FAST, FLEXIBLE, SUSTAINABLE: THE NEW GENERATION OF STEEL CULVERTS

MACCAFERRI

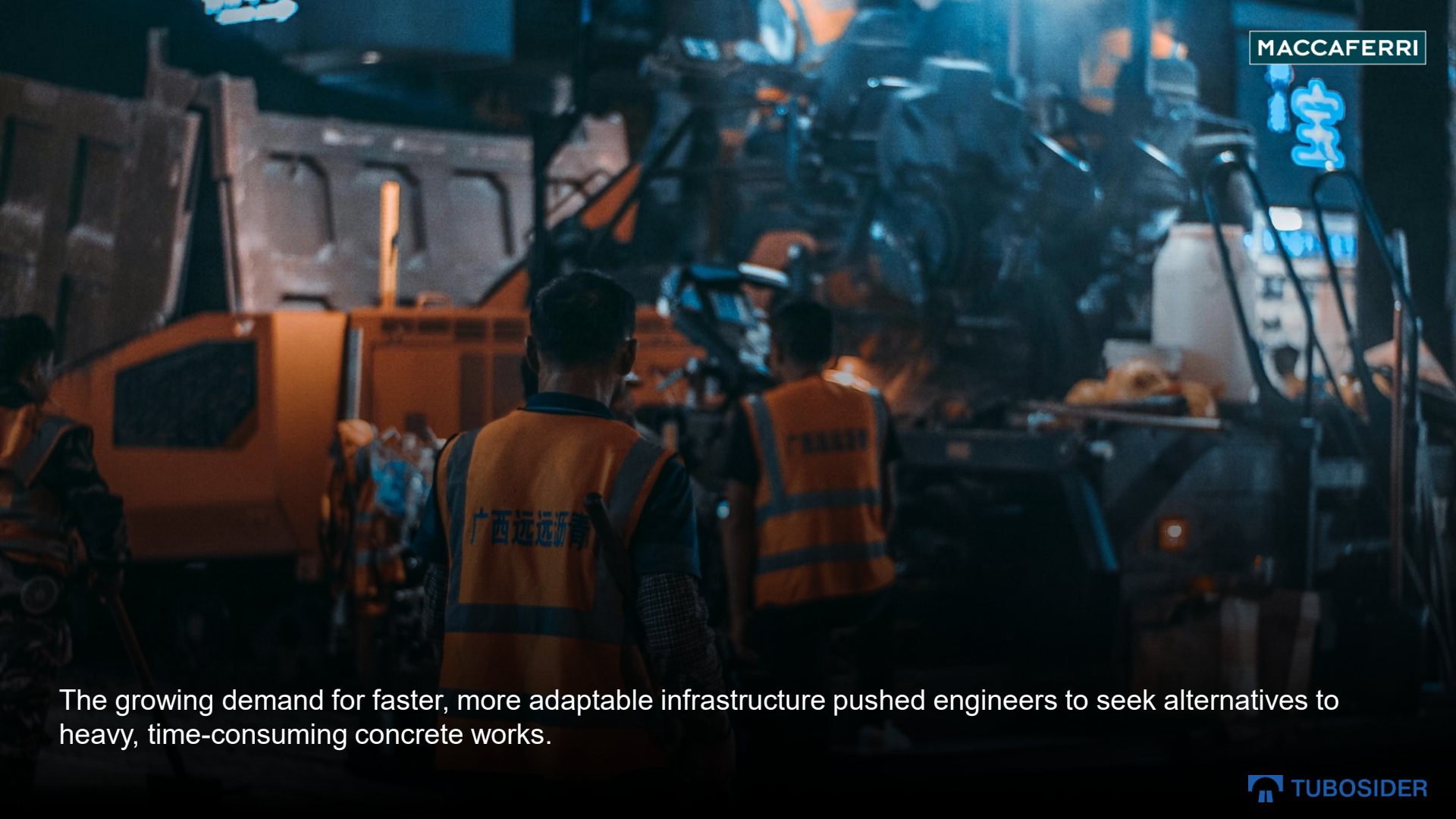
TUBOSIDER

AGENDA WEBINAR

MACCAFERRI

5’	Introduction
15’	Our Portfolio
15’	Design Method
5’	Our Success Stories and Conclusions
	Live Q&A

Speakers: ***Anisur Rahman*** *− Business Developer DT Business Unit at Maccaferri*
Paolo Francesco Quaglia *− Head of Culverts Division at Tubosider*



The growing demand for faster, more adaptable infrastructure pushed engineers to seek alternatives to heavy, time-consuming concrete works.

This need sparked the development of corrugated steel culverts: a smart, modular solution born from innovation and shaped by efficacy.

TUBOSIDER

WHO WE ARE

With over **140 years of engineering heritage**, Maccaferri brings global expertise in geotechnical and infrastructure solutions.

Tubosider, with more than **60 years of experience** in corrugated steel culverts (SSCB), is a reference in lightweight steel structures.

Together, they offer a unique synergy of innovation and reliability, delivering smart, efficient, and future-ready infrastructure solutions.

CULVERTS AT A GLANCE

Steel culverts, also known as **Soil Steel Composite Bridges (SSCB)**, are engineered structures made of corrugated steel sheets used to create passages for roads, railways, waterways and wildlife beneath embankments.

Developed through extensive research into new applications of steel in civil engineering, this technology offers a **versatile and efficient alternative to conventional concrete bridges and tunnels**.

Thanks to their modular design, these structures allow for quick assembly without the need for specialized labor and can be easily adapted to a wide range of site conditions, including complex geological and geotechnical environments.

FULL RANGE OF SOLUTIONS

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Steel culverts are designed to satisfy any need and they are differently used in all construction fields:

Road and railways infrastructure:
- Underpasses and tunnels
- Formworks
- Lightening of backfills and bridge structures

Drainage and hydraulic:
- Culverts for water canalization
- Road pipes culverts
- Drainage pipes and irrigation pipes
- Channels for rainwater control
- Underground and open-air tanks

Environmental engineering:
- Sewage treatment systems (waterwaste tanks)
- Dumps (water conveying networks)
- Land reclamation works (conveying networks and groundwater disposal)

Mining, Plants & Industry:
- Reclaim Tunnels
- Utility Conduits
- Service Tunnels
- Conveyor Tunnels

TECHNICAL FEATURES

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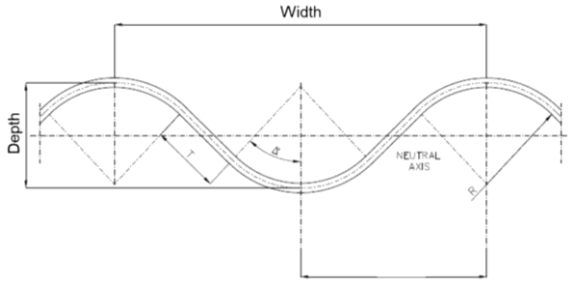
Steel culverts are produced with 3 types of **sinusoidal corrugated profiles**, with pitches ranging from 70 to 200 mm.
Culverts, based on different width and depth, can be distinguished in: T70/T100/T200.

Corrugation	Width [mm]	Depth [mm]
T 70	67.7	12.7
T 100	100	22
T 200	200	55



Plates made with steel:
- S235JR according to EN 10025-2 2019
- S355MC according to UNI EN 10149-2013.

High resistance class 8.8 or 10.9 bolts are used, complying with standard EN ISO 898-1 and EN ISO 898-2.

In order to **protect against corrosion**, Tubosider culverts are **hot-dip galvanized** according to EN ISO 1461: 2009.

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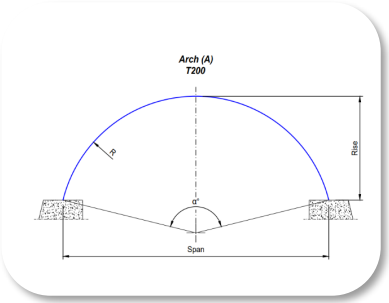
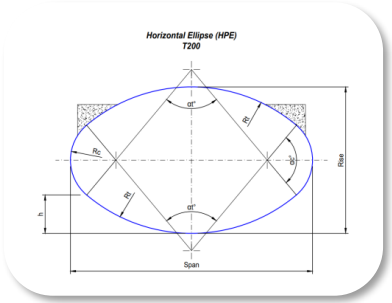
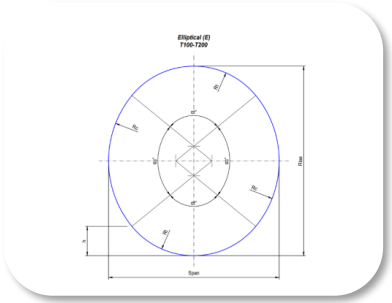
CULVERT PROFILES RANGE



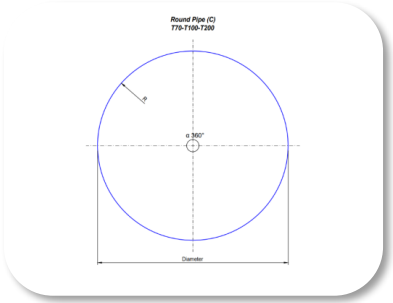
TYPE A
Arch with a single radius



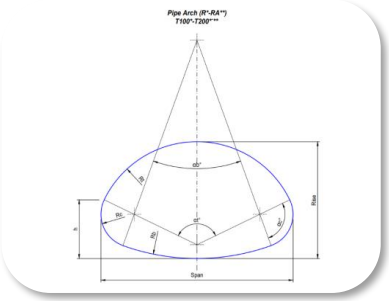
TYPE HPE
Horizontal ellipse



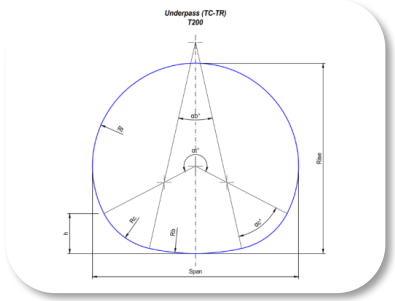
TYPE E
Vertical ellipse



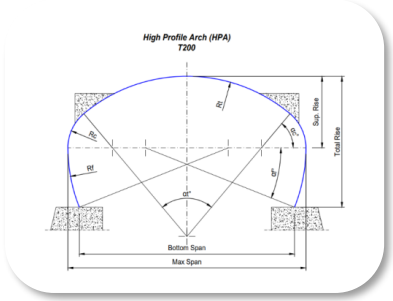
TYPE C
Round - Pipe



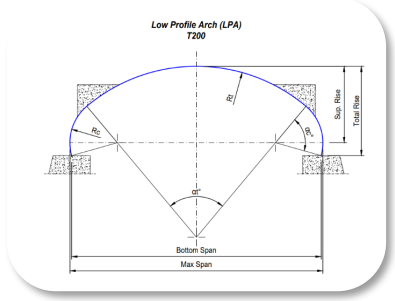
TYPE TC – TR
Underpass



TYPE R – RA
Pipe Arch

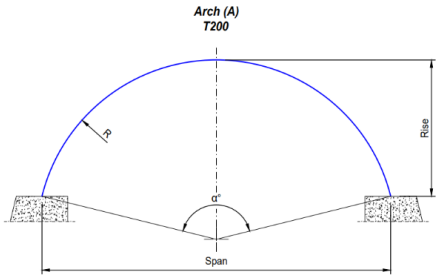


TYPE HPA
High Profile Arch (Arch with 3 radii)



TYPE LPA
Low Profile Arch (Arch with 2 radii)

CULVERT PROFILES RANGE

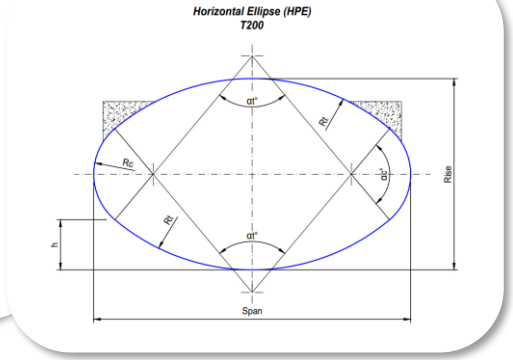


TYPE A (Arch with a single radius)

Span Max 7.55 m
- covering of existing canals
- reinforcement of deteriorated structures
- covering of small storehouses
- temporary shelters

TYPE HPE (Horizontal ellipse)

Span Max 12.14 m
- water canalization
- bridges of I° and II° category



CULVERT PROFILES RANGE

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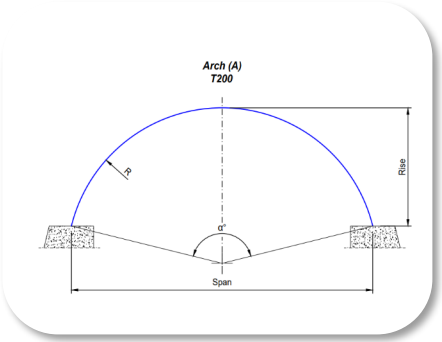
TYPE A (Arch with a single radius)



Water canalization

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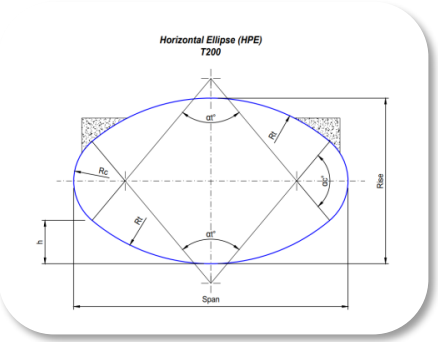
CULVERT PROFILES RANGE

MACCAFERRI

TYPE HPE (Horizontal ellipse)



Bridges

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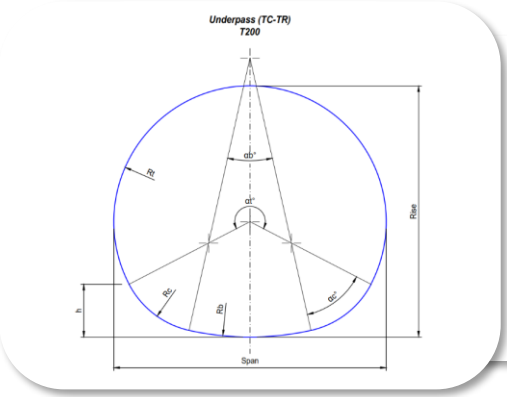
CULVERT PROFILES RANGE

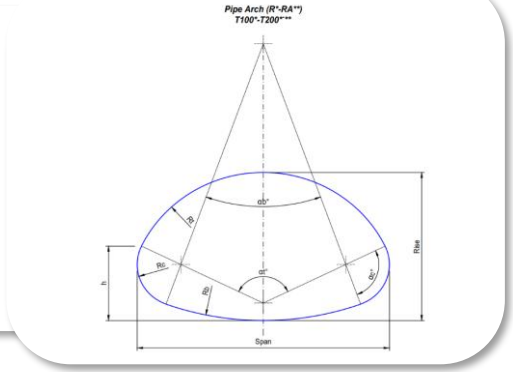


TYPE TC – TR (Underpass)

Span Max 8.32 m
- tunnels / pedestrian underpasses
- road traffic
- formworks

TYPE R – RA (Pipe arch)

Span Max 7.30 m
- water conduits
- drainage hydraulic collectors
- service tunnels



CULVERT PROFILES RANGE

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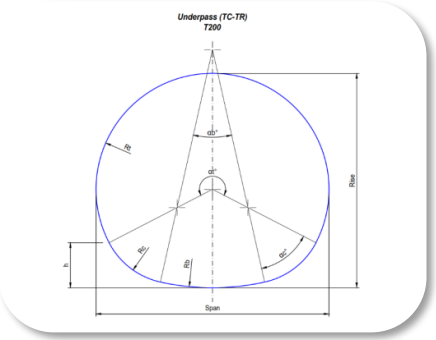
TYPE TC – TR (Underpass)



Tunnels / Pedestrian underpasses

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CULVERT PROFILES RANGE

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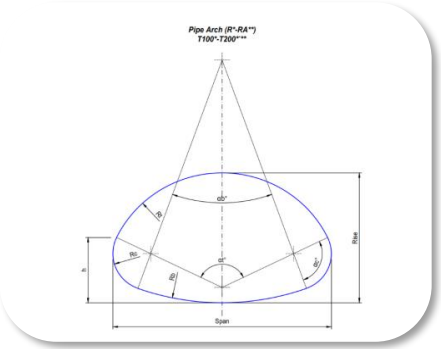
TYPE R – RA (Pipe arch)



Water conduits

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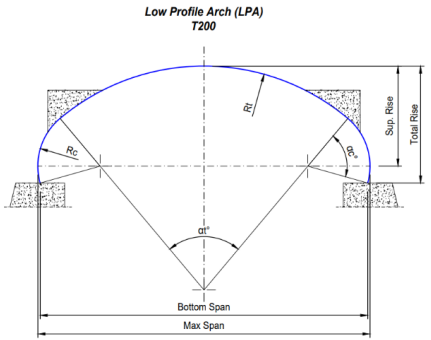
CULVERT PROFILES RANGE

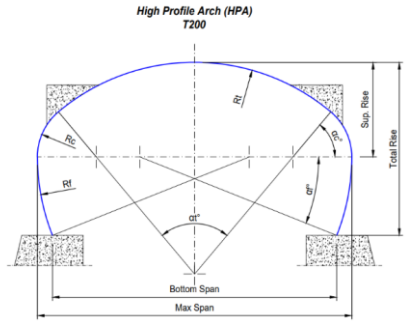


TYPE LPA (Low Profile Arch)

Span Max 12.14 m
- water canalization
- bridges of I° and II° category

TYPE HPA (High Profile Arch)

Span Max 11.85 m
- water canalization
- bridges of I° and II° category



CULVERT PROFILES RANGE

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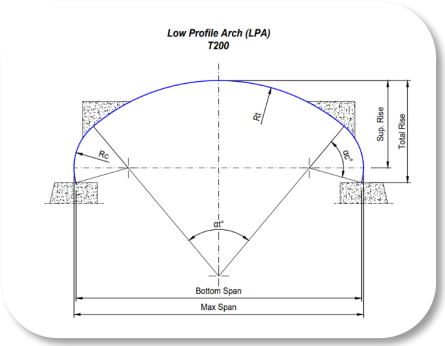
TYPE LPA (Low Profile Arch)



Water canalization

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CULVERT PROFILES RANGE

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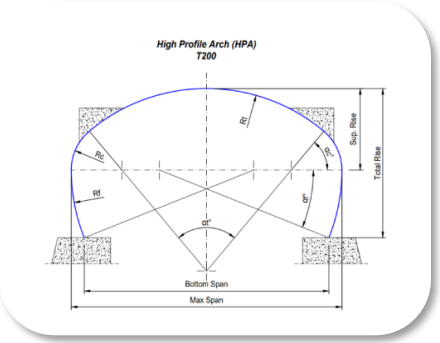
TYPE HPA (High Profile Arch)



Bridges

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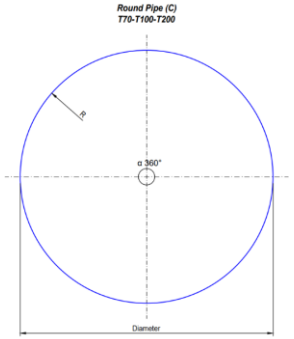
CULVERT PROFILES RANGE

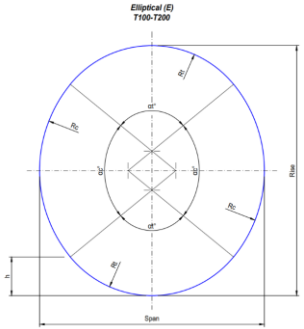


TYPE C (Round-Pipe)

Span Max 7.41 m
- water conduits
- drainage hydraulic collectors
- service tunnels

TYPE E (Vertical ellipse)

Span Max 7.54 m
- water conduits
- drainage hydraulic collectors
- service tunnels



CULVERT PROFILES RANGE

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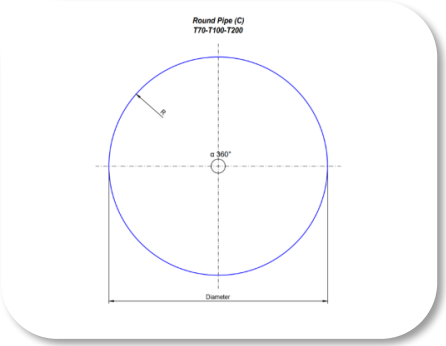
TYPE C (Round-Pipe)



Water conduits

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CULVERT PROFILES RANGE

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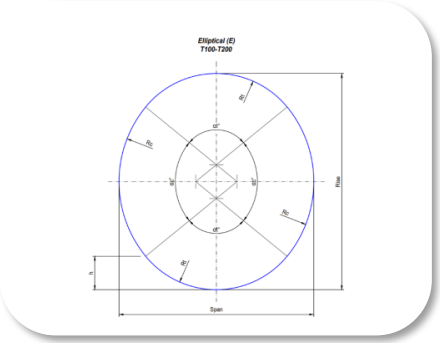
TYPE E (Vertical ellipse)



Drainage hydraulic collectors

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CULVERT DESIGN METHODS

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TRADITIONAL METHODS

1- AISI Method

- **Overview**

  The AISI method, developed in the late 1960s, is a flexible steel culvert design approach based on ring compression theory.

- **Method Limitations**

  It excludes bending stresses, axial-flexural interaction, seismic effects, and detailed soil properties in analysis.

2- CHBDC Methods

- **Overview**

  CHBDC advances with finite element analysis, seismic considerations, and ultimate limit state verifications.

- **Method Limitations**

  Despite improvements, it does not consider axial-flexural interaction and relies on Proctor density for soil characterization.

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CULVERT DESIGN METHODS

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ADVANCED METHODS – TOWARDS INNOVATION

3- SDM (Swedish Design Method)

- **Overview**

  The SDM, developed in 2000, uses limit state approaches aligned with Eurocode 3 for steel structure design.

- **Method Benefits**

  Includes soil characteristic, calibrated on real-scale testing.

4- ARMCO Method (Glock Superspan)

- **Overview**

  Glock Superspan uses push beams and reinforcement rings for large-span multi-radius steel culverts design.

- **Method Benefits**

  Conservative steel use, large span verification (up to 13 m), considers axial-flexural interaction

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CULVERTS BENEFITS

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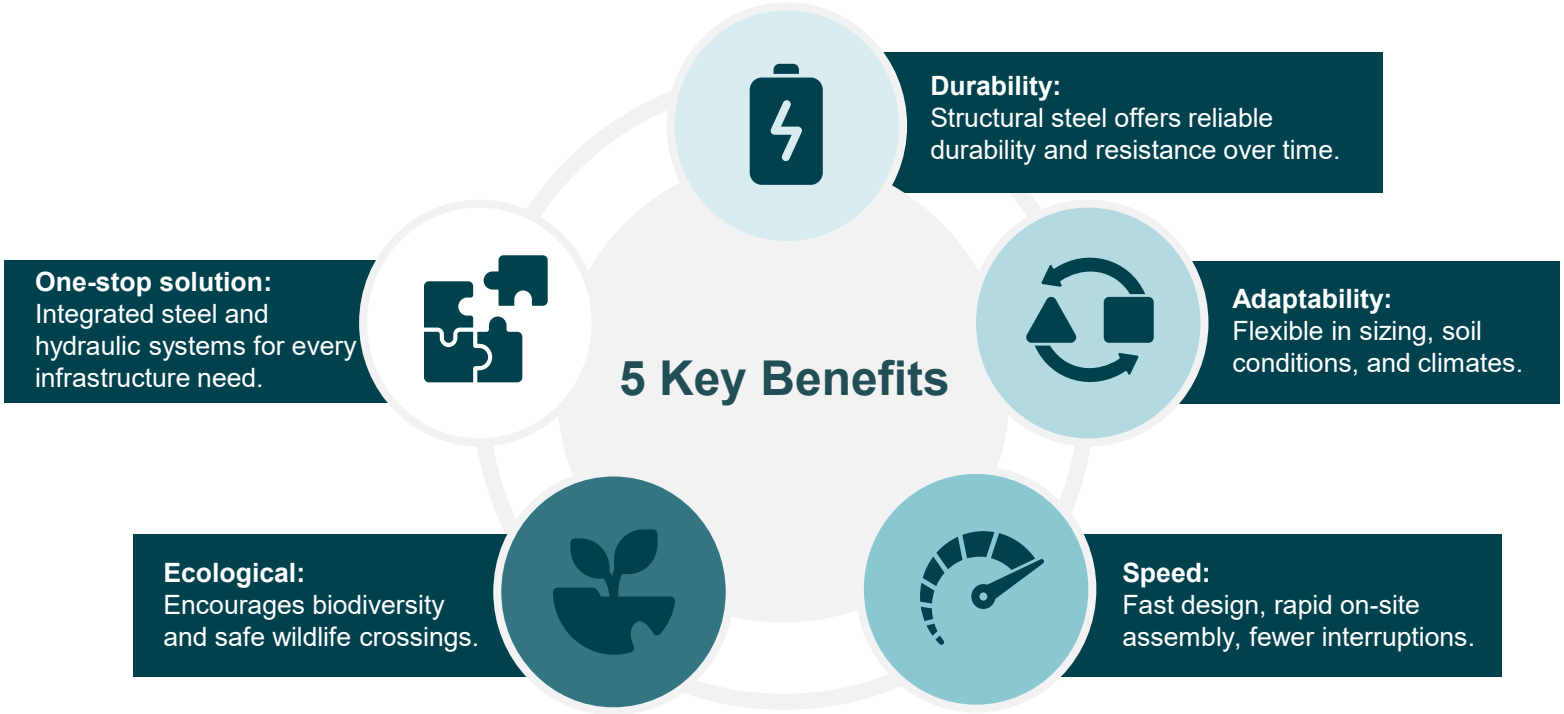
Structures SSCB - Soil-Steel Composite Bridge - are a good alternative to reinforced concrete structures.
Main benefits are:



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STEEL CULVERTS VS CONCRETE

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	MULTIPLATE STEEL CULVERTS	PRECAST OR CAST-IN-SITU CONCRETE CULVERTS
INSTALLATION SPEED	Rapid (days)	Slow, heavy (equipment required), formworks
CUSTOM DESIGN FLEXIBILITY	Easily shaped to fit site conditions or project requirements	Limited to standard moulds
TOTAL INSTALLED COST	Globally lower across the board	Generally requires large scale excavation and foundations
SITE IMPACT	Minimal site impact	Higher impact
WEIGHT & TRANSPORT	Lightweight & stackable	Heavy, needs special transport and casting equipment
PAVEMENT INTEGRATION	Seamless, no deck needed	Needs approach slabs & bridge deck
TIMELINE IMPACT	Accelerates schedules	Can delay progress if not timed perfectly
MAINTENANCE OVER TIME	Low, durable coating	Higher with jointed sections

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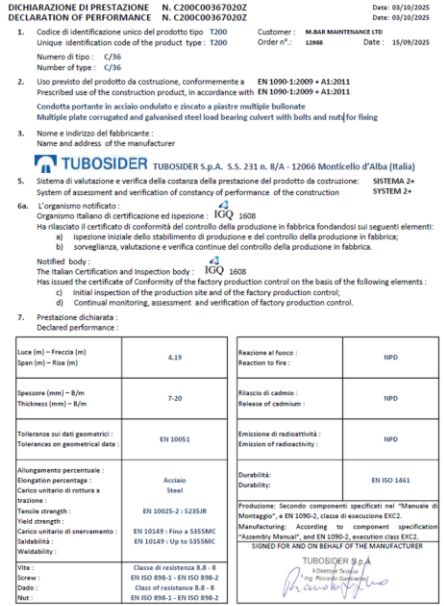
CERTIFICATION

SSCB Structures are a construction product complying with the standard **EN 1090-1:2009 + A1:2011** and therefore always accompanied by the DOP (Declaration of Performance).



DICHIARAZIONE DI PRESTAZIONE N. C200C00367020Z
DECLARATION OF PERFORMANCE N. C200C00367020Z

Data: 03/10/2025
Date: 03/10/2025

1. Codice di identificazione unico del prodotto tipo T200
Unique identification code of the product type : T200
Customer : M.BAR MAINTENANCE LTD
Order n°: 12988 Date : 15/09/2025
Numero di tipo : C/36
Number of type : C/36

2. Uso previsto del prodotto da costruzione, conformemente a EN 1090-1:2009 + A1:2011
Prescribed use of the construction product, in accordance with EN 1090-1:2009 + A1:2011
Condotta portante in acciaio ondulato e zincato a piastre multiple bullonate
Multiple plate corrugated and galvanised steel load bearing culvert with bolts and nuts for fixing

3. Nome e indirizzo del fabbricante :
Name and address of the manufacturer
TUBOSIDER TUBOSIDER S.p.A. S.S. 231 n. 8/A - 12066 Monticello d'Alba (Italia)

5. Sistema di valutazione e verifica della costanza della prestazione del prodotto da costruzione: SISTEMA 2+
System of assessment and verification of constancy of performance of the construction SYSTEM 2+

6a. L'organismo notificato :
Organismo Italiano di certificazione ed ispezione : IGQ 1608
Ha rilasciato il certificato di conformità del controllo della produzione in fabbrica fondandosi sui seguenti elementi:
a) ispezione iniziale dello stabilimento di produzione e del controllo della produzione in fabbrica;
b) sorveglianza, valutazione e verifica continue del controllo della produzione in fabbrica.
Notified body :
The Italian Certification and Inspection body : IGQ 1608
Has issued the certificate of Conformity of the factory production control on the basis of the following elements :
c) Initial inspection of the production site and of the factory production control;
d) Continual monitoring, assessment and verification of factory production control.

7. Prestazione dichiarata :
Declared performance :

Luce (m) – Freccia (m) / Span (m) – Rise (m)	4.19
Spessore (mm) – B/m / Thickness (mm) – B/m	7-20
Tolleranze sui dati geometrici : / Tolerances on geometrical data :	EN 10051
Allungamento percentuale : / Elongation percentage : / Carico unitario di rottura a trazione : / Tensile strength : / Yield strength : / Carico unitario di snervamento : / Saldabilità : / Weldability :	Acciaio / Steel / EN 10025-2 : S235JR / EN 10149 : Fino a S355MC / EN 10149 : Up to S355MC
Vite : / Screw : / Dado : / Nut :	Classe di resistenza 8.8 - 8 / EN ISO 898-1 - EN ISO 898-2 / Class of resistance 8.8 - 8 / EN ISO 898-1 - EN ISO 898-2

Reazione al fuoco : / Reaction to fire :	NPD
Rilascio di cadmio : / Release of cadmium :	NPD
Emissione di radioattività : / Emission of radioactivity :	NPD
Durabilità: / Durability:	EN ISO 1461

Produzione: Secondo componenti specificati nel "Manuale di Montaggio", e EN 1090-2, classe di esecuzione EXC2.
Manufacturing: According to component specification "Assembly Manual", and EN 1090-2, execution class EXC2.

SIGNED FOR AND ON BEHALF OF THE MANUFACTURER
TUBOSIDER S.p.A.

La prestazione del prodotto di cui ai punti 1 è 2 è conforme alla prestazione dichiarata di cui al punto 7.
The performance of the product referred to in points 1 è 2 is consistent with the performance declared in point 7.
Si rilascia la presente dichiarazione di prestazione, in conformità al regolamento UE n°. 305/2011, sotto la responsabilità esclusiva del fabbricante di cui al punto 3.
The present Declaration of performance, according to UE n°. 305/2011 regulation, is released under the sole responsibility of the manufacturer mentioned inpoint n. 3.

CE 12

DDP N. C200C00367020Z
DOP N. C200C00367020Z

Condotta portante in acciaio ondulato e zincato a piastre multiple bullonate
Multiple plate corrugated and galvanized steel load bearing culvert with bolts and nuts for fixing T200 C/36

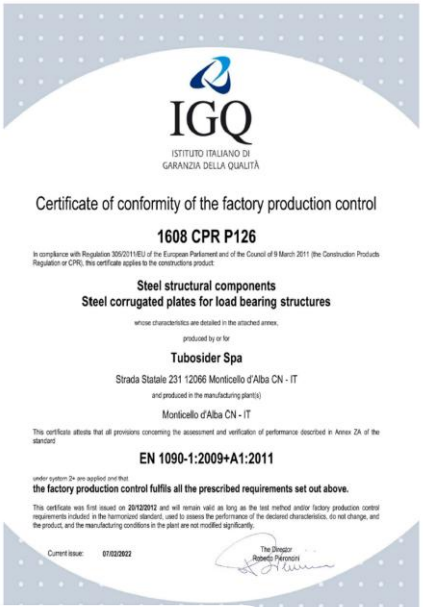
Uso previsto del prodotto da costruzione, conformemente a: EN 1090-1:2012 O.N. 1608
Prescribed use of the construction product, in accordance with: EN 1090-1:2012 N.B. 1608

Certificato n°:1608 CPR P126
Certificate no:1608 CPR P126

TUBOSIDER TUBOSIDER S.p.A. S.S. 231 n. 8/A - 12066 Monticello d'Alba (Italia)

Luce (m) – Freccia (m) / Span (m) – Rise (m)	4.19
Spessore (mm) – B/m / Thickness (mm) – B/m	7-20
Tolleranze sui dati geometrici : / Tolerances on geometrical data :	EN 10051
Allungamento percentuale : / Elongation percentage : / Carico unitario di rottura a trazione : / Tensile strength : / Yield strength : / Carico unitario di snervamento : / Saldabilità : / Weldability :	Acciaio / Steel / EN 10025-2 : S235JR / EN 10149 : Fino a S355MC / EN 10149 : Up to S355MC
Vite : / Screw : / Dado : / Nut :	Classe di resistenza 8.8 - 8 / EN ISO 898-1 - EN ISO 898-2 / Class of resistance 8.8 - 8 / EN ISO 898-1 - EN ISO 898-2
Durabilità: / Durability:	EN ISO 1461

Produzione: Secondo componenti specificati nel "Manuale di Montaggio", e EN 1090-2, classe di esecuzione EXC2.
Manufacturing: According to component specification "Assembly Manual", and EN 1090-2, execution class EXC2.



IGQ
ISTITUTO ITALIANO DI GARANZIA DELLA QUALITÀ

Certificate of conformity of the factory production control

1608 CPR P126

In compliance with Regulation 305/2011/EU of the European Parliament and of the Council of 9 March 2011 (the Construction Products Regulation or CPR), this certificate applies to the constructions product:

Steel structural components
Steel corrugated plates for load bearing structures

whose characteristics are detailed in the attached annex,

produced by or for

Tubosider Spa

Strada Statale 231 12066 Monticello d'Alba CN - IT

and produced in the manufacturing plant(s)

Monticello d'Alba CN - IT

This certificate attests that all provisions concerning the assessment and verification of performance described in Annex ZA of the standard

EN 1090-1:2009+A1:2011

under system 2+ are applied and that

the factory production control fulfils all the prescribed requirements set out above.

This certificate was first issued on 20/12/2012 and will remain valid as long as the test method and/or factory production control requirements included in the harmonized standard, used to assess the performance of the declared characteristics, do not change, and the product, and the manufacturing conditions in the plant are not modified significantly.

Current issue: 07/02/2022

The Director
Roberto Pierroncini

IGQ
ISTITUTO ITALIANO DI GARANZIA DELLA QUALITÀ

APPENDIX TO CERTIFICATE 1608 CPR P126

Design[1] and manufacture of multiplate corrugated steel for load bearing structures according to EN 1090-1

Product name	Standard	Class of steel	Class of execution	Sizes	Delivery condition
Steel corrugated plates	EN 1090-2	EN 10025-2: S235JR EN 10149: up to S355 MC	EXC2	T70 - T100 - T200	Hot dipped galvanizing in accordance to EN ISO 1461
Bolts and threaded bars in accordance to Tubosider Spa drawing	Screw EN ISO 898-1 / Nut EN ISO 898-2	Class of resistance 8.8		From M12 to M20	

Note 1): The applicability of the design shall be checked in compliance with the technical rules of each EU Member State.

WELDING	
Welding process :	135, 136 BW FW
Welding Coordinator :	Metr. 1485

first issue: 20/12/2012
current issue: 07/02/2022

Il Direttore
ing. Roberto Pierroncini

CE Marked

CERTIFICATION

MACCAFERRI

A corporate Ethical Policy brings transparency, respect and accountability to our operations and interactions with clients.

Our products are certified in accordance with internationally recognised standards and we are members of key industry organisations.

The Environmental Product Declaration (EPD) certificate quantifies our environmental impact allowing us to perform accurate LCA

ECO PLATFORM EPD VERIFIED

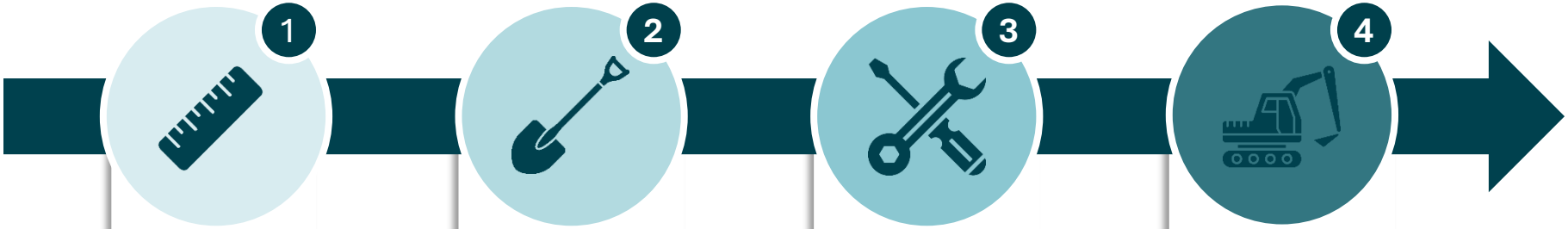
EPD®
THE INTERNATIONAL EPD® SYSTEM

TUBOSIDER

FAST INSTALLATION

MACCAFERRI

The SSCB structures are settled in 4 simple steps :



Path
Delimitation of the area on which the pipeline will be installed

Excavation and bed preparation
Homogeneous strong bed with a minimum thickness of 0.20 m of tamped granular material

Assembly
We supply assembly manual with all the instructions and schemes

Backfill
With material groups A1, A2-4, A2-5, A3 according to:

- AASHTO M145
- EN ISO 14688
- CNR UNI 10006.

Backfill material has to be compacted at 90-95% of AASHTO T180

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Livigno Snow Park – Milano Cortina 2026 Winter Games

Livigno (SO) – Mottolino Ski Area, Italy

Construction year: 2025

Project: For the “Milano Cortina 2026” Winter Games, a corrugated steel tunnel (T200 TR/25) was installed beneath the Slopestyle course at Mottolino Ski Area to allow safe passage for snowcats and skiers. The 75 m long, 8.5 m span structure (128.5 t) ensures safety, durability, and perfect environmental integration. Installed by Mair Josef & Co. SAS, the project highlights Tubosider’s contribution to a world-class sporting venue.

TUBOSIDER

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Variante di Valico – Area Poggiolino

Sasso Marconi / Barberino del Mugello (Bologna - Italy)

Construction year: 2005

Project: Temporary diversion entirely underground, designed to collect and transmit, downstream of the Poggiolino, the waters of Casaglia River and its tributaries.
Functionally, the temporary diversion, once completed for definitive use, will achieve the dual role of draining the cover on the bottom of the valley and the “relief” (from a static point of view) of the cover itself.

TUBOSIDER

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Neom project trojena dam – rock processing plant tabuk

Tabuk District - Saudi Arabia

Construction year: under construction

Project: As part of the NEOM mega-project, three dams are under construction—two in RCC, including a 2.7 million m³ main dam, and one rockfill dam of 4.3 million m³. The site features advanced industrial plants with a rock processing capacity of 2,700 tons/hour. Tubosider is supplying 14 corrugated steel culverts for the stockpile reclaim tunnels, totaling 1,000 meters and 800 tons of high-performance steel—ensuring strength and reliability at the core of this visionary development.

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BRIDGE CONSTRUCTION IN RIPICENI

Botoșani County, Romania

Construction year: 2022
Project: Maccaferri supplied a T200 R/13 steel culvert (S355MC, 5 mm) for a new road bridge in Ripiceni, designed to withstand LM1 and LM2 loads (road bridge load models) under a 0.80 m embankment. Engineered to manage 10 m³/s flow at just 16% filling, the solution combined hydraulic efficiency with structural reliability. Flute-cut ends, anchored to reinforced concrete wing walls, and stone-lined slopes ensured performance and durability in a demanding environment.

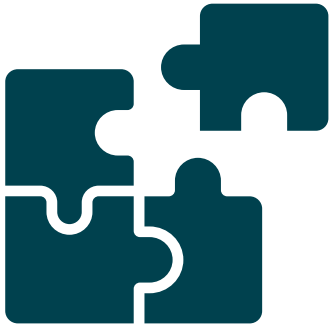
TUBOSIDER

360° SUPPORT

Do you need technical assistance?

Our engineers are always here to support you in designing and selecting the most suitable solutions for every type of project.

CUSTOMISATION



Tailor-Made Culvert Solutions

We design and supply customized culverts in any shape or configuration—arched, round, elliptical, or special geometries—engineered to meet specific hydraulic, structural, and installation needs. Looking for a bespoke solution? Get in touch with our team to develop the culvert that fits your project perfectly.

MACCAFERRI

Q&A

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Thank you

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