Smart Transportation Alliance

2022 Annual Conference
& Innovation Awards

Physical and Virtual Qualification Tests for Road Safety Infrastructures: New Challenges

J. PÉRISSE
jocelyn.perisse@transpolis.fr
Transpolis

29 November 2022

sta
Smart Transportation Alliance

Transpolis

About Transpolis…

French laboratory with:

- International recognition
- 30 years experience

- ✓ ISO 17025 Quality accredited by the COFRAC
- ✓ Accredited to international standards related to Road Infrastructures (EN 1317, EN 16303, EN 12767, ASHTO-MASH, IWA 14-1, PAS 68, ASTM F2656M/F2656, etc.)
- ✓ Agreements with several Notified Bodies

Safety for Road Infrastructures

CRASH-TESTS AND 3D SIMULATION LAB

- ✓ **Road Restraint Systems** : Guardrail, Crash-cushion, Transition, Terminals, etc.
- ✓ **Support Structures** : Sign & Signal pole, Lighting column, Utility pole, plastic bollard, etc.
- ✓ **HVMS** : Hostile Vehicle Mitigation System
- ✓ **Others** : Truck Mounted Attenuator, Motorcycle Protection, Self-righting bollard, accident reconstitution, in-situ assessment
- ✓ Advanced **computation tools** for virtual testing
- ✓ **Customer Technical support** for system design, expertise

Smart Transportation Alliance

Transpolis

Current situation & challenges

1. **Crashworthiness** is a key feature of road infrastructure characteristics : kinetic energy transfer between the three elements [**vehicle** ⇔ **road infrastructure system** ⇔ **soil/asphalt-concrete**]
2. **Physical tests** are mainly used excepted for transitions or modifications : **virtual testing** with numerical simulation can be used
3. Specific **test standards** are required according to road infrastructure type : safety guardrail, pole, sign, bollard, etc.
4. **Qualification test report** is a major key of the **product certification** process (CE certification)
5. No regulation or CE certification exists for Hostile Vehicle Mitigation Systems (**HVMS**), excepted for rare national initiative in some country (e.g. UK)
6. Real (old) vehicles are used for crash-testing but **poor representativeness** in regards of current road vehicles
7. The **risk injury assessment** of vehicle occupant shall be more taken into accound for test compliancy vs physical parameters of the vehicle
8. Requirements of **soil or asphalt/concrete characteristics** used during qualification tests shall be clearly specified in standards (repeatability)
9. Excellence **Safety+ voluntary labelling** can be a good opportunity to solve EN1317 weaknesses and increase quality and safety confidence
10. **Aging of road infrastructures** is one of the major challenge for maintenance and safety insfrastrucure replacement (expertise is required before road works)

Smart Transportation Alliance

Transpolis

The way ahead

1. **Need of EU certification for HVMS :**
   - Number of product increasing because of terrorism risk
   - Improve crashworthiness quality
2. Crah-test qualification tests : need of more data about **road system and soil-aphalt/concrete interaction** :
   - Verification of soil resistance
   - Verification of anchorage design
   - Comparative test results between laboratories
3. **Development of in-situ tests with dedicated characterisation tools** :
   - Quality control during installation works
   - Assessment and pre-study for old/ageing infrastructures (replacement projects)
4. **EN 1317 revision seems impossible** due to the NB-CPR stand-by but voluntary crash-test/certification can be introduced taking into account :
   - *More recent vehicles* : e.g. evolution of mass and COG
   - *New occupant safety criteria* : e.g. THIV severety criteria defined whitout using airbag and safety belt (use of HIC ?)
   - *Use of instrumented dummy* or *some Euro NCAP criteria* : e.g. front door opening after impact (see Adult occupant protection protocol)

Smart Transportation Alliance

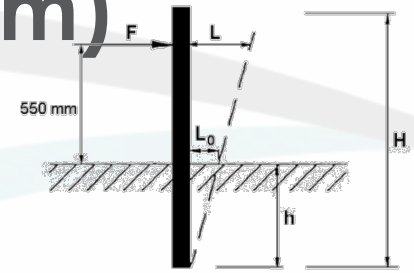
Transpolis

Focus on HVMS

Smart Transportation Alliance

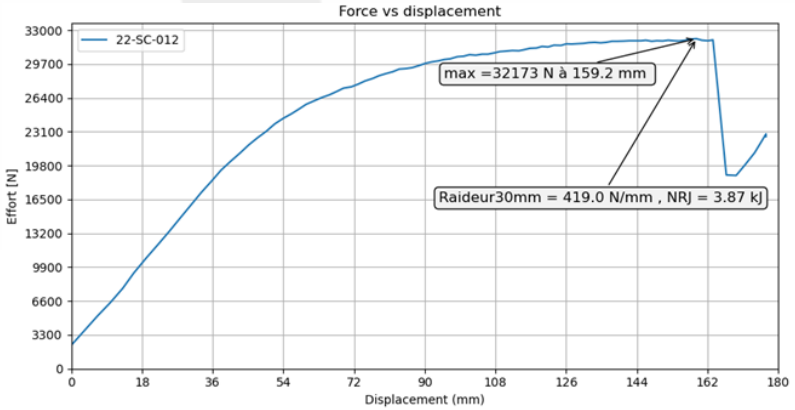
Focus on soil characterization (push-pull system)

Transpolis



Field test on a highway concrete barrier

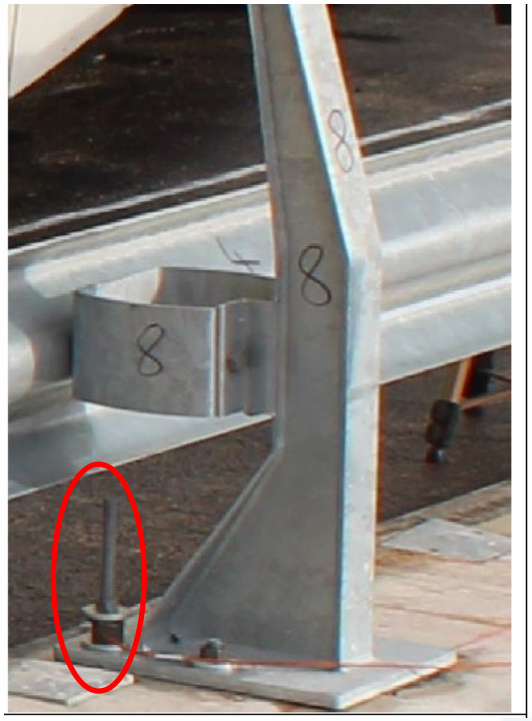
Laboratory test – soil/post resistance assessment

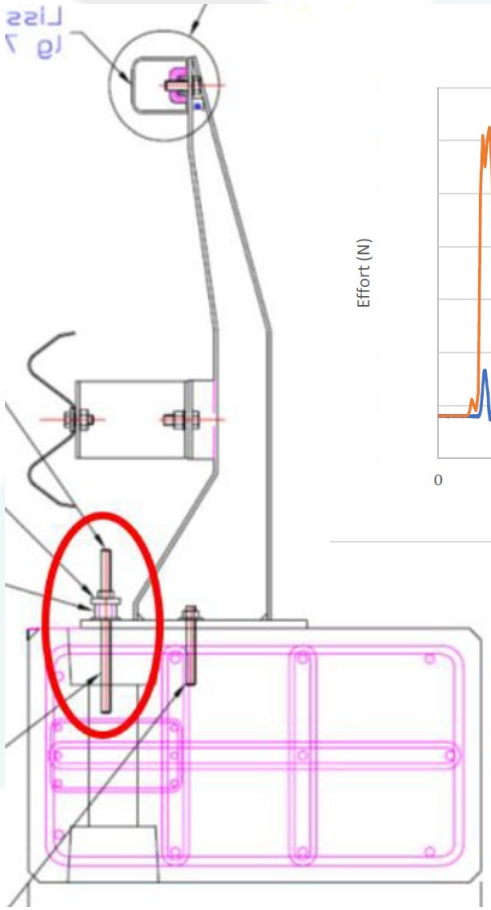


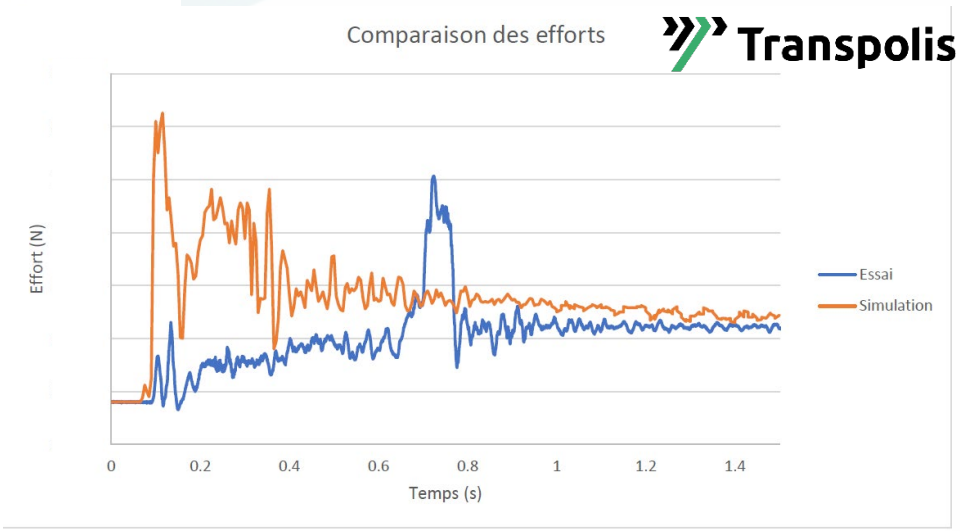
Smart Transportation Alliance

Focus on fastener loads control during crash-test

Measurement of dynamic loads of the barrier post bolts installed on a concrete slab with load strain sensors







Rondelle de charge : capteur de force uniaxial M22
Ref. CF-M22-210 kN

Étendue de mesure = 210 kN
Sensibilité = 9,295 10^{-3} mV/V/kN

Smart Transportation Alliance

THANK YOU FOR YOUR ATTENTION

Tribes European Quarter
Avenue Marnix 17
1000 Brussels (Belgium)
Tel: + 32 2 808 60 50

Email: info@smart-transportation.org

www.smart-transportation.org