

LABORATORY AND
INFRASTRUCTURES
FOR RAILWAY TESTING



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

www.c-e-f.fr



**EXPERTISE
AT THE SERVICE OF INNOVATION
AND PERFORMANCE**

A reference in Europe

- **2 TESTING PLATFORMS: CEF1 – CEF2**
- **20 KM OF TRACKS**

CEF



RAILWAY TESTING CENTRE

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.

ADAPTABILITY



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

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.

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

CEF1	CEF2	NOISE	BRAKING	CEF1	CEF2
✗	✗	• Measurement of internal noise, both static and dynamic	• Braking performance	✗	✗
✗	✗	• Measurement of external noise at 7.50 m from the track: with train at constant speed, in acceleration and in deceleration	• Tests on degraded adhesion conditions	✗	✗
			• Wheel Slide protection System: adjustment and tests under very degraded adhesion conditions	✗	✗
CEF1	CEF2	TRACTION PERFORMANCE	• Parking brake: measurement of forces applied on wheels and discs + operation of braking test system	✗	✗
✗	✗	• Electric traction and braking performance	• Anti-slip system: performance and operation	✗	✗
✗	✗	• Starting performance of traction control systems	• Brake blending: operation	✗	✗
✗	✗	• Speed regulation system tests / imposed speed	TRAIN OPERATION	CEF1	CEF2
✗	✗	• Adherence performance at starting and in traction	• Train command, control and monitoring systems	✗	✗
✗	✗	• Residual acceleration of the train at maximum speed	• Sanding and wheel flange lubrications systems	✗	✗
✗	✗	• Brake management during emergency brake application	• Magnetic friction braking / eddy-current braking	✗	✗
✗	✗	• Speed indicator: measurement of the display accuracy	• Braking in the event of loss of train integrity		✗
CEF1	CEF2	COMPATIBILITY BETWEEN ROLLING STOCK AND TRAIN DETECTION SYSTEMS	OPERATION OF SAFETY EQUIPMENT	CEF1	CEF2
	✗	• Compatibility with track circuits	• Communication ground/train, recording of events, control of driver vigilance		✗
	✗	• Compatibility with electronic wheel detectors	• ERTMS level 1 and 2, ETCS and GSMR radio system	✗	
CEF1	CEF2	ELECTROMAGNETIC COMPATIBILITY	• Operation of the systems of indication: repetition of signals (BRS), KVB...	✗	✗
✗	✗	• Radiated electromagnetic disturbances	• Operation of the braking automation	✗	✗
	✗	• Interference with telecommunication lines	THERMAL CAPACITY TESTS	CEF1	CEF2
CEF1	CEF2	DYNAMIC PERFORMANCE	• In traction	✗	✗
✗	✗	• Vibrational comfort (ride quality)	• In braking		✗
✗	✗	• Running behaviour – measurement of forces on the track	• Air flow control		✗

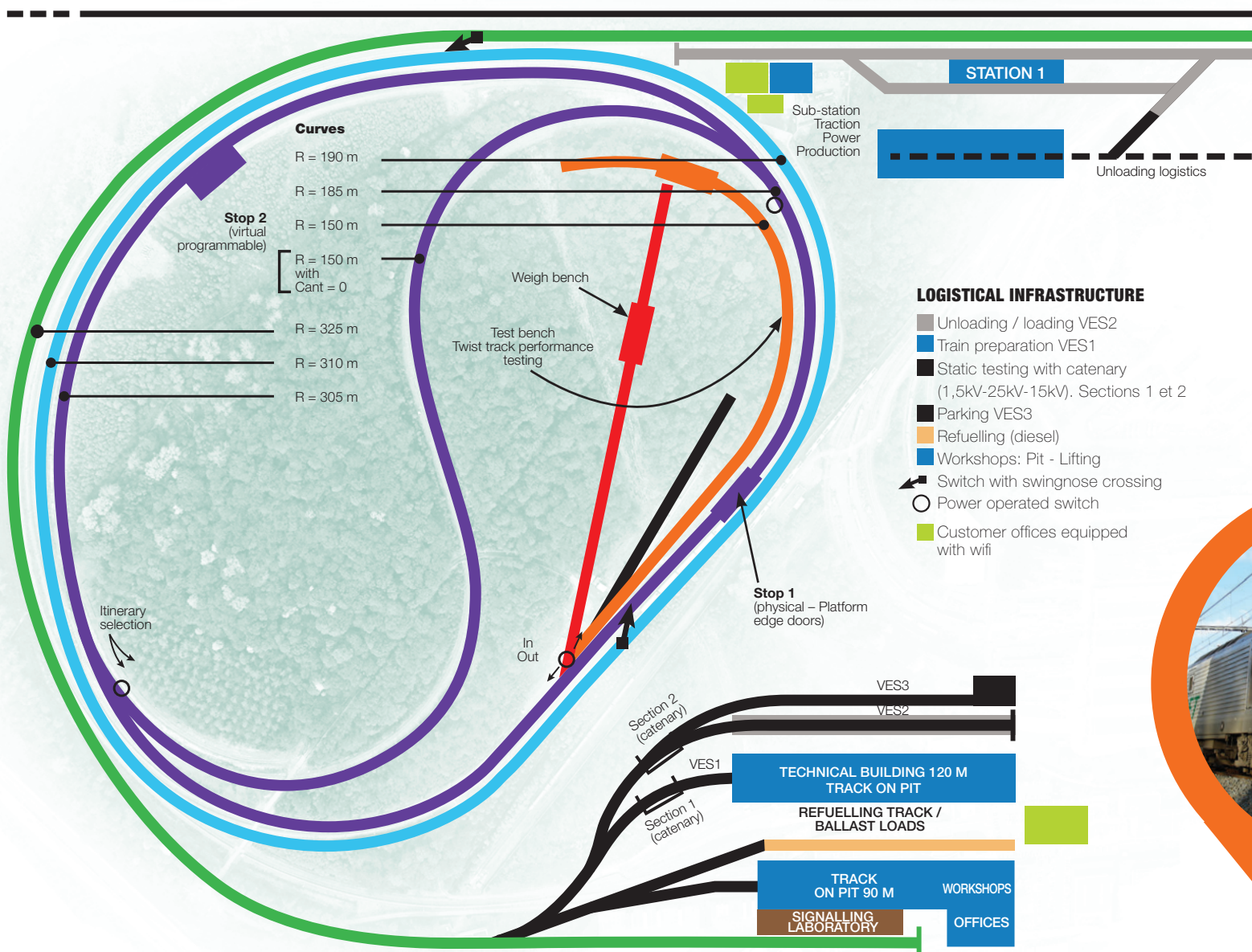




TESTING PLATFORM - UP TO 110 KPH PEAK

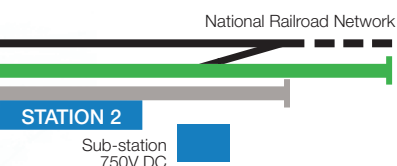
BASED IN PETITE-FORÊT, CLOSE TO VALENCIENNES, AT THE HEART OF THE REGION LES HAUTS OF FRANCE, THE CEF1 IS LINKED WITH THE NATIONAL RAILROAD NETWORK (RFN).

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-tired 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



DYNAMIC TESTS TRACKS		LENGTH & MAXIMUM GRADIENT	MAXIMUM SPEED KPH	STRAIGHT SECTION	OVERHEAD POWER SUPPLY	THIRD RAIL POWER SUPPLY	DYNAMIC GAUGE POWER COLLECTION
Performance testing tracks	VEV	2720 m 7,6 ‰	110	1400 m including 380 m of long welded rail	25 kV 50 Hz 15 kV 16 Hz 2/3 3000 V CC	750 V CC contact on the underside	UIC VARIABLE
Endurance ring testing track	VAE	1828 m 8,8 ‰	90	201 m	1500 V CC 750 V CC		UIC CATENARY
Driverless testing track	PASC1	1798 m 9 ‰	80	181 m	1500 V CC	750 V CC lateral contact	UIC VARIABLE
	PASC2	1200 m 10 ‰	30	60 m	750 V CC		UIC VARIABLE
Concrete testing track for tyre-mounted vehicles	VEBP	800 m 2 ‰	75	650 m			VARIABLE



STATIC TESTS TRACKS	LENGTH	CAPTATION	VOLTAGE	PIT	ROOF ACCESS	EQUIPMENTS
Technical workshop	110 m + 35 m building excluded	Catenary PAT plug	1500 V 750 V	98 m (on pilotis)	Aerial bucket	Crane Lifting columns
Workshop VES1	120 m	External catenary PAT plug	25 kV 15 kV 3000 V 1500 V 750 V	110 m	Catwalks Climbing protection	Crane Lifting columns
Workshop VEMS	50 m	PAT plug	750 V	-	-	Lifting columns
Tracks VES2 & VES3	210 m	Rigid catenary (140 m)	25 kV 15 kV 3000 V 1500 V 750 V	6,5 m	-	Catwalks Storage track (18m)
Fueling track	210 m	-	-	15 m	-	2 oil pumps

CEF2

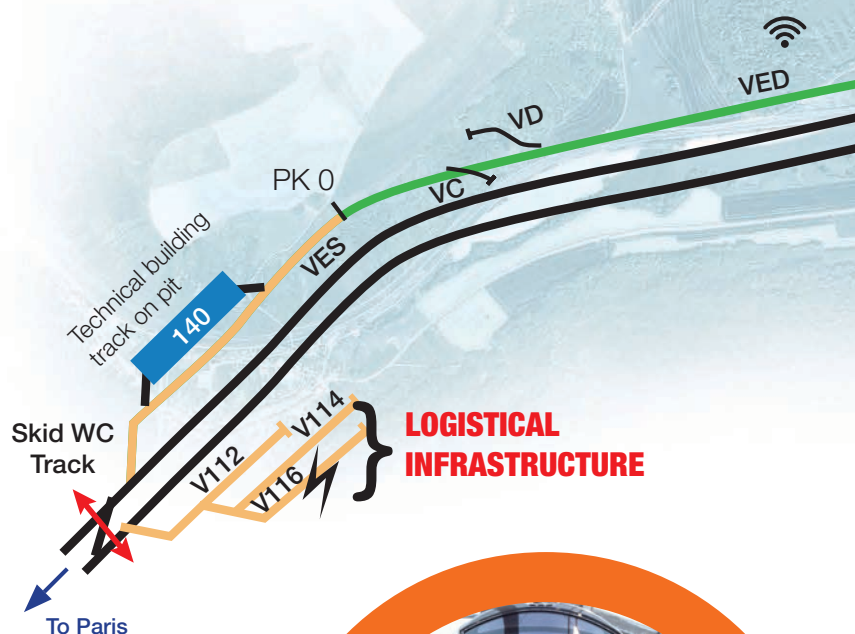
BAR-LE-DUC



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 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).





DYNAMIC TESTS TRACKS

DIMENSIONAL FEATURES	
Length	11,200 km
Maximum speed	160 kph overspeed up to 176 km/h under conditions
Straight section	1100 m (2)
Maximum gradient	8‰
Flat section	0
Curve radius	750 m to 4500 m

POWER	
25 kV 50Hz	6 MVA with regenerative function
1500V CC	3,5 MVA without regenerative function

SIGNALLING	
KVB system	Evolvable bi-standard KVB-ERTMS

INSTALLATIONS	
Suburban - Regional - Intercity - Locomotive	

TECHNICAL HALLS AND ASSOCIATED TOOLINGS

STATIC TEST TRACKS	LENGTH	CAPTATION	VOLTAGE	PIT	ROOF ACCESS	EQUIPMENTS
Technical workshop	140 m	Rigid catenary (19 m) PAT plug	25 kV 1500 V	110 m	Mobile catwalks	Crane Lifting columns
Static track : VES	815 m	Catenary	25 kV 1500 V	-	-	-
Static track : VC	200 m	-	-	-	-	-
Deviated track : VD	110 m	-	-	-	-	-
Skid WC track	265 m					
STORAGE TRACKS						
Track 116	467 m	Catenary	25 kV	-	-	-
Track 114	269 m					
Track 112	408 m					

TESTS UNDER ACCREDITATION

TESTS 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 axes
- 20 sensors

ASSOCIATED MEASUREMENTS

- Exploitable in static and dynamic mode
- Weight assessment
- Weather conditions
- Accuracy: $\pm 0,5$ kN

STANDARD REFERENCE: NF 00-701

TWIST TRACK

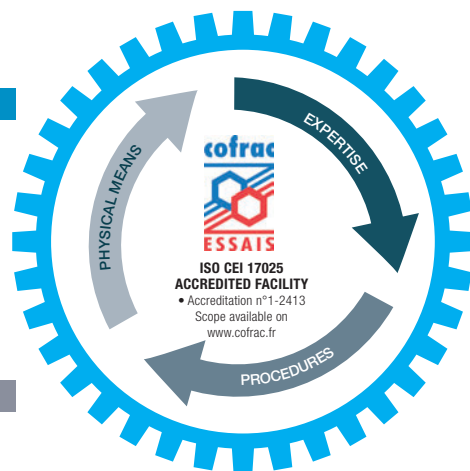
CHARACTERISTICS

- 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: $\pm 0,5$ mm

STANDARD REFERENCE: EN 14363



TESTS ON ALL TYPES OF ROLLING STOCK TRAINS

URBAN/SURBURBAN TRAIN



FREIGHT TRAIN



RAIL-ROAD



SPECIFIC TRAIN



TESTS ON ROLLING STOCK

TESTS LABORATORY

THE CEF'S LABORATORY TEAM CAN PERFORM VARIOUS TESTS ON ROLLING STOCK ON CEF INFRASTRUCTURE OR EVERYWHERE IN THE WORLD.

BRAKE TESTS

- ✓ Standard or drag test
- ✓ Dry or soaped

ASSOCIATED MEASUREMENTS:

- ◆ Pressures
- ◆ Distances
- ◆ Speeds
- ◆ Flows

STANDARD REFERENCE: UIC 544-1

LONGITUDINAL AND VERTICAL LOADING TESTS/ COLLISION TESTS/ TORSIONAL RIGIDITY

ASSOCIATED MEASUREMENTS:

- ◆ Extensometry
- ◆ Deflections
- ◆ Efforts
- ◆ Acceleration

STANDARD REFERENCE: EN 12663-2

RESISTANCE TO MOTION TEST

- ✓ A Coefficient
- ✓ B & C Coefficients

ASSOCIATED MEASUREMENTS:

- ◆ Speeds
- ◆ Distance
- ◆ Hauling tests
- ◆ Acceleration/Deceleration
- ◆ Energy consumption

STANDARD REFERENCE: EN 14067

OTHER TESTS UNDER PARTNERSHIP

- ◆ Acoustic tests

STANDARD REFERENCES: STI MR BRUIT / STI MR LOC&PAS / NF EN ISO 3095, ETC...

- ◆ Mobile weighing test

In addition to the previous described tests, the laboratory team is flexible and able to assist the Customers or to lead for them all new type tests as specific measurements, on specifications writing...



RTM TEST
IN POLAND



DRAG TEST
IN CEF1



EXTENSOMETRY
ON CUSTOMER SITE



MOBILE WEIGHING TEST





TESTS ON RAILWAY INFRASTRUCTURES

TESTS LABORATORY



Thanks to its unique infrastructure, the CEF is able to adapt its tracks in order to meet the specific Customers requirements (R&D tests, tests on various prototypes as sleepers, new catenary parts, tests on defected rails...) whatever the duration of the project is. This flexibility allows to avoid all the classical networks constraints.

The laboratory team is also able to instrument on existing on new or existing test tracks.





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 : $\approx 1000 \text{ m}^3$
- Usable Volume: $\approx 750 \text{ m}^3$
- Usable length : 35 m
- Usable width : 4,3 m
- 240 thermic test loops

Raw performances

- $T^\circ \text{ min} = -30^\circ\text{C}$
- $T^\circ \text{ max} = +60^\circ\text{C}$
- Max. Relative Hygrometry: 90%
- Solar radiation: $1000\text{W}/\text{m}^2$

Reference standards

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

they trust us :



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 : $69,8 \text{ m}^3$
- Reception room volume : $58,7 \text{ m}^3$

Maximum dimensions of the specimen

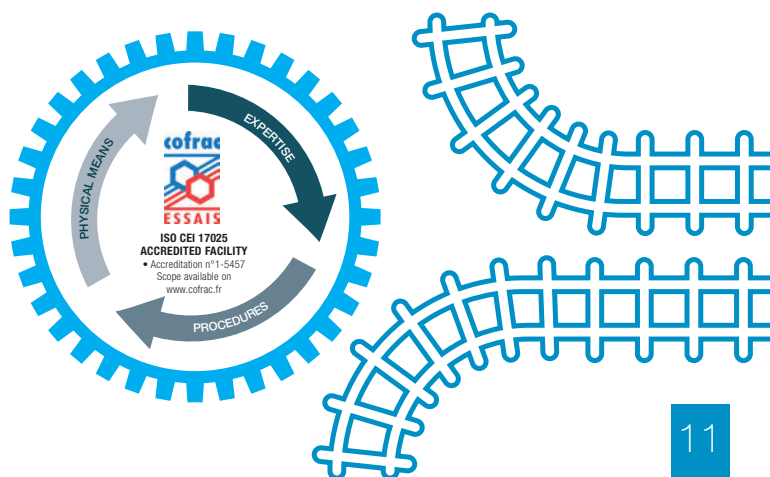
- Length = 2,295 m
- Width = 1,465 m
- Thickness = 0,3 m

Raw performances

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

Reference standards

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





At the heart of a region renowned for rail excellence, CEF is a decisive partner in the I-TRANS worldwide competitiveness cluster.



THEY TRUST US

ALSTOM	B	BOMBARDIER	CAF	STADLER
ETF	EURAILSCOUT	eurailtest	GE	DOOSAN
SNCF	Sopaval Sopemea	COLAS RAIL	EUROPORTE	RATP
THALES	TP Ferro	TITAGARH	vossloh	



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