

EXPO Milano 2015

Safety of tractors and agricultural machinery

23 settembre 2015



EVOLUTION OF OCSE/OECD TRACTOR PROTOCOLS

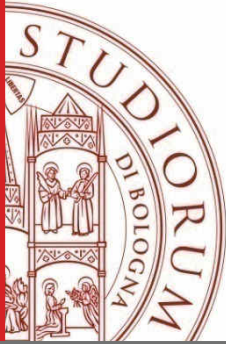
Valda Rondelli

*Dipartimento di Scienze e Tecnologie Agro–alimentari
Università di Bologna*

Evolution of OECD Tractor Codes

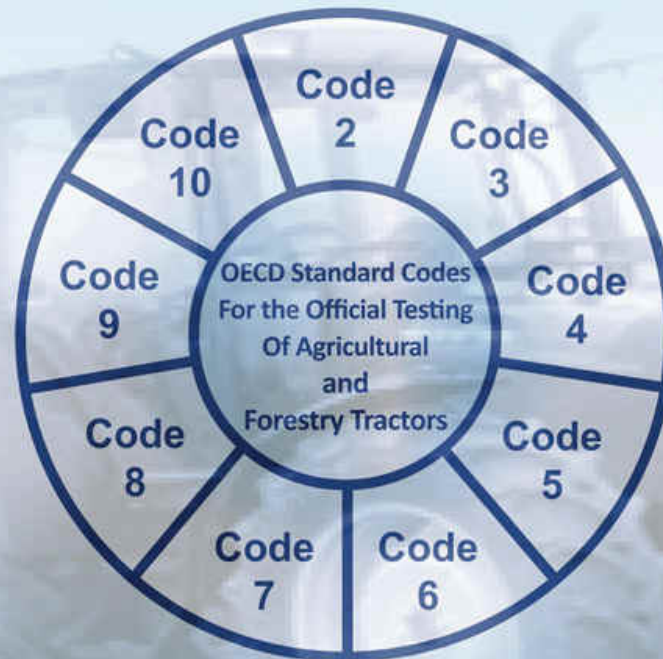
Outline of the presentation:

- What are the OECD Tractor Codes?
- What is the OECD certification system?
- What is the evolution of the OECD Tractor Codes with respect to tractor evolution in design and use?



2015

THE OECD TRACTOR CODES



Code 2:
the performance of tractors

Code 4:
the strength of protective structures for standard tractors (Static Test)

Code 8:
the strength of protective structures on tracklaying tractors

Code 9:
the strength of protective structures for telehandlers

Code 10:
the strength of falling object protective structures for agricultural and forestry tractors

Code 3:
the strength of protective structures for standard tractors (Dynamic Test)

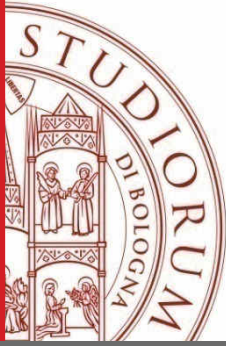
Code 5:
noise measurement at the driver's position(s)

Code 6:
the strength of the front-mounted roll-over protective structures on narrow-track wheeled agricultural and forestry tractors

Code 7:
the strength of the rear-mounted roll-over protective structures on narrow-track wheeled agricultural and forestry tractors



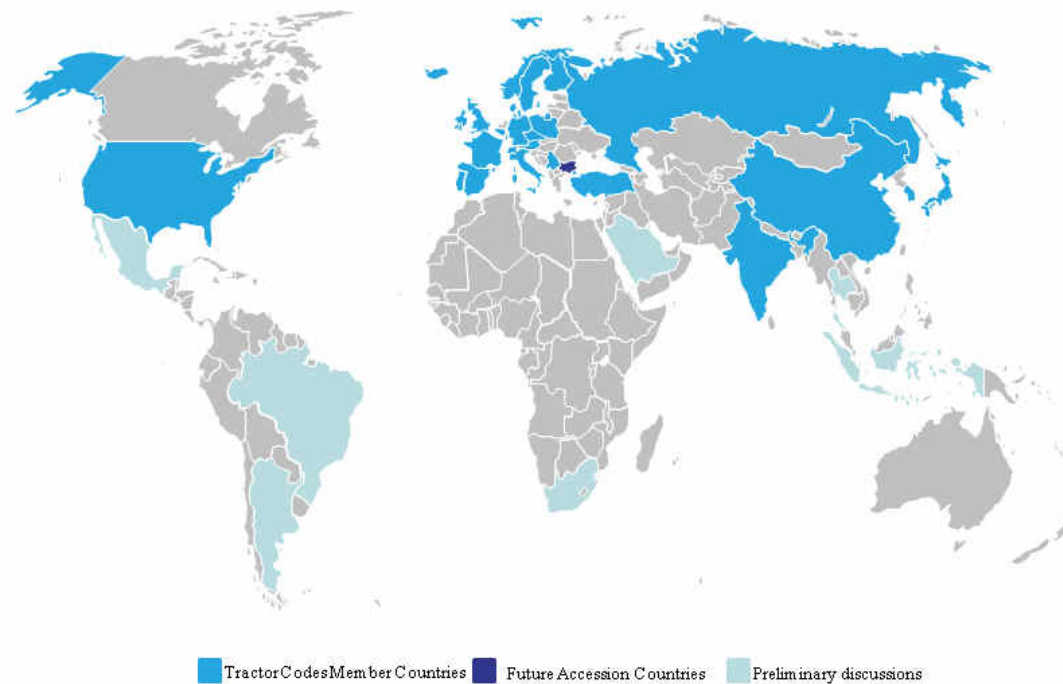
www.oecd.org/tad/tractor

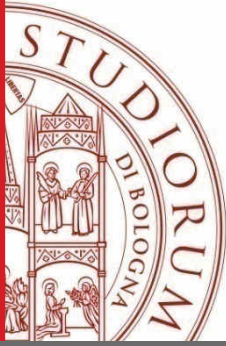


Countries Participating in the OECD Tractor Codes

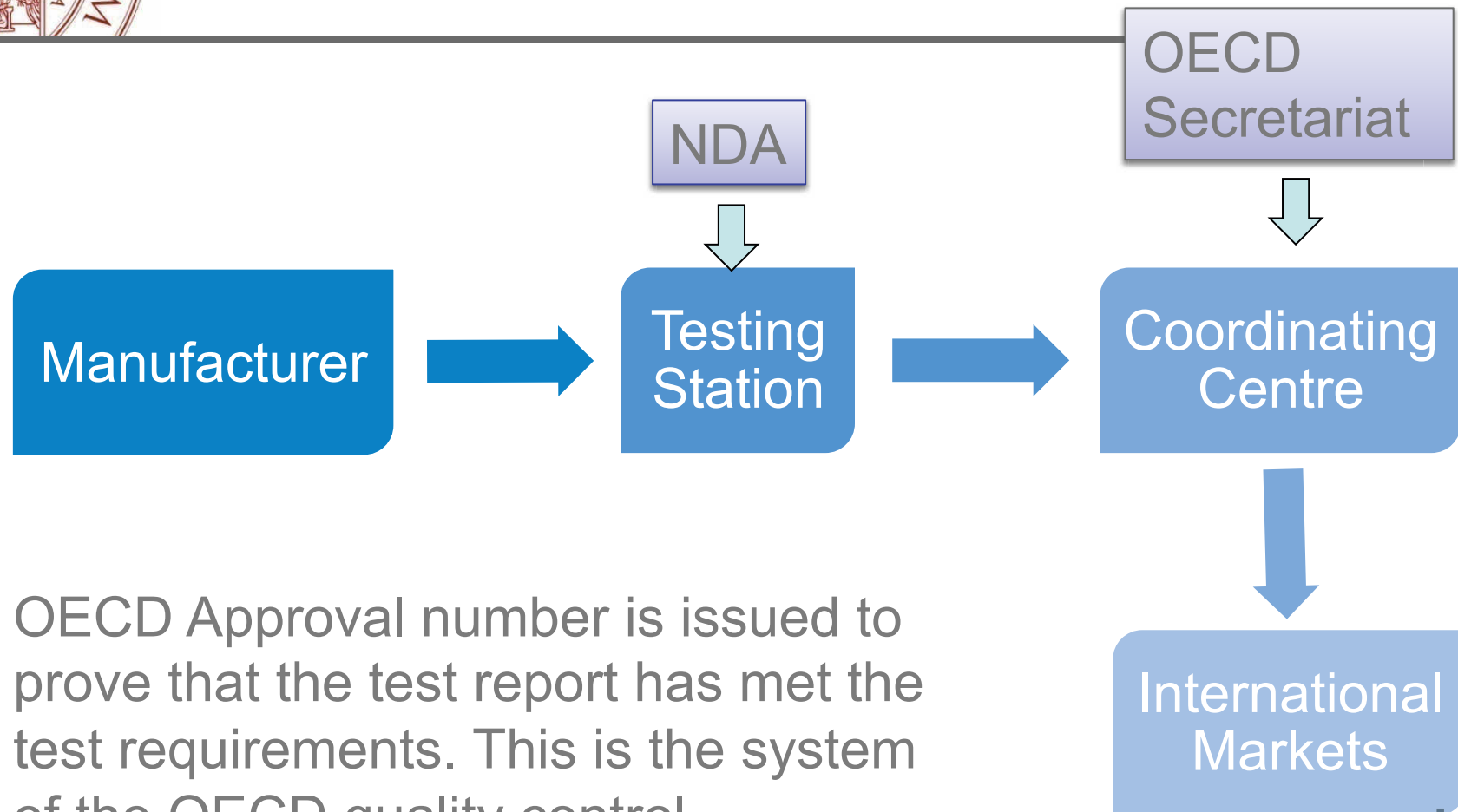
2015

26 countries in the world implement the tractor codes, 22 are OECD members and 4 non-OECD economies (China, India, Serbia and Russia)

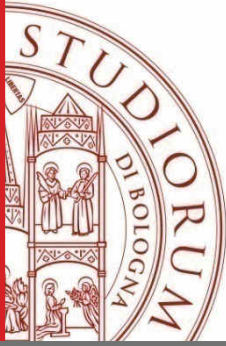




The OECD system



OECD Approval number is issued to prove that the test report has met the test requirements. This is the system of the OECD quality control.

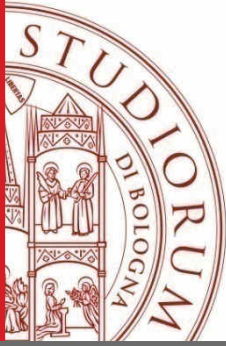


4 OECD Testing Stations in Italy

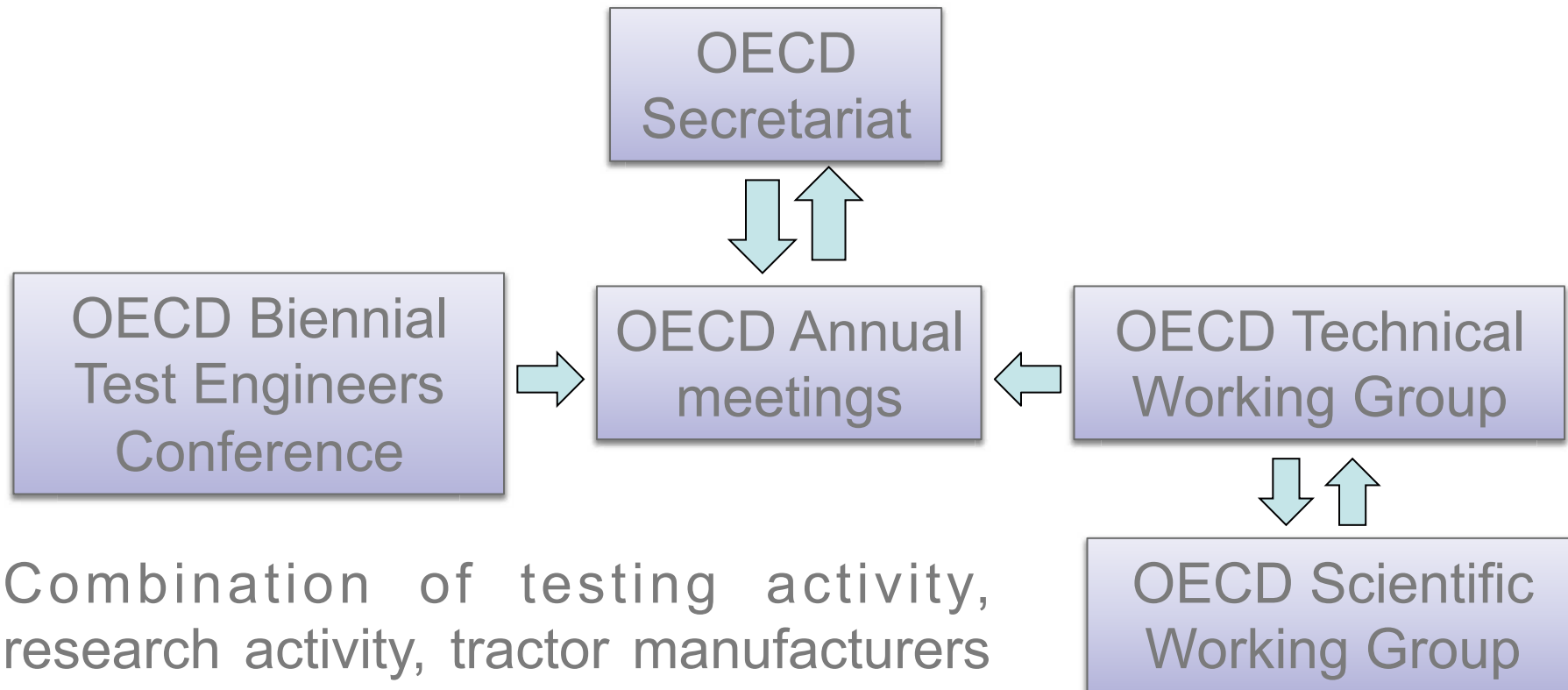
- ✓ OECD Test Station –
(Laboratorio di Meccanica Agraria) – Università di Bologna
- ✓ OECD Test Station –
Università di Milano
- ✓ OECD Test Station –
CNR IMAMOTER (Torino)
- ✓ OECD Test Station -
CREA-ING Teviglio



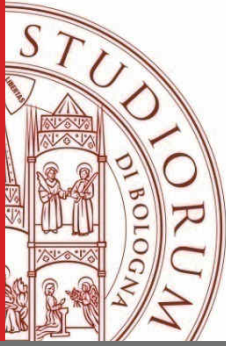
OECD Coordinating Centre: ENAMA (Italy- Rome)



Updating of the OECD Codes



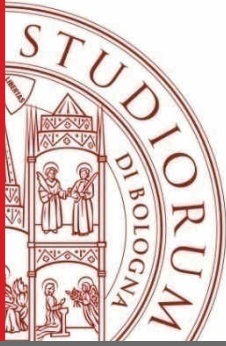
Combination of testing activity, research activity, tractor manufacturers experience, tractor rollover accidents evaluation.



The first OECD tested tractor McCormick International b-450



OCSE/OECD code for tractor performance - April 1959



ROPS CODES

Since 1930 tractors have been considered at risk of rollover. Moberg in Sweden proposed to protect the driver introducing a ROPS on the tractor so as to provide a clearance zone for the operator during the rollover accident. ROPS was not expected to prevent all deaths but it was conceived to minimise the rollover effects in the normal operation of the vehicle.

- ✓ 1967 – OECD CODE 3 – dynamic procedure for official ROPS tests
- ✓ 1983 – OECD CODE 4 – static procedure for official ROPS tests
- ✓ 1990 – OECD CODES 6 and 7 – procedure for official ROPS tests on narrow-track tractors
- ✓ 1992 – OECD CODES 8– procedure for official ROPS tests on tracklaying tractors

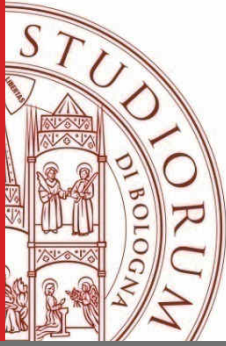


OFFICIAL ROPS TESTS DYNAMIC PROCEDURE (1967)



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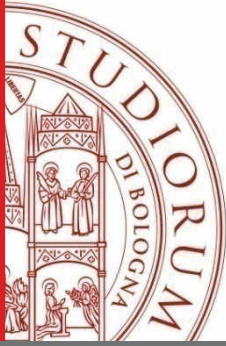


OFFICIAL ROPS TESTS: STATIC PROCEDURE (1983)

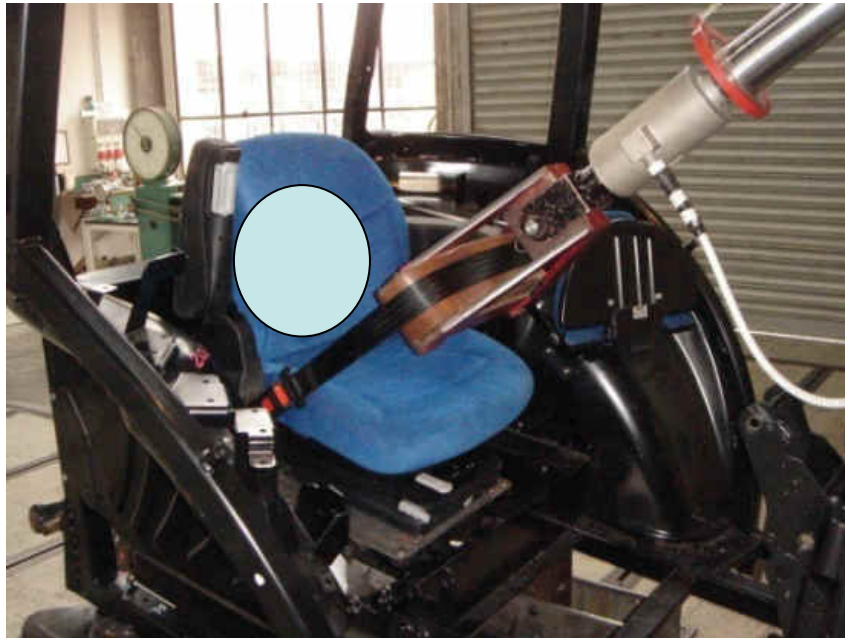


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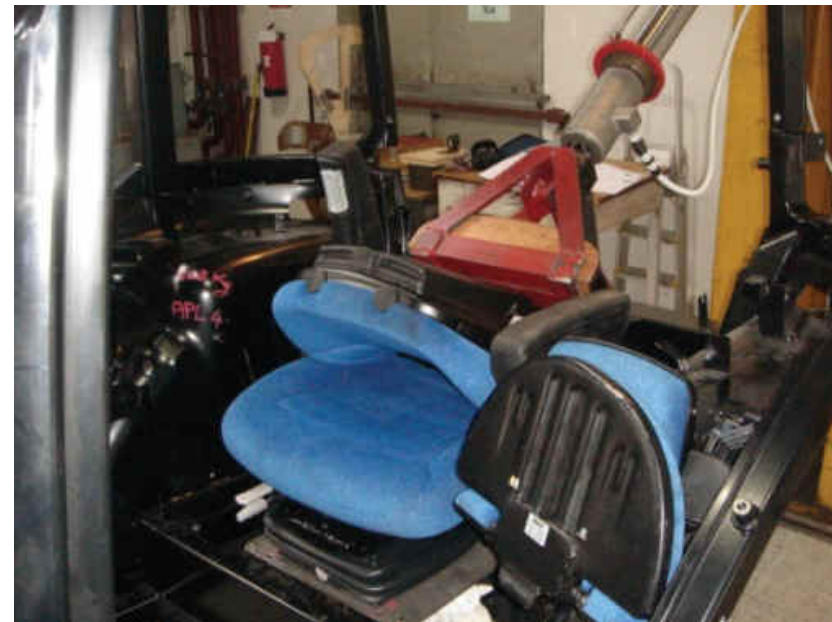


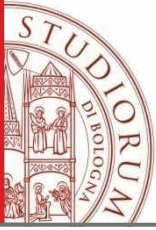
ROPS CODES: seat belt anchorage test



Forward loading

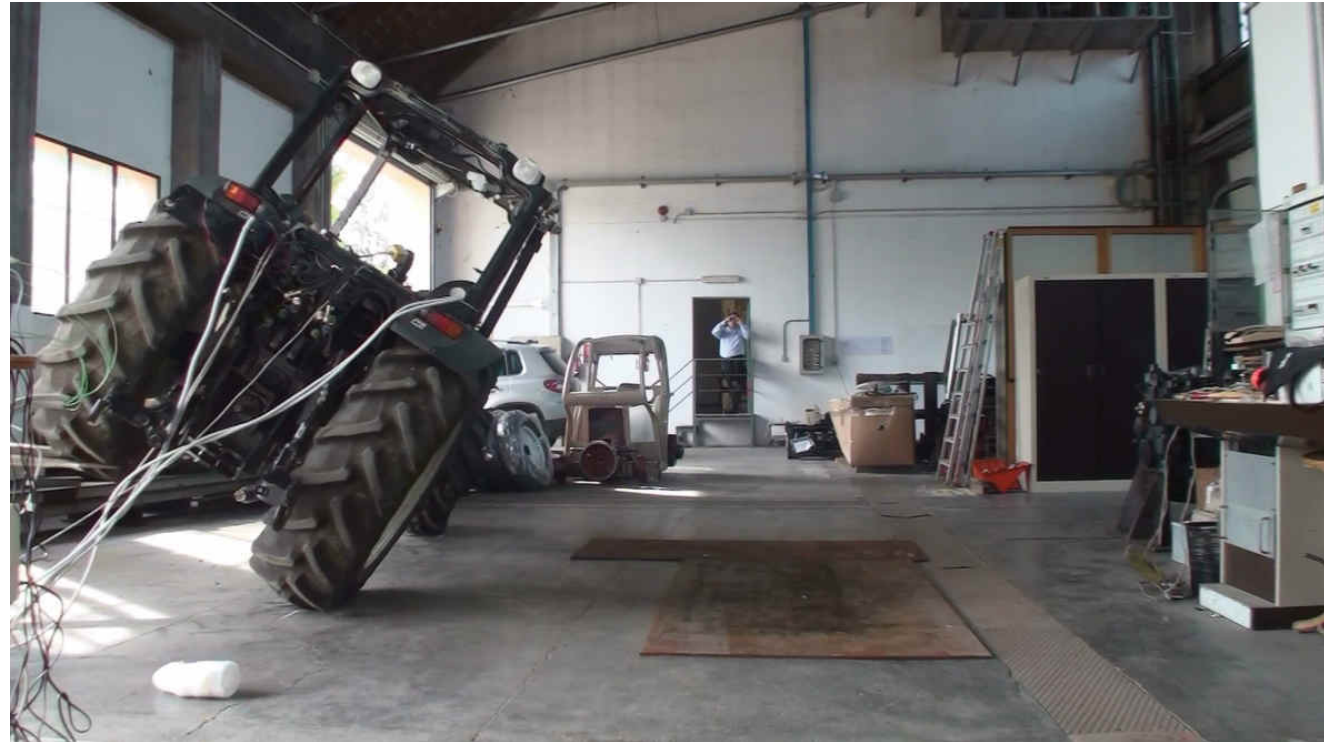
Reardward loading

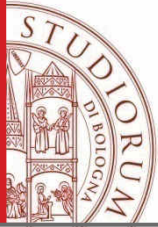




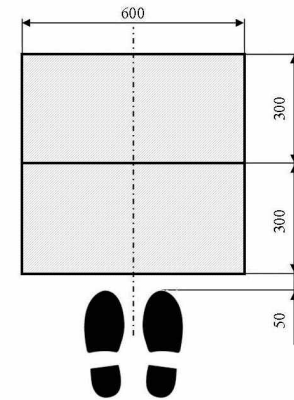
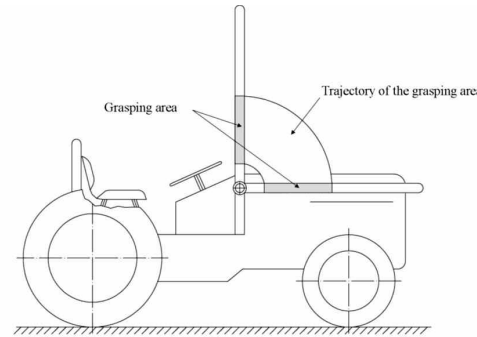
ROPS Codes: mass ratio limit

The activity of the
OECD Scientific
Working Group
(Italy-BO; France,
Germany, Austria,
Spain, UK, US)



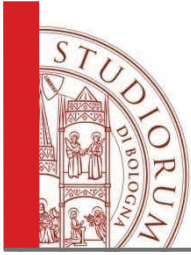


Foldable ROPS: ergonomic approach



Top view of the accessible zones



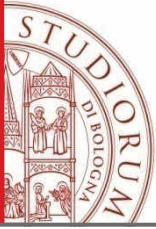


Folbable ROPS: tractor lateral stability and non-continuous rolling behaviour



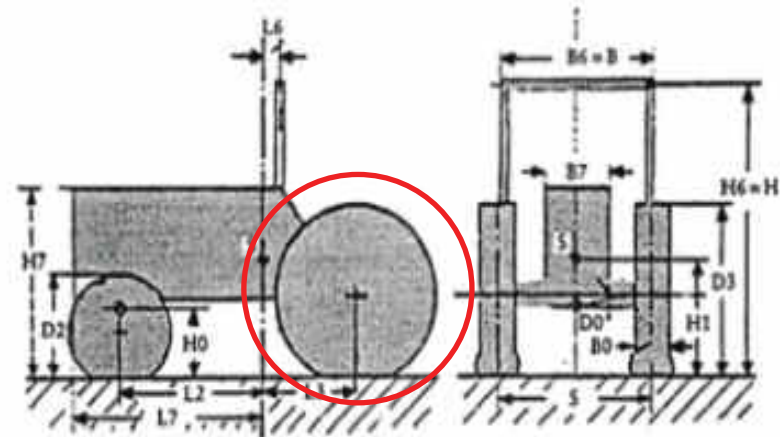
Narrow rubber track
tractor  Code 6 ?



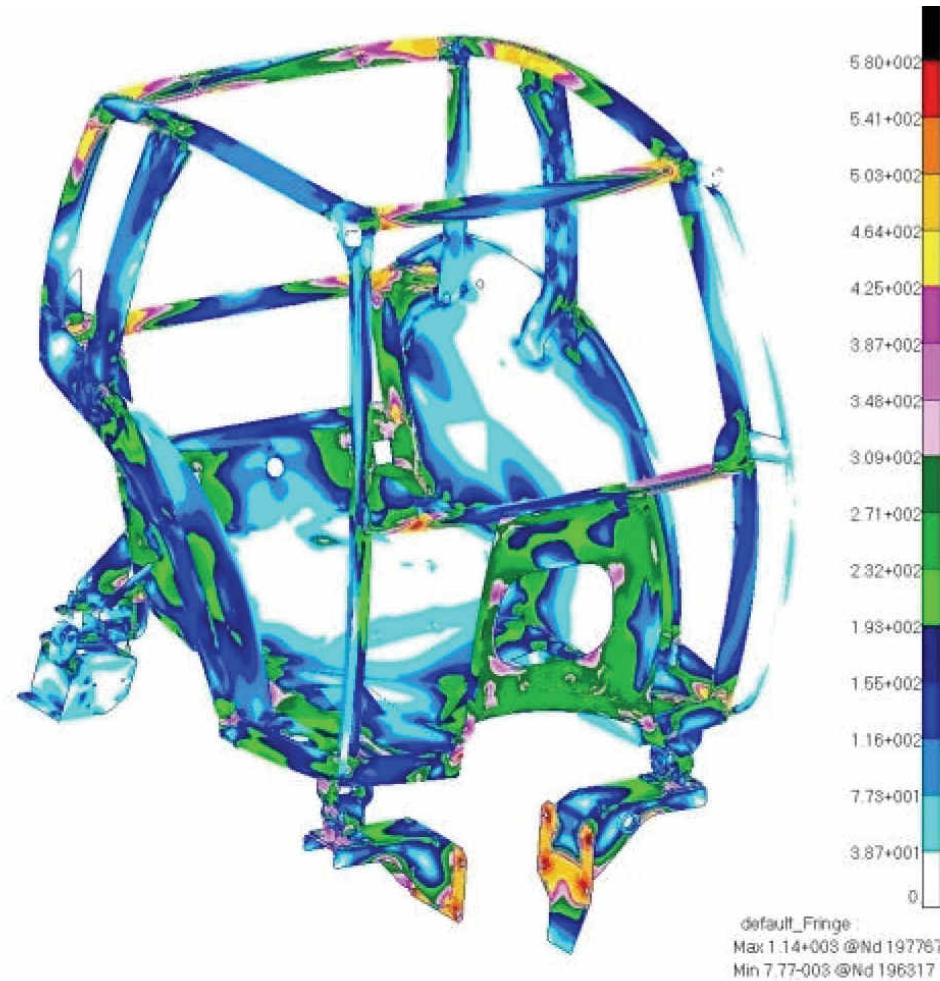


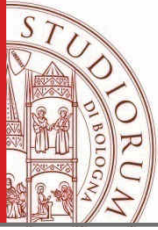
Non Continuous rolling calculation

Among the 17 data to be inserted in the computed model, **D3** and **B0** have to be updated considering the track design. The original model has to be updated to produce the right model output.



OECD ROPS tests vs virtual tests?





Falling Object Protective Structures FOPS

OECD Code 9
OECD Code 10



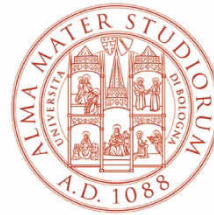
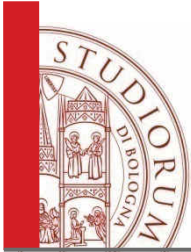
Conclusions

- OECD Test Stations all around the world
- OECD Quality Control
- Continuous knowledge exchange among Test Engineers, OECD Secretariat, Coordinating Centre and Manufacturers
- Research activity carried out to deepen the knowledge

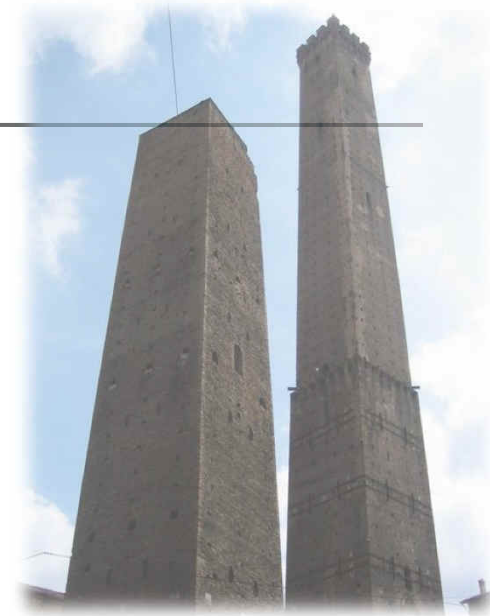


First OECD tested tractor - 1959





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