Reinforced Earth®,
the Value of Experience

When it was invented almost 50 years ago, nobody could foresee the great success of the Reinforced Earth® technique. It is now recognized as a major innovation in the field of civil engineering. Reinforced Earth® has substantially widened its scope of applications to beyond just roads in the last 30 years, demonstrating its advantages in other markets. Structures associated to railway projects have been designed and supplied by companies of the global Terre Armée Internationale network on five continents since 1973.

For railway owners and engineers Reinforced Earth® simultaneously provides unique key benefits:

- **Strength** – significant load bearing capacity
- **Resilience** – effective absorption of vibrations and an exceptional seismic response
- **Durability** – high quality materials, proven track record and ease of inspection
- **Adaptability** – to geotechnical, environmental and architectural site conditions
- **Low impact** – rapid construction, limited land use, no traffic disruption and reduced environmental footprint

Choosing a Reinforced Earth® solution means getting the best of:

- the longest experience in the field of mechanically stabilized earth structures
- a global network of innovative companies deeply rooted in their markets
- bespoke engineered solutions adapted to complex situations
- the widest range of reliable and sustainable materials with a complete independence from manufacturers

With TechSpan® technique, the same philosophy is pursued with the inherent advantages of:

- engineered backfills
- precast construction components

Reinforced Earth®, Terre Armée® and TechSpan® are trademarks owned by members of Terre Armée Internationale.

It was only five years after the introduction of Reinforced Earth® that this technique was first used to build structures near railway lines. By the mid-seventies, the civil engineering community had become more aware of the capabilities of this unique construction method, particularly in terms of mobile and dynamic load bearing capacity.

Engineers and project owners began using Reinforced Earth® extensively to build structures under railway tracks. Hundreds of such structures have been designed and built since the construction of the first walls supporting a railway line in the USA in 1973. TechSpan®, a precast arch system developed by Terre Armée Internationale from the end of the eighties also has applications for railway projects.

Reinforced Earth® and TechSpan® bring all the answers to the legitimate concerns for safety governing railroad designs and exploitation.

The railway applications for our technologies in road and rail-related structures are numerous and they are used for:

- retaining walls along railways
- bridge abutments spanning railway lines
- retaining walls and bridge abutments supporting the track beds
- rail tunnels beneath earthen embankments
- arch bridges supporting the track beds
- underpasses and culverts beneath earthen embankments supporting the track beds
- steep embankments for noise and collision protection

... and for all types of trains

Lo-Lo
Hi-Speed
High Capacity

Our goal is to create, design and supply innovative technologies to the civil engineering industry with a strong commitment to excellence in design, service and public welfare.

www.terre-armee.com

Railways

Reinforced Earth® and TechSpan® structures

Sustainable Technology

- LRT
- MRT
- Regional
- Intercity
- High speed
- Freight

… and for all types of trains

Lo-Lo
Hi-Speed
High Capacity
When it was invented almost 50 years ago, nobody could foresee the great success of the Reinforced Earth® technique. It is now recognized as a major innovation in the field of civil engineering. Reinforced Earth® has substantially widened its scope of applications to beyond just roads in the last 30 years, demonstrating its advantages in other markets. Structures associated to railway projects have been designed and supplied by companies of the global Terre Armée Internationale network on five continents since 1973.

For railway owners and engineers Reinforced Earth® simultaneously provides unique key benefits:

- **Strength** – significant load bearing capacity
- **Resilience** – effective absorption of vibrations and an exceptional seismic response
- **Durability** – high quality materials, proven track record and ease of inspection
- **Adaptability** – to geotechnical, environmental and architectural site conditions
- **Low impact** – rapid construction, limited land use, no traffic disruption and reduced environmental footprint

Choosing a Reinforced Earth® solution means getting the best of:

- the longest experience in the field of mechanically stabilized earth structures
- a global network of innovative companies deeply rooted on their markets
- bespoke engineered solutions adapted to complex situations
- the widest range of reliable and sustainable materials with a complete independence from manufacturers

With TechSpan® technique, the same philosophy is pursued with the inherent advantages of:

- engineered backfills
- precast construction components

Reinforced Earth®, Terre Armée® and TechSpan® are trademarks owned by members of Terre Armée Internationale

It was only five years after the introduction of Reinforced Earth® that the technique was first used to build structures near railway lines. By the mid seventies, the civil engineering community had become more aware of the capabilities of this unique construction method, particularly in terms of mobile and dynamic load bearing capacity.

Engineers and projects owners began using Reinforced Earth® extensively to build structures under railway tracks. Hundreds of such structures have been designed and build since the construction of the first walls supporting a railway line in the USA in 1973. TechSpan®, a precast arch system developed by Terre Armée Internationale from the end of the eighties also has applications for railway projects.

Reinforced Earth® and TechSpan® bring all the answers to the legitimate concerns for safety governing railroad designs and exploitation. The railway applications are part of this introduction. In fact, rail track systems design is mondial. It is less sensitive to original constraints, allowing for structures on unfavorable physical, ecological and cultural site conditions.

Reinforced Earth® and TechSpan® are used for the construction of a wide range of railway related structures...

- retaining walls along railways
- bridge abutments spanning railway lines
- retaining walls and bridge abutments supporting the track beds
- rail tunnels beneath earthen embankments
- arch bridges supporting the track beds
- underpasses and culverts beneath earthen embankments supporting the track beds
- steep embankments for noise and collision protection

... and for all types of trains

- LRT
- MRT
- Regional
- Intercity
- High speed
- Freight

Our goal is to create, design and supply innovative technologies to the civil engineering industry with a strong commitment to excellence in design, service and public welfare.

www.terre-armee.com

Railways

Reinforced Earth® and TechSpan® structures

Sustainable Technology
In addition to the numerous advantages of earth retention solutions, Reinforced Earth® is also a versatile structural solution for recommendations. The high load bearing capacity of the system allows for the use of slim foundations, the footing of which must be set within an excavation protected by steel shoring if necessary. Additionally, the excavation does not encroach upon the track bed. A Reinforced Earth® wall is built entirely from the backfill side, without the need for pile supports or other costly foundation improvements. These are designed to withstand the heavy bearing pressure and breaking stresses transmitted through the track bed. A significant feature is that, even on poor foundation soils, the profile remains vertical without the need for pile supports or other costly foundation improvements. This eliminates the need for pile supports or other costly foundation improvements.

The advantages of Reinforced Earth® walls are also obtained in Reinforced Earth® bridge abutments. The foundation is adapted to comply with the safety requirements, especially for high speed railways. Reinforced Earth® structures have often been used, particularly in Japan, for widening railway embankments. Since the system is versatile and built in successive layers, the Reinforced Earth® TechSpan® method is especially efficient when building the structures over existing rail tracks under traffic when closure is not an option. Reinforced Earth® is a logical complementary technique to using the TechSpan® method being a unique combination of high level engineering, straightforward constructability and site integration functionalities. Reinforced Earth® can be used to build embankments along railways to provide protection and to facilitate the integration of railways into populated areas. The system allows the faces of the embankments to be vertical and the rate of construction is rapid. It also facilitates the integration of railways into populated areas, and its aesthetic qualities are an added advantage.
Bridge abutments spanning railway lines

The advantages of Reinforced Earth® abutments built against existing rail lines are evidentiably presented below:

- **Economy in foundation works**: Reinforced Earth® abutments require no footing beyond the front face, and as a result, excavations do not encroach upon rail line beds. A Reinforced Earth® wall is built entirely from the backfill side, without need for pile supports or other costly foundation improvements.

- **Minimal traffic disruption during construction**: Reinforced Earth® technique is well suited for the construction of new structures against, and even above existing rail tracks. Structures are not deeply founded, require no footing beyond the front face, and as a result, excavations do not encroach upon rail line beds. By contrast, a Reinforced Earth® abutment, even one built on relatively poor soil, will typically be founded at a shallow depth, enabling the construction contractor to work outside the area influenced by the railway. Thus the construction of overpasses combined with retaining walls often allows the abutment to be placed up to a clearance line or to a service road without any serious scaffolding and without the necessity of any structure or equipment in front of the wall. It may therefore be placed right up to a clearance line or to a service road without any serious scaffolding and without the necessity of any structure or equipment in front of the wall.

- **Economy in building materials**: A Reinforced Earth® abutment is built entirely from the backfill side, without need for pile supports or other costly foundation improvements.

- **High load bearing capacity**: Reinforced Earth® railroad bridge abutments have been built in several countries since 1975. Reinforced Earth® structures have often been used, particularly in Japan, for widening railway tracks, as well as metro and light rail transit lines. Reinforced Earth® structures have been built with sound absorbing facings.

- **Versatility in design and construction**: In Japan, engineering firms are interested in demonstrating their professional capabilities by designing structures which aesthetically integrate into their environments and enhance their surroundings. Landscape architects are interested in demonstrating their professional capabilities by designing structures which aesthetically integrate into their environments and enhance their surroundings. Site integration functionalities are therefore particularly important in rail corridors, where land use and consumption of materials the faces of the embankments can be vertical or steepened, with mineral or vegetalized facings. Site integration functionalities are therefore particularly important in rail corridors, where land use and consumption of materials the faces of the embankments can be vertical or steepened, with mineral or vegetalized facings.

- **Custom designed**: Each embankment is custom designed for the specific requirements of the project.

- **Optimized traffic clearance envelopes**: TechSpan® arches are frequently used for the construction of railway tunnels in earthen embankments. The TechSpan® method is especially efficient when building the structures over existing rail tracks and bridges, because of the architectural flexibility of the TechSpan® method being a unique combination of high level engineering, straightforward constructability and architectural versatility.

- **Ease of construction**: TechSpan® arches are designed to withstand the heavy bearing pressure and breaking stresses transmitted by high speed railways and highways, due to the inherent resilience of Reinforced Earth®. To optimize the traffic clearance envelopes, high load bearing capacity is evidenced by numerous tests conducted in the USA, France and Germany.

- **Absorption of vibrations**: High speed railways and highways often require particularly high levels of noise abatement. TechSpan® arches can be built with sound absorbing facings, providing effective noise reduction.

- **Shock absorbing capacity**: TechSpan® arches are designed to absorb vibrations and to provide protection against environmental nuisances such as noise or visual pollution. This type of structure can be an integral part of the landscape, blending seamlessly into the surroundings.

- **Attractive appearance combined with technical performance**: In Japan, engineering firms are interested in demonstrating their professional capabilities by designing structures which aesthetically integrate into their environments and enhance their surroundings. Site integration functionalities are therefore particularly important in rail corridors, where land use and consumption of materials the faces of the embankments can be vertical or steepened, with mineral or vegetalized facings. Site integration functionalities are therefore particularly important in rail corridors, where land use and consumption of materials the faces of the embankments can be vertical or steepened, with mineral or vegetalized facings.

- **Moderate slope embankments**: Embankments built with Reinforced Earth® are easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments. Reinforced Earth® embankments are also easy to build and sturdy enough to provide maximum protection for the embankments.

- **Avoidance of vibrations**: High speed railways and highways often require particularly high levels of noise abatement. TechSpan® arches can be built with sound absorbing facings, providing effective noise reduction.

- **Economic savings**: TechSpan® arches are designed to absorb vibrations and to provide protection against environmental nuisances such as noise or visual pollution. This type of structure can be an integral part of the landscape, blending seamlessly into the surroundings.

- **Attractive appearance combined with technical performance**: In Japan, engineering firms are interested in demonstrating their professional capabilities by designing structures which aesthetically integrate into their environments and enhance their surroundings.
Bridge abutments spanning railway lines

The advantages of Reinforced Earth® abutments are also evident in the case of existing railways, where the existing embankments or track beds are cut away to avoid construction over the bed of the existing railway. These unique abutments can provide support for the new embankment, in addition to the track bed, while allowing the new embankment to be integrated into the existing embankment. This allows for the seamless transition of the new embankment into the old embankment, ensuring minimal disruption to rail service.

Bridge abutments supporting the track beds

Reinforced Earth® bridge abutments have been built in several countries since 1975. These abutments are designed to provide support for the new embankment, in addition to the track bed, while allowing the new embankment to be integrated into the existing embankment. This allows for the seamless transition of the new embankment into the old embankment, ensuring minimal disruption to rail service.

Retaining walls supporting the track beds

Reinforced Earth® retaining walls are used to support the track beds and provide stability to the embankments or cut and covers. These walls are designed to withstand the forces exerted by the track beds and provide support to the embankments or cut and covers. They are constructed using a combination of steel and soil, ensuring minimal disruption to rail service.

Site integration functionalities

For the successful integration of railways into populated areas, it is essential to consider the site integration functionalities. Reinforced Earth® structures are designed to provide minimal disruption to existing infrastructure, allowing for the seamless integration of new structures into the existing environment. They are also designed to provide aesthetics and architectural versatility, ensuring a harmonious integration of new structures into the existing landscape.

Bridge abutments supporting the track beds

Reinforced Earth® bridge abutments have been built in several countries since 1975. These abutments are designed to provide support for the new embankment, in addition to the track bed, while allowing the new embankment to be integrated into the existing embankment. This allows for the seamless transition of the new embankment into the old embankment, ensuring minimal disruption to rail service.

Rail tunnels under surface embankments and cut and covers

Reinforced Earth® can be used for rail tunnels under surface embankments and cut and covers. This construction method, involving a strong soil-structure interaction, combines the foundation soil, backfill, and abutments and bridge deck of precast concrete girders or slabs using TechSpan® arches or TechSpan® arches and bridge deck. TechSpan® arches are frequently used for the construction of railway tunnels in earthen embankments. The main advantage of TechSpan® arches is the material and structural quality, the rapidity of installation and the adaptability to the specific requirements of each project.

Retaining walls along railways

Retaining walls are used to support the track beds and provide stability to the embankments or cut and covers. They are designed to withstand the forces exerted by the track beds and provide support to the embankments or cut and covers. These walls are constructed using a combination of steel and soil, ensuring minimal disruption to rail service.

Retaining walls supporting the track beds

Reinforced Earth® retaining walls are used to support the track beds and provide stability to the embankments or cut and covers. These walls are designed to withstand the forces exerted by the track beds and provide support to the embankments or cut and covers. They are constructed using a combination of steel and soil, ensuring minimal disruption to rail service.

Bridge abutments spanning railway lines

The advantages of Reinforced Earth® abutments are also evident in the case of existing railways, where the existing embankments or track beds are cut away to avoid construction over the bed of the existing railway. These unique abutments can provide support for the new embankment, in addition to the track bed, while allowing the new embankment to be integrated into the existing embankment. This allows for the seamless transition of the new embankment into the old embankment, ensuring minimal disruption to rail service.

Bridge abutments supporting the track beds

Reinforced Earth® bridge abutments have been built in several countries since 1975. These abutments are designed to provide support for the new embankment, in addition to the track bed, while allowing the new embankment to be integrated into the existing embankment. This allows for the seamless transition of the new embankment into the old embankment, ensuring minimal disruption to rail service.

Retaining walls along railways

Retaining walls are used to support the track beds and provide stability to the embankments or cut and covers. They are designed to withstand the forces exerted by the track beds and provide support to the embankments or cut and covers. These walls are constructed using a combination of steel and soil, ensuring minimal disruption to rail service.

Bridge abutments spanning railway lines

The advantages of Reinforced Earth® abutments are also evident in the case of existing railways, where the existing embankments or track beds are cut away to avoid construction over the bed of the existing railway. These unique abutments can provide support for the new embankment, in addition to the track bed, while allowing the new embankment to be integrated into the existing embankment. This allows for the seamless transition of the new embankment into the old embankment, ensuring minimal disruption to rail service.

Bridge abutments supporting the track beds

Reinforced Earth® bridge abutments have been built in several countries since 1975. These abutments are designed to provide support for the new embankment, in addition to the track bed, while allowing the new embankment to be integrated into the existing embankment. This allows for the seamless transition of the new embankment into the old embankment, ensuring minimal disruption to rail service.

Retaining walls along railways

Retaining walls are used to support the track beds and provide stability to the embankments or cut and covers. They are designed to withstand the forces exerted by the track beds and provide support to the embankments or cut and covers. These walls are constructed using a combination of steel and soil, ensuring minimal disruption to rail service.
The advantages of Reinforced Earth® walls are also obtained in Reinforced Earth® bridge abutments. The TechSpan® method is especially efficient when building the structures over existing rail tracks to work outside the area influenced by the railway. Thus the construction of overpasses compatible with the speed and safety requirements the Reinforced Earth® structures can be pure or integral load bearing abutments, a minimum of inconvenience for train traffic. Depending on the sites conditions and owners’ requirements the Reinforced Earth® structures can be pure or mixed abutments. The advantages of Reinforced Earth® walls are also obtained in Reinforced Earth® bridge abutments. Reinforced Earth® bridge abutments reduce highly concentrated superstructure loads to acceptable uniform bearing pressures at the foundation level. This eliminates the necessity of any structure or equipment in front of the wall. It may therefore be placed right up to a clearance line or to a service road without any serious disruption of rail service.

The technology is similar to roadway applications except the design of the retaining structure, which always consists entirely of a steel strip soil reinforcement, recommended for structures supporting railways, is the guarantee of minimal deformations under high loads. Structures beneath the tracks are designed to accommodate sudden braking decelerations.

Reinforced Earth® structures have often been used, particularly in Japan, for widening railway track beds. A Reinforced Earth® wall is built entirely from the backfill side, without scaffolding and without the necessity of any structure or equipment in front of the wall. It can be built adjacent to the rail line beds. A Reinforced Earth® wall is build entirely from the backfill side, without scaffolding and without the necessity of any structure or equipment in front of the wall. It can be built adjacent to the rail line beds. For the site upon rail line beds. A Reinforced Earth® wall is build entirely from the backfill side, without scaffolding and without the necessity of any structure or equipment in front of the wall. It can be built adjacent to the rail line beds.

Among its many earth-retaining and load-supporting applications, Reinforced Earth® has gained significant attention for its unique bridge abutments. Reinforced Earth® bridge abutments reduce highly concentrated superstructure loads to acceptable uniform bearing pressures at the foundation level. This eliminates the necessity of any structure or equipment in front of the wall. It may therefore be placed right up to a clearance line or to a service road without any serious disruption of rail service. The inextensibility of the steel strip soil reinforcement, recommended for structures supporting railways, is the guarantee of minimal deformations under high loads. Structures beneath the tracks are designed to accommodate sudden braking decelerations.

The advantages of Reinforced Earth® walls are also obtained in Reinforced Earth® bridge abutments. Reinforced Earth® bridge abutments reduce highly concentrated superstructure loads to acceptable uniform bearing pressures at the foundation level. This eliminates the necessity of any structure or equipment in front of the wall. It may therefore be placed right up to a clearance line or to a service road without any serious disruption of rail service. The inextensibility of the steel strip soil reinforcement, recommended for structures supporting railways, is the guarantee of minimal deformations under high loads. Structures beneath the tracks are designed to accommodate sudden braking decelerations.

Reinforced Earth® structures have often been used, particularly in Japan, for widening railway track beds. A Reinforced Earth® wall is built entirely from the backfill side, without scaffolding and without the necessity of any structure or equipment in front of the wall. It can be built adjacent to the rail line beds. A Reinforced Earth® wall is build entirely from the backfill side, without scaffolding and without the necessity of any structure or equipment in front of the wall. It can be built adjacent to the rail line beds. For the site upon rail line beds. A Reinforced Earth® wall is build entirely from the backfill side, without scaffolding and without the necessity of any structure or equipment in front of the wall. It can be built adjacent to the rail line beds. The technology is similar to roadway applications except the design of the retaining structure, which always consists entirely of a steel strip soil reinforcement, recommended for structures supporting railways, is the guarantee of minimal deformations under high loads. Structures beneath the tracks are designed to accommodate sudden braking decelerations. Structu
Reinforced Earth®,
the Value of Experience

When it was invented almost 50 years ago, nobody could foresee the great success of the Reinforced Earth® technique. It is now recognized as a major innovation in the field of civil engineering. Reinforced Earth® has substantially widened its scope of applications to beyond just roads in the last 30 years, demonstrating its advantages in other markets. Structures associated to railway projects have been designed and supplied by companies of the global Terre Armée Internationale network on five continents since 1973.

For railway owners and engineers Reinforced Earth® simultaneously provides unique key benefits:

- **Strength** – significant load bearing capacity
- **Resilience** – effective absorption of vibrations and an exceptional seismic response
- **Durability** – high quality materials, proven track record and ease of inspection
- **Adaptability** – to geotechnical, environmental and architectural site conditions
- **Low impact** – rapid construction, minimal land use, no traffic disruption and reduced environmental footprint

Choosing a Reinforced Earth® solution means getting the best of:

- the longest experience in the field of mechanically stabilized earth structures
- a global network of innovative companies deeply rooted on their markets
- bespoke engineered solutions adapted to complex situations
- the widest range of reliable and sustainable materials with a complete independence from manufacturers

With TechSpan® technique, the same philosophy is pursued with the inherent advantages of:

- engineered backfills
- precast construction components

Reinforced Earth®, Terre Armée® and TechSpan® are trademarks owned by members of Terre Armée Internationale

It was only five years after the introduction of Reinforced Earth® that the technique was first used to build structures near railway lines. By the mid seventies, the civil engineering community had become more aware of the capabilities of this unique construction method, particularly in terms of mobile and dynamic load bearing capacity. Engineers and projects owners began using Reinforced Earth® extensively to build structures under railway tracks. Hundreds of such structures have been designed and built since the construction of the first walls supporting a railway line in the USA in 1973. TechSpan®, a precast arch system developed by Terre Armée Internationale from the end of the eighties also has applications for railway projects.

Reinforced Earth® and TechSpan® bring all the answers to the legitimate concerns for safety governing railroad designs and exploitation. The railway applications for the former introduction in 1973 and in the end, the latter are based on similar principles.

Reinforced Earth® and TechSpan® are used for the construction of a wide range of railway related structures...

... and for all types of trains

... for all types of trains

Our goal is to create, design and supply innovative technologies to the civil engineering industry with a strong commitment to excellence in design, service and public welfare.

www.terre-armee.com

Sustainable Technology

Railways

Reinforced Earth® and TechSpan® structures

Sustainable
Technology

Reinforced Earth. Terre Armée are member companies of Terre Armée Internationale.

LGV Rhin-Rhone (France)
Pilbara (Australia)

For railway owners and engineers Reinforced Earth® simultaneously provides unique key benefits:

- **Strength** – significant load bearing capacity
- **Resilience** – effective absorption of vibrations and an exceptional seismic response
- **Durability** – high quality materials, proven track record and ease of inspection
- **Adaptability** – to geotechnical, environmental and architectural site conditions
- **Low impact** – rapid construction, minimal land use, no traffic disruption and reduced environmental footprint

Choosing a Reinforced Earth® solution means getting the best of:

- the longest experience in the field of mechanically stabilized earth structures
- a global network of innovative companies deeply rooted on their markets
- bespoke engineered solutions adapted to complex situations
- the widest range of reliable and sustainable materials with a complete independence from manufacturers

With TechSpan® technique, the same philosophy is pursued with the inherent advantages of:

- engineered backfills
- precast construction components

Reinforced Earth®, Terre Armée® and TechSpan® are trademarks owned by members of Terre Armée Internationale

It was only five years after the introduction of Reinforced Earth® that the technique was first used to build structures near railway lines. By the mid seventies, the civil engineering community had become more aware of the capabilities of this unique construction method, particularly in terms of mobile and dynamic load bearing capacity. Engineers and projects owners began using Reinforced Earth® extensively to build structures under railway tracks. Hundreds of such structures have been designed and built since the construction of the first walls supporting a railway line in the USA in 1973. TechSpan®, a precast arch system developed by Terre Armée Internationale from the end of the eighties also has applications for railway projects.

Reinforced Earth® and TechSpan® bring all the answers to the legitimate concerns for safety governing railroad designs and exploitation. The railway applications for the former introduction in 1973 and in the end, the latter are based on similar principles.

Reinforced Earth® and TechSpan® are used for the construction of a wide range of railway related structures...

... and for all types of trains

... for all types of trains

Our goal is to create, design and supply innovative technologies to the civil engineering industry with a strong commitment to excellence in design, service and public welfare.

www.terre-armee.com

Sustainable Technology

Railways

Reinforced Earth® and TechSpan® structures

Sustainable
Technology

Reinforced Earth. Terre Armée are member companies of Terre Armée Internationale.

LGV Rhin-Rhone (France)
Pilbara (Australia)
When it was invented almost 50 years ago, nobody could foresee the great success of the Reinforced Earth® technique. It is now recognized as a major innovation in the field of civil engineering.

Reinforced Earth® has substantially widened its scope of applications to beyond just roads in the last 30 years, demonstrating its advantages in other markets. Structures associated to railway projects have been designed and supplied by companies of the global Terre Armée Internationale network on five continents since 1973.

For railway owners and engineers Reinforced Earth® simultaneously provides unique key benefits:

- **Strength** – significant load bearing capacity
- **Resilience** – effective absorption of vibrations and an exceptional seismic response
- **Durability** – high quality materials, proven track record and ease of inspection
- **Adaptability** – to geotechnical, environmental and architectural site conditions
- **Low impact** – rapid construction, limited land use, no traffic disruption and reduced environmental footprint

Choosing a Reinforced Earth® solution means getting the best of:

- the longest experience in the field of mechanically stabilized earth structures
- a global network of innovative companies deeply rooted on their markets
- bespoke engineered solutions adapted to complex situations
- the widest range of reliable and sustainable materials with a complete independence from manufacturers

With TechSpan® technique, the same philosophy is pursued with the inherent advantages of:

- engineered backfills
- precast construction components

Reinforced Earth®, Terre Armée® and TechSpan® are trademarks owned by members of Terre Armée Internationale.

It was only five years after the introduction of Reinforced Earth® that this technique was first used to build structures near railway lines. By the mid-1970s, the civil engineering community had become more aware of the capabilities of this unique construction method, particularly in terms of mobile and dynamic load bearing capacity.

Engineers and projects owners began using Reinforced Earth® extensively to build structures under railway tracks. Hundreds of such structures have been designed and built since the construction of the first walls supporting a railway line in the USA in 1973. TechSpan®, a precast arch system developed by Terre Armée Internationale from the end of the 1980s also has applications for railway projects.

Reinforced Earth® and TechSpan® bring all the answers to the legitimate concerns for safety governing railroad designs and exploitation.

The railway applications are seen as a natural extension of the knowledge already acquired on roads and in particular on the use of this technique under railway structures.

Reinforced Earth® and TechSpan® are used for the construction of a wide range of railway related structures:

- Retaining walls along railways
- Bridge abutments spanning railway lines
- Retaining walls and bridge abutments supporting the track beds
- Rail tunnels beneath earthen embankments
- Arch bridges supporting the track beds
- Underpasses and culverts beneath earthen embankments supporting the track beds
- Steep embankments for noise and collision protection

… and for all types of trains:

- LRT
- MRT
- Regional
- Intercity
- High speed
- Freight