



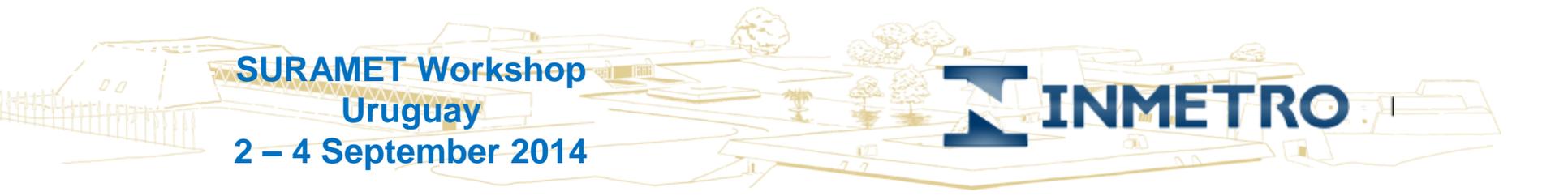
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# **Inmetro's actions to reduce vehicle emissions and fuel consumption- Inmetro's Center for Automotive Technology**

**Romeu Daroda  
and  
Humberto S. Brandi**



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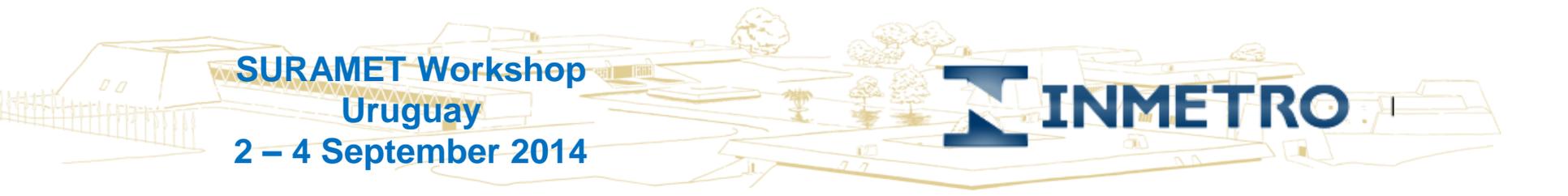
## Encuesta de IBOPE 2013

**81%**

de la población  
conoces Inmetro

**88%**

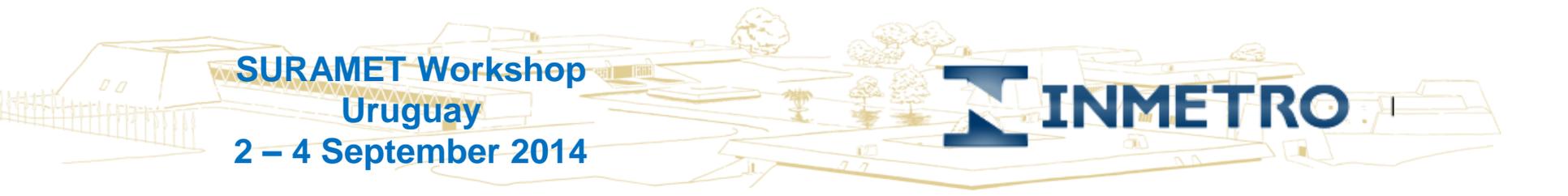
de los que conocen  
Inmetro, confían



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# INMETRO'S Energy Efficiency Programs



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# Smart Grids

## Brazilian Program



## Traceability of PMU

## Dynamic Monitoring of Electric Grids

## Security Protocols

## Colaboration- NIST, PTB

## The Brazilian System for More Efficient Products

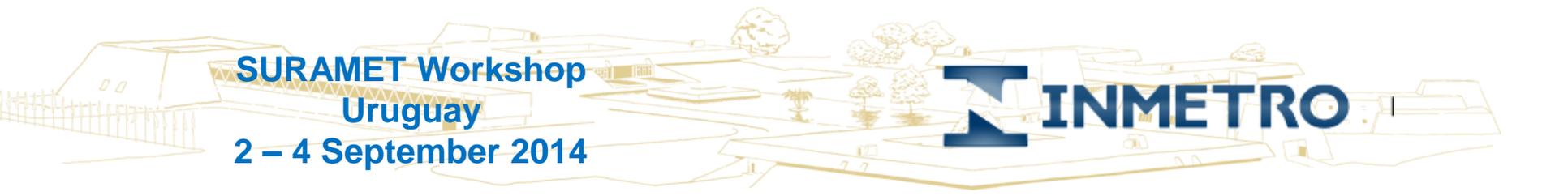
Endorsement seals (Procel / Conpet)



Accredited laboratories  
Accredited certification bodies

Minimum Energy Performance Standards  
(Energy Efficiency Level and Indicators  
Management Committee)





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**29 schemes**

**21 mandatory**

**12 more in the next 2**  
**years**

**Demands are**  
**increasing in number**  
**and complexity**

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In Brazil, 78% of  
the consumers  
take the  
labeling into  
consideration  
when buying  
products

**INMETRO**  
**ENERGIA**  
CONDICIONADOR DE AR  
Fabricante  
Marca  
Modelo

220 volts  
30mil BTU

Mais eficiente

A B C D E

Menos eficiente

Com base nos resultados do ciclo normalizado pelo Inmetro, de 1 hora por dia por mês

**XYZ**  
kWh/mês

PROCEL  
PROGRAMA BRASILEIRO DE ETIQUETAGEM

Segurança Desempenho  
Nº Registro  
000 000/Ano

Instruções de instalação e recomendações de uso, leia o Manual do aparelho

2012/XYZ

In the last 10 years, the average refrigerator      In the same period, it saved

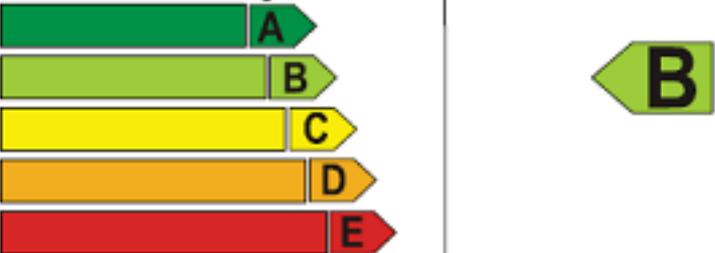
70%  
more efficient.

US\$ 2,3 billions  
on energy bills.

And more efficient lighting saved

us\$ 11,5 billions.

# INNOVATE AUTO

<b>Energia ( Combustível )</b>		<b>2013</b> Ano de aplicação
Categoria do veículo	Compacto	
Marca	<b>(Nome/Logo)</b>	
Modelo	Samba Flex	
Versão	LXP ou nome	
Motor	XYZ	
Transmissão	Manual 5 Velocidades	
Menor consumo na categoria		
		
		
		
		
Maior consumo na categoria		
		
<b>Quilometragem por litro e CO<sub>2</sub></b>	<b>Etanol</b>	<b>Gasolina</b>
Cidade ( km/l )	<b>6,9</b>	<b>9,8</b>
Estrada ( km/l )	<b>8,1</b>	<b>11,3</b>
CO <sub>2</sub> fóssil não renovável ( g/km )	<b>0</b>	<b>145</b>
	Etiqueta Nacional de Conservação de Energia, de acordo com o Regulamento de Avaliação de Conformidade para Veículos Leves de Passageiros e Comerciais Leves, com Motores do Ciclo Otto.	
	ESTA ETIQUETA NÃO PODE SER REMOVIDA ANTES DA VENDA DO VEÍCULO	
<b>conpet</b>	<b>IMPORTANTE:</b>	
* Valores medidos em condições padrão de laboratório (NBR-7024) e ajustados para similares condições mais comuns de utilização. O consumo percebido pelo motorista poderá variar para mais ou para menos, dependendo das condições de uso. Para saber por que, consulte <a href="http://www.inmetro.gov.br">www.inmetro.gov.br</a> e <a href="http://www.conpet.gov.br">www.conpet.gov.br</a>		
Instruções e recomendações de uso, leia o Manual do Proprietário		

## Adhesion to inmetro Tagging System

YEAR	% CONFORMITY
2013	25
2014	40
2015	60
2016	80
2017	100

## The Production Steps to Achieve the Benefits

According to the government determinations, to apply for this regime car producers must perform six out of the twelve steps physically in Brazil, for at 80% of the production:

stamping

welding

anti-corrosion treatment and painting

plastic injection

engine manufacture

gearbox and transmitting manufacture

assembly of steering and suspension systems

assembly of electric system

assembly of brakes and axles systems

chassis or monoblock manufacture

assembly, final revision and tests

self-infrastructure of labs to the development and test of products.

Between 2014 and 2015, the number of steps that must be carried out in Brazil by car producers will increase to seven, and in 2016 and 2017 to eight.

## Global Auto Sales-2013 (Millions units)

**China- 17.7**

**USA-15.6**

**Japan- 5.2**

**Brazil- 3.7**

**Germany- 3.1**

**Russia- 2.8**

**India- 2.6**

**UK- 2.4**

- **Statistical Yearbook of Traffic Accidents - Brazil - RENAEST - 2008 reported the occurrence of:**

653.827 accidents with victims

Accidents are caused primarily by three main participants:

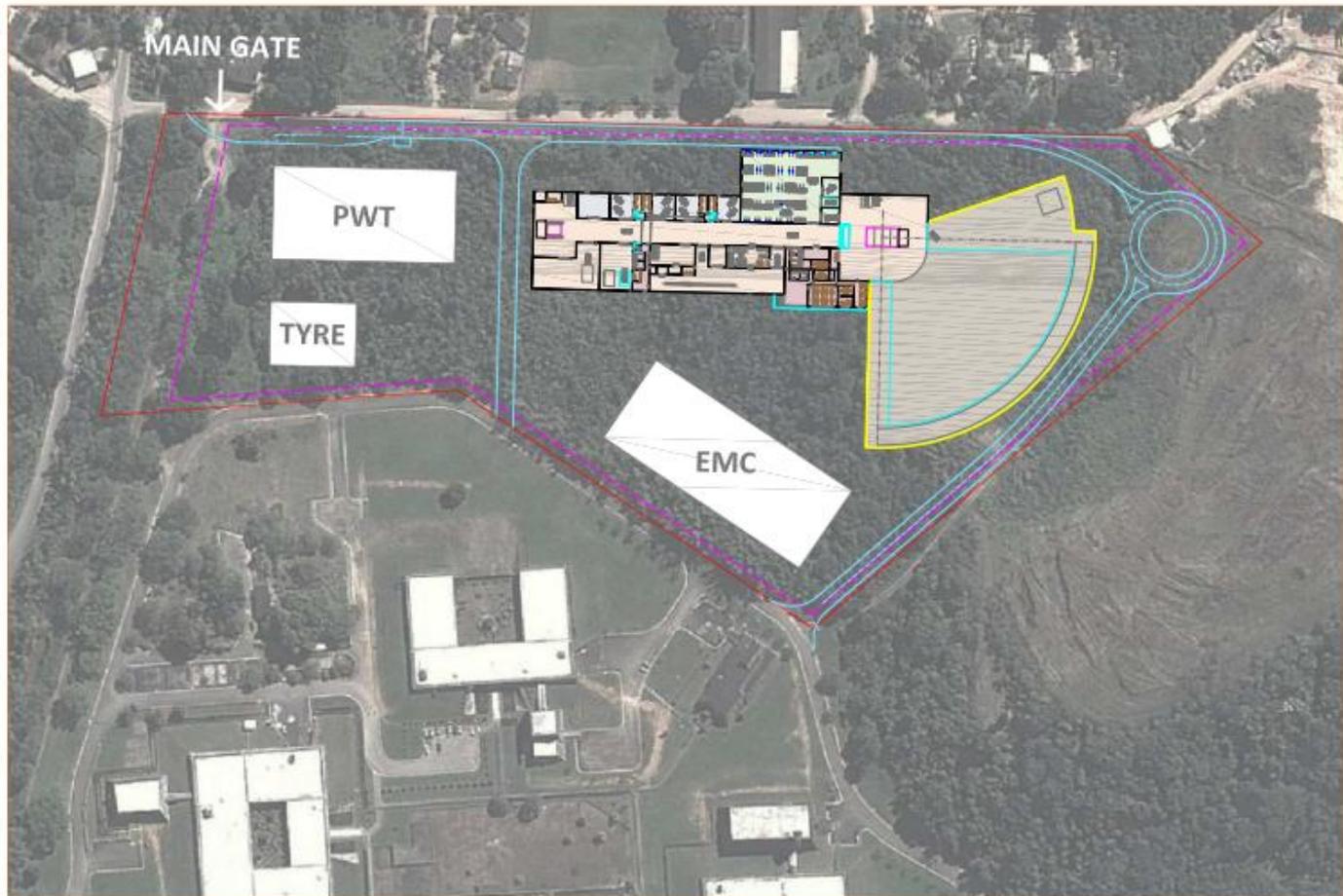
Driver  
Vehicle  
Road

The Center for Automotive Technology - Inmetro focuses on vehicle.

## **Structure of the Center for Automotive Technology**

- **Laboratory of Vehicle Passive Safety**
- **Laboratory of Emissions and Energy Efficiency**
- **Laboratory of Active Safety – test trak**
- **Laboratory for tires testing.**
- **Laboratory of Electromagnetic Compatibility**
- **Laboratory Network for Development and Testing of Autoparts.**

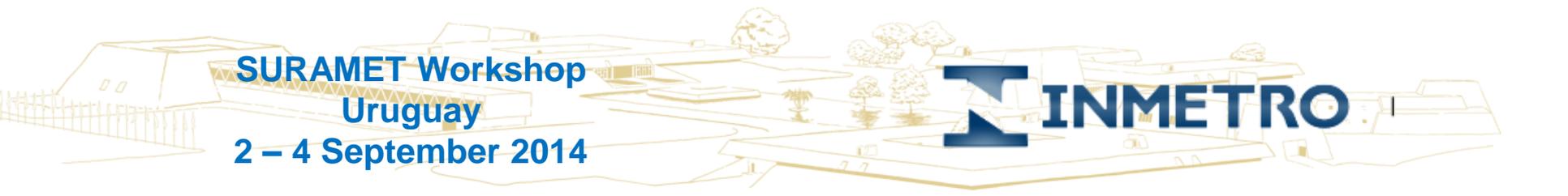
## Location of the center in the campus of Inmetro



## **Laboratory Vehicle Safety**

### **OBJECTIVE**

- **Research and Development.**
- **Tests requested by the National Department of Transit**
- **Support for the Automotive Industry promoting competitiveness and innovation.**
- **Market surveillance.**
- **Testing new materials.**



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The laboratory of passive vehicle safety :  
area of 26,000 square meters

## Tests to be performed:

> Frontal collision in rigid barrier



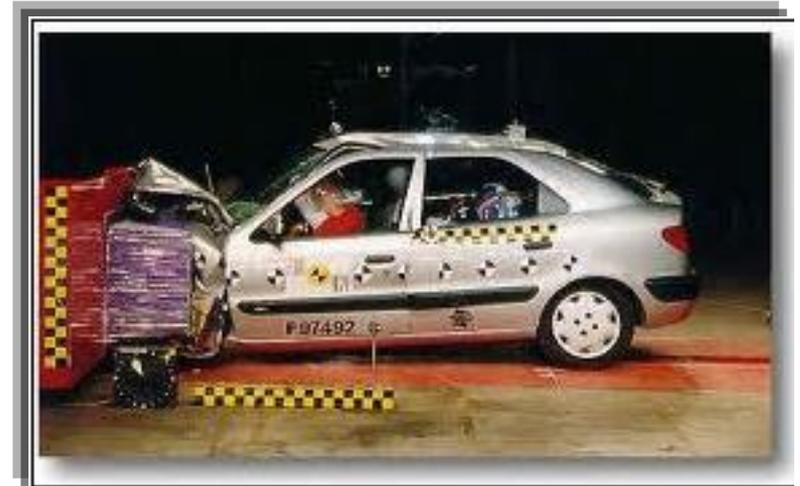
> Frontal collision in deformable barrier



**> frontal collision**  
**Car to car**



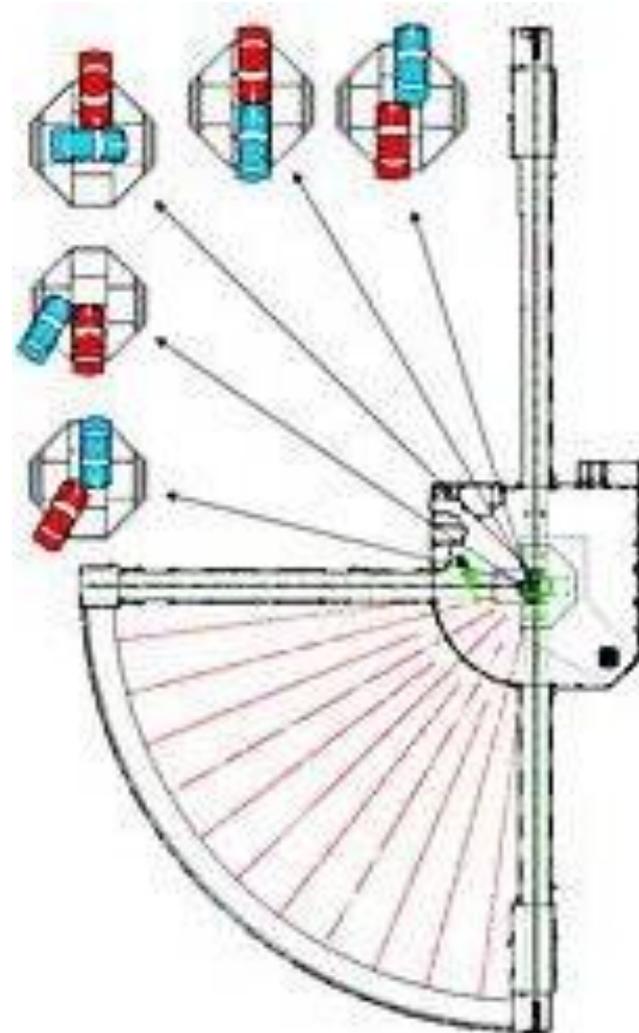
**> Partial collision in**  
**deformable barrier**



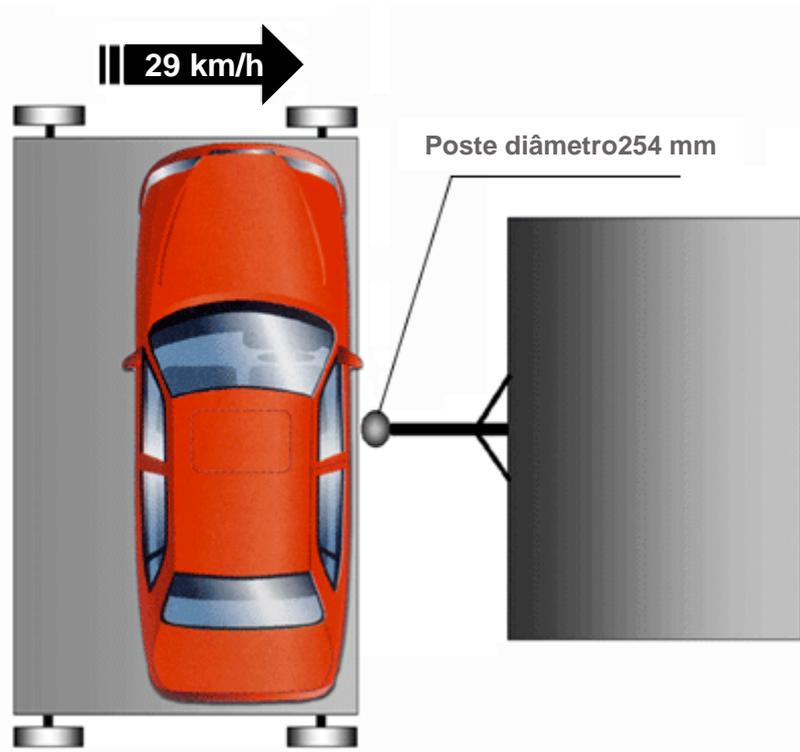
> Side collision



## > Angular collision(car to car)



## > Collision pole (tree)



## > Rollover



Longitudinal type (corkscrew)



Lateral

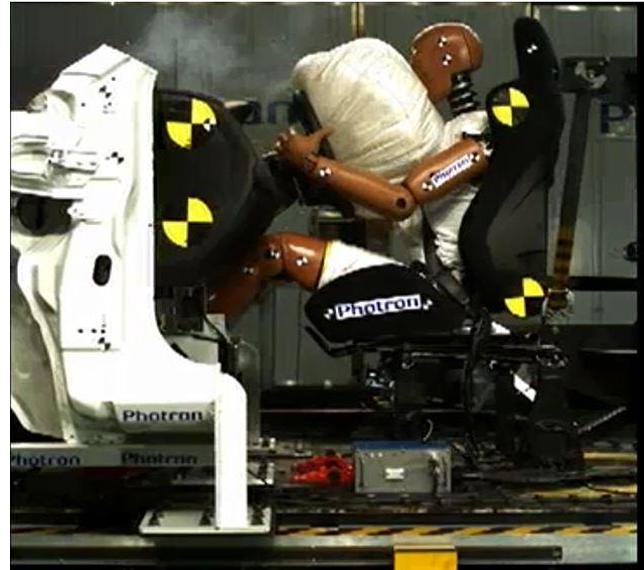


**Static test  
checking for leaks (pós-crash)**

## > Rear-end collision



## Sled Test ( “crash” simulation)



- **Retention**
  - Seats and belts.
- **Performance of the occupant restraint system**
- **Child seat**

## > Static testing of components



**Ceiling deformation(structural evaluation)**



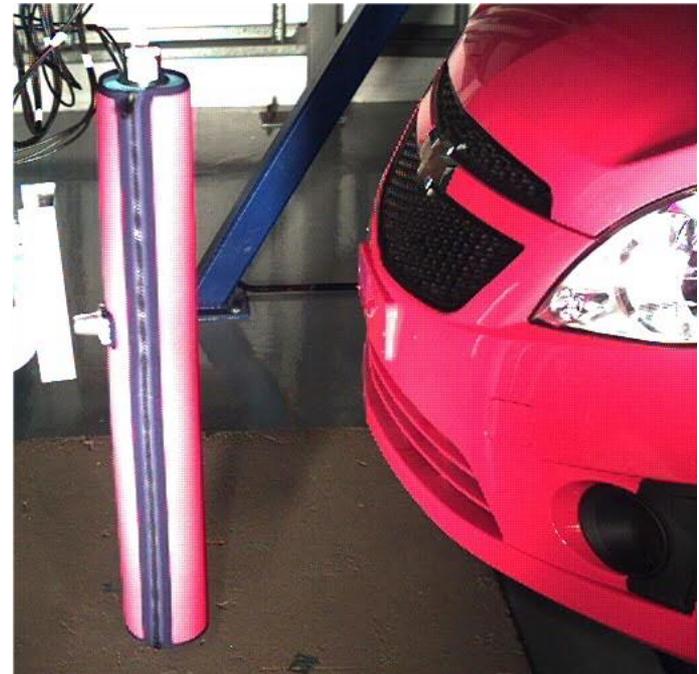
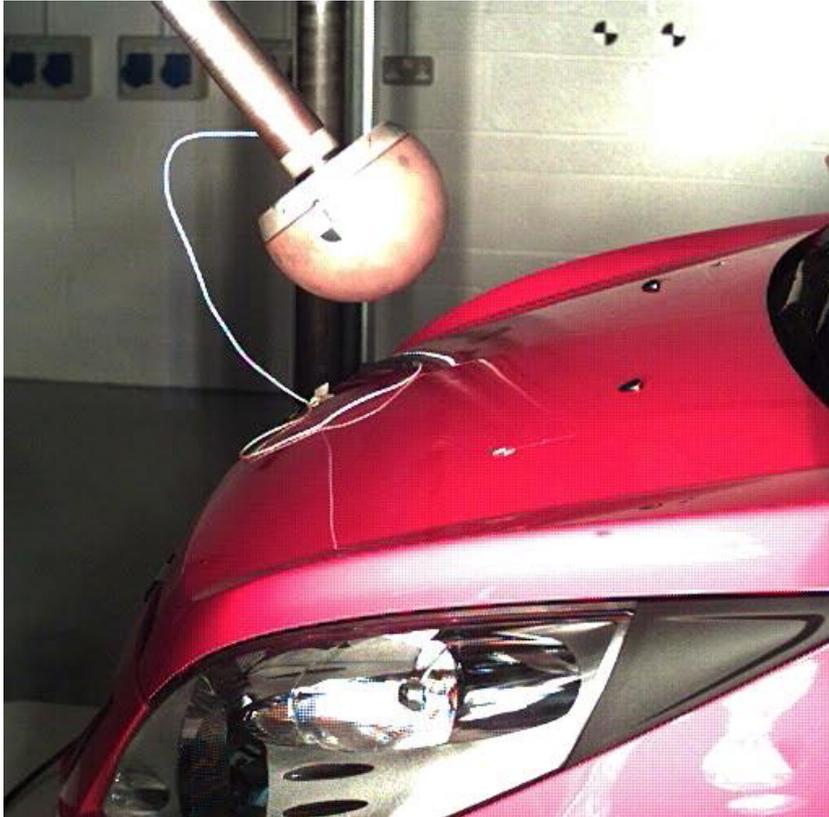
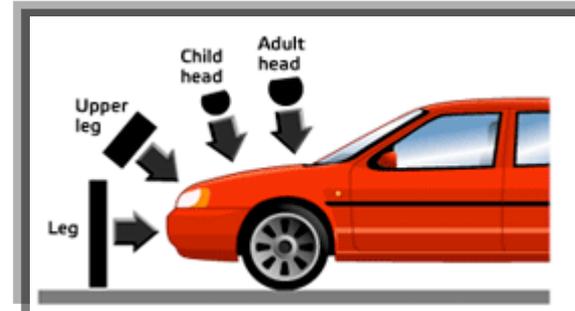
**Pendulum for Impact bumpers**

**Airbag evaluation**



**Structures and finishes inside  
the vehicle**

## Collision pedestrian (pedestrian protection)



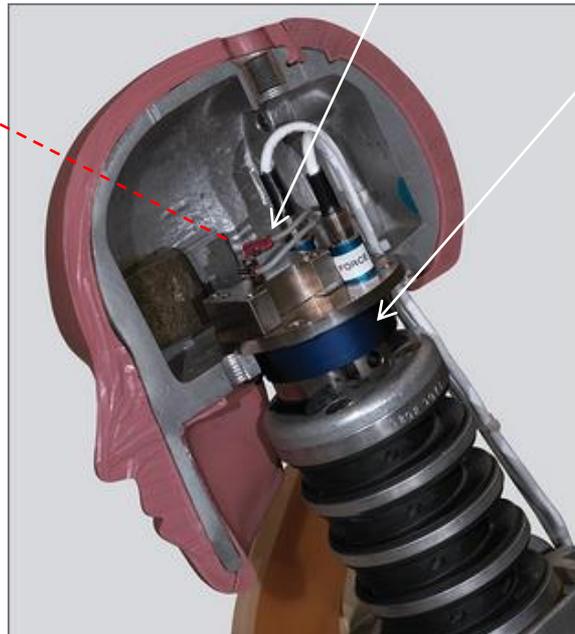
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## > Laboratory for calibration of sensors



\* Head Accelerometers



\* Load cell  
Neck, femur



\* ISO 6487: Transducers calibrated every 12 months

## > Measurement Systems



Data Acquisition  
embedded (Hi-G)

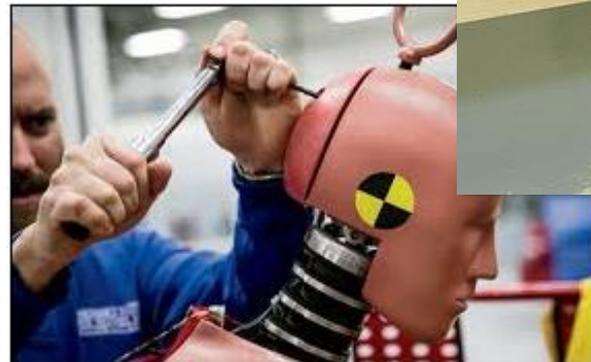
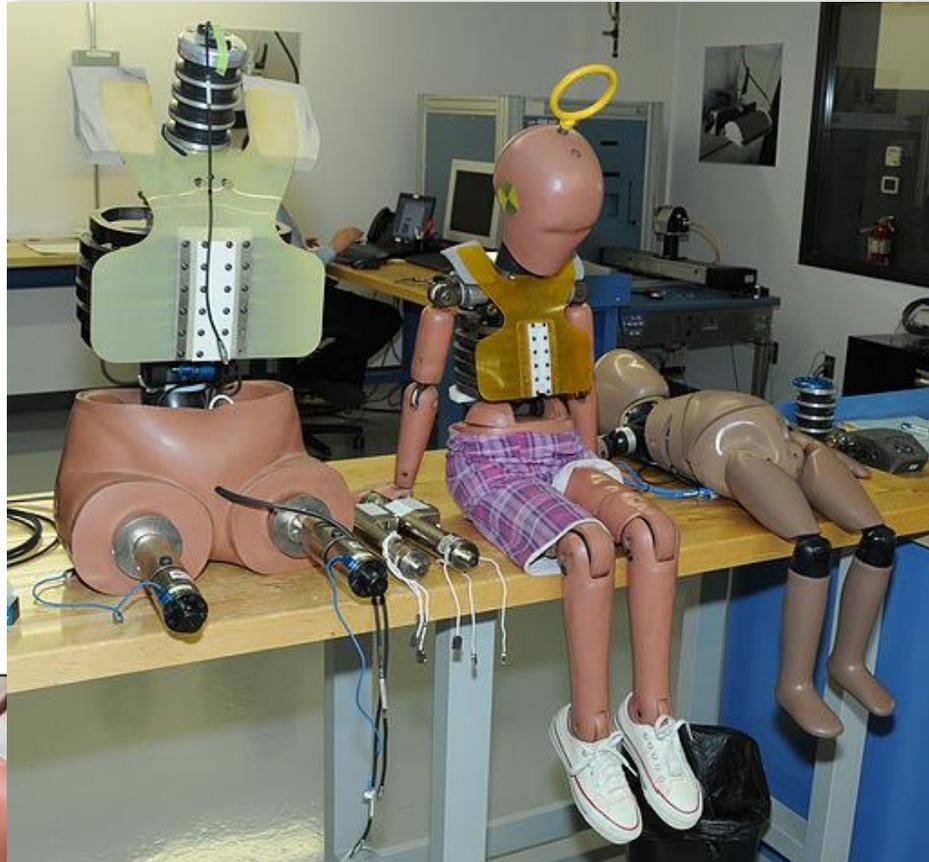


High Speed Cameras  
15000 FPS



Instrumentation “In Dummy”

## Laboratory for preparation of Dummies



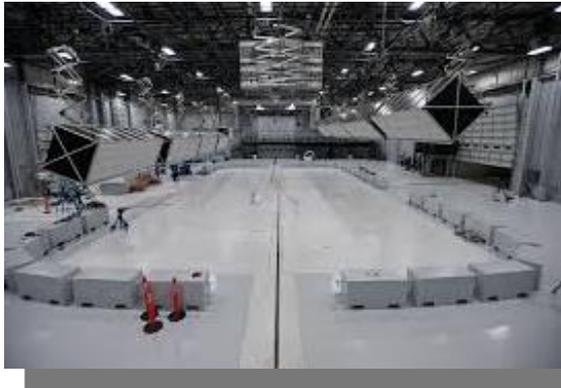
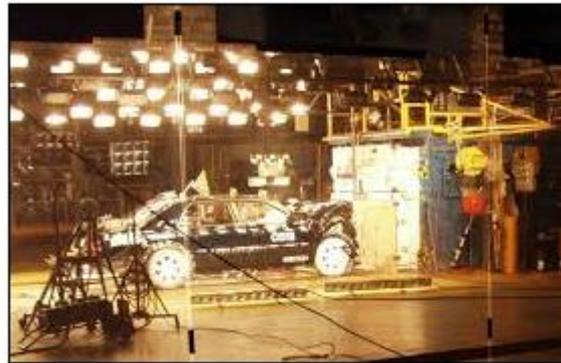
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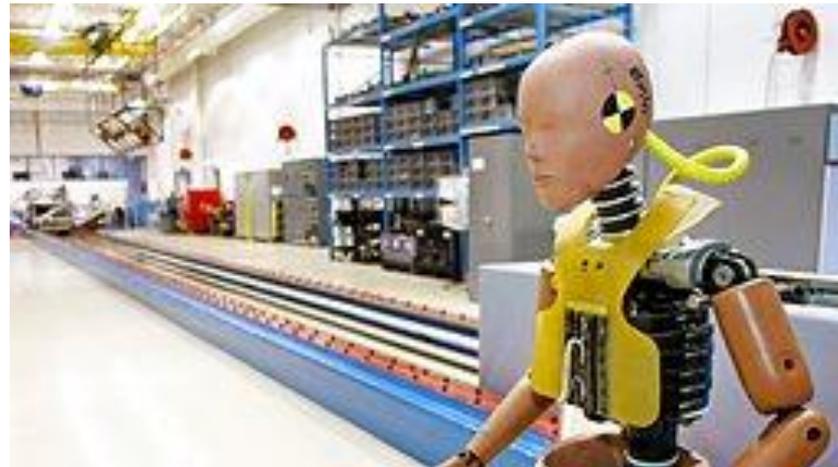
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## View the entire Lab. Vehicular Safety



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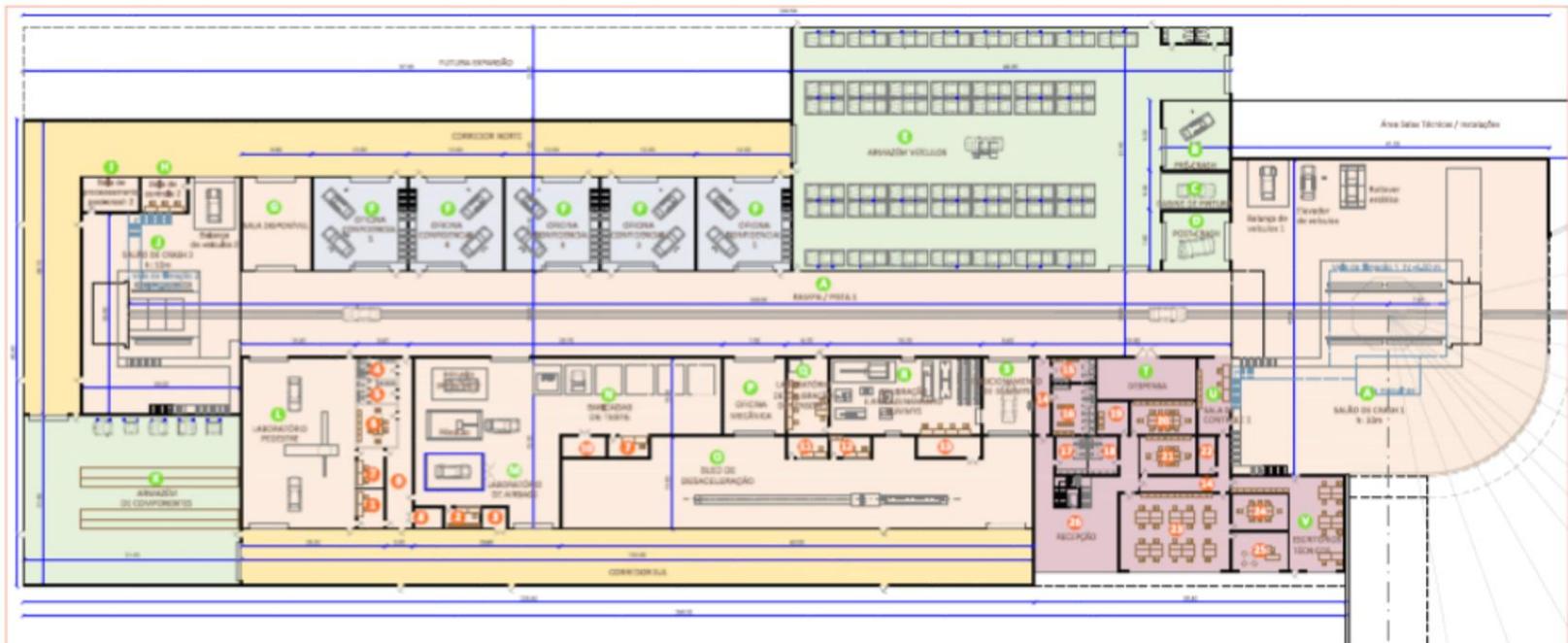


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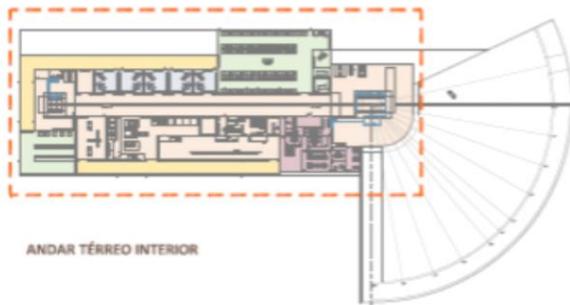


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**ANDAR TÉRREO INTERIOR**



**ANDAR TÉRREO INTERIOR**

**Descrição das salas principais**

- 1 SALÃO DE CRASH 1
- 2 PRÉ CRASH
- 3 CABINE DE PINTURA
- 4 POST-CRASH
- 5 ARMAZÉM VEÍCULOS
- 6 OFICINA CONFIDENCIAL
- 7 SALA DISPONÍVEL
- 8 SALA DE CONTROLE 2
- 9 SALA DE PROCESSAMENTO POST-CRASH 2
- 10 SALÃO DE CRASH 2
- 11 ARMAZÉM DE COMPONENTES

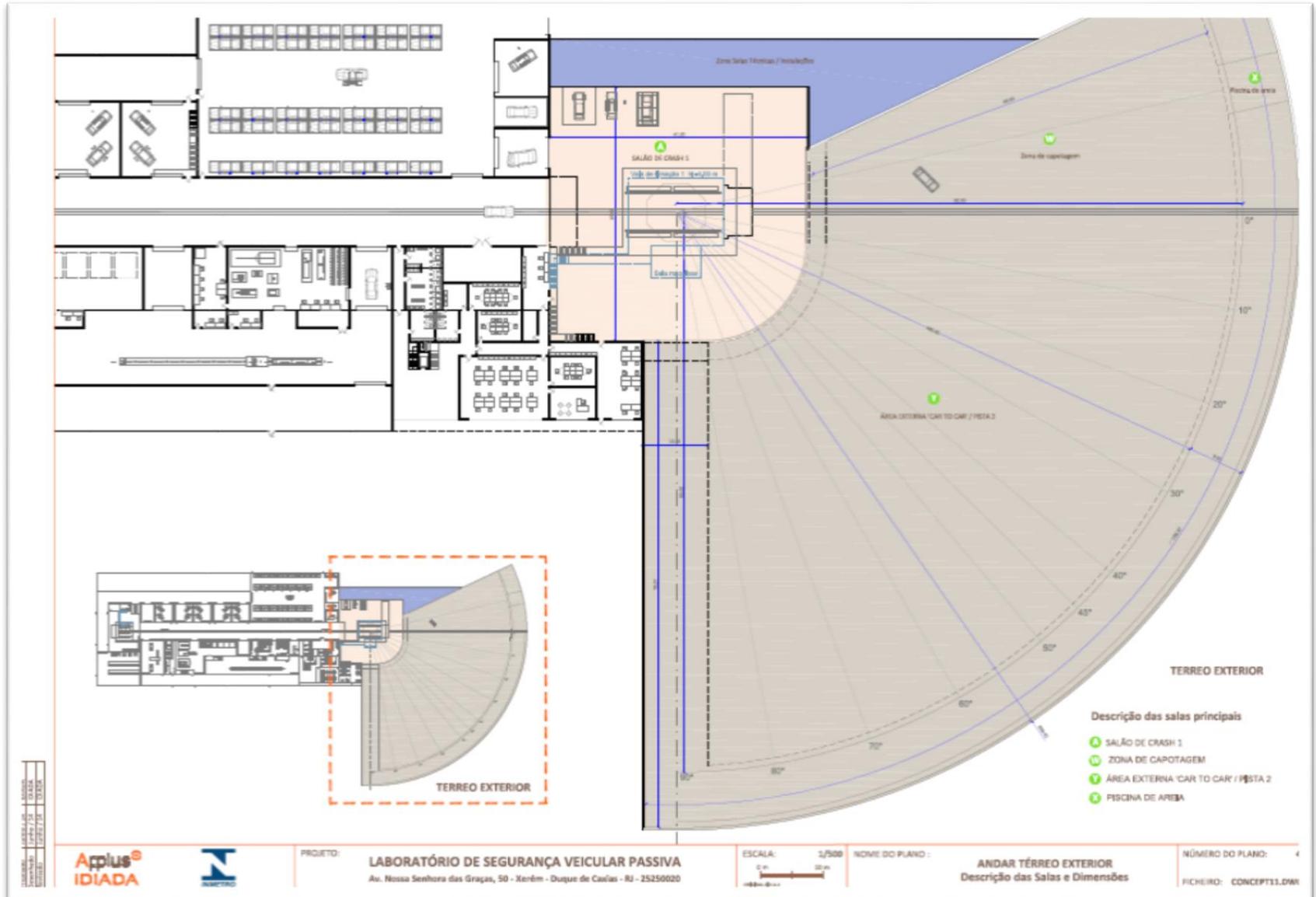
- 12 LABORATÓRIO PEDESTRE
- 13 LABORATÓRIO DE AIRBAGS
- 14 BANCADAS DE TESTE
- 15 SLED DE DESACELERAÇÃO
- 16 OFICINA MECÂNICA
- 17 LABORATÓRIO DE CALIBRAÇÃO DE SENSORES
- 18 CALIBRAÇÃO E ARMAZENAMENTO DUMMYS
- 19 POSICIONAMENTO DE DUMMYS
- 20 DESPENSA
- 21 SALA DE CONTROLE 1
- 22 ESCRITÓRIOS TÉCNICOS

**Descrição das outras salas**

- 23 Sala do cliente
- 24 Sala de controle
- 25 Despensa
- 26 Banheiros Senhores
- 27 Banheiros Senhoras
- 28 Sala de reuniões
- 29 Sala de controle
- 30 Sala de servidores 2
- 31 Hall de distribuição
- 32 Despensa
- 33 Sala do cliente
- 34 Sala de controle
- 35 Despensa
- 36 Áreas de distribuição
- 37 Vestiários senhoras
- 38 Vestiários homens
- 39 Banheiros senhoras
- 40 Banheiros Senhores
- 41 Sala de servidores 1
- 42 Sala de controle
- 43 Sala de reuniões 2
- 44 Despensa 1
- 45 Área principal de escritórios
- 46 Escritório do gerente
- 47 Sala de reuniões
- 48 Recepção

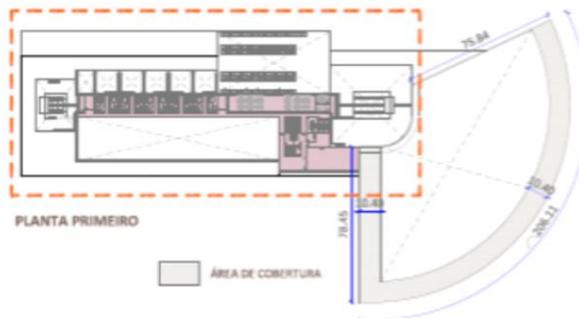
ESCALA: 1/500  
NOME DO PLANO: ANDAR TÉRREO INTERIOR  
NÚMERO DO PLANO: 3  
FICHEIRO: CONCEPT11.DWG

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PLANTA PRIMEIRO



PLANTA PRIMEIRO

ÁREA DE COBERTURA

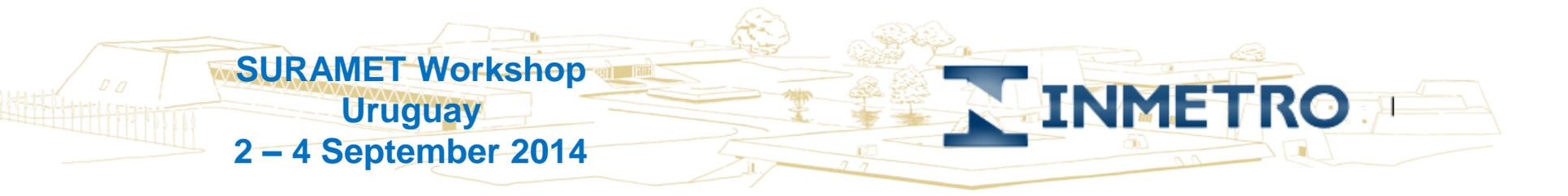
Descrição das salas principais

- 10. ESCRITÓRIO 1 (OFICINA CONFIDENCIAL 1)
- 11. ESCRITÓRIO 2 (OFICINA CONFIDENCIAL 1)
- 12. ESCRITÓRIO 3 (OFICINA CONFIDENCIAL 2)
- 13. ESCRITÓRIO 4 (OFICINA CONFIDENCIAL 2)
- 14. ESCRITÓRIO 5 (OFICINA CONFIDENCIAL 3)
- 15. ESCRITÓRIO 6 (OFICINA CONFIDENCIAL 3)
- 16. ESCRITÓRIO 7 (OFICINA CONFIDENCIAL 4)
- 17. ESCRITÓRIO 8 (OFICINA CONFIDENCIAL 4)
- 18. ESCRITÓRIO 9 (OFICINA CONFIDENCIAL 5)
- 19. ESCRITÓRIO 10 (OFICINA CONFIDENCIAL 5)

Descrição das outras salas

- 20. Banheiros Senhores
- 21. Banheiros Senhoras
- 22. Sala polivalente
- 23. Sala auxiliar
- 24. Despensa 2
- 25. Sala de reuniões 1
- 26. Sala de reuniões 2
- 27. Arquivo
- 28. Sala de observação do cliente 1
- 29. Área de distribuição
- 30. Escritórios de futura expansão
- 31. Despensa 3
- 32. Corredor
- 33. Despensa 4
- 34. Sala de observação do cliente 2
- 35. Despensa 1

ESCALA: 1/500  
 DATA: 14/09/14  
 PROJETO: 14/09/14



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**Laboratory of emissions and energy  
efficiency**

**The Lab will conduct emissions testing according to Brazilian Standards (NBR) and Brazilian Association of Technical Standards (ABNT), Economic Commission for Europe (ECE), and U.S. Environmental Protection Agency (EPA) regulatory requirements, including:**

**Vehicle Air Pollution Control Program (PROCONVE/PROMOT)**

- Determination of hydrocarbon, carbon monoxide, nitrogen oxide, carbon dioxide and particulate material in exhaust gas (NBR6601)**
- Fuel consumption measurement (NBR7024)**
- Measurement of carbon monoxide in exhaust gas operating at idle (NBR10972)**
- Evaporative emissions measurement (NBR11481)**
- Determination of aldehydes and ketones in exhaust gas (NBR12026)**
- Determination of unburned ethanol in exhaust gas (NBR15598)**
- European regulatory schedules (Directive 70/220/EEC)**
- European regulatory schedules for motorcycles (Directive 97/24/EC)**
- Determination of hydrocarbon during vehicle refueling, On-board Refueling Vapor Recovery (ORVR) Testing**
- Custom tailored testing and development**

## The Vehicle Emissions and Energy Efficiency Laboratory

One vehicle emissions test sites for measuring tailpipe emissions and fuel consumption in passenger vehicle (4-wheel) and motorcycle (2-wheel) programs:

- Single roll, 48 inch chassis dynamometer

- Temperature and humidity control

- Exhaust emissions measurement testing for engine management systems and component development, including post-engine and post-converter (modal end bag)

- Drivability verification tests

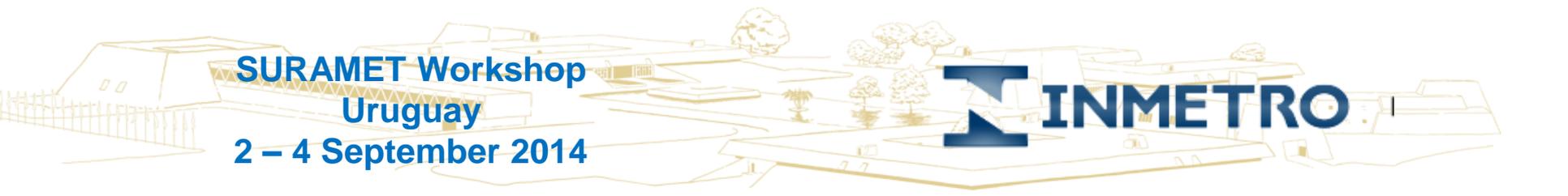
- Type approval/certification

- Bench dynamometer for heavy duty engine

Climatic chambers for cold and hot start assessment:

- Temperature range -30° C to 80° C

- Chassis dynamometer:



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## **Multiple fuel capabilities:**

**Gasoline**

**Alcohol (up to 100% ethanol)**

**Gaseous fuel**

**Diesel**

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**Chassis dynamometer**

**Chamber for different  
climatic conditions**

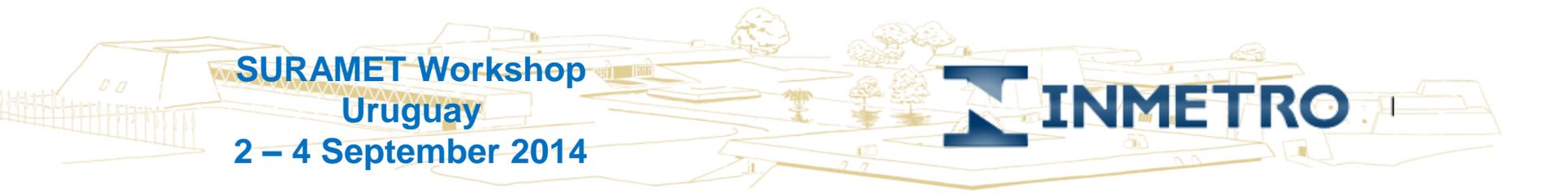




Laboratory for  
emissions test e fuel  
consumption

## Vapor recovery





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## **Active Vehicle Safety**

## Track for fatigue test



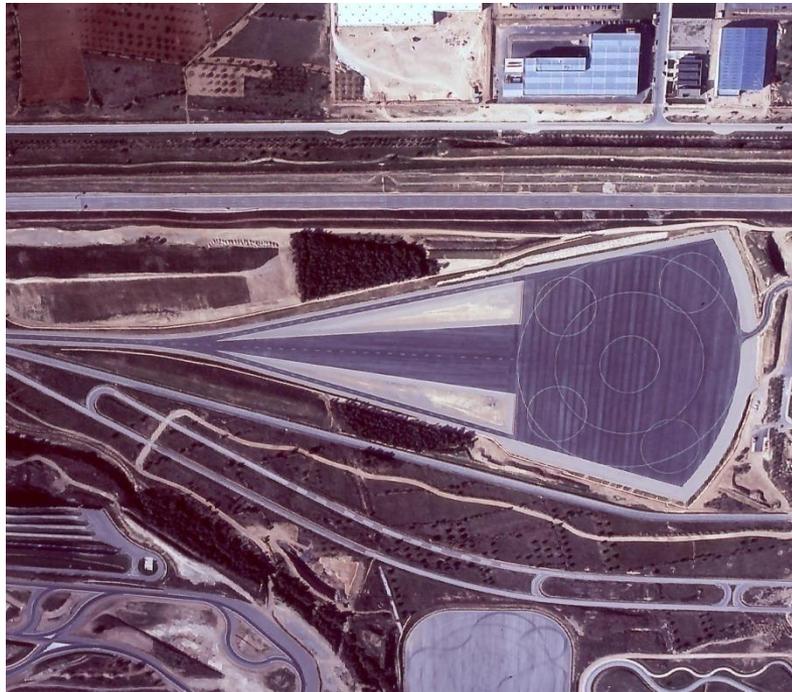
## Traks for braking tests



## Track for noise test



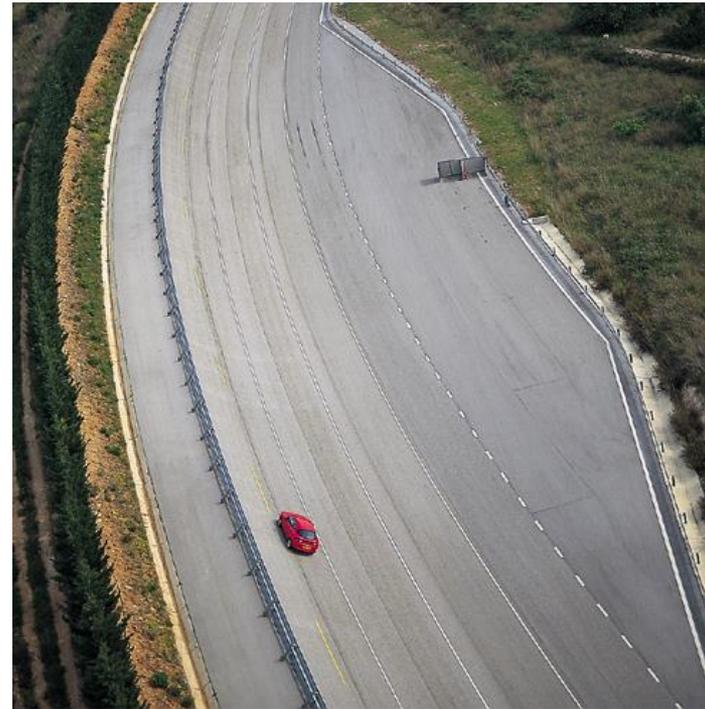
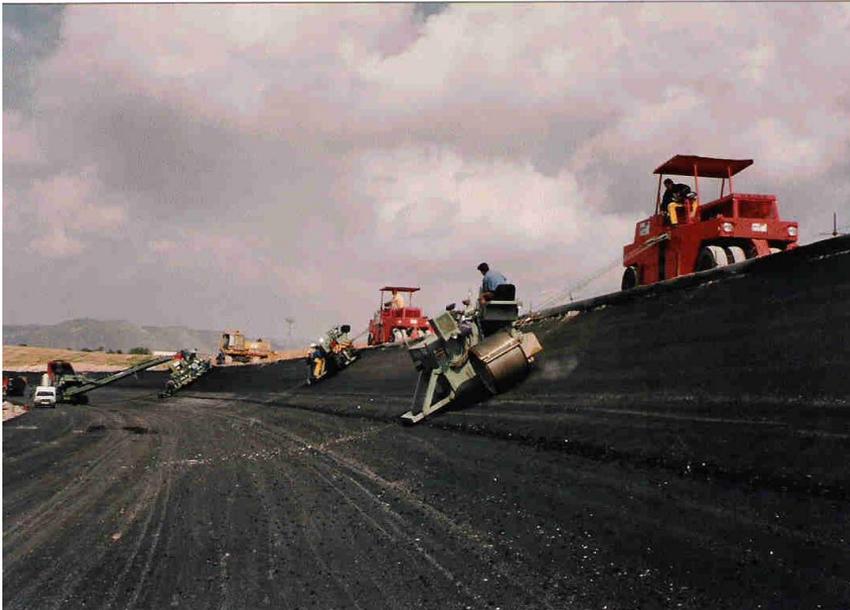
## Platform for dynamic test



## Test in wet trak



## **Fast lane (durability/drivability)**



## General arrangement of tracks





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**Obrigado !**