

HKR INC.

Engineering Specification Guide

Glass Fiber Reinforced Polymer (GFRP) Reinforcement Systems

COMPANY INFORMATION

Company: HKR INC.

Industry: Composite Materials Manufacturing

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INTRODUCTION

This Engineering Specification Guide provides general technical guidance for the specification, selection, handling, and application of HKR INC. Glass Fiber Reinforced Polymer (GFRP) reinforcement products for concrete structures.

GFRP reinforcement is designed for use in corrosive, marine, industrial, and chemically aggressive environments where traditional steel reinforcement is susceptible to corrosion and long-term deterioration.

This guide is intended for:

- Engineers
 - Consultants
 - Architects
 - EPC contractors
 - Government agencies
 - Infrastructure developers
 - Industrial project owners
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PRODUCT DESCRIPTION

HKR GFRP reinforcement bars are manufactured using continuous glass fibers embedded within a polymer resin matrix through a pultrusion manufacturing process.

The resulting reinforcement product provides:

- High tensile strength
 - Corrosion resistance
 - Reduced structural maintenance
 - Lightweight handling advantages
 - Non-conductive properties
 - Non-magnetic properties
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APPLICABLE STANDARDS

Designers and contractors should reference the latest applicable standards and codes.

Reference Standards

- ASTM D7957 — Solid Round Glass Fiber Reinforced Polymer Bars
 - ASTM D7205 — Tensile Properties of FRP Bars
 - ACI 440.1R — Guide for Design and Construction with FRP Bars
 - CSA S806 — Design and Construction of Building Structures with FRP Components
 - ISO 9001:2015 — Quality Management Systems
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MATERIAL PROPERTIES

Property	Typical Range
Tensile Strength	800–1200 MPa
Elastic Modulus	45–60 GPa
Density	Approx. 2.0 g/cm ³
Coefficient of Thermal Expansion	Low
Electrical Conductivity	Non-conductive
Magnetic Properties	Non-magnetic
Corrosion Resistance	Excellent
Water Resistance	Excellent
Alkali Resistance	High

Note: Values are representative only and may vary based on product configuration and manufacturing process.

DESIGN CONSIDERATIONS

Corrosion Resistance

GFRP reinforcement is recommended in environments exposed to:

- Saltwater
- Chlorides
- Humidity
- Industrial chemicals
- Wastewater exposure
- Coastal and marine conditions

Structural Design

Design should consider:

- Lower modulus of elasticity compared to steel
- Serviceability requirements
- Crack width limitations
- Deflection behavior
- Long-term creep characteristics

Concrete Cover

Concrete cover should follow applicable engineering standards and project specifications.

Thermal Considerations

GFRP reinforcement has lower thermal conductivity than steel and is suitable for structures requiring reduced thermal bridging.

RECOMMENDED APPLICATIONS

Transportation Infrastructure

- Bridges
- Highways
- Drainage systems
- Retaining structures
- Culverts

Marine & Coastal Structures

- Seawalls
- Jetties
- Docks
- Port facilities
- Waterfront infrastructure

Industrial Facilities

- Chemical plants
- Water treatment plants
- Utility structures
- Industrial slabs
- Corrosion-prone process facilities

Oil & Gas

- Pipe supports
- Offshore support structures
- Concrete foundations
- Industrial walkways
- Corrosion-sensitive infrastructure

BAR SIZES

Diameter	Designation
6 mm	#2
10 mm	#3
12 mm	#4
16 mm	#5
20 mm	#6
25 mm	#8
32 mm	#10

Custom sizes available upon request.

HANDLING & STORAGE

Storage Requirements

- Store on flat surfaces
- Protect from impact damage
- Avoid prolonged UV exposure during extended storage
- Keep bundles elevated from standing water

Handling Recommendations

- Use non-metallic slings when possible
 - Avoid excessive bending during transport
 - Prevent surface damage during loading and unloading
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CUTTING & FABRICATION

Cutting

Use approved abrasive or diamond cutting tools suitable for FRP materials.

Bending

GFRP reinforcement should not be field bent unless specifically engineered and manufactured for bending applications.

Custom bent shapes may include:

- Stirrups
 - U-bars
 - Hooks
 - Project-specific reinforcement shapes
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INSTALLATION GUIDELINES

- Follow approved structural drawings
 - Maintain specified spacing and concrete cover
 - Use compatible support accessories and spacers
 - Avoid damaging surface coatings during installation
 - Coordinate with project engineer regarding lap lengths and detailing
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QUALITY CONTROL

HKR INC. targets implementation of quality control systems including:

- Raw material inspection
 - Dimensional verification
 - Tensile property testing
 - Surface inspection
 - Production traceability
 - Batch identification
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ENVIRONMENTAL BENEFITS

GFRP reinforcement can contribute to:

- Reduced lifecycle maintenance
 - Longer infrastructure service life
 - Lower replacement frequency
 - Reduced transportation weight
 - Improved durability in corrosive environments
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LIMITATIONS

Design professionals should evaluate:

- Fire exposure requirements
 - Long-term service conditions
 - Deflection criteria
 - Project-specific loading requirements
 - Applicable local regulations and standards
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DISCLAIMER

This document is intended as a general engineering reference guide only.

Final design responsibility remains with the project engineer of record.

HKR INC. recommends that all designs and specifications comply with applicable building codes, engineering standards, and project-specific requirements.

CONTACT INFORMATION

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For technical support, engineering consultation, or project-specific inquiries, contact HKR INC.

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