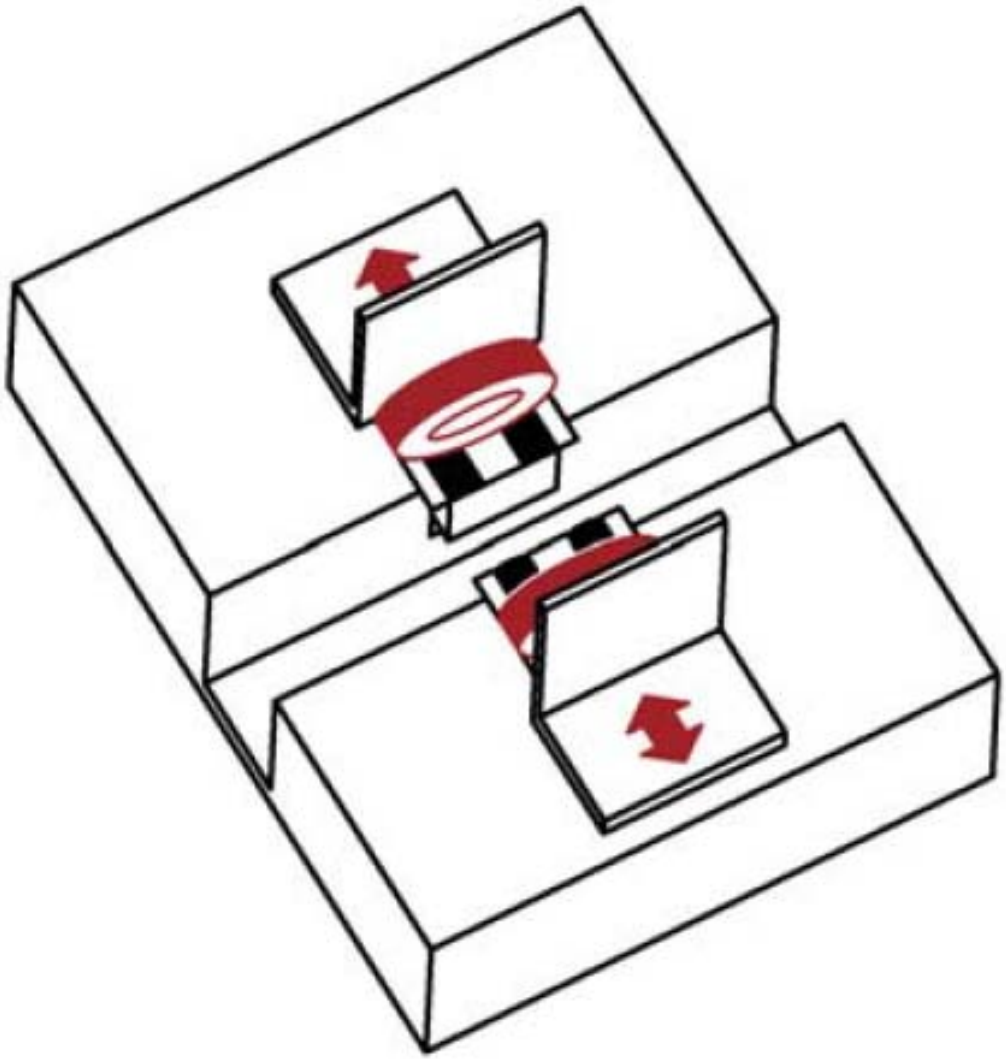


# Other protection on the floor

Protection with laser scanner



# Other protection on the floor



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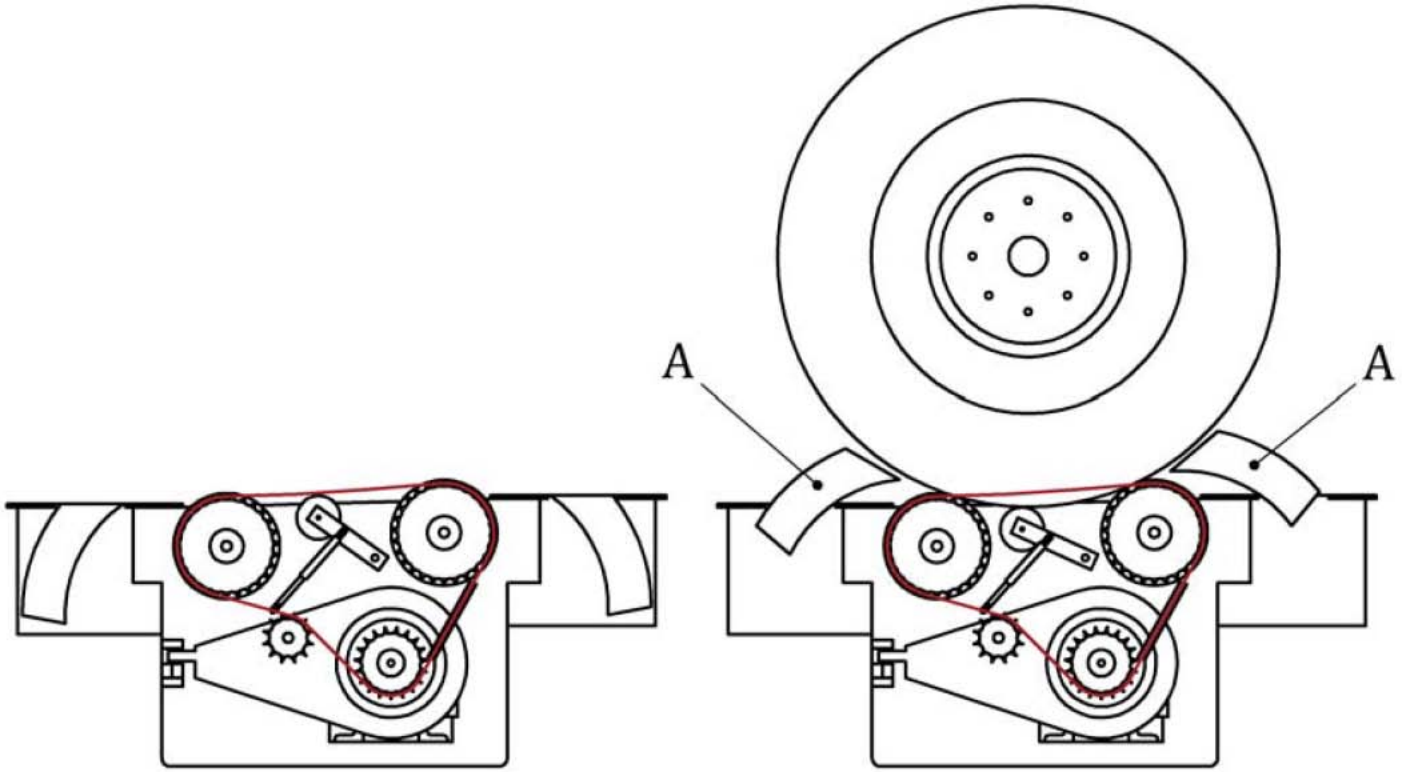
# Other protection on the floor



# Emergency Stop

The performance level required for emergency stop function is PLr = d
All device able to command any start of the motor must be equiped with an emergency stop.

Start command can only be given by the control device selected for the current test.
The stop and emergency stop devices are active on all cabinet and remote control active simultaneously

# Operating modes

The machine can have different functioning modes :

- the normal operating mode used for testing the vehicles
- the “degraded” mode of operation used when there is, for example, a conflict between AOPD and the body of the vehicle
- the mode of operation for maintenance and inspection which warrant to safely work on the machine when it is powered

# Warning devices

Warning device :

A lighting warning device must be installed on each side of the brake tester, and be active at least three seconds before and during the time of the rotation.

Software :
Information displayed on the cabinet should always warn the operator of :

- Any presence in the roller set
- Any imminent starting of the rollers

User’s manual :

- the manual should prevent all risks listed in the risk analysis and propose any protective measures to be taken to prevent residual risks

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EUROPEAN GARAGE EQUIPMENT ASSOCIATION

# Thank you!