



**METAL:RI**  
ADVANCED BUILDING SOLUTIONS



METAL.RI

## THE RIGHT PARTNER TO SHAPE THE FUTURE

Since 1995, we have designed and produced composite steel and concrete structures supported by our engineers. Our experience allows us to be a **point of reference** for engineers and companies working in this sector.

Experience and competence allowed us to design innovative and target oriented products aiming to enhance the building sector. For this reason, we developed and patented the building system called **MTR® System**.



# MTR® SYSTEM

## THE INNOVATIVE CHOICE FOR THE ADVANCED CONSTRUCTION SITE

The **MTR® System** represents the most reliable system belonging to the composite steel-concrete structures.

The system comprises three types of trusses (type A, T and C). It is used to build horizontal structures and it can partially or totally replace the main and the secondary beams.

Thus preserving the setting of a typical building site for concrete structures, we do not use beams made on site, but only prefabricated composite steel beams which are delivered to the construction site ready for being assembled.

An industrialisation process for the certified building site and for “error-free” structures. Many advantages and high safety for the client, the structural designer and the contractor.



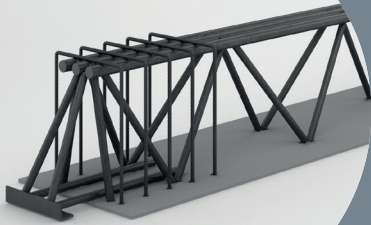


# WHAT IS THE MTR<sup>®</sup> SYSTEM?

The **MTR<sup>®</sup> System** is composed of three different types of trusses having their pertaining calculation system for the designing process:

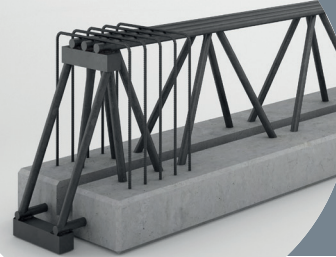


## MTR<sup>®</sup> A BEAM



is self-supporting during the assembly and casting phase of the floor. It has a steel bottom plate.

## MTR<sup>®</sup> C BEAM



is self-supporting during the assembly and casting phase of the floor. It has a concrete bottom plate.

## MTR<sup>®</sup> T BEAM



has to be shuttered and propped during the assembly and casting phase of the floor. It does not have the bottom plate and it is completely embedded in the cast-in place-concrete.

## SOFTWARE MTR

is the application software for the calculation and designing of the MTR<sup>®</sup> Beams. It is implemented in the specific production process used by Metal.Ri.



## ADVANTAGES

# WHY CHOOSE THE MTR® SYSTEM



1

### > EXECUTION SPEED

The speed and ease of assembly of the structures reduce costs by 60% and the time required to build the floors:

MTR® A BY 70%

MTR® T BY 50%

MTR® C BY 70%



The MTR® steel structures are made in our factory so we deliver ready to cast product.

2

### > ECO-SUSTAINABILITY

Reduced on-site construction waste and use of timber:

MTR® A BY 100%

MTR® T BY 60%

MTR® C BY 100%

3

### > CONSTRUCTION SITE SAFETY

Prefabrication of slabs with MTR® beams improves safety on the construction site by 60%.

4

### > PRODUCT GUARANTEE AND SEISMIC RESISTANCE

The MTR® beams are produced in the factory and arrive at the construction site ready for installation. This guarantees 100% certainty for the client, the structural designer and the contractor

5

### > ARCHITECTURAL FREEDOM AND VERSATILITY

The reduction of the number of columns and their section and the increasing the column spacing, permit to optimize the interior spaces and realize complex architectural structures.

6

### > CONCRETE REDUCTION

The section of the MTR® Beams are smaller than the ones in traditional reinforced concrete beams.

7

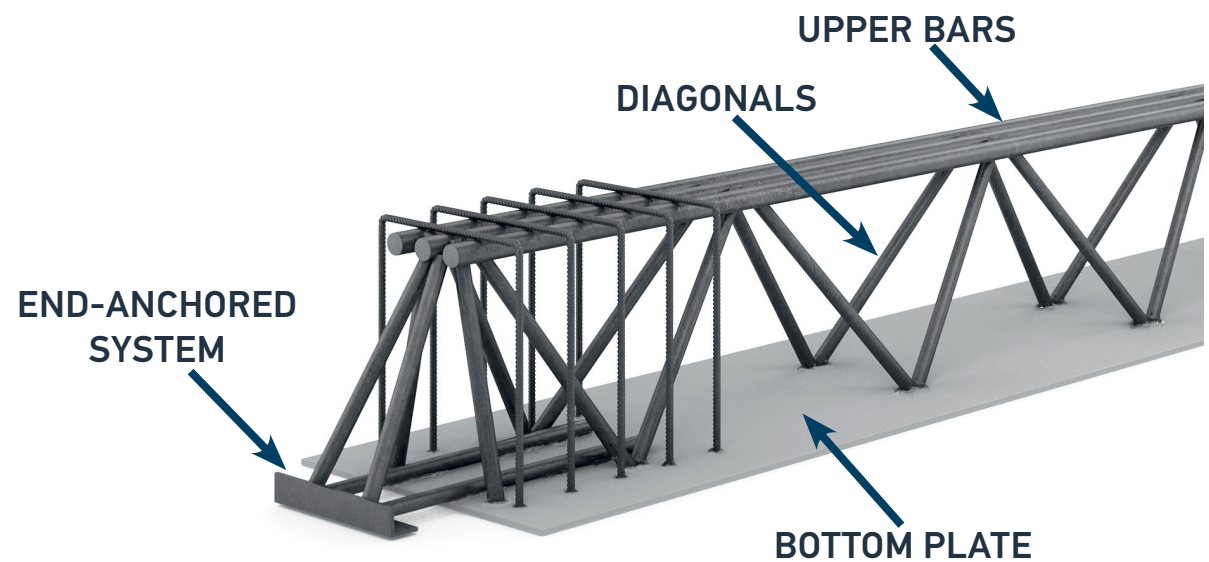
### > FIRE RESISTANCE

The steel, coated or incorporated in the concrete, guarantees the resistance of the structure in case of fire, without additional costs and processing.

# MTR® TRUSSES FOR STEEL AND CONCRETE STRUCTURES

MTR® beams are composite steel and concrete self load-bearing structural elements with steel truss for the reinforcement of the concrete.

MTR® beams produced by Metal.Ri are made with structural steel S355 as by EN 10025-2 regulations, assembled in industrial workshop using a welding procedure certified in accordance with UNI EN ISO 3834-2 regulations and completed on site with a casting concrete.



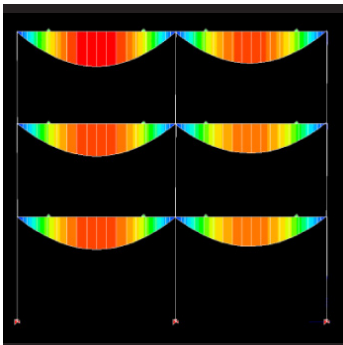
# STATIC BEHAVIOUR OF **MTR® BEAMS** SELF LOAD-BEARING



## PHASE 1



The **MTR® beam** before concrete hardening is an ISOSTATIC STRUCTURE IN STEEL MATERIAL  
*(isostatic scheme)*



### Beam loads:

1. Self weight
2. Weight of liquid concrete
3. Permanent floor loads



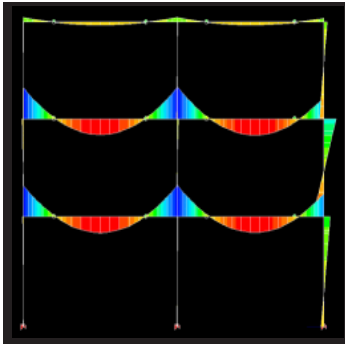


# STATIC BEHAVIOUR OF **MTR® BEAMS** SELF LOAD-BEARING



## PHASE 2

After concrete hardening MTR® beams are completely connected with the frame structure (iperstatic scheme).

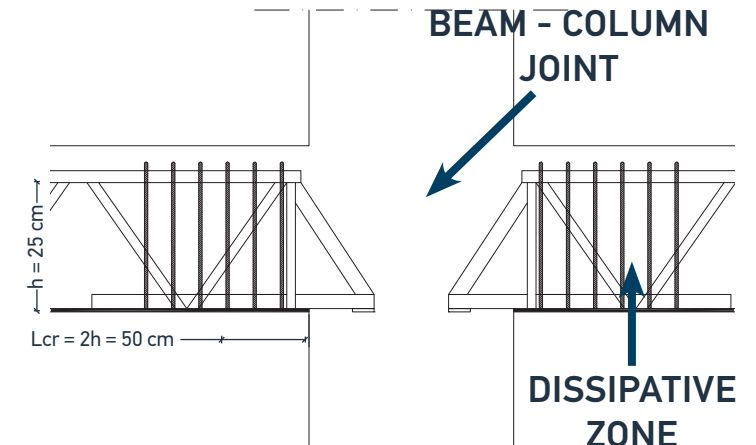


Middle sections → **COMPOSITE STEEL AND CONCRETE STRUCTURE**

Terminal sections → **REINFORCED CONCRETE (TERMINAL DISSIPATIVE ZONES)**

### Beam loads:

1. Permanent loads not included in phase 1
2. Variable loads



# REFERENCE BUILDING CODES



## PHASE 1



### STEEL STRUCTURE

UNI EN 1993-1-1:2005 (1/08/2005) **Eurocode 3**

*Design of steel structures - Part 1-1: General rules and rules for buildings*

## PHASE 2



### COMPOSITE STEEL AND CONCRETE STRUCTURE

UNI EN 1994-1-1:2005 (March 2005) **Eurocode 4**

*Design of composite steel and concrete structures - Part 1-1: General rules and rules for buildings.*

UNI EN 1993-1-1:2005 (1/08/2005) **Eurocode 3**

*Design of steel structures - Part 1-1: General rules and rules for buildings*

UNI EN 1992-1-1:2005 **Eurocode 2**

*Design of concrete structures - Part 1-1: General rules and rules for buildings*

# MTR<sup>®</sup> BEAM DESIGN

## PHASE 1



### 1. LOCAL VERIFICATIONS OF THE TRUSS MEMBER

- Verification of buckling behaviour during axial bending and compression of the top chord
- Verification of buckling behaviour during axial bending and compression of the diagonal members

### 2. GLOBAL VERIFICATIONS

- Verification lateral torsional buckling during axial bending of the steel truss

### 3. LOCAL VERIFICATIONS ON THE PLATE (MTR<sup>®</sup> A BEAMS)

- Verification during the plate punching
- Verification of the resistance of the steel plate on loaded area

### 4. LOCAL VERIFICATIONS ON THE PLATE (MTR<sup>®</sup> C BEAMS)

- Cracking control of the concrete plate
- Verification of the resistance of the concrete plate on loaded area

### 5. LOCAL VERIFICATIONS ON THE SUPPORTING APPLIANCES

- Verification of the instability for bending and axial compression
- Verification of shear resistance
- Verification of the bending, shear and axial force

### 6. VERIFICATION OF STEEL TRUSS DEFLECTIONS



# MTR<sup>®</sup> BEAM DESIGN

## PHASE 2



1. COMPRESSION AND BENDING VERIFICATION OF THE STEEL-CONCRETE BEAM
2. SHEAR VERIFICATION OF THE STEEL-CONCRETE BEAM
3. LOCAL VERIFICATIONS ON THE PLATE (MTR<sup>®</sup> A BEAMS)
  - Verification during the plate punching
4. SERVICEABILITY LIMIT STATES (SLS) VERIFICATION
  - Verification of cracking Verification of the stress limitation
  - Verification of the deflections

## JOINTS WITH MTR® BEAMS - PHASE 1



**01** Central joint with **MTR® A**  
**beam** - Phase 1

**02** Corner joint with **MTR® A**  
**beam** - Phase 1



## JOINTS WITH MTR® BEAMS - PHASE 2



**01** Corner joint with **MTR® A beam** - Phase 2

**02** Edge joint with **MTR® A beam** - Phase 2



# SOFTWARE MTR®

## THE CERTIFIED SOFTWARE



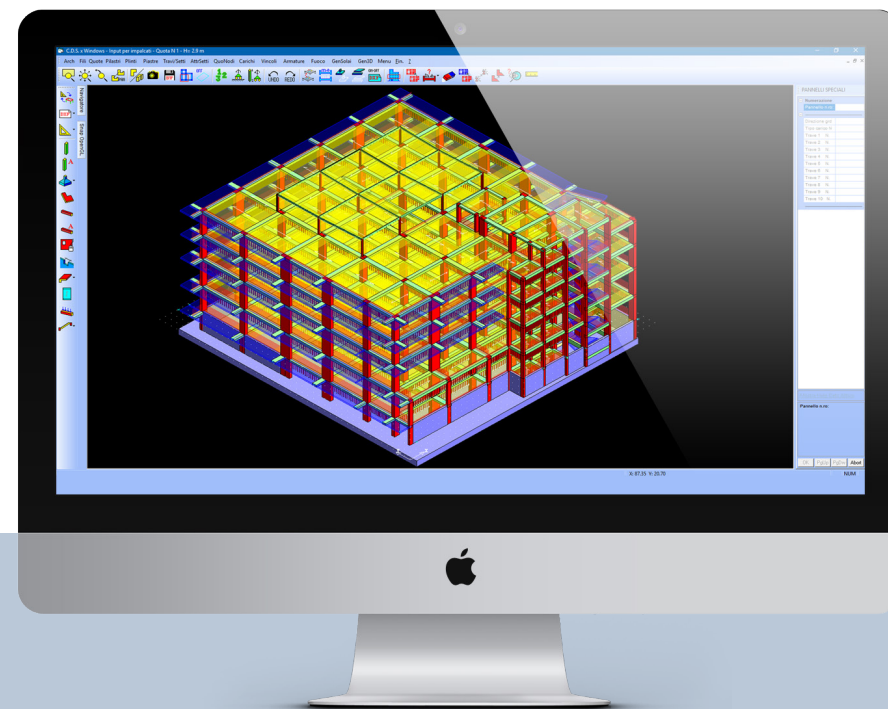
The building system of the MTR® beams is equipped with a specific structural design software. It has been designed taking into account the production process and the technical Italian and European law. The purpose of this software is to integrate the different existing structural design systems in order to plan works using the MTR® technology.

The **MTR® Software** has been developed by **INFO.MTR Srl**, the software house on which Metal.Ri relies on to develop, experiment and implement new technologies. The software is produced in a certified quality system in compliance with the **UNI EN ISO 9001** regulation.

### OUR ADDED VALUE

The MTR® System can be designed to suit any purpose such as residential, commercial, tertiary and industrial buildings. Request a technical consultation: one of our engineers will become your reference **MTR®** designer and will support you in any activity required.

The designer will carry out the tests of details of the MTR® elements. He will also develop the mathematical model in three dimensions of the entire structure using the calculation software that is able to interact with the application **Software MTR®**.



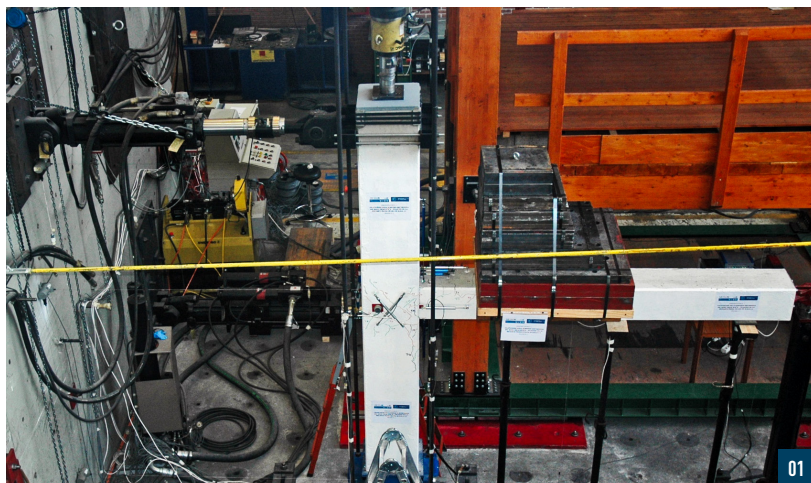
A perfect synergy between our designers and your needs to offer you the best technical, practical and economical solutions

[www.metalri.it](http://www.metalri.it)

# LEGISLATION AND CERTIFICATIONS

## WE INVEST IN RESEARCH TO ENSURE THE BEST STANDARDS

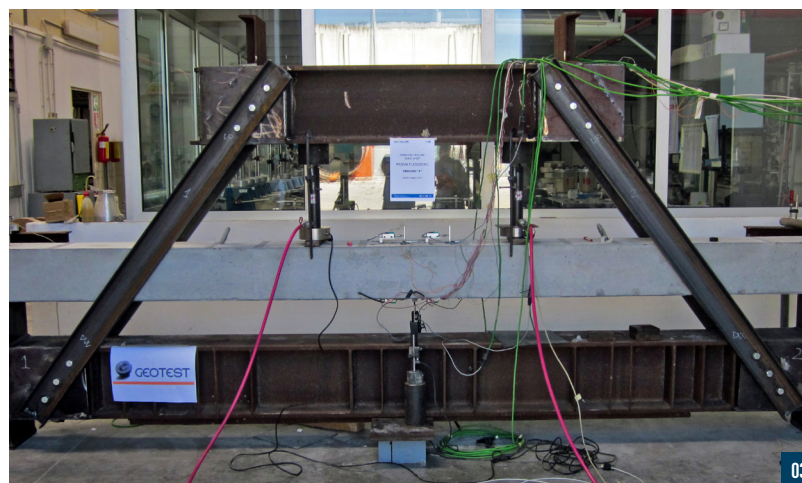
[www.metalri.it](http://www.metalri.it)



Metal.Ri takes part in teamwork and belongs to different professional associations involved in specific research projects (*Universities, National and International Research Centres*). The company is making investment in research and development of products and in conforming to the law and to the European legislation in order to put on market new products which are made thanks to the most advanced technology and with controlled and certified quality.



The theories for calculating and verifying the MTR® System have been tested with the **Polytechnic University of Bari**, the **University la Sapienza of Rome** and the **University of Basilicata**.



- 01** Evaluation of the anti-seismic response by means of a 1:1 scale cyclic test of the reinforced concrete column node - MTR® beam
- 02** Static load test on a not poured MTR® beam - Phase 1
- 03** Static load test on a poured MTR® beam - Phase 2



The tests are carried out in collaboration with official and authorized laboratories according to the article 20 of the Law 1086/71, in order to verify the applicability of calculations theories. Tests, controls and structural inspections are also carried out in the case of non-common situations or of structures bearing higher loads.

*In the pictures: place of worship where the MTR® beams slumps are monitored in order to verify that their behaviour replicate the theoretical values.*



## LEGISLATION AND CERTIFICATIONS



### EUROPEAN UNION PATENT

Issued by EPO (European Patent Office)



### CE MARKING

According to the EN 1090-1. The production control in the factory in conformity to the requirements of the Maximum Execution Class of EXC4.



### CERTIFICATION OF BELONGING TO CLASS A

Issued by the C.S.L.L.P.P (Superior Council of Public Works- Central Technical Service)



### QUALITY MANAGEMENT SYSTEM CERTIFICATION

According to the UNI EN ISO 9001 regulation



### WELDING CERTIFICATION

According to the UNI EN ISO 3834-2 regulation

### PRODUCT QUALIFICATION AND PRODUCTION PROCESS

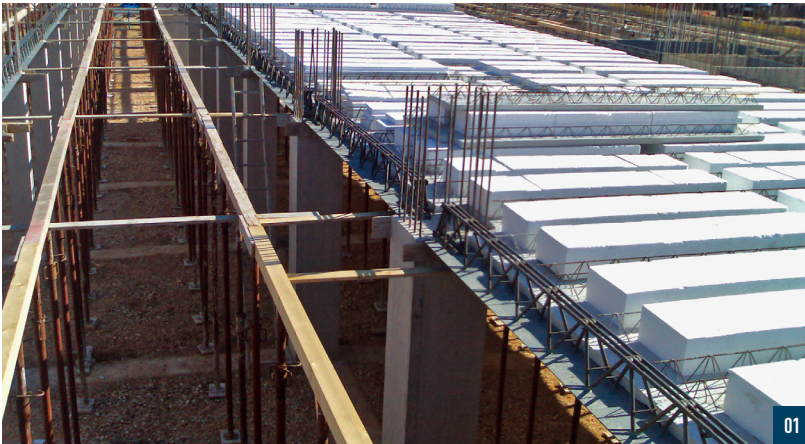
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# THE ADVANCED CONSTRUCTION SITE



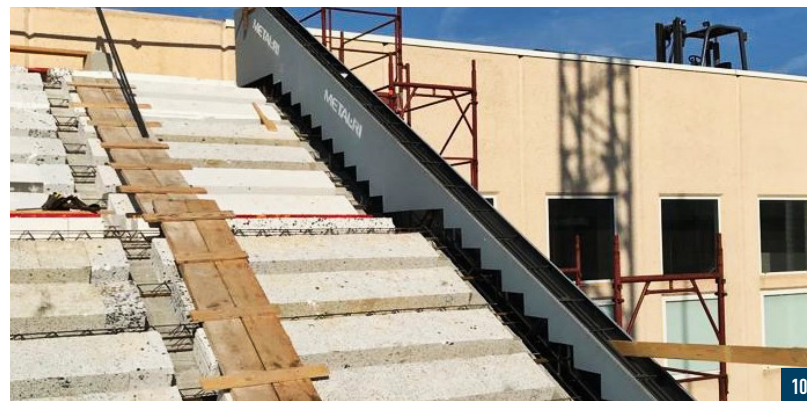
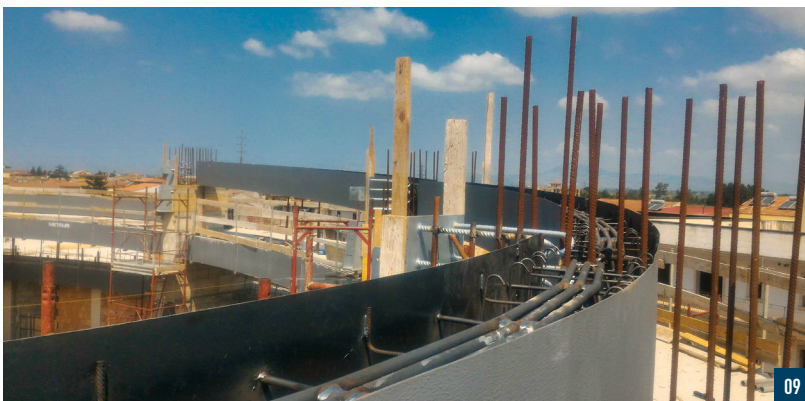
[www.metalri.it](http://www.metalri.it)



- 01 MTR® A beams with predalles slab floor
- 02 MTR® A beams with lightweight floor
- 03 Long span MTR® A beams
- 04 MTR® T beams on predalles slabs



## THE ADVANCED CONSTRUCTION SITE

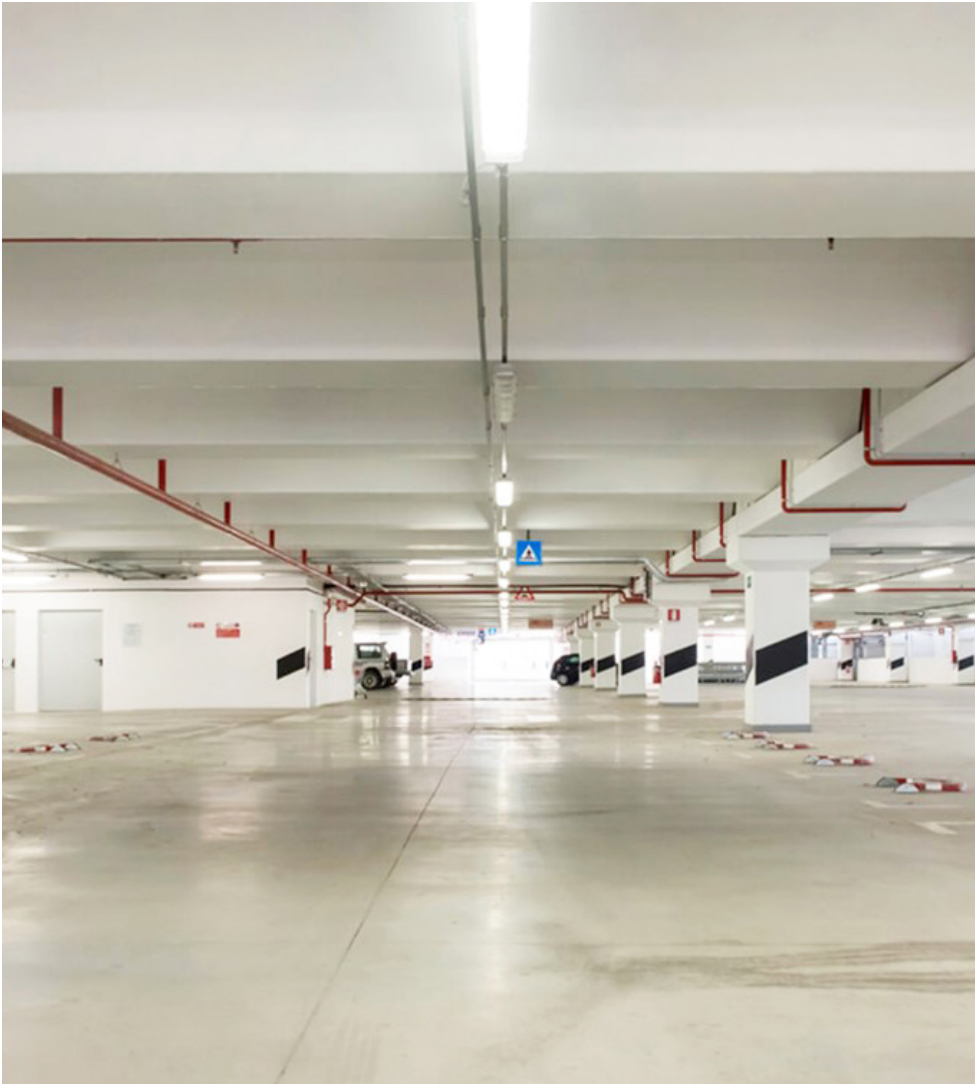


- 05 MTR® T beams placed on wooden formwork
- 06 MTR® C beams with predalles slab floor
- 07 MTR® C with hollow-core self-supporting floor
- 08 MTR® A curved beams
- 09 MTR® A curved beams
- 10 MTR® A beams shaped for staircase



# ABSENCE OF EXTRADOSSES

TRADITIONAL SYSTEM





# EXECUTION SPEED

## TRADITIONAL SYSTEM



**9.000 MQ<sup>2</sup> IN 7 MONTHS**



**15.000 MQ<sup>2</sup> IN 7 MONTHS**



# PROPS REDUCTION

## TRADITIONAL SYSTEM





# FORMWORKS REDUCTION

TRADITIONAL SYSTEM





# PILLARS SECTION REDUCTION

TRADITIONAL SYSTEM





# MANPOWER REDUCTION

## TRADITIONAL SYSTEM







# CONSTRUCTION PHASES OF MTR<sup>®</sup> SYSTEM





1

**FOUNDATIONS** ARE CREATED AS FOR REINFORCED CONCRETE STRUCTURES. SELF-SUPPORTING MTR® BEAMS REDUCE THE AMOUNT OF STRESS AT THE FOUNDATION.





2

THE **VERTICAL STRUCTURES** (PILLARS AND WALLS) ARE CREATED. THE USE OF SELF-SUPPORTING MTR® BEAMS REDUCES THE SECTIONS OF THE VERTICAL ELEMENTS.





3

THE **HORIZONTAL STRUCTURE** IS MADE USING **MTR® BEAMS**



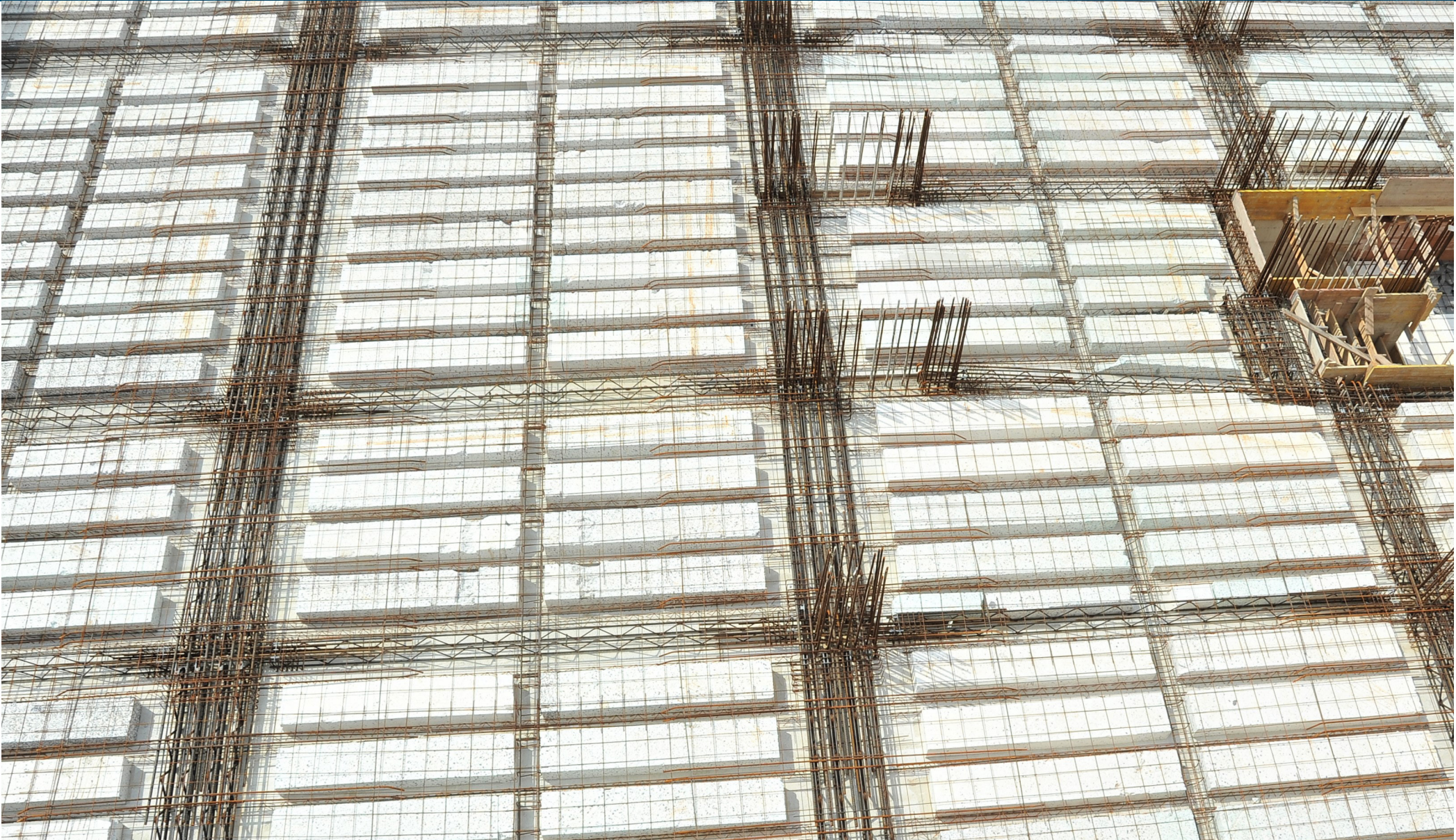


# FLOOR WITH MTR® A BEAMS





# FLOOR WITH MTR® T BEAMS





# FLOOR WITH MTR<sup>®</sup> C BEAMS





# PREFABRICATED FLOORS TO COMBINE WITH **MTR®** BEAMS



BRICKS



EPS



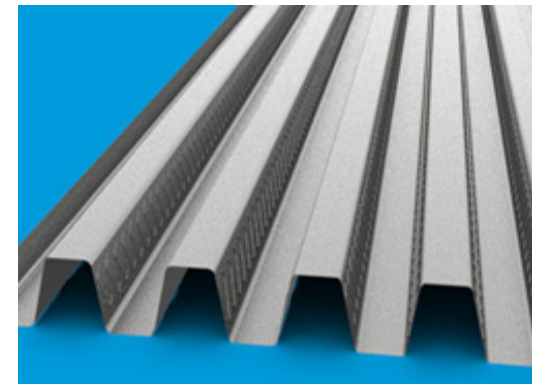
CONCRETE



PREDALLES SLABS



SPIROLL SLABS



CORRUGATED SHEETS

# RESULT OF HORIZONTAL STRUCTURE

WITHOUT THICK BEAMS, EXCELLENT FOR SOLVING ACOUSTIC AND IMPLANT PROBLEMS





## USES AND COMPLETED BUILDINGS

# FROM EACH OF OUR ACHIEVEMENTS, COMES A NEW CHALLENGE



[www.metalri.it](http://www.metalri.it)

Over 20 years experience in the field of composite steel – concrete structures. We have built millions of square meters of structures in different fields of construction, from residential to commercial, from industrial to services and infrastructures.

The structural design using the **MTR® system** adapts to any intended use such as residential, commercial, tertiary and industrial buildings. Each building can be designed and built according to the technical characteristics of both a single type of the MTR® beam or combining the different beams. A range of options to get the best results and meet any technical and economical need.



01



02

- RESIDENTIAL BUILDINGS
- COMMERCIAL AND TERTIARY BUILDINGS
- INDUSTRIAL BUILDINGS
- ACCOMMODATION FACILITIES
- PARKING LOTS
- BRIDGES
- INFRASTRUCTURE

01 Tertiary building with underground parking with **MTR® C** beams

02 Residential building with **MTR® A** and **MTR® T** beams



# HOSPITAL GARAGE - AVELLINO

CA. 25.000 MQ<sup>2</sup>





# HOSPITAL IN CASTELVOLTURNO (CE)

PROJECT RENDER - WORK IN PROGRESS - CA. 35.000 MQ<sup>2</sup>



PROGETTO DI AMPLIA  
PINETA GRAN  
HOSPITAL





# RESIDENTIAL BUILDING - BITETTO (BA)





# RESIDENTIAL BUILDING - BARI





# HOTEL - OTRANTO (LE)





# CAR DEALERSHIP - BARI





# SERVICE STATION - BARONISSI (SA)





# OFFICES FOR BOSCH - MODUGNO (BA)



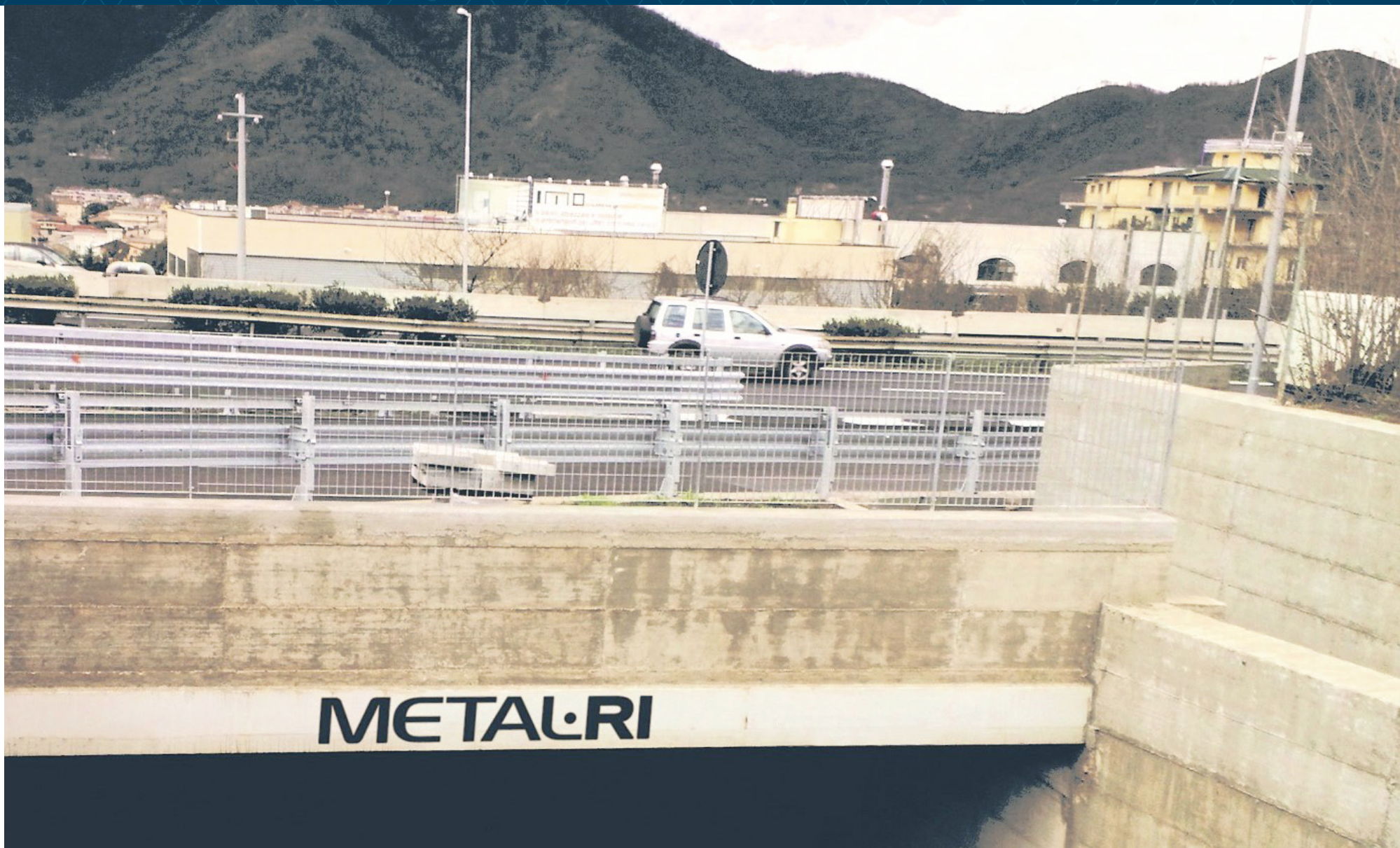


# PEDESTRIAN BRIDGE - CINQUE TERRE (SP)





# ROAD BRIDGE - BARONISSI (SA)





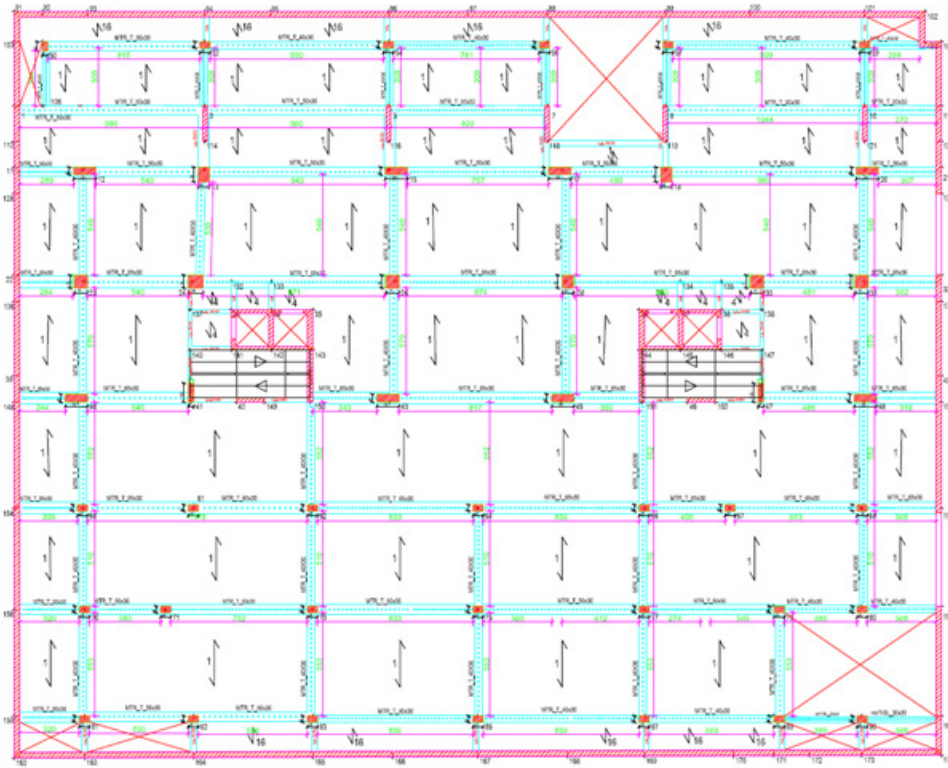
# ROAD BRIDGE - FOGGIA



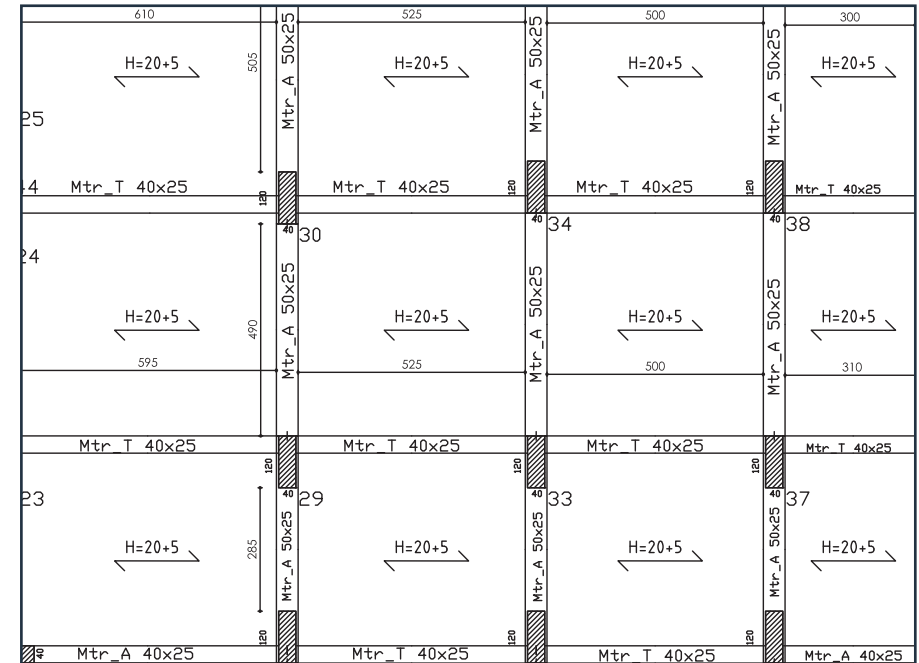


# HOW WE CARRY OUT OUR PROJECTS

## FROM THE ARCHITECTURE



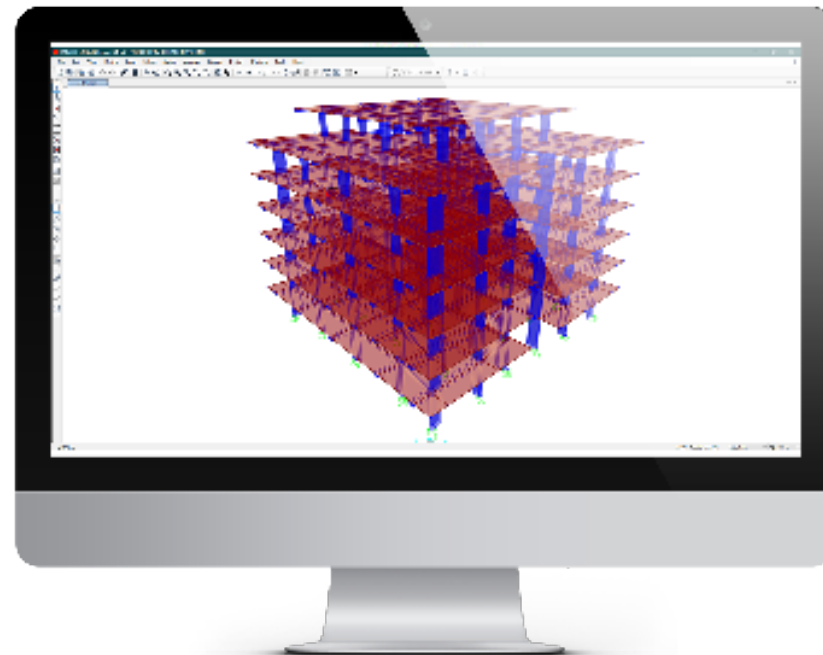
## TO THE STRUCTURE





# HOW WE CARRY OUT OUR PROJECTS

Once the structural framework has been defined and the type of MTR® beams to be used has been identified, the designer will proceed with the **calculation of the MTR® beams**.





# HOW WE CARRY OUT OUR PROJECTS

After the design has been completed, we prepare an economic offer for the supply of the **MTR® System** and the prefabricated floors (if required).



Pr. E542-C/17\_3  
Spett.le

BITETTO 05/06/2018

OGGETTO: Offerta economica per la fornitura di TRAVI MTR® T occorrenti per la realizzazione di un autosilo nel Comune di Monopoli (BA).

Facendo seguito alla Sua gentile richiesta, siamo lieti di sottoporLe la nostra migliore offerta economica in merito alla fornitura di TRAVI MTR®.

### SOLUZIONE UNICA (TRAVI MTR® T)

TRAVE MTR® T

Trave da puntellare formata da uno o più tralicci reticolari in acciaio da carpenteria metallica (UNI EN 10025-2), collegati tra loro. Ciascun traliccio reticolare è costituito da due correnti superiori collegati a due correnti inferiori da un'anima reticolare centrale. La Trave MTR® T, completa di eventuali distanzatori inferiori, si posiziona su cassero in legno o su fondo di lastre predalles.

Il calcolo, impostato agli stati limite secondo il DM 17/01/18, ha fornito n° 12 TRAVI MTR® T "da puntellare e cassero in fase di getto".

Nel calcolo abbiamo ipotizzato l'utilizzo di un solaio alveolare autoportante di spessore  $h = 25+5$  cm ed un solaio a lastre predalles spessore  $h = 25$  cm.

Le situazioni di carico previste in fase di preventivo e le luci delle singole travi utilizzate sono riportate sugli elaborati grafici allegati (allegati 1,2,3) che diventano parte integrante ed essenziale del presente preventivo.

Impalcato	TRAVI MTR® T	Allegato grafico n.
primo	2	1
secondo	2	2
terzo	2	3
quarto	2	3
quinto	2	3
sesto	2	3
Totale	12	---

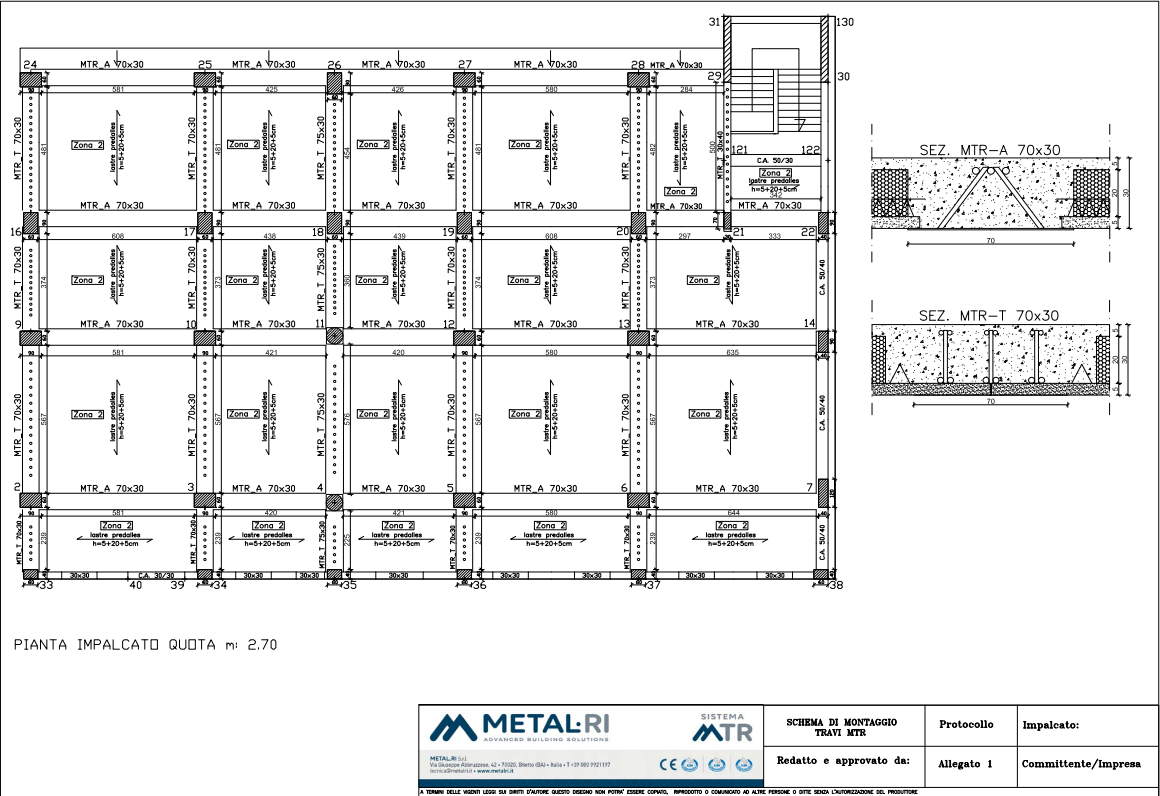
L'importo per la **sola fornitura** delle TRAVI MTR® ammonta ad € \_\_\_\_\_ (euro \_\_\_\_\_/00) oltre IVA.

**SISTEMA MTR**

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**SISTEMA MTR**

CE

<b>SCHEMA DI MONTAGGIO TRAVI MTR</b>	<b>Protocollo</b>	<b>Impalcato:</b>
Redatto e approvato da:	Allegato 1	Committente/Impresa

A TUTTI GLI EFFETTI LEGALI GLI AUTENTI DOTTORI QUESTO DISEGNO NON POTRA' ESSERE COPIATO, RIPRODOTTO O COMUNICATO AD ALTRE PERSONE O ALTRE REDEA L'UTILIZZAZIONE DEL PRODOTTO



# HOW WE CARRY OUT OUR PROJECTS

Before production, we will provide the **MTR® beam calculation and verification report signed by an MTR® designer**, complete with graphic drawings for assembly and additional bars.



## RELAZIONE DI CALCOLO TRAVI MTR®

OGGETTO:

COMMITTENTE

PROGETTISTA STRUTTURALE  
E DIRETTORE DEI LAVORI  
DELLE STRUTTURE

PROGETTISTA TRAVI MTR

DIRETTORE DI PRODUZIONE  
TRAVI MTR

CANTIERE

PRATICA N.

PRODUTTORE TRAVI MTR: **- METALRI s.r.l.**  
Via G. Abbruzzese, 42 – 70020 Bitetto

PROGETTISTA  
TRAVI MTR

DIRETTORE DI  
PRODUZIONE TRAVI MTR

PRODUTTORE  
TRAVI MTR

PROGETTISTA STRUTTURALE E  
DIRETTORE DEI LAVORI DELLE STRUTTURE



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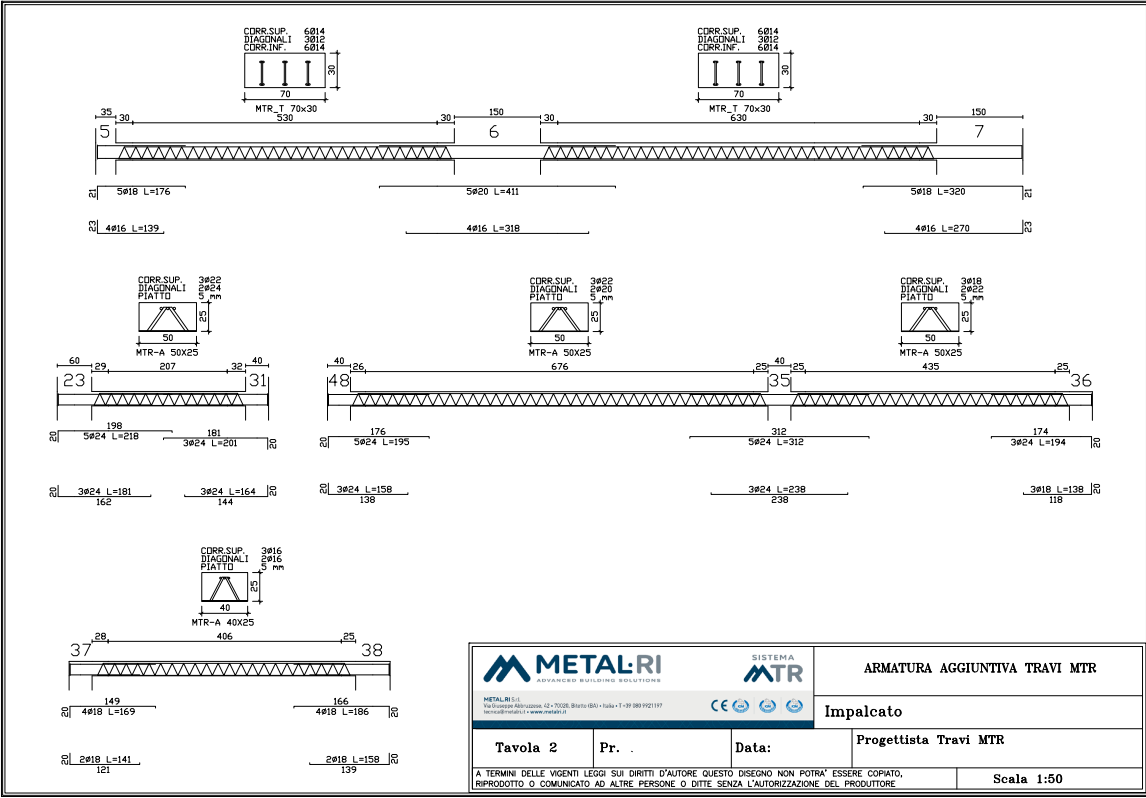
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C.F./P. IVA 0369870723  
R.E.A. Bari 203712  
Cap. Soc. 100.000,00 Int. vers.

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