



PREMIUM REINFORCEMENT

STRUCTURAL FIBERGLASS REBAR

**REPLACEMENT OF STEEL REBAR FOR
ABOVE GRADE AND BELOW GRADE
INSULATED CONCRETE FORM (ICF) WALLS**



**G2 BUILDING
PRODUCTS** Inc.

G2BUILDINGPRODUCTS.COM



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Note: 2024 ICFMA Prescriptive Design Guide Charts in Guidebook are provided for planning and discussion purposes, and do not include general notes, design assumptions and cross sections which are included in the full document. Locally stamped versions of the ICFMA Prescriptive Design Guide should be sourced from local suppliers for building permit and construction purposes, and may be read in conjunction with the Stealth Engineering Document.

REFERENCES

The ICFMA Prescriptive ICF Design for Part 9 Structures in Canada

G2BuildingProducts.com/resources

Insulating Concrete Forms Manufacturers Association. 2024. The Insulating Concrete Forms Manufacturers Association Prescriptive ICF Design for Part 9 Structures in Canada. Version 1. Insulating Concrete Forms Manufacturers Association. Design limitations should include those outlined in the 2024 ICFMA Design Manual and the limits specified in the mentioned document. This document should be read in conjunction with the 2024 ICFMA Design Manual.



MST-BAR is a Glass Fiber Reinforced Polymer (GFRP) Rebar

MST-BAR is a Glass Fiber Reinforced Polymer (GFRP) Rebar. It is the only GFRP Rebar that is an Integrally Ribbed Maximum Strength Rebar. MST-BAR is the only GFRP Rebar that bonds to concrete better than steel. Steel Rebar oxidizes in concrete which creates rust cancers. The oxidation process causes the rebar to expand which results in the cover concrete to spall, leading to failure.

MST-BAR is 4x lighter than steel rebar, 3x stronger than steel rebar, does not conduct heat, cold or electricity, substantially reduces workplace injuries, takes half the time to install with half the amount of people, requires no maintenance or repairs and lasts longer than the concrete it is reinforcing. Governments are specifying it and the world is starting to realize MST-BAR is the solution.

CODES & STANDARDS

CSA S807-19

ASTM D8505/

D8505M-23

ASTM D7913

CSA 806-12

NBCC 2015 9.15.4.4.

NBCC 2015 9.4.4.



What to look for

#8 - 25M Grade III



#6 - 20M Grade III



#5 - 15M Grade III



#4 - 13M Grade III



#3 - 10M Grade III



Replacement of Steel Reinforcement in ICF Walls with MST-BAR

As long as the conditions below are met, the horizontal and vertical black steel rebar as described in the 2024 ICFMA Prescriptive Design for Part 9 Buildings in Canada, can be replaced one to one with MST-BAR in ICF walls.

Nonetheless, longitudinal reinforcement of lintels needs to be increased so that each rebar may be bundled with an additional rebar, one size smaller, in order to mitigate deflection.

MST-BAR Rebar specification is as follows:

STRUCTURAL GLASS FIBER REINFORCED POLYMER (GFRP) MARKED WITH THE PREFIX GIII DENOTE GRADE III GLASS FIBER REINFORCEMENT POLYMER BARS. GLASS FIBER REINFORCED POLYMER REINFORCING BARS SHALL BE GRADE III, MEETING ALL REQUIREMENTS OF CSA S807-12, ASTM D8505/D8505M-23 AND THE FOLLOWING:

- a.** STRAIGHT BARS SHOULD HAVE INTEGRAL DEFORMED RIBS AND BOND STRENGTH TESTED AND ACCORDING TO ASTM D7913 SHOULD HAVE A MINIMUM CHARACTERISTIC VALUE $> 20\text{MPa}$ AND SLIP AT LOADED END $< 0.5\text{MM}$ (0.02").
- b.** THE BOND DEPENDENT COEFFICIENT (K_b) ACCORDING TO CSA S806-12 ANNEX S SHOULD BE < 0.8 FOR STRAIGHT BARS.
 - MINIMUM TENSILE STRENGTH: 145KSI (1000MPa) FOR ALL SIZES
 - MINIMUM MODULUS OF ELASTICITY: 8700KSI (60GPa)

NOTE: GROOVED/MILLED AND SAND COATED BARS ARE NOT ALLOWED

PARAMETERS:

When a project falls outside the outlined parameters, MST Bar may be site specific engineered to confirm a 1:1 conversion or otherwise suitable MST-Bar reinforcing design.

- This is only applicable for residential buildings conforming to Part 9 of the National Building Code of Canada, or relevant local/provincial building code (hereby abbreviated as NBCC for clarity). See included list of governing local codes by province.
- Components with MST-BAR should meet the fire performance requirements of the NBCC or other applicable building codes. The building should meet the fire performance requirements of the NBCC, including fire resistance ratings, flame-spread rating, smoke development classifications, and non combustibility requirements.
- This is only applicable for locations where $S_a(0.2) < 0.475$ overall structure lateral (seismic/earthquake) design is not a concern. ICF walls are to resist gravity and out of plane bending due to wind and soil pressure in accordance with the NBCC for the criteria indicated in the design limitations and in the tables.
- Deflection is limited to $L/240$ for walls.
- Flat ICF walls (concrete core of uniform thickness) must align vertically. Wherever soil is significantly weaker during earthquakes, such as liquefiable soils, is not applicable.
- ICF walls are limited to one floor below grade and a maximum of two stories above grade.
- ALL walls should laterally be supported by the building roof and floor framing systems.
- Foundation walls should be laterally supported at the top and bottom prior to backfilling.
- Lateral support at the bottom of the foundation wall in accordance with NBCC part 9.15.4.4. or dowels between the wall and footing as per 2024 ICFMA design manual are provided.

THE MAXIMUM BUILDING DIMENSIONS ARE:

Building Area	300 m ²	3200 ft ²
Maximum Building Dimension	24.4 m	80 ft
Building Aspect Ratio (Length : Width)	2.5:1	
Roof Clear Span	12.2 m	40 ft
Floor Clear Span	7.32 m	24 ft
Second Floor Wall Height	3.05 m	10 ft
Main Floor Wall Height	4.88 m	16 ft
Foundation Wall Height	3.66 m	12 ft

THE MAXIMUM UNFACTORED GRAVITY LOADS ARE:

Roof Snow	4.0 kPa	84 psf
Floor Live	1.9 kPa	40 psf
Roof Dead	0.7 kPa	15 psf
Floor Dead	0.7 kPa	15 psf
Concrete Density	23.6 kN/m ³	150 lb/ft ³

THE LATERAL SOIL PRESSURE AGAINST GRADE WALLS ARE:

Area Surcharge (Ko = 0.5)	2.4 kPa	50 psf
Equivalent Fluid Density of Soil (Ko = 1.0)	480-1200 kg/m ³	30-75 pcf

- Drainage is in accordance with NBCC 9.4.4. and is there to avoid there being hydrostatic pressure on the ICF walls if there was water build-up.
- Frost protection for all foundation walls and footings is present during construction and final installation.
- Horizontal temperature and shrinkage reinforcement may be less than specified in the codes. (This is due to ideal curing conditions within the ICF system, which reduces the risk of cracking. In addition, finishes are not applied directly to the concrete walls, minimizing the risk of potential cracks propagating to the surface of the finishes.)
- An engineering approval and review is required for any below grade wall with a height above 12 feet.

Local Codes Per Province as of January, 2025:

The following provinces have adopted the NBCC 2020 in their local building bylaws:

Manitoba
Saskatchewan
Northwest Territories
Newfoundland and Labrador

The following provinces have adopted the NBCC 2015 in their local building bylaws:

Yukon Territory
Nunavut
Prince Edward Island

The following provinces have adopted the NBCC 2010 in their local building bylaws:

New Brunswick

The following provinces have adopted their own provincial building codes based on the NBCC and adapted to suit local requirements:

Alberta - NBCC 2019 Alberta Edition
British Columbia - British Columbia Building Code 2024
Nova Scotia Building Code Regulation 2020, R2021
Quebec Construction Code 2022, based on NBCC 2015 with amendments for Quebec
Ontario - The 2024 Ontario Building Code

STEALTH ENGINEERING

Innovation Sustainability Durability

200A Hanlan Road
Woodbridge, Ontario
Canada, L4L 3R7

T: 647.447.0405
E: info@stealthengineeringinc.com
W: stealthengineeringinc.com

This design guide is certified for all provinces of Canada.

All stamps and seals are included on this page.



C.O.F.A: 100624458



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PERMIT #1000308



2025-06-12



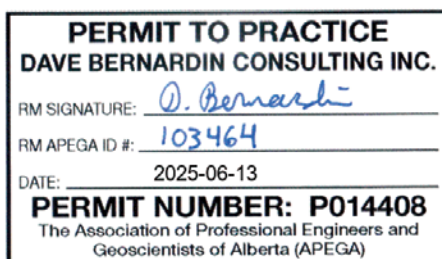
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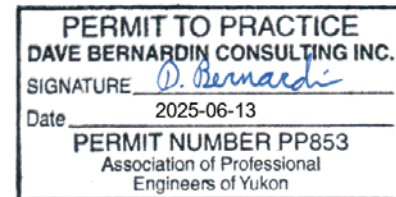
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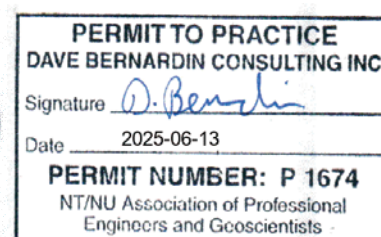
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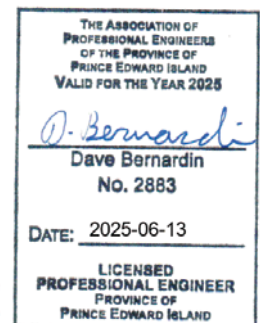
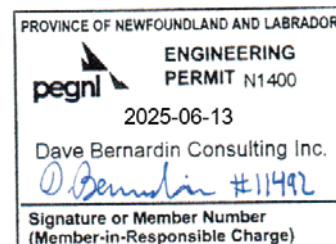
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Should you have any questions or concerns, do not hesitate to contact us at:

info@stealthengineeringinc.com



PREMIUM REINFORCEMENT

APPENDIX A

MST-BAR SPECIAL USES



**G2 BUILDING
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Special Uses Appendix

MST BAR – GENERAL USAGE

MST Bar – ICF Usage:

MST Bar, a Grade III Structural Rebar is an alternative to steel rebar for use as concrete reinforcing in Insulated Concrete Form (ICF) construction. MST Bar meets or exceeds CSA and ASTM requirements as noted on the drawings as well as NBC Section 9.3.1.1. (4)(b)(i)&(ii)&(iii) due to its tensile yield strength >1000 MPa and its bond strength > 20 MPa. Due to the non-corrosive nature of MST Bar, it can be installed with considerably less concrete cover/clearance than carbon steel rebar. MST Bar has been tested and approved for structural use by International Code Council (ICC) report ESR #4644. MST Bar also holds BMEC building materials certification 2024.

MST Bar – Footing Usage:

MST Bar, a Grade III Structural Rebar is an alternative to steel rebar for use in traditional footing reinforcement at a 1:1 conversion from steel. MST Bar may also be used for footing “dowels” when installed in accordance with the accompanying drawings. This application meets or exceeds CSA and ASTM requirements. MST Bar installed in accordance with typical standard requirements provides that the foundation walls are laterally supported as per NBC 9.15.4.4.(1)(c).

This footing “dowel” may be installed as either a 90° “L” shaped dowel or a “straight” dowel as indicated on the accompanying drawings and must stand a minimum of 600mm above the footing.

MST Bar – Wall Corner Usage:

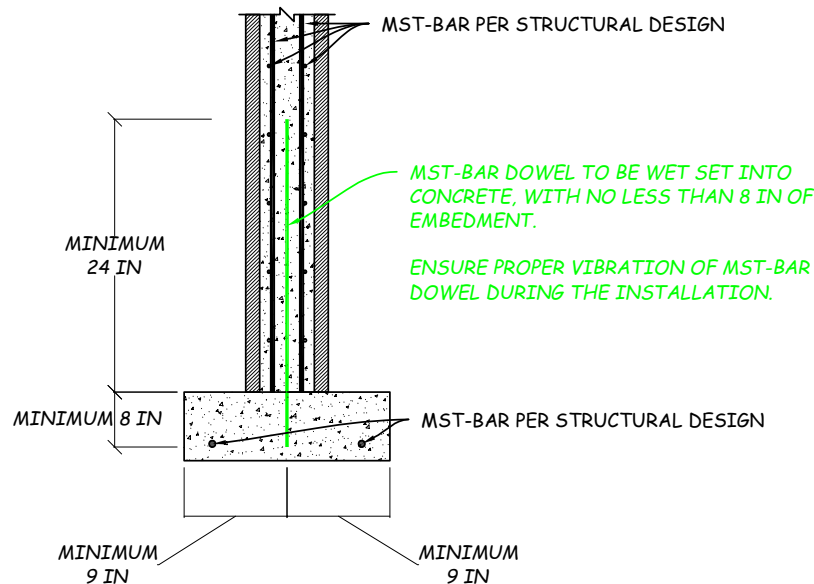
MST Bar, a Grade III Structural Rebar is an alternative to steel rebar for use as a wall corner reinforcing member when installed in accordance with the accompanying drawing. This application meets or exceeds CSA and ASTM requirements as noted on the drawings.

This wall corner reinforcing may be installed as a standard 90° corner or as a straight piece on a 45° diagonal across the horizontal bar as indicated in the accompanying drawing. Due to the high bond strength (>20 MPa) of MST Bar, the 45° detail accomplishes a higher strength corner than a traditional 90° overlapping corner.

MST Bar – Bent Bar Usage:

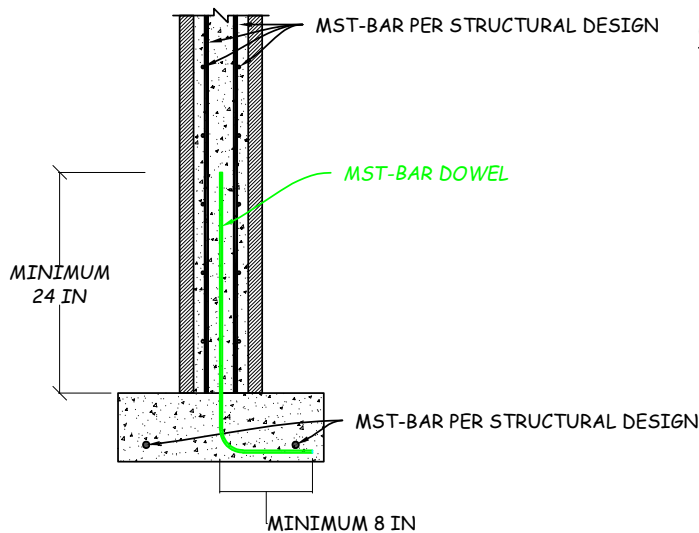
MST Bar, a Grade III Structural Rebar is an alternative to steel rebar for use as bent/shaped reinforcing (i.e. 90° corners; lintel stirrups; brick ledge; etc) in accordance with typical requirements and standards. The same standard practice overlap requirements apply to MST Bar as per industry standards (minimum 40x diameter of bar).

MST Bar bent/shaped bar components are engineered to meet or exceed CSA and ASTM requirements.



MST-BAR FOOTING DETAILS STRAIGHT DOWEL APPLICATION

NOT TO SCALE



MST-BAR FOOTING DETAILS DOWEL APPLICATION

NOT TO SCALE

GENERAL NOTE:



STRUCTURAL GLASS FIBER REINFORCED POLYMER [GFRP]

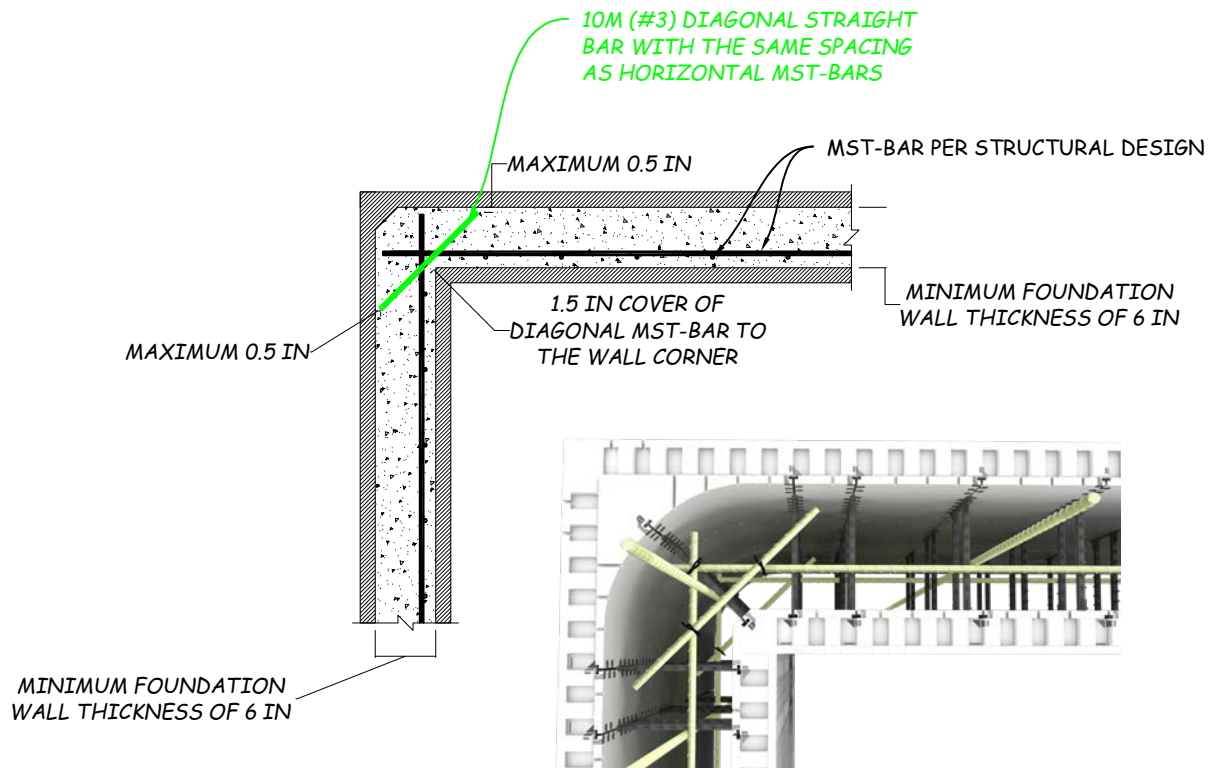
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- STRAIGHT BARS SHALL HAVE INTEGRAL DEFORMED RIBS AND BOND STRENGTH TESTED ACCORDING TO ASTM D7913 SHALL HAVE A MINIMUM CHARACTERISTIC VALUE $> 2900\text{PSI}$ AND SLIP AT LOADED END $< 0.5\text{ mm}(0.02")$.
 - THE BOND DEPENDENT COEFFICIENT (KB) ACCORDING TO CSA S806-12 ANNEX S SHALL BE < 0.8 FOR STRAIGHT BARS.
- MINIMUM TENSILE STRENGTH: 145KSI (1000MPa) FOR ALL SIZES
-MINIMUM MODULUS OF ELASTICITY: 8700KSI (60GPa)

NOTE: GROOVED/MILLED AND SAND-COATED BARS NOT ALLOWED

FOOTING AND FOUNDATION WALL CONCRETE
MINIMUM COMPRESSIVE STRENGTH OF 20 MPA

Special Uses Appendix



MST-BAR CORNER DETAILS MST-BAR DIAGONAL STRAIGHT BAR APPLICATION

NOT TO SCALE

GENERAL NOTE:



STRUCTURAL GLASS FIBER REINFORCED POLYMER [GFRP]

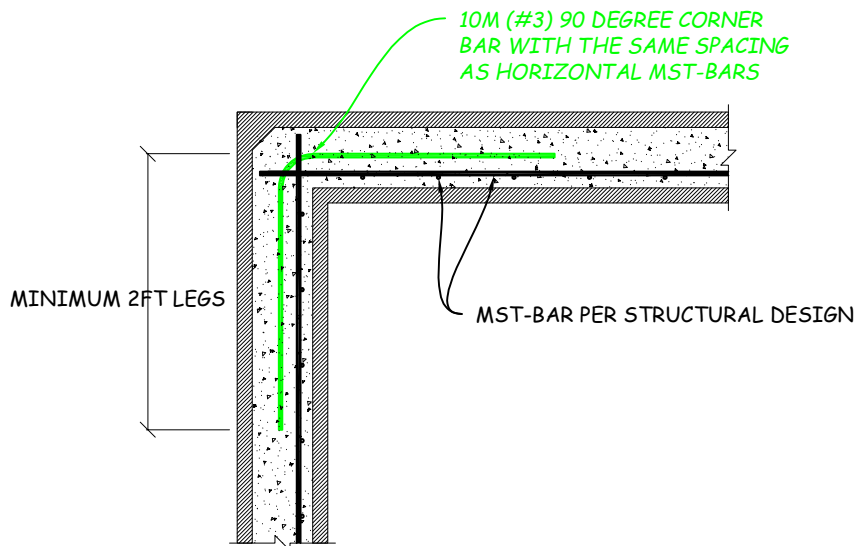
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NOTE: GROOVED/MILLED AND SAND-COATED BARS NOT ALLOWED

FOUNDATION WALL CONCRETE

MINIMUM COMPRESSIVE STRENGTH OF 20 MPa



MST-BAR CORNER DETAILS MST-BAR 90 DEGREE CORNER APPLICATION

NOT TO SCALE

GENERAL NOTE:



STRUCTURAL GLASS FIBER REINFORCED POLYMER [GFRP]

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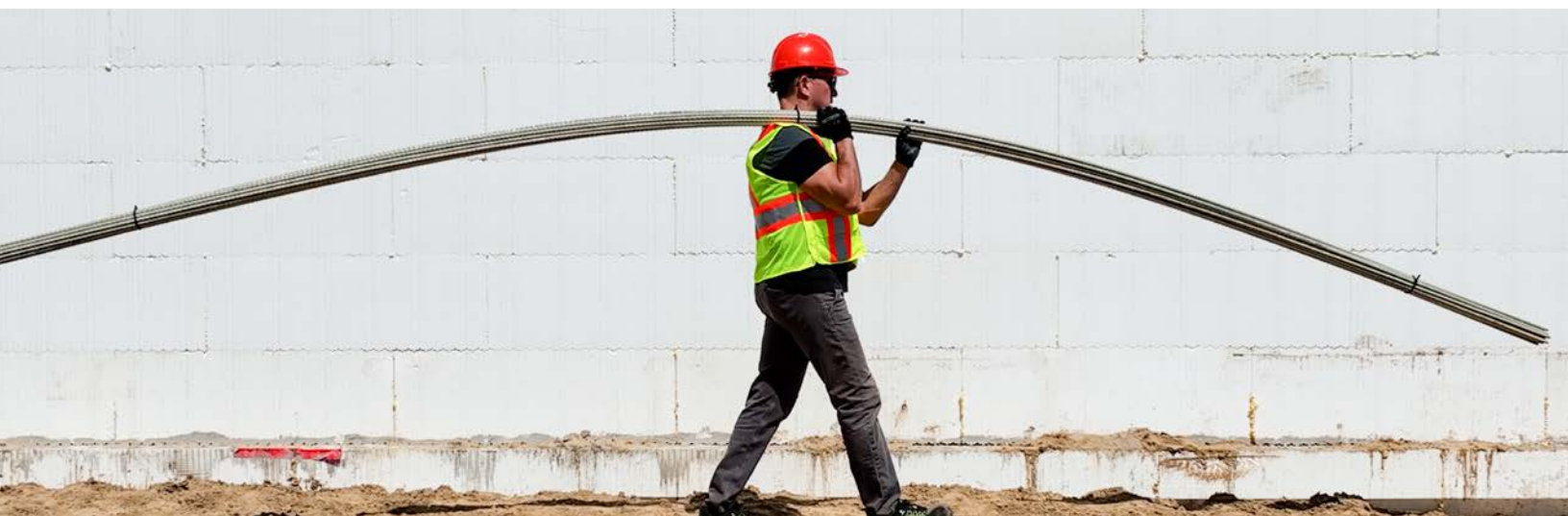
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FOUNDATION WALL CONCRETE

MINIMUM COMPRESSIVE STRENGTH OF 20 MPA



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**G2 BUILDING
PRODUCTS Inc.**

sales@G2buildingproducts.com

1-800-731-5098

G2buildingproducts.com