Railway Testing Centre
Partner of manufacturers, network managers, operators and scientific players

LABORATORY AND INFRASTRUCTURES FOR RAILWAY TESTING

EXPERTISE AT THE SERVICE OF INNOVATION AND PERFORMANCE
A reference in Europe

• 2 TESTING PLATFORMS: CEF1 – CEF2
• 20 KM OF TRACKS
The Railway Testing Centre (CEF) is a unique tool in France dedicated to leasing its infrastructures and services for testing, maintenance and training activities.

It allows, the railway manufacturers, equipment manufacturers, operators, infrastructure managers, test laboratories or researchers to:

- carry out their tests on dedicated infrastructures, without the constraints inherent in commercially exploited networks
- benefit from appropriate logistical facilities and high level technical support
- have facilities that can be configured according to their needs

**OUR STRENGTHS**

**FLEXIBILITY**

Given the challenges inherent in the testing process, the CEF makes it a point of honor to be able to propose to its clients organizational solutions adapted to their constraints.

**SAFETY**

Safety is the first priority of the CEF, both for staff and for traffic. Each year, the CEF is subject to two safety audits according to ALSTOM Transport standards.

**ADAPTABILITY**

CEF strives to offer tailor-made solutions to best meet the testing needs of its customers.

**SECURITY**

CEF has invested in significant means of protection in order to preserve in particular the rolling stock present on the site from any malicious acts.

**ISO-COFRAC**

CEF has obtained ISO 9001 certification since 2009 for its test tracks operations and, since 2012, for its testing laboratory activity.

The test laboratory is also accredited by COFRAC according to ISO/CEI 17025.
### Dynamic Tests Performed on Rolling Stock

<table>
<thead>
<tr>
<th>Test Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Noise</strong></td>
<td>Measurement of internal noise, both static and dynamic.</td>
</tr>
<tr>
<td></td>
<td>Measurement of external noise at 7.50 m from the track: with train at constant speed, in acceleration and in deceleration.</td>
</tr>
<tr>
<td><strong>Braking</strong></td>
<td>Braking performance.</td>
</tr>
<tr>
<td></td>
<td>Tests on degraded adhesion conditions.</td>
</tr>
<tr>
<td></td>
<td>Wheel Slide protection System: adjustment and tests under very degraded adhesion conditions.</td>
</tr>
<tr>
<td><strong>Traction Performance</strong></td>
<td>Electric traction and braking performance.</td>
</tr>
<tr>
<td></td>
<td>Starting performance of traction control systems.</td>
</tr>
<tr>
<td></td>
<td>Speed regulation system tests / imposed speed.</td>
</tr>
<tr>
<td></td>
<td>Adherence performance at starting and in traction.</td>
</tr>
<tr>
<td></td>
<td>Residual acceleration of the train at maximum speed (limited to 100 kph).</td>
</tr>
<tr>
<td></td>
<td>Brake management during emergency brake application.</td>
</tr>
<tr>
<td></td>
<td>Speed indicator: measurement of the display accuracy.</td>
</tr>
<tr>
<td><strong>Train Operation</strong></td>
<td>Starting performance of traction control systems.</td>
</tr>
<tr>
<td></td>
<td>Speed regulation system tests.</td>
</tr>
<tr>
<td></td>
<td>Adherence performance at starting and in traction.</td>
</tr>
<tr>
<td></td>
<td>Braking in the event of loss of train integrity.</td>
</tr>
<tr>
<td><strong>Compatibility Between Rolling Stock and Train Detection Systems</strong></td>
<td>Compatibility with track circuits.</td>
</tr>
<tr>
<td></td>
<td>Compatibility with electronic wheel detectors.</td>
</tr>
<tr>
<td><strong>Electromagnetic Compatibility</strong></td>
<td>Radiated electromagnetic disturbances.</td>
</tr>
<tr>
<td></td>
<td>Interference with telecommunication lines.</td>
</tr>
<tr>
<td><strong>Dynamic Performance</strong></td>
<td>Vibrational comfort (ride quality).</td>
</tr>
<tr>
<td></td>
<td>Running behaviour – measurement of forces on the track.</td>
</tr>
<tr>
<td><strong>Operation of Safety Equipment</strong></td>
<td>Communication ground/train, recording of events, control of driver vigilance.</td>
</tr>
<tr>
<td></td>
<td>ERTMS level 1 and 2, ETCS and GSMR radio system.</td>
</tr>
<tr>
<td></td>
<td>Operation of the systems of indication: repetition of signals (BRS), KVB…</td>
</tr>
<tr>
<td></td>
<td>Operation of the braking automation.</td>
</tr>
<tr>
<td><strong>Thermal Capacity Tests</strong></td>
<td>In traction.</td>
</tr>
<tr>
<td></td>
<td>In braking.</td>
</tr>
<tr>
<td></td>
<td>Air flow control.</td>
</tr>
</tbody>
</table>

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**Plaque**

- **CEF1 CEF2**
  - Measurement of internal noise, both static and dynamic
  - Measurement of external noise at 7.50 m from the track: with train at constant speed, in acceleration and in deceleration
  - Electric traction and braking performance
  - Starting performance of traction control systems
  - Speed regulation system tests / imposed speed
  - Adherence performance at starting and in traction
  - Residual acceleration of the train at maximum speed (limited to 100 kph)
  - Brake management during emergency brake application
  - Speed indicator: measurement of the display accuracy
  - Compatibility with track circuits
  - Compatibility with electronic wheel detectors
  - Radiated electromagnetic disturbances
  - Interference with telecommunication lines
  - Vibrational comfort (ride quality)
  - Running behaviour – measurement of forces on the track
  - Braking performance
  - Tests on degraded adhesion conditions
  - Wheel Slide protection System: adjustment and tests under very degraded adhesion conditions
  - Parking brake: measurement of forces applied on wheels and discs + operation of braking test system
  - Anti-slip system: performance and operation
  - Brake blending: operation
  - Train command, control and monitoring systems
  - Sanding and wheel flange lubrications systems
  - Magnetic friction braking / eddy-current braking
  - Braking in the event of loss of train integrity

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TESTING PLATFORM - UP TO 110 KPH PEAK

BASED IN PETITE-FORÊT, CLOSE TO VALENCIENNES, AT THE HEART OF THE REGION LES HAUTS OF FRANCE, THE CEF1 COVERS A 52 HECTARE SURFACE AND IS LINKED WITH THE NATIONAL RAILROAD NETWORK (RFN).

CEF1 is perfectly adapted in tests of urban / suburban rolling stock (such as metro, trams and tram-trains) equipped with standard gauge bogies (1435 mm). CEF1 has also installations allowing to test rubber-tyred vehicles, as well as the driverless systems. CEF1 is equipped with a ERTMS track, a weigh bench and an anti-derailment test track.
A FLEXIBLE, CONFIGURABLE HIGH-TECH PLATFORM
FOCUSED ON VALIDATION OF NEW PRODUCT
DEVELOPMENTS AND THEIR INTEGRATION

<table>
<thead>
<tr>
<th>CHARACTERISTICS OF THE CEF1 CIRCUITS</th>
<th>PERFORMANCE TESTING TRACKS</th>
<th>ENDURANCE RING TESTING TRACK</th>
<th>DRIVERLESS TESTING TRACK</th>
<th>CONCRETE TESTING TRACK FOR TYRE-MOUNTED VEHICLES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VEV</td>
<td>VAE</td>
<td>PASC1</td>
<td>PASC2</td>
</tr>
<tr>
<td>DIMENSIONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>2720 m</td>
<td>1828 m</td>
<td>1798 m</td>
<td>1200 m</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>110 kph</td>
<td>90 kph</td>
<td>80 kph</td>
<td>30 kph</td>
</tr>
<tr>
<td>Straight section</td>
<td>1400 m including 300 m of long welded rail</td>
<td>201 m</td>
<td>181 m</td>
<td>60 m</td>
</tr>
<tr>
<td>Maximum gradient</td>
<td>7.6 ‰</td>
<td>8.8‰</td>
<td>9‰</td>
<td>10‰</td>
</tr>
<tr>
<td>Curve radius</td>
<td>325 m</td>
<td>310 m</td>
<td>305 m</td>
<td>150 m</td>
</tr>
<tr>
<td>Dynamic gauge Power collection</td>
<td>UIC - Variable</td>
<td>UIC - Catenary</td>
<td>UIC - Variable</td>
<td>Variable</td>
</tr>
<tr>
<td><strong>OVERHEAD POWER SUPPLY – 5 MVA PER TRACK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 kV 50Hz - 60Hz</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>15 kV 16Hz 2/3</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>3000 V CC</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>1500 V CC</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>750 V CC</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td><strong>3rd RAIL POWER SUPPLY VIA AND CONTACT MODE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>750 V CC</td>
<td>Below</td>
<td>Lateral</td>
<td>Lateral</td>
<td>Lateral</td>
</tr>
<tr>
<td>Power supply sections</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>INFRASTRUCTURE FOR RUBBER-TYRED METRO</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rollways</td>
<td>Ballasted track</td>
<td>Ballasted track</td>
<td>Ballasted track</td>
<td>Concrete track</td>
</tr>
</tbody>
</table>
CEF2
BAR-LE-DUC

TESTING PLATFORM - 160 KPH SEMI-STABILISED

BASED IN THE MEUSE DEPARTMENT, IN TROUVILLE EN BARROIS, CLOSE TO BAR-LE-DUC, CEF2 HAS BEEN BUILT TO MEET THE EXPECTATIONS AND TESTS NEEDS OF THE CONVENTIONAL ROLLING STOCKS (INTERCITY, MAIN LINE AND FREIGHT).

CEF 2 offers a 12 km straight line, capable of 160km / hour, and is linked with the National Railroad network (RFN).
**OPERATIONAL PARKING AREA**
- Operational parking area
- Static tests with catenary 25kV

**DIMENSIONAL FEATURES**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>12 km</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>160 kph</td>
</tr>
<tr>
<td>Straight section</td>
<td>1100 m (2)</td>
</tr>
<tr>
<td>Maximum gradient</td>
<td>8‰</td>
</tr>
<tr>
<td>Flat section</td>
<td>0</td>
</tr>
<tr>
<td>Curve radius</td>
<td>750 m to 4500 m</td>
</tr>
</tbody>
</table>

**POWER**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 kV 50Hz</td>
<td>6 MVA with regenerative function</td>
</tr>
<tr>
<td>1500V CC</td>
<td>3,5 MVA without regenerative function</td>
</tr>
</tbody>
</table>

**SIGNALLING**

- KVB system
- Evolvable bi-standard KVB-ERTMS

**INSTALLATIONS**

<table>
<thead>
<tr>
<th>Item</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical building</td>
<td>140 m</td>
</tr>
<tr>
<td>Pit</td>
<td>120 m</td>
</tr>
<tr>
<td>Complete lifting of train</td>
<td>Set of lifting jacks</td>
</tr>
</tbody>
</table>

**SUBURBAN – REGIONAL INTERCITY - LOCOMOTIVE**

- Dynamic testing track

**VED**

- Stabilised traction / braking performance at 160 kph
- Power collection 25 kV - 1.5 kV
- Low adhesion
- Tests on 8‰ slope
- Speed control using beacons

**FUNCTIONS**

- Stabilised traction / braking performance at 160 kph
- Power collection 25 kV - 1.5 kV
- Low adhesion
- Tests on 8‰ slope
- Speed control using beacons
TEST LABORATORY

THANKS TO SPECIFIC INFRASTRUCTURES IN CEF1 AND ITS COFRAC ISO / CEI 17025 ACCREDITATION, THE LABORATORY TEAM CAN PERFORM THE TESTS BELOW, AND DEMONSTRATE THE RESULTS:

✔ Rolling stock weigh tests
✔ Non-derailment performance tests (twist track, method 1).

Thanks to our benches capacities, CEF is a key player in Europe able to perform these tests.

WEIGH BENCH

CHARACTERISTICS
- Length in straight alignment: 288 m
- Track equipped with pit and centering device
- Simultaneous measurement of 2 axles
- 20 sensors

ASSOCIATED MEASUREMENTS
- Exploitable in static and dynamic mode
- Weight assessment
- Weather conditions
- Accuracy: ± 0,5 kN

REFERENCE STANDARD: NF 00-701

TESTS ON ALL TYPES OF ROLLING STOCK TRAINS
TWIST TRACK

CHARACTERISTICS
- Length 350 m
- With 30 m slab track covered for measurements
- Radius of curvature: 150 m
- Slope: -45mm/+45mm on 30 m
- Twist: 3%
- 150 sensors

ASSOCIATED MEASUREMENTS
- Non-derailment performance tests
- Wheel / rail contact stress
- Weather conditions
- Wheel lifting
- Striking angle
- Wheel profile
- Accuracy: ± 0,5 mm

REFERENCE STANDARD: EN 14363
Thanks to its international recognized skills and certifications (COFRAC, ISO/CEI 17025) and rich in its contribution of various projects certified by the pole of competitiveness I-Trans, the test laboratory makes of CEF the preferred partner for your research and development programs.

The test laboratory takes advantage in test, metrology, rolling stock, infrastructure, to invest in complex, scientific and technical projects combining innovation and performance.

- Preliminary study
- Implementation, instrumentation
- Data acquisition

- Measurement processing
- Test reports
- Customers project management
THANKS TO OUR PARTNERSHIP WITH ALSTOM, CEF HAVE THE ACCESS TO DELOCALIZED TESTS BENCHES TO REALIZE CLIMATIC AND ACOUSTIC TESTS.

CLIMATIC CHAMBER

This installation was previously dedicated to type tests and to develop cooling or heating/ventilation equipment. It can also be used in other domains as electrical, road, aeronautics, military, etc… in order to test bigger specimen under extreme conditions.

Physical characteristics
- Total volume: ≈ 1000 m³
- Usable Volume: ≈ 750 m³
- Usable length: 35 m
- Usable width: 4.3 m
- 240 thermic test loops

Raw performances
- T° min = -30°C
- T° max = +60°C
- Max. Relative Hygrometry: 90%
- Solar radiation: 1000W/ m²

Reference standards
- EN 13129-1, EN 13129-2, EN 14750-1, EN 14750-2, EN 14813-1, EN 14813-2

ACOUSTIC CHAMBER

This installation is made by a double reverberation chamber, designed for tests of acoustic transparency in diffuse field.

Vibratory analysis with impacts hammers of adapted sizes.

Physical characteristics
- Radiation room volume: 69.8 m³
- Reception room volume: 58.7 m³

Maximum dimensions of the specimen
- Length = 2.295 m
- Width = 1.465 m
- Thickness = 0.3 m

Raw performance
- Maximum sound transmission loss: 57dB(A)
- Frequency range: 100 Hz - 5000 Hz

Reference standards
- EN 3095; EN 3381; EN 15892; EN 60268; EN 3382

they trust us:

- KATP
- APAVE
- SNCF
- Schneider Electric
- ntv
- iribus
- Keolis
- Sagem
At the heart of a region renowned for rail excellence, CEF is a decisive partner in the I-TRANS worldwide competitiveness cluster.