

# MST-BAR™



*For Certification & PDH credit*



**WHEN YOU THINK OF DURABILITY  
THINK OF MST-BAR**

***Do it Right, Do it Once!***

**[www.fibar.ca](http://www.fibar.ca)**



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# Outline

Cost Of Corrosion In Canada/USA

Example Of Corrosion

Why MST-BAR?

Recent Changes

Benefits

Who We Are

Project Highlights

Approvals

Thermal Break & Ultra Anchor

Green Products



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The cost of corrosion study (IMPACT Study) Reveals

\$52 billion USD in Canada

>500 billion USD in USA Annual cost

\$Billions could be saved by using **MST-BAR**



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# Why Steel Rebar Corrode



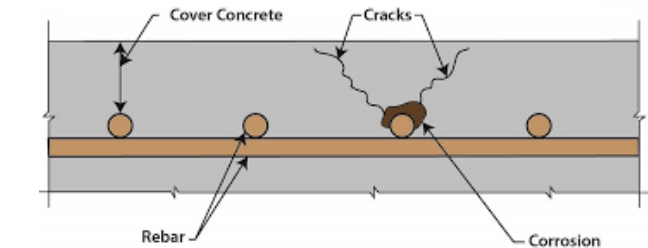
Built **1600 years ago** by Roman  
Empire (6<sup>th</sup> Century)

**Without Steel Rebar**



Built in **2000** in North America

**With Steel Rebar**



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# Evolution/History of Rebar



**Black Bar**

**1920s**



**Galvanized &  
ECR**

**1970s**



**Fiberglass Rebar**

**1990s**



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# Example of Steel Corrosion



Designed for **100** years

Last less than **50** years

Start to corrode after **8** years



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# Deterioration of Deck Top Surface due to corrosion and freeze-thaw



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# Scaling and corrosion damage of barrier wall due to salt splashing



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# Corrosion damage of pier caps and columns due to leaking joints



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# All Steel rebar corrodes as well as StainLESS steel

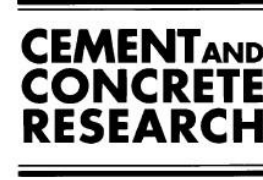
Engineers take additional measures to mitigate corrosion of steel reinforcement in concrete: use of corrosion inhibiting admixtures, use of epoxy-coated or galvanized steel, use of sealers and membranes on the concrete surface, providing additional concrete cover, etc.

Those measures only delay corrosion. MST-BAR  
Eliminates Corrosion.



Pergamon

Cement and Concrete Research 31 (2001) 713–718



Corrosion inhibitors in concrete  
Part III. Effect on time to chloride-induced corrosion initiation and subsequent corrosion rates of steel in mortar

S.M. Trépanier<sup>a,\*</sup>, B.B. Hope<sup>b</sup>, C.M. Hansson<sup>c</sup>

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<sup>b</sup>Civil Engineering Department, Queen's University, Kingston, Ontario, Canada

<sup>c</sup>Mechanical Engineering Department, University of Waterloo, Waterloo, Ontario, Canada

Received 26 April 1999; accepted 26 January 2001

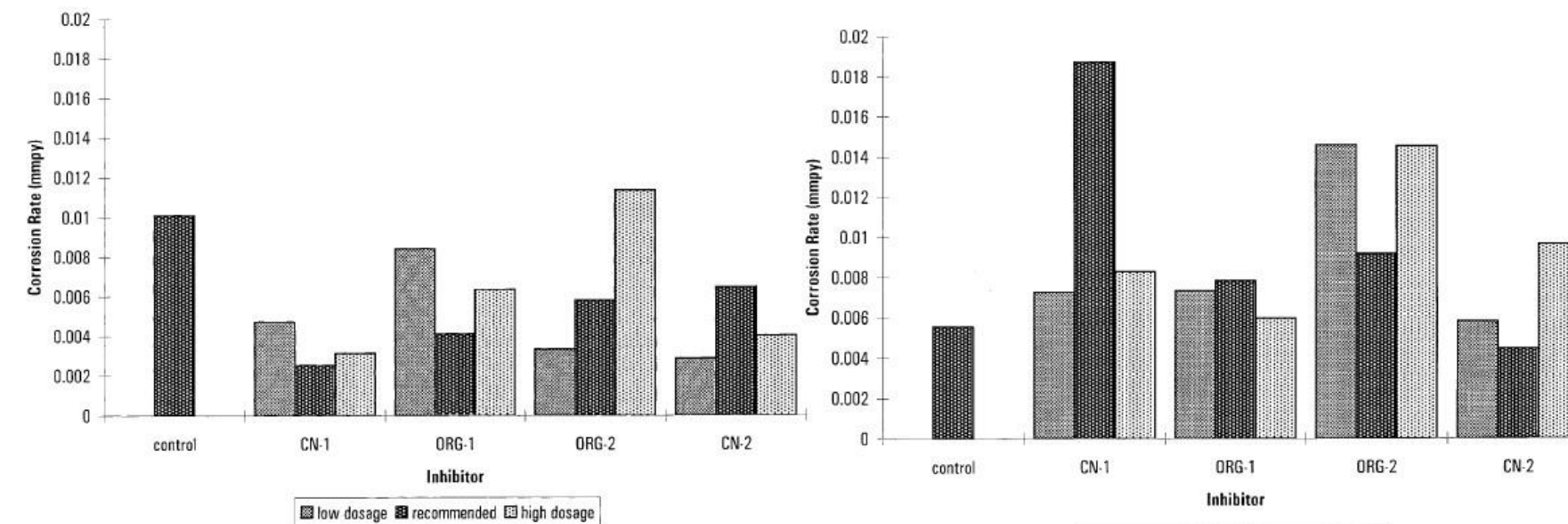


Fig. 3. (a) Nominal corrosion rates for samples with W/C 0.50. (b) Nominal corrosion rates for samples with W/C 0.70.



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# Solution!

## New Great Success Story Used Globally & Made Locally in North America



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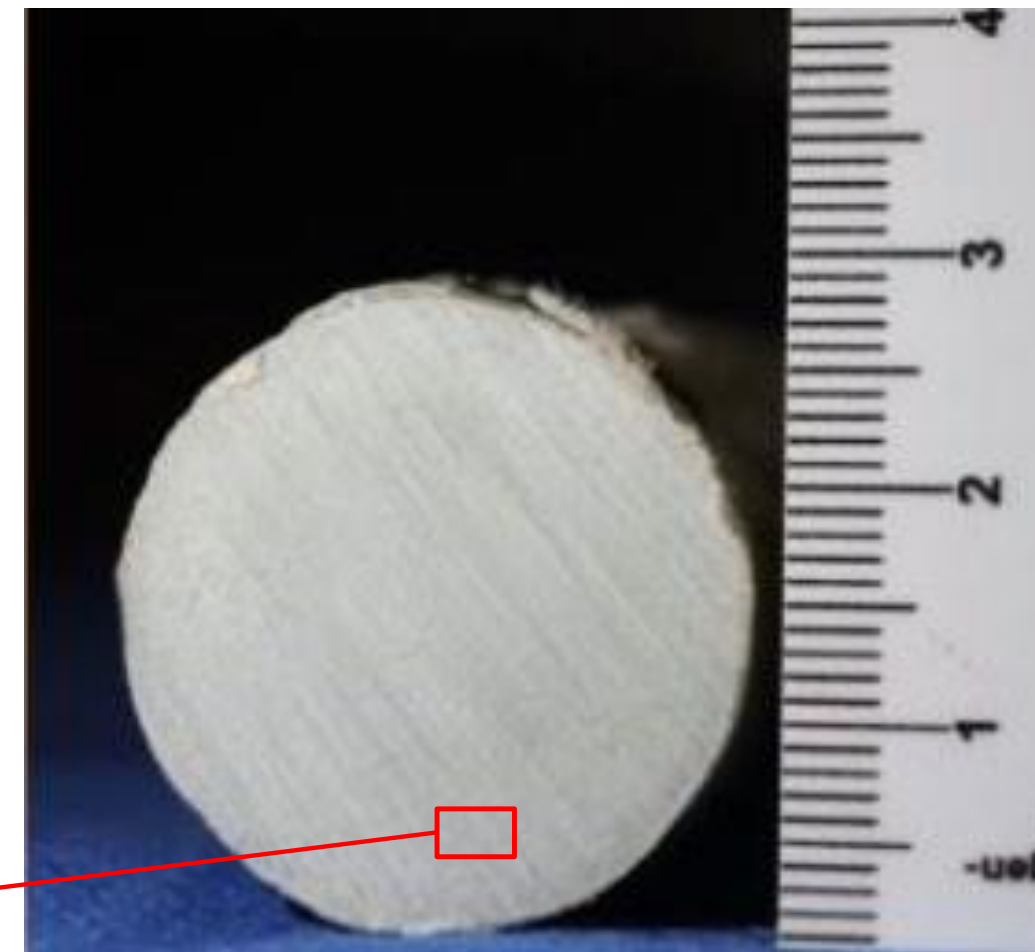
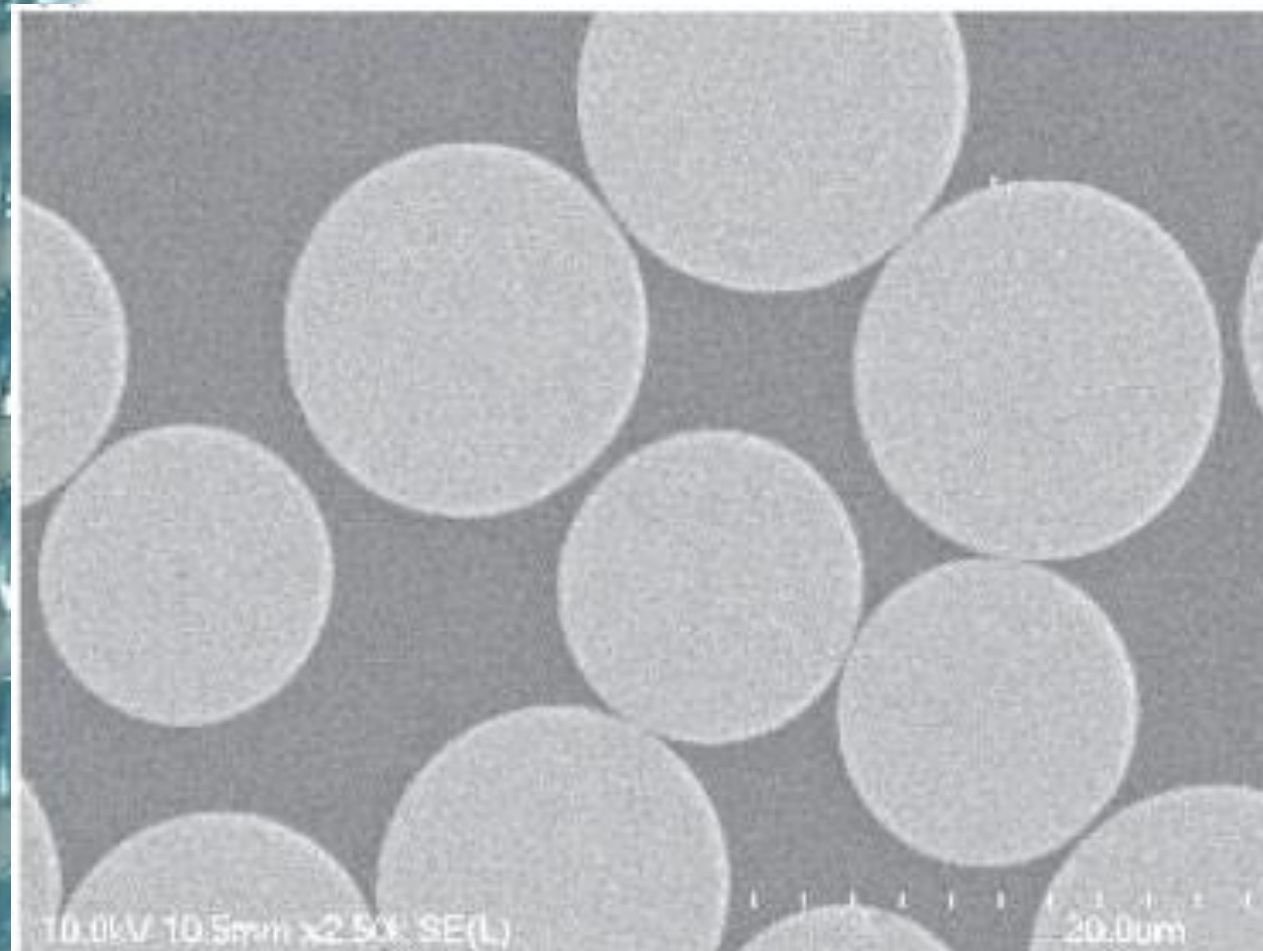


# Glass Fiber Reinforced Polymer (GFRP) Bars

**Fiber:** E-CR glass fiber

**Resin:** Vinyl ester

**Interface**



Source: Benmokrane et al. (2019)

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# 80 Years History to Fight Corrosion



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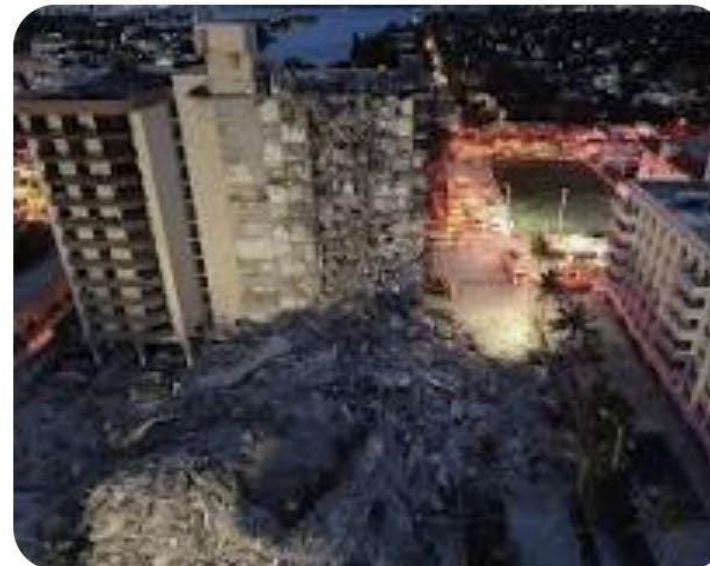
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# Becoming Mandatory in Many Regions

- ✓ Halton Region is requesting more GFRP
- ✓ Brampton Region is requesting more GFRP
- ✓ FDOT and Florida is promoting and encouraging
- ✓ ODOT is mandating
- ✓ MTO is encouraging
- ✓ MTQ, MDOT, TXDOT and Others are heavily using it

A contributing factor under investigation is long-term degradation of reinforced concrete structural support in the basement-level parking garage under the pool deck, due to **water penetration and corrosion of the reinforcing steel**. The problems had been reported in 2018 and noted as "much worse" in April 2021.



[https://en.wikipedia.org/wiki/Surfside\\_condominium\\_collapse](https://en.wikipedia.org/wiki/Surfside_condominium_collapse)

Surfside condominium collapse - Wikipedia



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# Why **MST-BAR**

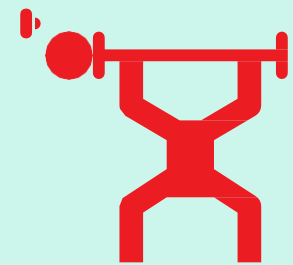


CODE APPROVED ICC, FRP Inst. , ASTM, CSA & ACI

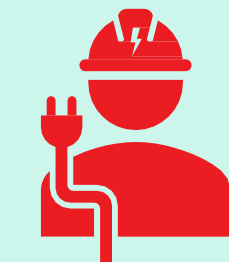


Reduce construction accidents- "OSHA: 61% of Construction accidents are due to steel rebar impalement "

15



Reduce back injuries -  $\frac{1}{4}$  of the weight



Easier to install - Non-Conductive (Thermal & Electrical)



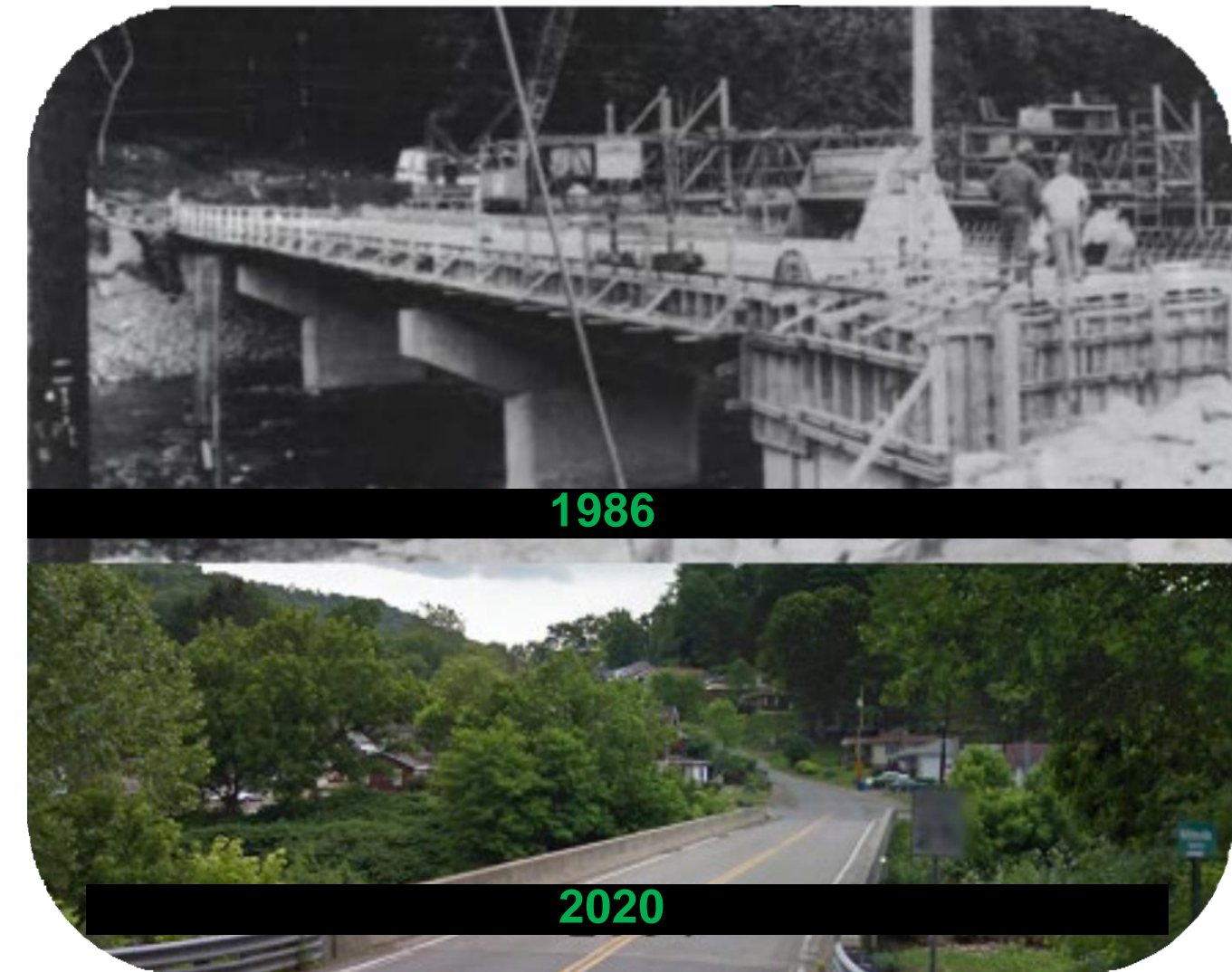
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# Why MST-BAR is Gaining Traction in last 10 years!

- **TRUST:** Proven history of Fiberglass Rebar since 1986
- **SLOW:** Construction Industry is slow in adaptation
- **ENGINEERING & CODE:** Finalized in the last 10 years
- **INCREASE IN PRODUCTION:** Capacity to match steel
- **Service Life:** +100 years of true service life
- **Support:** Many DOT's, Ministries, Government



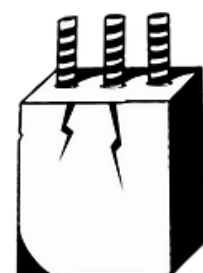
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# Benefits of MST-BAR

- Corrosion Resistance = Risk Insurance
- Weight - 4 X Lighter Than Steel
- Bonding Strength
- Ease Of Cutting - No Sharp Edge
- Fire Rated- Over 3 Hours
- Strength – 3 X Steel
- Fatigue Strength
- Economical Curing – No Need For Fresh Water
- Conductivity – No Grounding Required
- Thermal Non-conductive – Suitable For Use In Hot & Cold Environments
- GREEN – 75% Less Energy to produce compare to Steel



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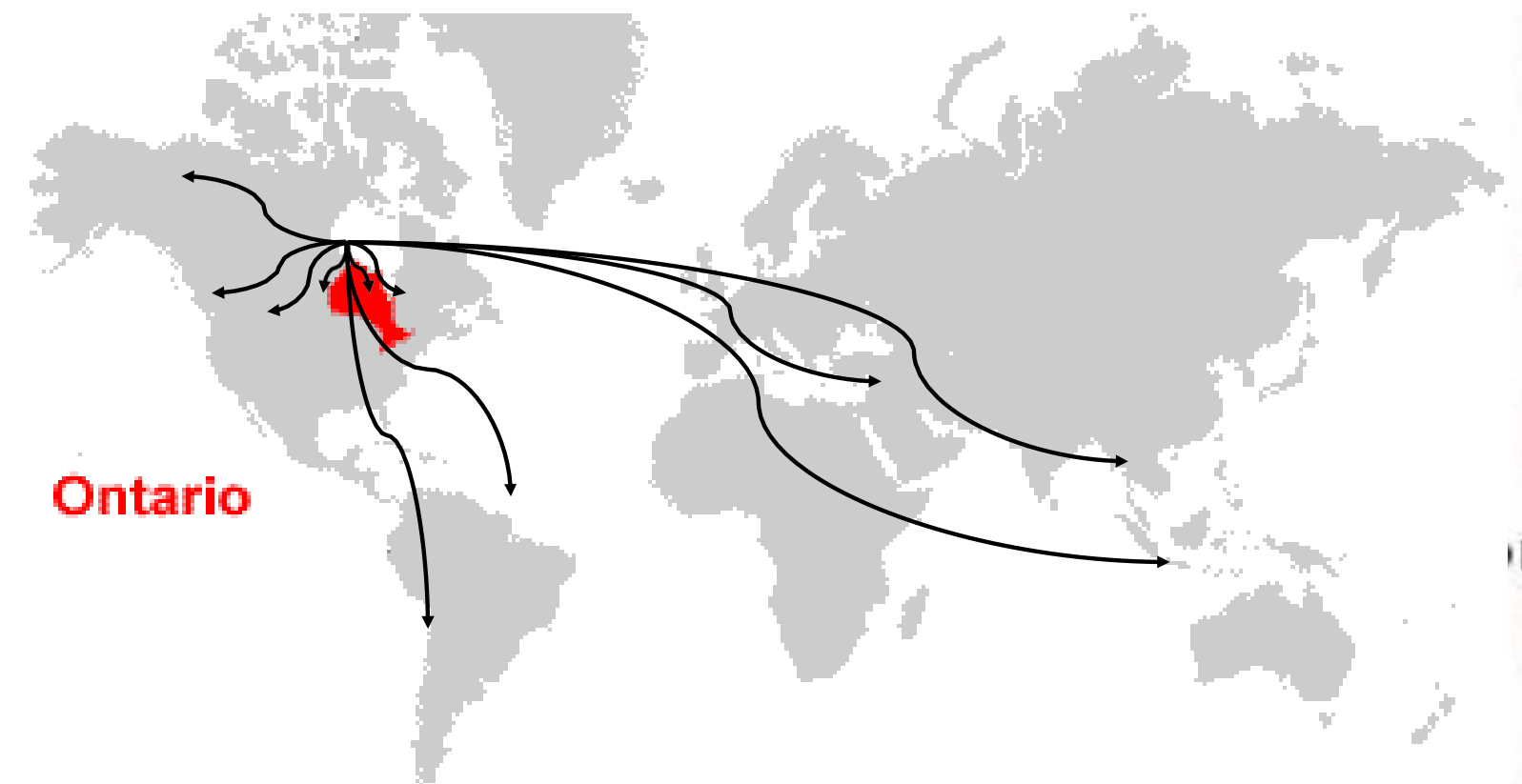
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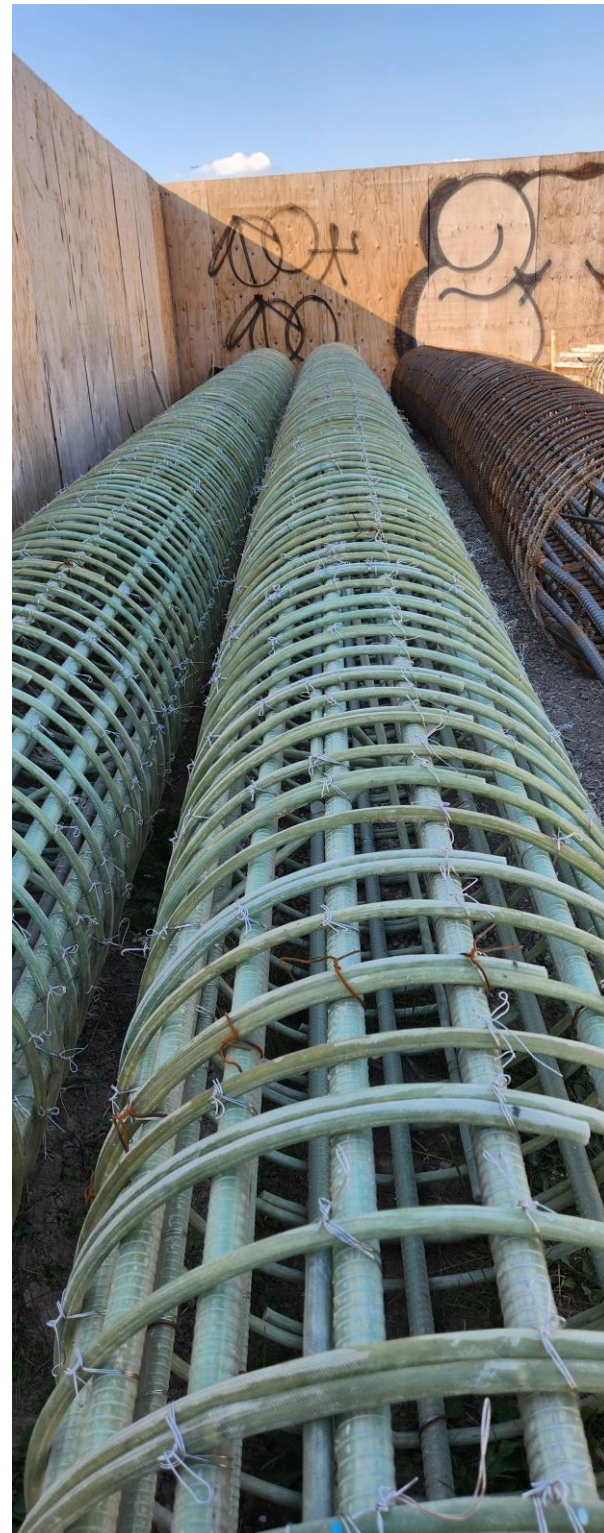
# MST Rebar Inc.

- 200,000 SQFT plant in Woodbridge
- Developed & Manufactured in North America
- Growing exponentially with \$10s of millions in exports
- Largest Pultruder in the world
- Sold over 850,000,000 ft of rebar to date with over 15,000 completed projects
- Current capacity of 42,000 km (Equivalent of 60,000,000 kg of steel)
- 2024 capacity to exceed 127,000 km
- We only manufacture Grade III- High Modulus GFRP Straight, Bent and Headed bar as required by MTO





# MST-BAR is Heavily Involved in Civil Projects for the Past 10 Years



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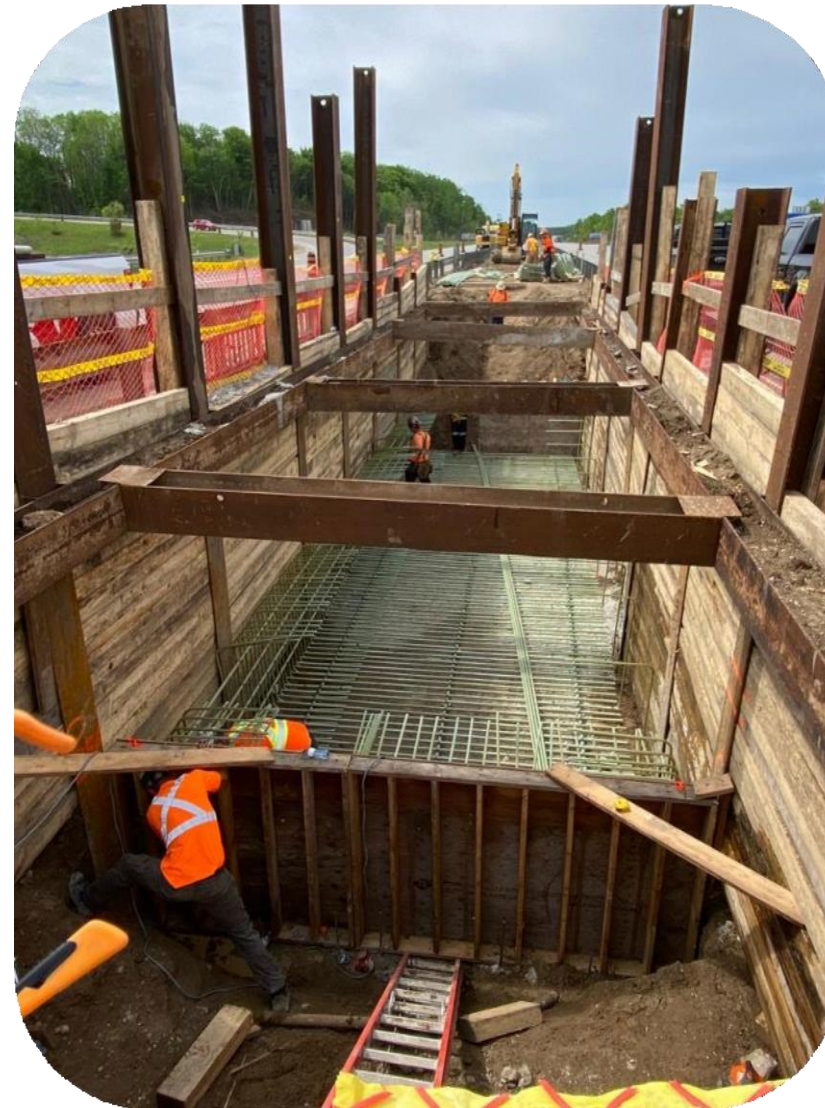
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# All MST-BAR bridges

MTO is using MST-BAR on 100s of bridges, but this is the only Steel free one!



- MST-BAR cost similar to black steel rebar
- Life expectancy +100 years
- \$18M bridge finishing under budget
- Locally made material
- Delivered faster than Steel
- Lighter Bridge with less Injury



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## Benefits

- **No Rust!**
- **No Divers!**
- **Lower cost!**
- **Not prone to freeze and thaw**



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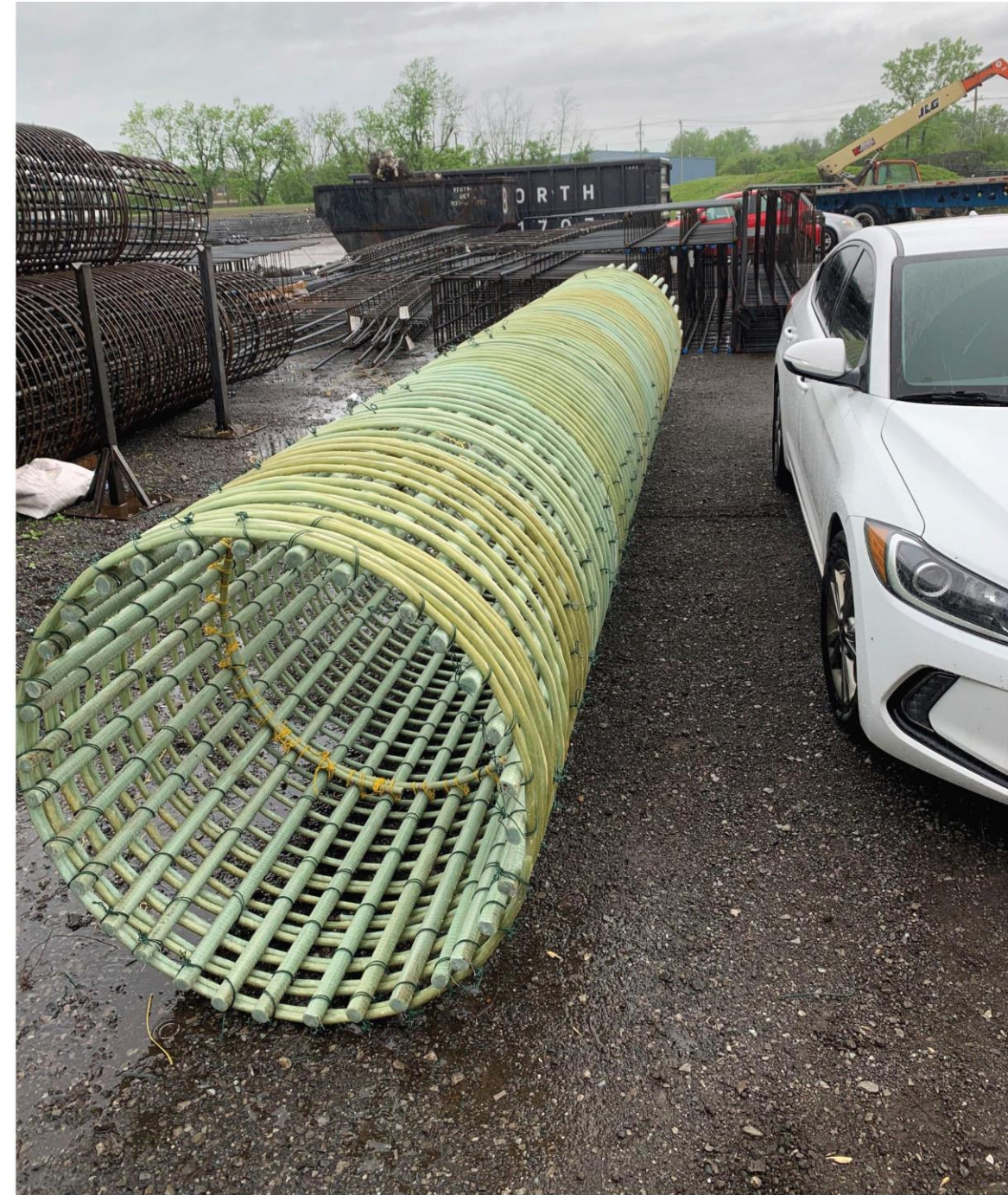
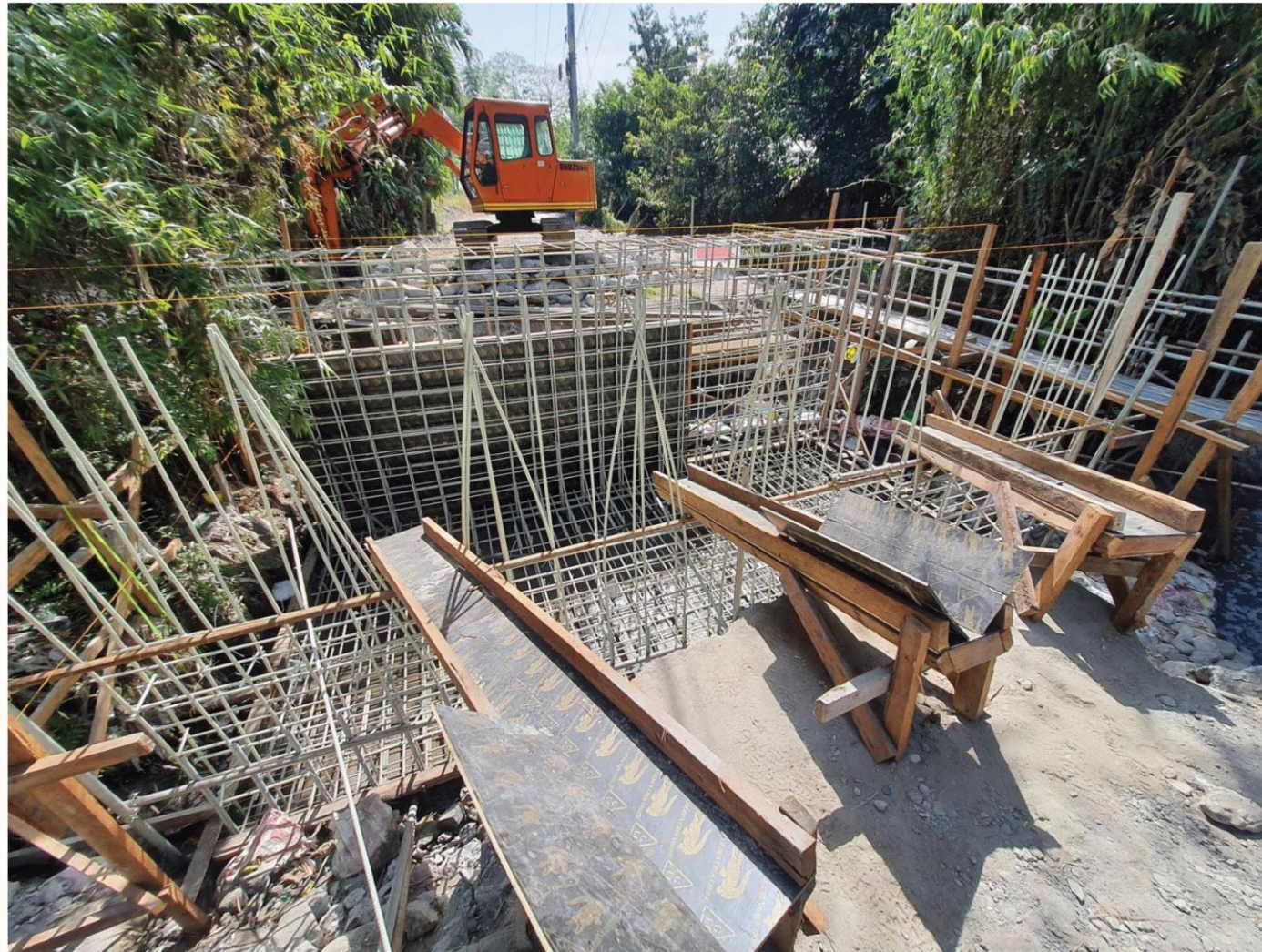


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# Residentials



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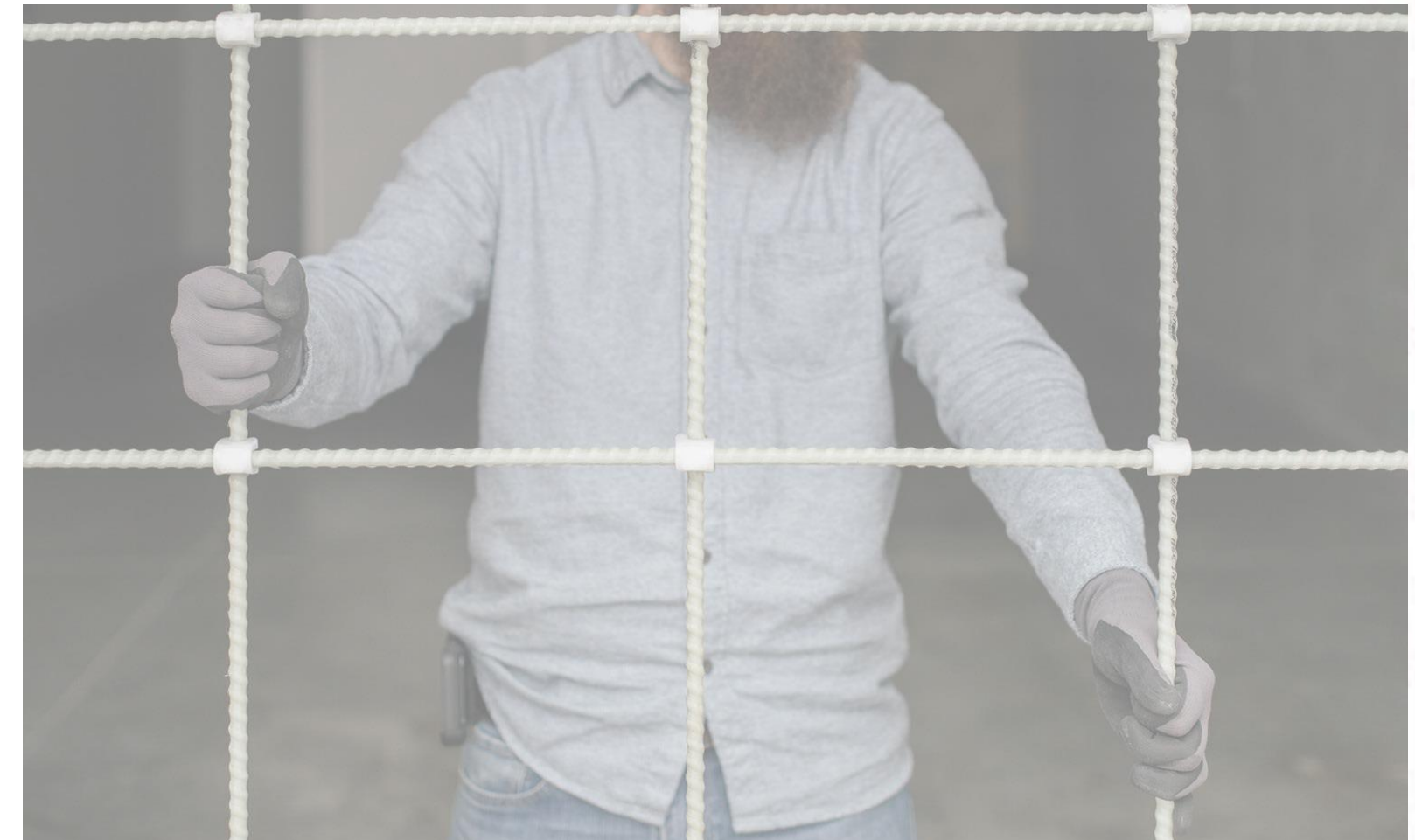


# Approval & Compliances

## North American & Int.

- FRP Institute Approved plant since 2022
- ASTM D7957 (Material Specification)
- Canadian Standard Association (CSA-S807)
- American Concrete Institution (ACI-440.11-22)
- ISO 9001:2008 Quality Control BSI-British Standard Institution
- MTO qualified for Grade III(DSM-Designated source of Material)
- FDOT/ODOT/MDOT/NCDOT/TXDOT/MADOT
- ICC-ES (ESR 4664)

### COMPLIANCE & CERTIFICATION

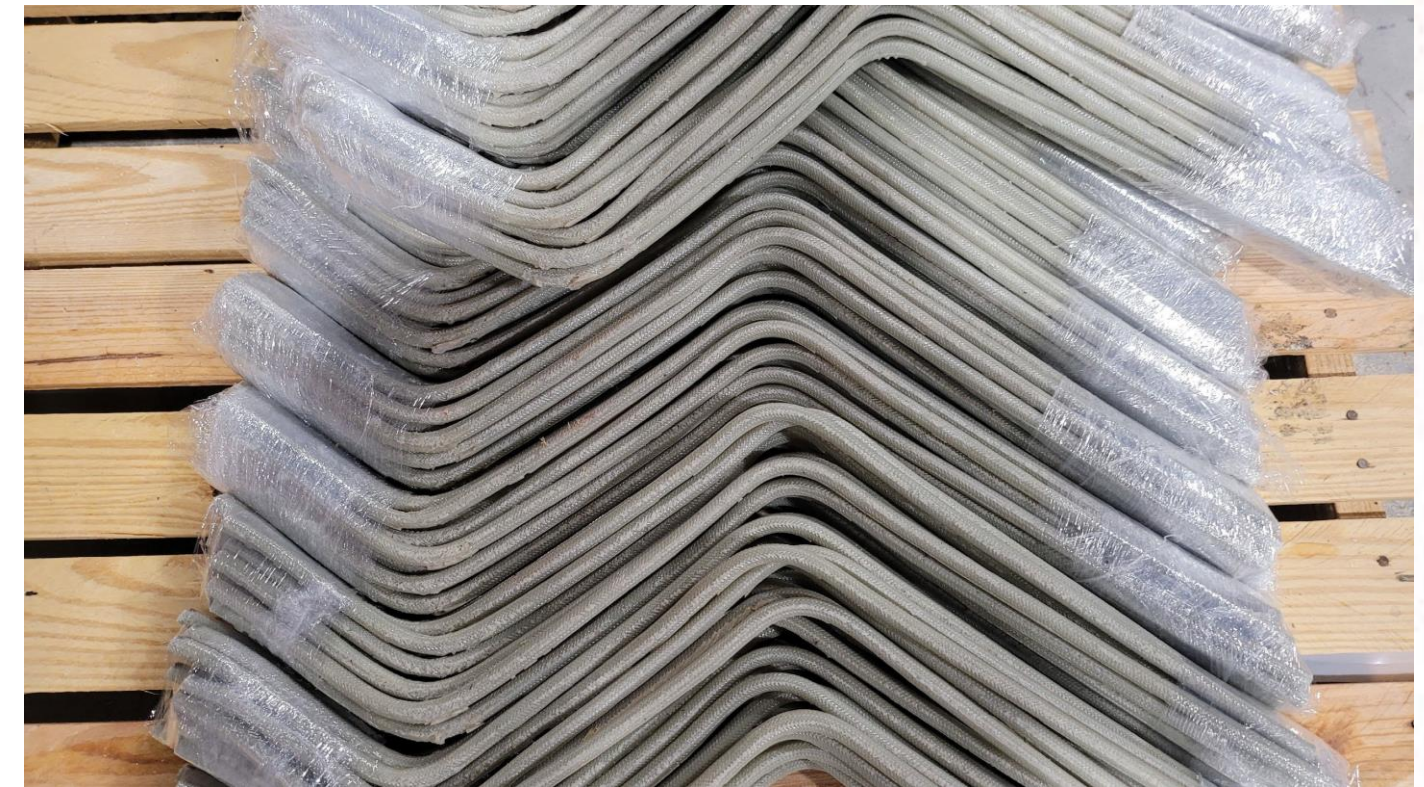


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# Bent Bar

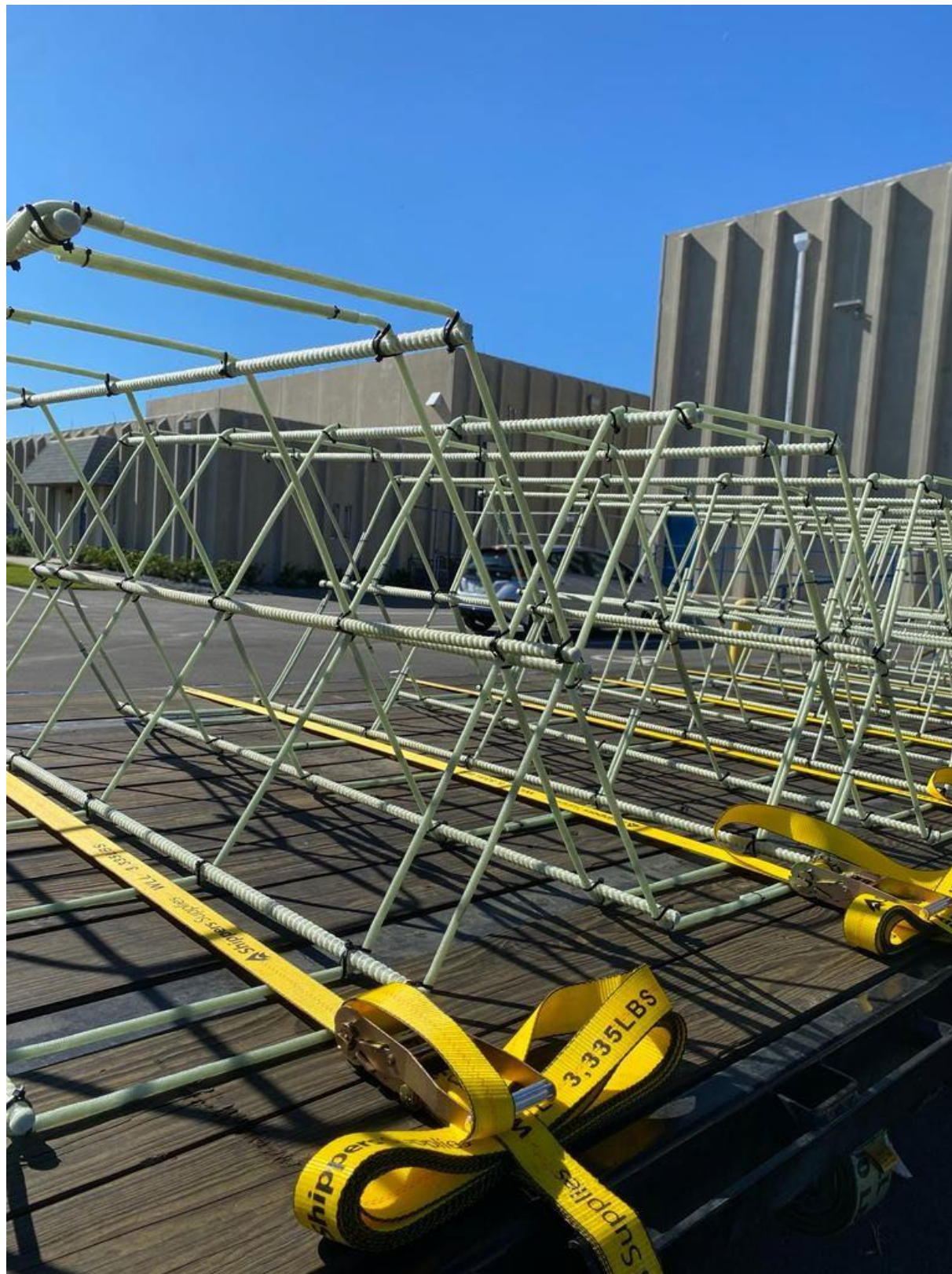


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# Bent Bar



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# Not Ductile!!!?



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# Not Ductile!!!?



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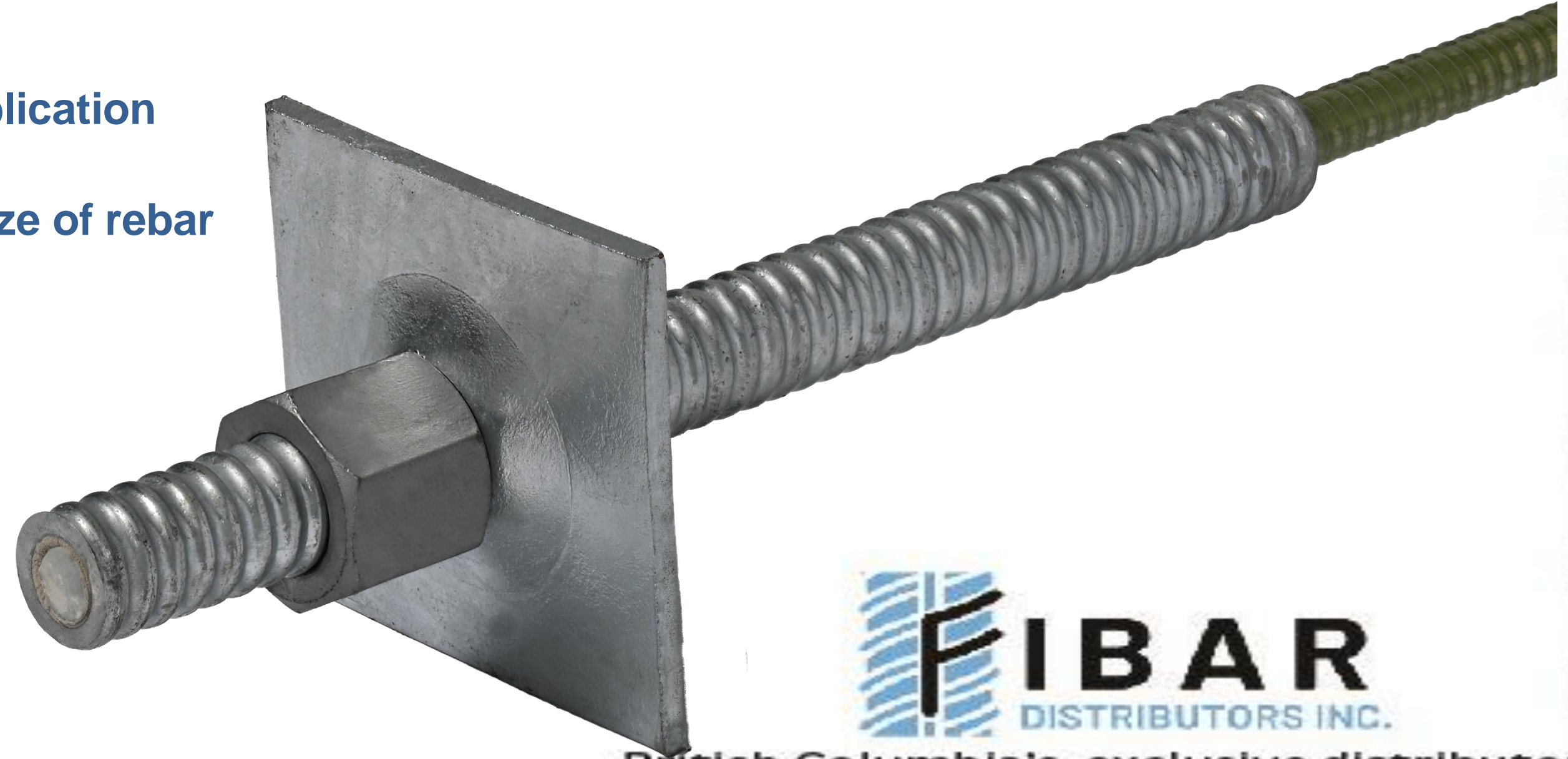
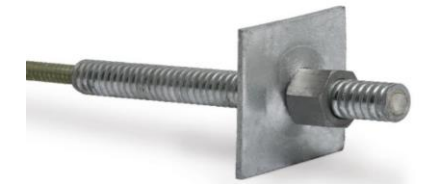
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# MST Ultra Anchor

- High Durability
- Easy to cut
- Protective sleeves
- Temporary & Permanent Application
- Maximum Strength for the size of rebar

**MST** **ULTRA**  
ANCHORS  
GFRP ROCK BOLT



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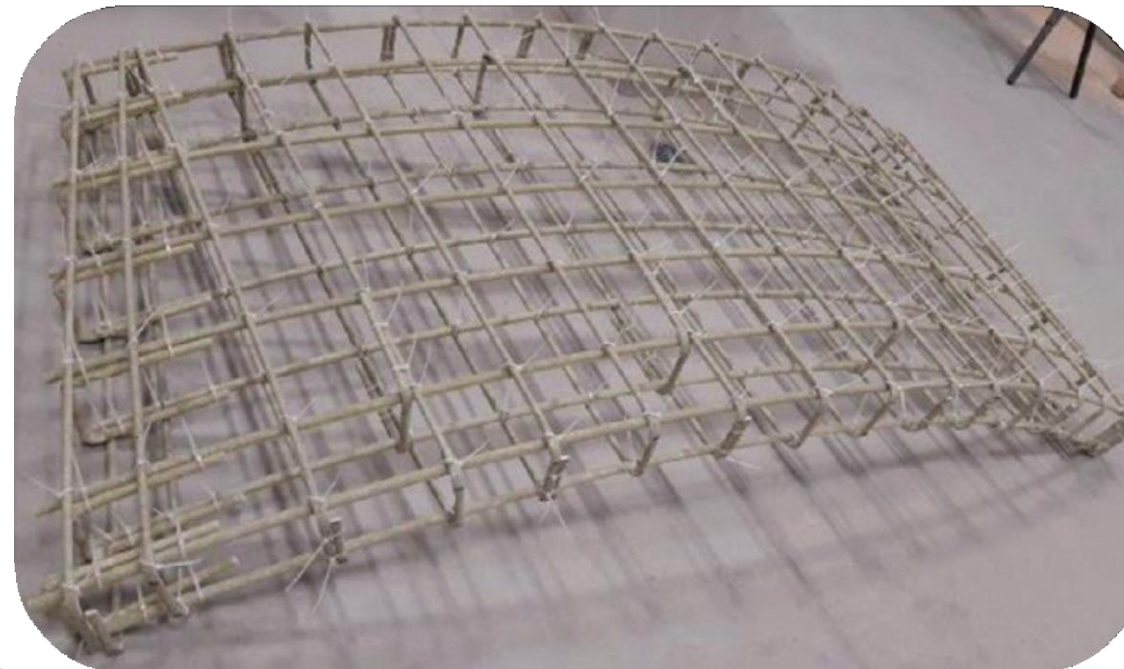
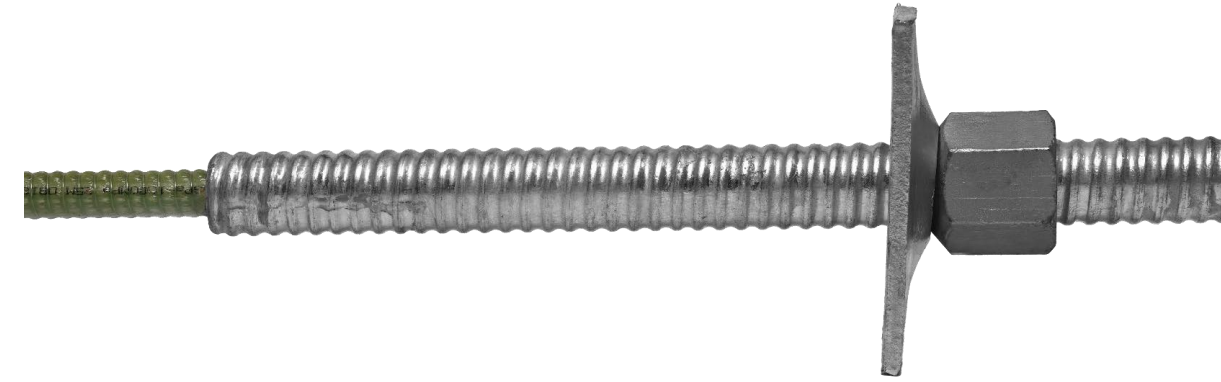
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- Rock Bolt and Tie back System

- Precast segments

- Tunnel platforms



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# MST Ultra Anchor

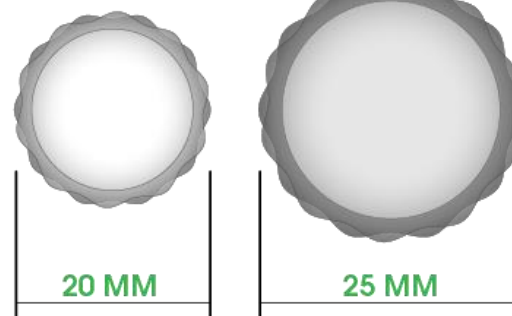


## ACME Threaded Steel Collar

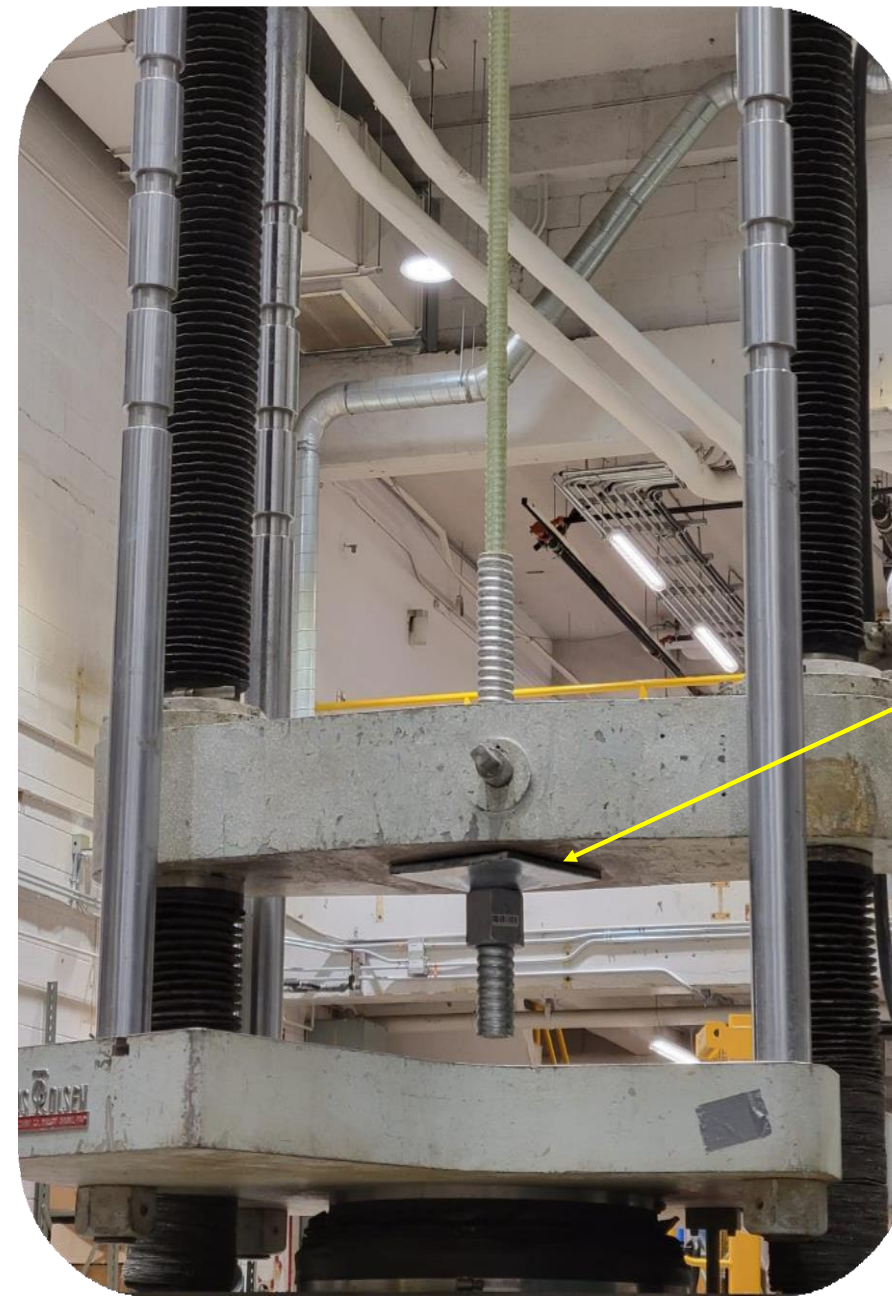
MST Ultra Anchors are capped with a steel collar with a thick acme style thread that prevents the risk of shearing.

Ultra adhesion between the ribbed MST fiberglass bar and the steel collar is provided using a high strength bonding agent ensuring a strong hold for the lifetime of the product.

## Sizing



- 2 standard sizes
- 20M & 25M
- Each single plate 250kN cap.
- 300kN and 500kN



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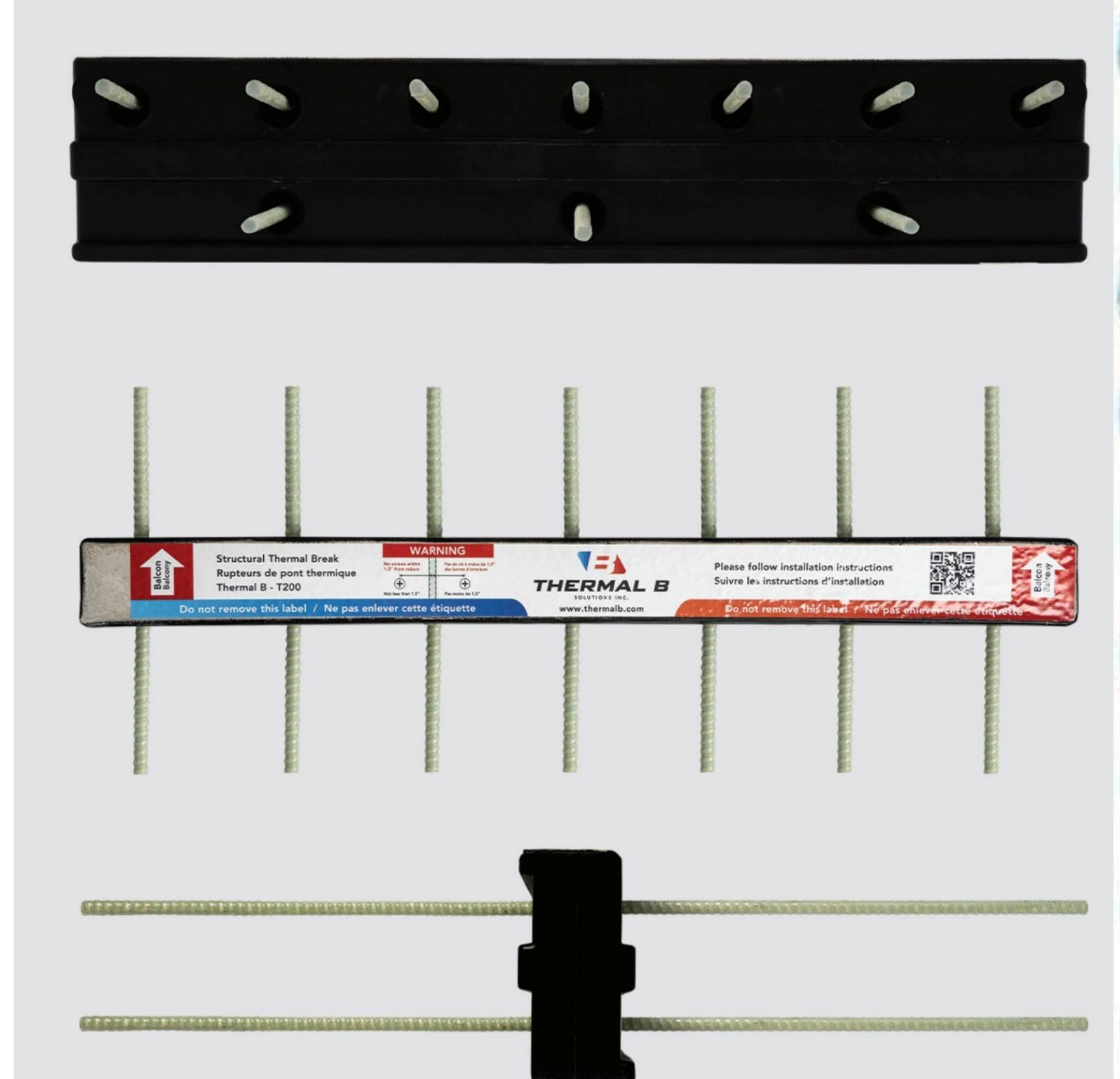


# Thermal Break by TBS

- Minimum 17% Average Energy Saving
- Mandatory regulation by City of Toronto TGS V4
- Durability & Longevity



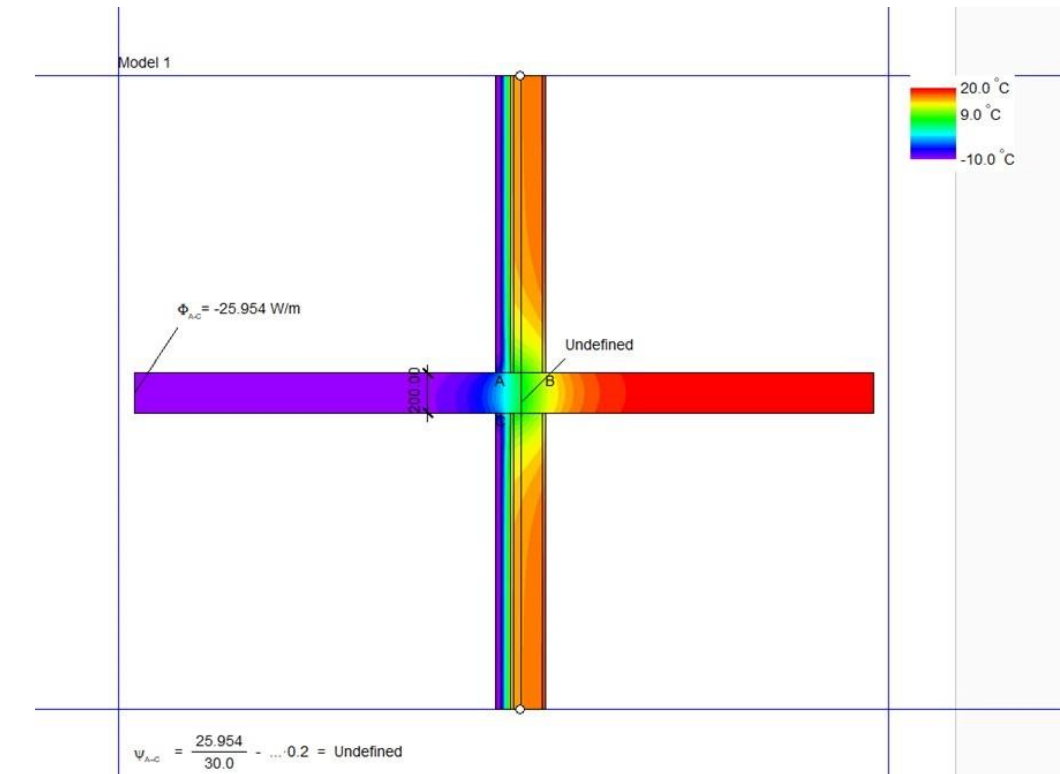
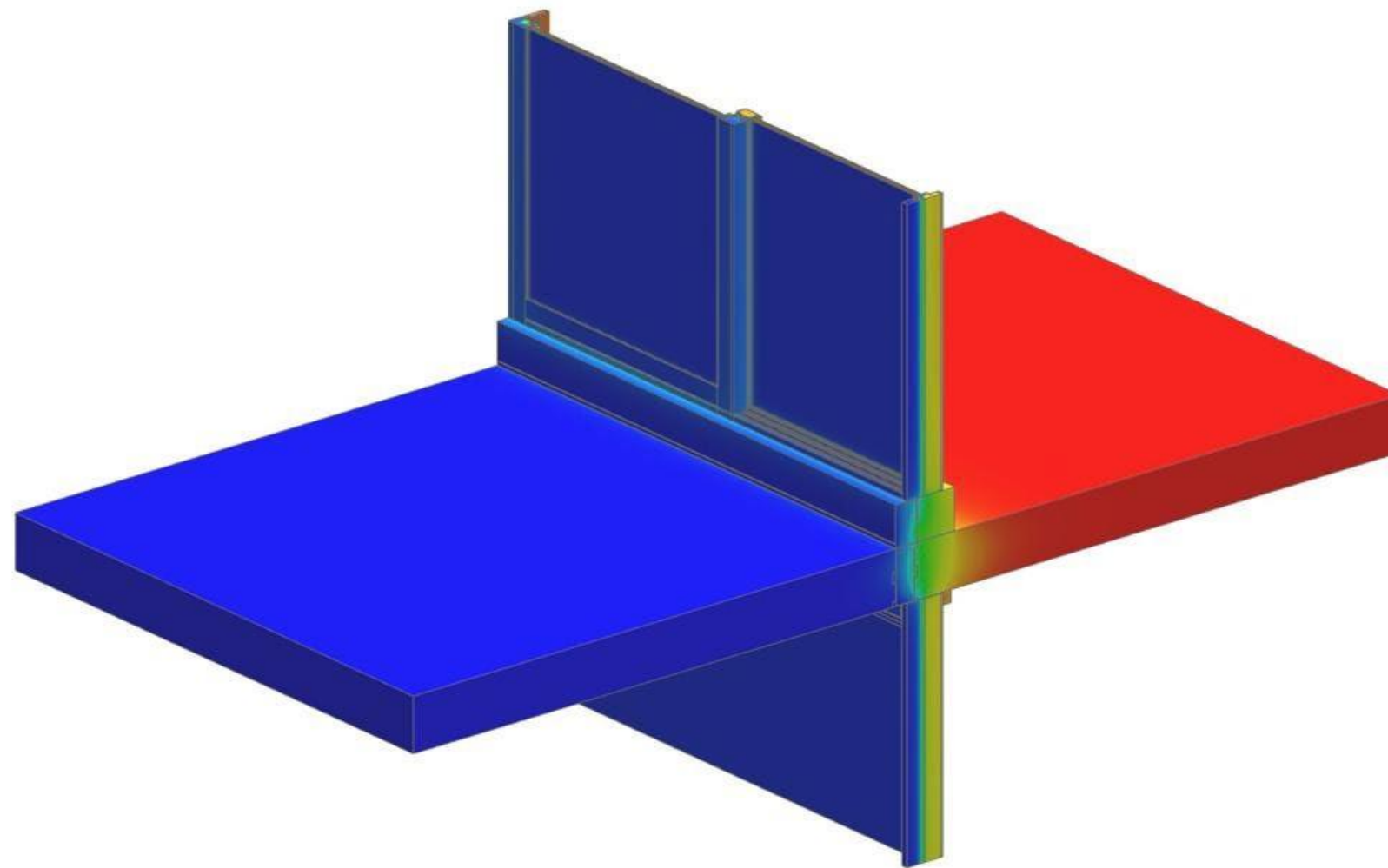
Energy Efficiency Report Submission &  
Modelling Guidelines  
For the Toronto Green Standard (TGS) Version 4



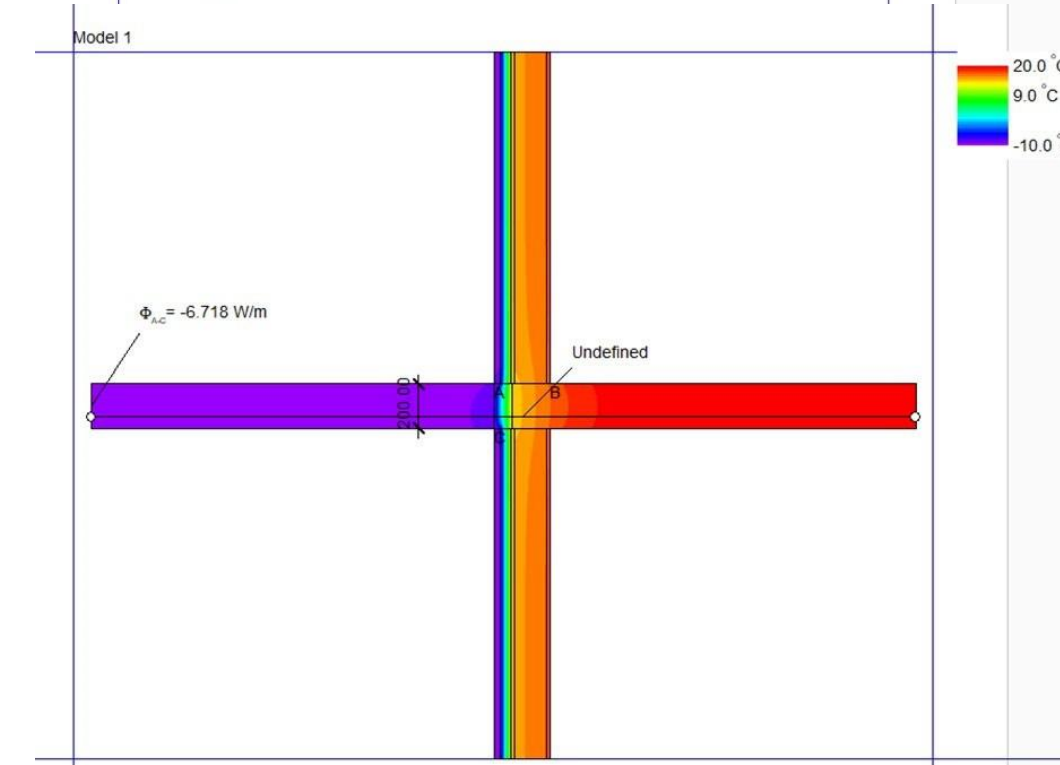
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# 17% Energy Saving



No TB



With TBS



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# Greener than Green!

- ¼ the Weight, ¼ CO2 from Transportation
- Longer Life – Less demolition – Less Concrete – Less CO2
- Save Energy by Providing Better Insulation
- No Rust – No Repair – No Replacement
- Adding 6 LEED Credits in Canada
- 70% Less Energy Required to Produce MST-BAR



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