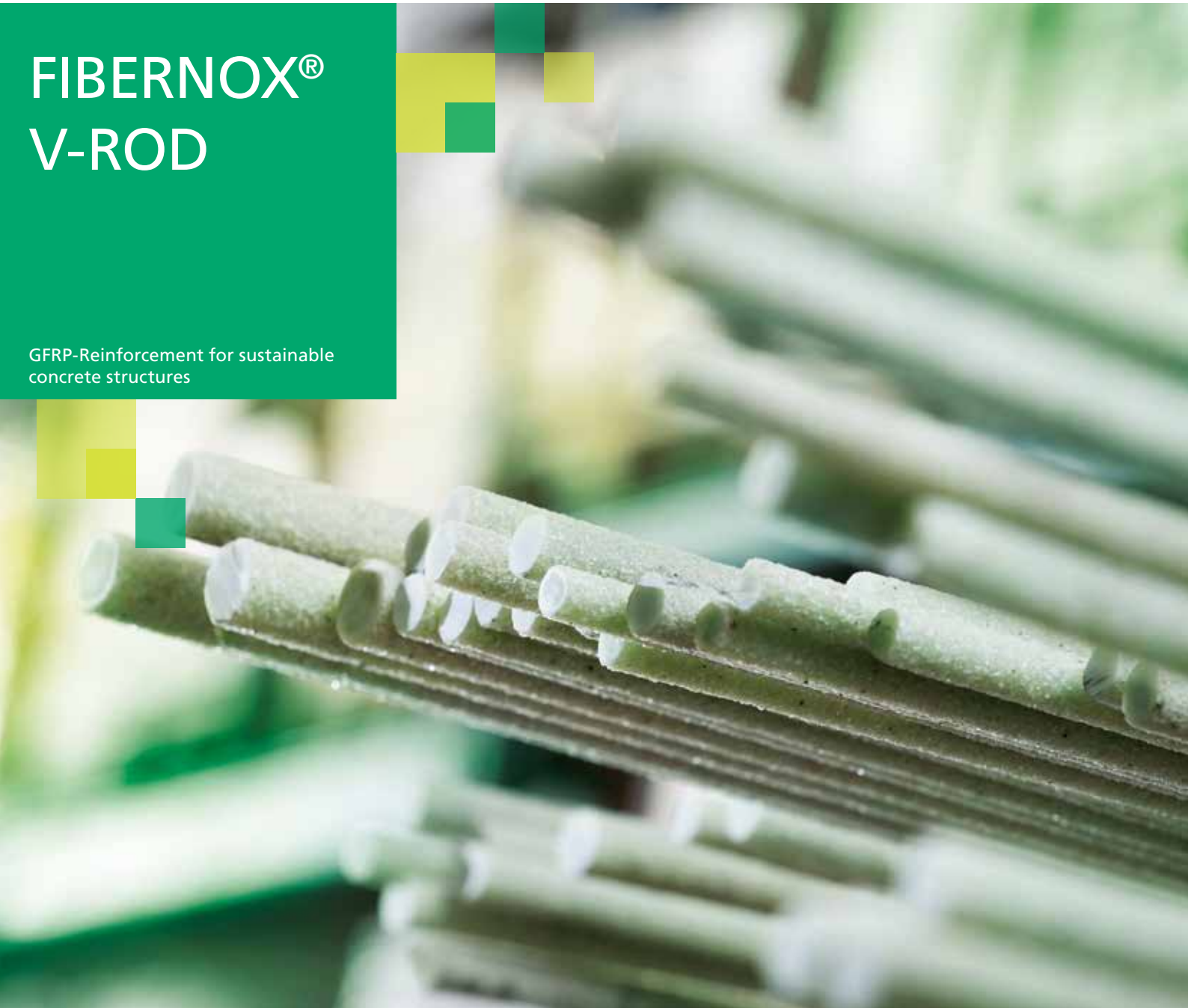


FIBERNOX® V-ROD

GFRP-Reinforcement for sustainable
concrete structures





OUR MISSION: FORWARD CONSTRUCTING.

It is our mission not only to provide the very latest building technology, but to also be one crucial step ahead of the game at all times. That is why we are constantly undertaking pioneering work in all product areas. Our employees consistently put their extensive practical experience and creativity to use in the interests of our customers. In constant dialogue with our target groups on a partnership basis, we are already developing the products today that will be needed tomorrow. Our momentum continues to set new benchmarks in structural engineering – yesterday, today and tomorrow, too. This is what we mean by "forward constructing".

CONTENT

04 ■
FIBERNOX® V-ROD

GFRP-Reinforcement

07 ■
Technical Information

Bemessung

08 ■
Stirrups and bent shapes

technical data
 available ben shapes

09 ■
Headbolts

09 ■
Dowels

09 ■
Rockbolts

12 ■
Service & contact

We are always there for you.
 We will be wherever you are.



FIBERNOX® V-ROD

GFRP-REINFORCEMENT

THE PRODUCT

FIBERNOX V-ROD is a concrete reinforcement bar made from composites designed for highest mechanical properties and durability. High quality, corrosion resistant glass-fibres and a highly durable vinyl ester resin are selected to manufacture the straight or curved reinforcing bars using the pultrusion process. The sand-covered surface of the rebar stands for a better bond with the concrete and additionally protects the fibres from a corrosive environment. FIBERNOX V-ROD is in many applications a technically and economically beneficial alternative to traditional reinforcing bars made from carbon steel or stainless steel. FIBERNOX V-ROD reinforcing bars have been used successfully worldwide for decades.

ADVANTAGES

- Durable in extreme environmental conditions
- Corrosion- and alkali resistant
- Very high tensile strength and low specific weight
- Electrically non-conductive and transparent for radio frequencies
- Non-magnetic
- Very low thermal conductivity
- Easy cutting for Tunnel Boring Machines
- Various diameters and shapes available

DELIVERY PROGRAMME

Available FIBERNOX® V-ROD types

- Straight bars
- Curved bars in several different shapes
- Straight bars with anchor head
- Dowels with smooth surface
- Rockbolts including washer and plate



FIELDS OF APPLICATION

GENERAL

The advantages and unique properties of FIBERNOX V-ROD listed on the previous page enable the following applications in precast and cast in-situ concrete members.

- **Projects with aggressive environmental conditions and extended durability requirements.** The raw materials vinyl ester resin and corrosion resistant glass fibres in combination with extra protection of the fibres by the surface sand-coating make FIBERNOX V-ROD an economical and highly durable alternative to stainless steel reinforcement. FIBERNOX V-ROD is also economical compared to carbon steel rebars if considering costly, corrosion delaying measures required in combination with steel rebars such as concrete admixtures, corrosion inhibitors, high concrete grades or usually applied increased concrete cover.

Applications: Marine- and coastal construction, Foundations, Tanks of the chemical industry, Desalination and Sewerage Treatment plants

- **Slim concrete members that require a minimum concrete cover.** The required concrete cover of FIBERNOX V-ROD is bar diameter + 10 mm enabling the manufacturing of slim precast elements without compromising on the durability.

Applications: Precast construction

- **Projects requiring an electrically- or magnetically non-conductive reinforcement.**

Application: Railway construction, Airport construction, Transformer buildings, Hospitals, Aluminium smelters, energetically neutral housing construction.

- **Projects with a low thermal conductivity requirement.**

The specific thermal conductivity of FIBERNOX V-ROD is only 0,5 W/mK; this is 30 to 100 times less than with stainless or carbon steel reinforcement.

Applications: Insulated precast sandwich walls

- **Projects constructed with a Tunnel Boring Machine (TBM).** In tunnel- and metro construction projects, FIBERNOX V-ROD is easily cuttable for the TBM and therefore installed in the breakthrough areas (soft eyes). FIBERNOX V-ROD is easily machineable for the TBM and avoids damage to the cutting equipment of the machine as well as time-consuming and expensive measures such as manual breakout often in combination with ground stabilisation injections.

ANWENDUNGSBEISPIELE



Montague bridge, Canada



Montague bridge, Canada



Victoria bridge, Canada



Hall's Harbour, Canada

GENERAL

MANUFACTURER OF FIBERNOX® V-ROD

The Canadian manufacturer PULTRALL has several decades of experience in manufacturing FIBERNOX V-ROD and holds a world-leading position in composites manufacturing through its unsurpassed product quality, dynamism and innovativeness. H-BAU Technik as stock holding distributor and engineering partner for the European market is well known as a reliable, innovative manufacturer of unique construction products. Both PULTRALL and H-BAU Technik are ISO 9001 certified. FIBERNOX V-ROD is certified as straight and bent rebar according to the internationally recognised standard for gfrp-reinforcement CSA 807.

THE MANUFACTURING PROCESS

FIBERNOX® V-ROD reinforcing bars are manufactured in a process called pultrusion. Depending on the rebar diameter, a defined number of fibres are pulled under high force and saturated with vinyl ester resin through a former, a surface sand-coating is applied, and the entire product thermally hardened to become a monolithic reinforcement bar. Straight or bent reinforcement bars are manufactured using different processes and machinery.



Manufacturing of FIBERNOX® V-ROD in the pultrusion process



FIBERNOX® V-ROD as a non-conductive ground slab reinforcement for hospital construction



Reinforcement cages made of straight and spiral-shaped FIBERNOX® V-ROD reinforcement



Installation of FIBERNOX® V-ROD in bridge deck and concrete barrier wall

TECHNICAL INFORMATION

TECHNICAL DATA FIBERNOX® V-ROD 60

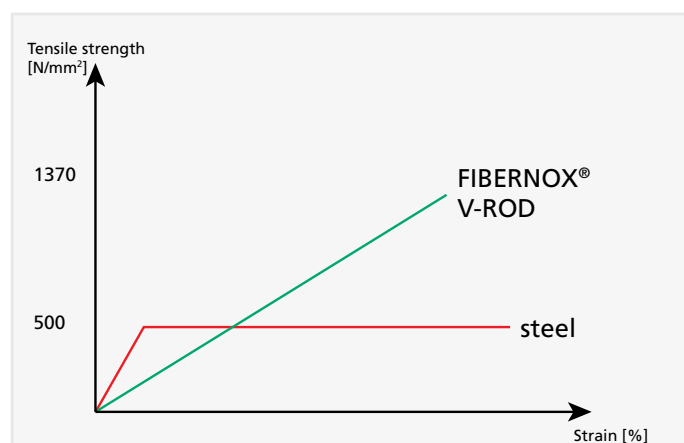
Type	6	8	10	12	16	20	25	32
nominal diameter [mm]	6	8	10	12	16	20	25	32
nominal cross-section [mm ²]	28,3	50,3	78,5	113,1	201,1	314,2	490,9	804,2
outside diameter[mm]	7,7	9,8	11,8	13,8	18,2	22,1	27,3	34,4
guaranteed tensile strength [N/mm ²]	1.000							
modulus of elasticity [N/mm ²]	60.000							
bond strength [N/mm ²]	>14,0							
bond coefficient acc. to ACI 440	0,8							
transverse strength [N/mm ²]	200							
axial coefficient of thermal expansion [°C x 10 ⁻⁶]	6,2							
radial coefficient of thermal expansion [°C x 10 ⁻⁶]	23,8							
glass content [vol. %]	66							
glass content [weight %]	83							
specific weight [t/m ³]	2,1							
weight [kg/m]	0,07	0,12	0,18	0,26	0,45	0,7	1,09	1,78

- Stock length 11.900 mm, specific length on request
- Additional, intermediary diameters are also available on request

MECHANICAL PROPERTIES

- Linear-elastic stress-strain behaviour up to the ultimate strength well above 1.000 N/mm²
- Tensile strength 2 – 3 times higher than steel- and stainless steel reinforcement
- Modulus of elasticity 3 times smaller than for steel reinforcement

DESIGN



Stress-strain diagramme

- The mechanical properties need to be considered for the design with FIBERNOX V-ROD
- Internationally recognised standard for the design with grfp-reinforcement is CSA 807
- Please consult H-BAU Technik for advice on the design

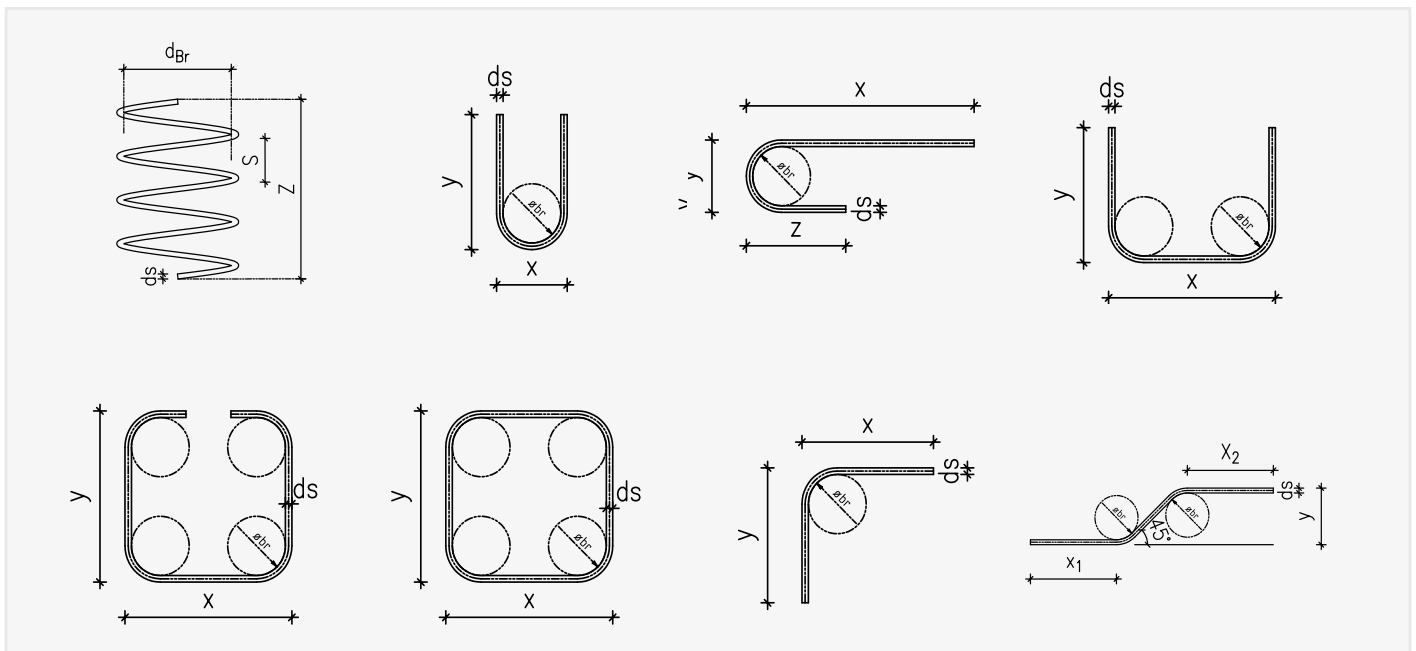
BENT SHAPES

TECHNICAL DATA BENT SHAPES FIBERNOX® V-ROD

Type	10	12	16	20	22	25
nominal diameter [mm]	10	12	16	20	22	25
nominal cross-section [mm ²]	71,26	126,68	197,93	285,02	387,95	506,71
total cross-section incl. sand coating [mm ²]	81,6	145,7	240	332,96	439,4	582,72
guaranteed tensile strength straight portion [N/mm ²]	1.000					
guaranteed tensile strength bent portion [N/mm ²]	450					
modulus of elasticity [N/mm ²]	50.000					
glass content [weight %]	78					
weight [kg/m]	0,167	0,292	0,443	0,651	0,887	1,136

- FIBERNOX V-ROD bent rebars are available in the diameters 6, 8, 10, 12, 16, 20, 22, 25, 32 mm as well as in intermediary diameters
- Please read the detailed bends guideline available on www.h-bau.com
- The minimum bending radius is $4 d_s$

AVAILABLE BENT SHAPES



NOTE

When ordering, a sketch of the desired bending shape is required.

ANCHOR HEADS

FIBERNOX® V-ROD straight rebar diameters 12 – 25 mm can be additionally fitted with anchor heads



Type	Diameter [mm]
E 4/12	12
E 5/16	16
E 6/20	20
E 7/22	22
E 8/25	25

FIBERNOX® V-ROD anchor heads

DOWELS WITH A SMOOTH SURFACE

Type	25	28	32	35	38	41	45
nominal diameter [mm]	25,4	28,6	31,8	34,9	38,1	41,3	45,5
nominal cross-section [mm ²]	506,7	642,4	794,2	956,6	1.140,1	1.339,8	1.555,3
guaranteed transverse strength [N/mm ²]	160						
glass content [weight %]	81						
weight [kg/m]	1,028	1,354	1,61	1,925	2,307	2,708	3,137



- dowels are available in various lengths
- stock length is 11.900 mm

ROCKBOLTS

Type	20	22	25	29	32
ultimate tensile load Rockbolt [KN]	280	250	490	650	790
modulus of elasticity [N/mm ²]	53.000				
glass content [weight %]	65	85	110	140	160
diameter standard plate [mm]	190				
glass content [weight %]	82				
weight [kg/m]	0,58	0,7	0,94	1,266	1,5



- complete system including plate and nut
- left- and right-hand thread available
- standard length 3.000 mm, additional lengths available

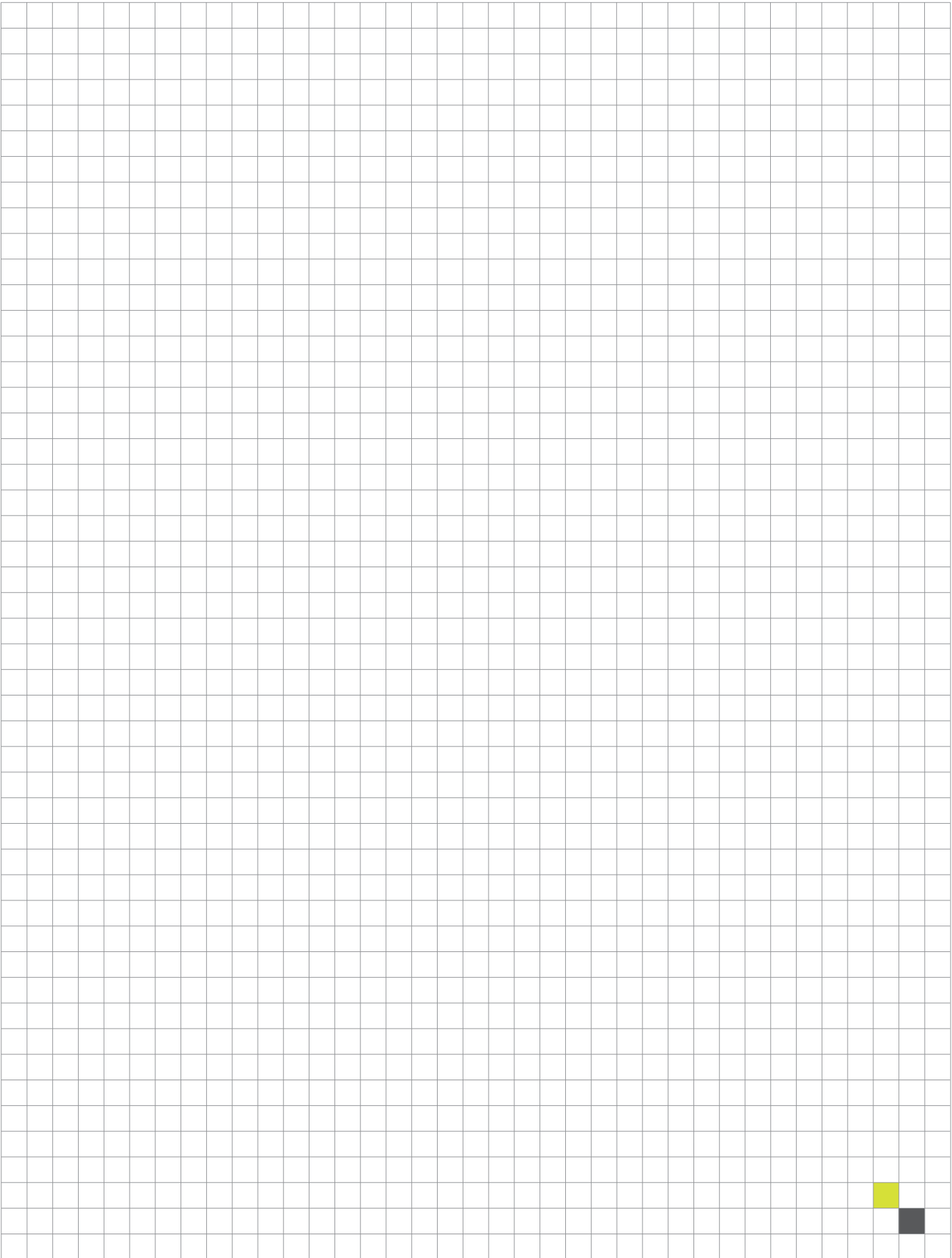
CASE STUDIES



Impact testing with a 36 tonne truck at speed of 80km/h



Tanks for sewerage treatment plant, slab- and wall reinforcement



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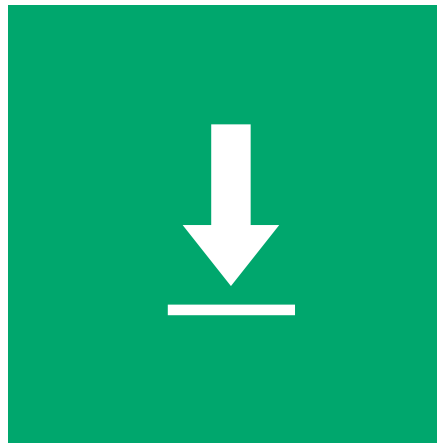
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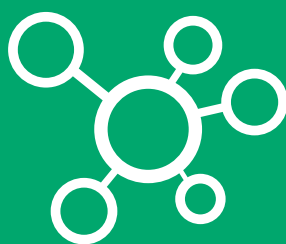
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