



CRIMAR INDUSTRIAL

Factories in US, Mexico and China

www.crimar.com

Crimar Industrial for over 30 years has been providing high quality fiberglass industrial equipment (tanks, piping, pumps, ductwork, roofs, process equipment, custom fabrication, and field installation and maintenance services) to a mining, municipal, petro-chemical and other industrial applications around the world.



We have fiberglass manufacturing facilities in the US, Mexico and China

We also provide a wide range of related products through our international sales and purchasing offices



President

Background



Roger Beman

- Over 30 years of experience in the design, manufacture and installation of industrial FRP products for corrosive environments
- Over 30 years of international sales and purchasing experience
- Fluent in English, Spanish & French
- Since 2006 has made over 150 trips to China to ensure quality and compliance for products made there.

Our regular customer base includes companies such as: WesTech, FLSmidth, Glencore Mining, Hatch Engineering, CODELCO, Freeport McMoRan, Jacobs Engineering, ASARCO, M3 Engineering, IMC Kalium, Biorem Technologies, Intrepid Potash, Grupo Mexico and many others.



Sales & Support:

We have sales & support offices in Tucson, AZ; Canada (Toronto); Santiago (Chile); Lima (Peru), Shijiazhuang (China), and Hermosillo (Mexico). Our office in China (Shijiazhuang Beman Commercial Co. Ltd.) provides complete sourcing, QC, import - export and expediting.

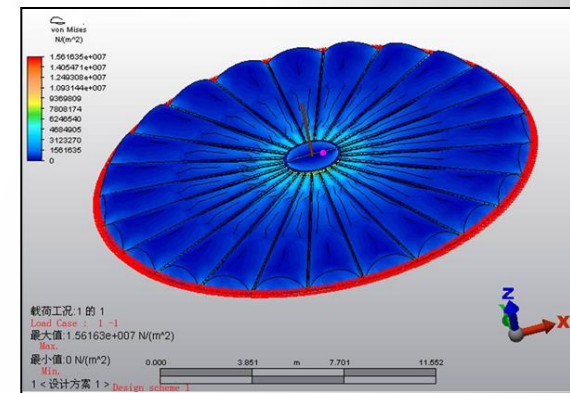
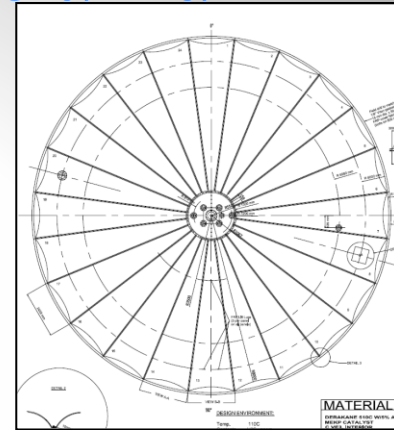
Design:

While we have extensive internal expertise in fiberglass design and fabrication, we also have the full support of the design center at our subcontract facility in as well as of Professional Engineers in the US and Canada that specialize in fiberglass design and inspection services.

Fabrication:

All design, fabrication and inspection is in accordance with international standards such as ASME RTP-1, ASTM 3299, ASTM 4097
Fabrication facilities in Hebei China, Tucson Arizona and Hermosillo Sonora

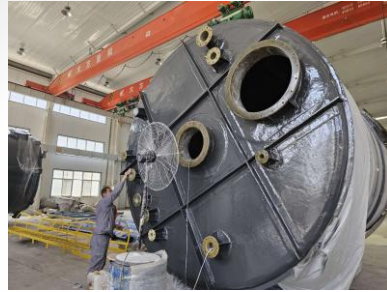
Background



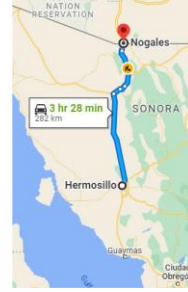
Fiberglass Fabrication



Fabrication facilities in Hebei, China



Sonora, Mexico



Tucson, Arizona



CRIMAR INDUSTRIAL

Crimar Industrial has supplying high quality fiberglass equipment for projects around the world since 2000. The products are made with resins appropriate for the operating environments in accordance with ASME and ASTM standards.



Effluent piping for Indianapolis



Odor control system for Avondale, Arizona



Feedwells & related for WesTech for GE Power Australia



60' dia. hot clarifier covers for FLS/SNC Lavalin



90' launder systems for Puerto Rico



FRP tanks for FMI Arizona



One of 88 tanks for Hatch/FMI Indonesia



6 mt FRP thickener for FLSmith/Hatch/FMI

CRIMAR INDUSTRIAL



52 Process vessels for Hatch Engineering QSLIC project



Biofilters - Manitoba Canada



Biofilters – British Colombia CA



34 tanks and process vessels for a uranium SXEW plant -Technip/Areva - Canada



On site installation

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Prefabricated piping system for Phelps Dodge



Prefabricated piping systems for Glencore Mining



Butterfly dampers for ArcelorMittal



Vacuum receivers, storage tanks and related piping for Westech/Jacobs Morocco project

Rectangular duct systems for water treatment plants in the US



Ductwork for Glencore Philippines



CRIMAR INDUSTRIAL

Field installation of large diameter tanks oblated for shipment and field assembly. We provide on-site fabrication and assembly around the world.

Shop fabrication in Hebei, China for shipment to Arizona:



Removing tank parts from the shipping frame in Arizona and assembling on site:



Fiberglass Design Standards

ASME RTP -1 - Fabrication Standard for Corrosion Resistant Fiberglass Vessels

ASTM 4097 – Standard for Filament Wound FRP Tanks

ASTM 3299 – Standard for Contact Molded FRP Tanks

NBS PS 1569 – Contact Molded Chemical Process Equipment

AWWA D120-09 – Standard for Thermoset FRP Tanks

SMACNA – Sheet Metal and AC - Fiberglass Ductwork

API 12P – American Petroleum Institute Standard for FRP Tanks

FABRICATION MATERIALS

GLASS REINFORCEMENT:

Roving

Mat

Woven roving

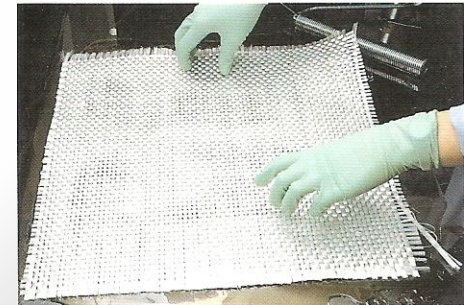
Surfacing veils

ADDITIVES:

Antimony trioxide

Silica carbide

Ultraviolet ray inhibitors





Fiberglass Fabrication

Fiberglass products can be made to be:

NSF61 compliant for potable water

Fire retardant

Abrasion resistant

Impact resistant

Electrically conductive

Heat resistant up to 450F

Corrosion resistant – acids, caustics, ..

UV resistant

Built-in leak detection capability

Sandwich core for strength and lighter weight

Insulated



Fiberglass Fabrication

Fiberglass products, unlike steel, do not need to be uniform throughout the laminate. As each layer is applied, different reinforcement materials can be used; different resins can be applied to provide the features required.

NSF61 compliant for potable water

Fire retardant

Abrasion resistant

Impact resistant

Electrically conductive

Heat resistant up to 450F

Corrosion resistant – acids, caustics, ..

UV resistant

Built-in leak detection capability

Sandwich core for strength and lighter weight

Insulated



Fiberglass Fabrication

Fiberglass products, since they are produced as a “wet” material that is then cured to provide the hardness required, are prepared on molds. Tanks, pipe and duct are made on “male” molds, with the fiberglass applied to the outside of the mold. Per FRP standards, dimensions are based on the internal diameters of the finished parts.

The first layers on the mold are the most critical for corrosive environments. These typically consist of a corrosion resistant veil followed by 2 to 3 layers of random mat to provide a resin-rich 100 to 125 mil corrosion liner. Plastics such as PVC, polypropylene and Viton can also be used for the internal barrier.





Fiberglass Fabrication

For other shapes, a variety of materials can be used to make molds depending on the complexity of the product and the number of parts to be made from the mold.

For one-time use, plaster, wood or foam can be used with a mold-release applied to the side that will receive the laminate. For multiple use molds, a fiberglass mold can be made from the first part pulled off from the plaster mold.





Fiberglass Fabrication

There are many different kinds of glass fiber to provide a wide variety of laminate strengths:

Glass fiber

Carbon fiber

Bamboo fiber

and different textures (see photos next slide):

Winding glass

Chopped strand glass

Woven glass

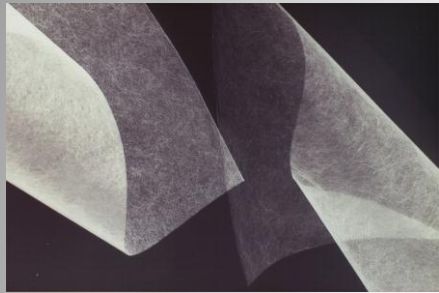
Unidirectional glass

Corrosion veil

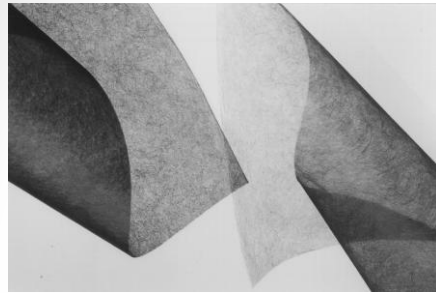


Fiberglass Fabrication

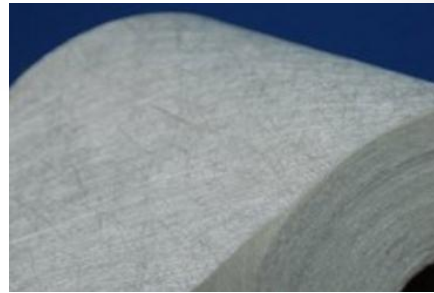
There are hundreds of different weaves or textures that can be used:



C veil for corrosion barrier



Carbon veil



Random mat



Gun roving and winding glass



Woven roving (many different weaves and weights)



Unidirectional glass



Maring cloth



Carbon fiber



3D vertical weave fiberglass



Honeycomb core materials



Polyurethane foam

FABRICATION METHODS



Filament winding
Chopper gun
Hand lay up
Resin Transfer
Pultrusion



FABRICATION METHODS

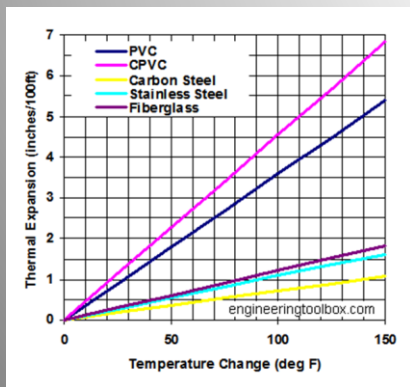


FRP DESIGN

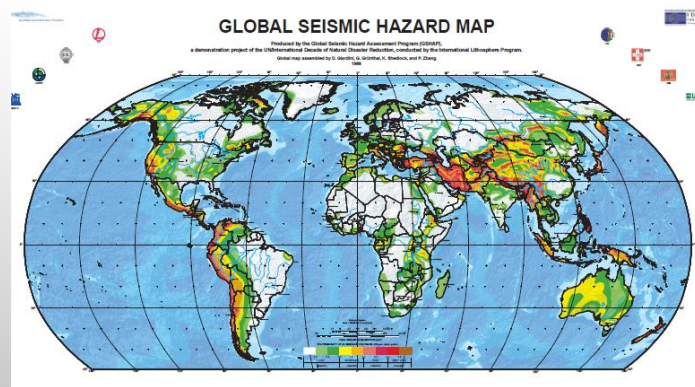
Some of the information required for FRP design include the:

- structural loading
- chemical resistance required
- temperature
- seismic loading
- wind loading

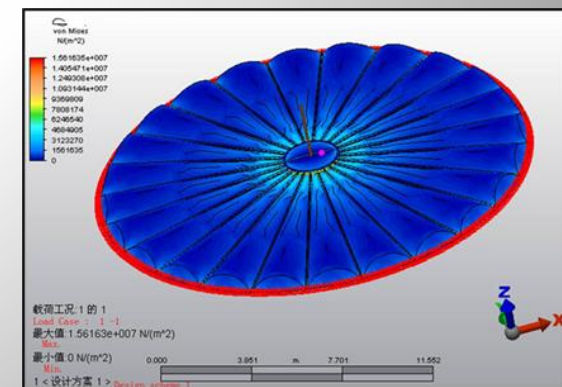
When appropriate we prepare finite element analyses (FEA's) to model the design and loads to ensure that the project requirements will be met



Thermal expansion



Seismic map



Finite element results



FRP PRODUCTION TRACKING

		TUCSON, AZ, USA	www.crimar.com	sales@crimar.com		Rev 0					Customer:	
SubContractor :		Crimar Inspection and Test Plan										Contract No.:
Fabrication location:												Project:
Item	Description	Acceptance Criteria	Frequency	Deliverable/ Verification Documentation	MDR	Management	Production	QC	WesTech-Customer Resp- QA/ QC	Client/ End User Resp QA/ QC		
Project Review / Review Contract Documents												
1.2	Design review	Design code and project specification requirements/ ASME RTP-1 2011	Prior to issuing of manufacturing drawings						Hold	Hold		
1.3	specification verification/ Raw material procurement	Design code and project specification requirements/ ASME RTP-1 2011	Prior to commencement of manufacture	Spec and raw material documentation	Include	Hold	Verify	Verify	Hold	Hold		
1.4	Drawing Review / Submit shop drawings for approval	Specification and Project standards	At the start of the project	Drawings	Include	Hold			Hold	Verify		
1.5	Preparation and submit ITP for approval	Specification requirements	Prior to commencement of manufacture	Completed ITP & Deliverable documents		Verify		Hold	Hold	Hold		
1.6	Prepare QA Documentation / check and issue shop drawings / work instructions / kick off meeting etc	Specification requirements- together with in-house quality management documentation	Prior to commencement of manufacture	Quality and design pack for approval review	Include ITP and relevant deliverable docs	Verify	Hold	Hold	Hold	Verify		
Inc om ing Raw Ma teri als Ins pe ction												
2.1	Revis	Manufacturers data sheets/ PO Spec requirements	Each delivery and or batch number	Supplier's Certificate of Compliance and Analysis Doc	Include Certs							
2.1.1	Traceability/ batch Nos.	Purchase Order and data sheets	Each Delivery lot/ drum	In house receiving documentation		Verify	Surveillance	Verify	Verify			
2.1.2	Gel Time	Resin Data sheets	1 sample from each Drum	In House Gel Time record sheet Supplier's Certificate of Compliance and Analysis Doc			Hold	Verify				
2.1.3	Barcol hardness on resin casting	90% of resin manuf value checked per ASME RTP-1 2011 (min 30 for D 411)	1 sample from each Drum	Gel Time test record		Hold	Witness	Verify				
2.2	Glass Fiber	Manufacturers data sheets/ PO Spec requirements	Each delivery and or batch number	Supplier's Certificate of Compliance and Analysis Doc	Include Certs							
2.2.1	Pallet Inspection	Appearance/ check for water damage	Each pallet/ lot	In house receiving documentation		Verify	Surveillance					
2.2.2	Traceability/identification/ batch Nos.	Purchase Order and data sheets	Each pallet/ lot	In house receiving documentation		Verify	Surveillance	Verify	Verify			
2.3	Surface veil/ tissue	Manufacturers data sheets/ Spec requirements	Each delivery and or batch number	Supplier's Certificate of Compliance Doc	Include Certs							
2.3.1	Traceability/identification/ batch Nos.	Purchase Order and data sheets	Each pallet/ lot	In house receiving documentation		Verify	Verify	Verify	Verify			
2.4	Catalysts	Manufacturers data sheets/ Spec requirements	Each delivery and or batch number	Supplier's Certificate of Compliance and Analysis Doc	Include Certs							
2.4.1	Traceability/ batch No.	Purchase Order and data sheets	Each pallet/ lot	In house receiving documentation		Verify	Verify	Verify	Verify			
2.4.2	Check shelf life/ date on manufacture	Data sheets	Each delivery and or batch number	In house receiving documentation			Verify					
2.4.3	Reactivity/ Gel time consistency	Production requirements	1 sample from each Batch	Test report/Supplier's Certificate of Compliance and Analysis Doc		Hold	Verify					
2.5	Additives	Manufacturers data sheets/Spec requirements	Each delivery and or batch number	Supplier's Certificate of Compliance and Analysis Doc	Include Certs							
2.5.1	Traceability/identification/ batch Nos.	Purchase Order and data sheets	Each Delivery/ Batch	In house receiving documentation		Verify	Verify	Verify	Verify			
2.5.2	Visual Inspection/ Shelf life expiry date	Manufacturers data sheets/ Spec requirements	Each delivery /pallet/ lot	In house receiving documentation			Verify					
Component Production and routine testing												
3.1	Record Temperature and Dew point humidity of work area	ASME RTP-1 2011 Min 10°C Not less than 3 degrees of Dew point	Minimum of 2 times a shift	In - house record sheet		Hold	Hold	Verify	Verify			
3.2	Tooling/ mould dimensions/ visuals/ release agent	Specification requirements / design validation	At beginning of production/ each tool equipment	In-house record sheet	include	Hold	Hold	Verify	Verify			

3.3	Record materials/ batch numbers	Specification/works instructions	Each component	Hebei Fulong Product QC sheet	Include					Surveillance	Verify	Verify				
3.4	Chemical Barrier - Visual , sequence , correct curing agents, correct resin and cure system	Specification	Each component	Hebei Fulong Product QC sheet	Include	Verify	Surveillance	Verify	Verify							
3.5	Application of structural layers/ external Chemical barrier/ correct resin, glass and cure system	Specification	Each component	Hebei Fulong Product QC sheet	Include	Verify	Surveillance	Verify	Verify							
3.6	Surface preparation and secondary bonding of components/ correct jointing laminate and resin systems	Specification/ drawings/ minimum tapers 1:6	Each component	Hebei Fulong Product QC sheet	Include	Verify	Surveillance	Verify	Verify							
3.7	Dimensional & tolerance, orientations, elevations, squareness, parallelism, flange flatness, nozzle orientation and all dimensions indicated in the drawing and the control sheet.	Specification, Drawings	Each component	Hebei Fulong Product QC sheet	Include	Hold	Surveillance	Surveillance	Verify							
3.8	Application of exterior top coat/ correct resin , wax and cure system	Specification	Each component	Hebei Fulong Product QC sheet		Verify	Surveillance	Verify	Verify							
3.9	Barcol Hardness.	90% of resin manuf checked per ASME RTP-1 value (min 30 for Derakane 411)	Each component	Hebei Fulong Product QC sheet	Include	Hold	Surveillance	Surveillance	Verify							
3.10	Acetone Surface sensitivity of surfaces	Checked per ASME RTP-1 2011 Procedure 6-910-b-7	Each component	Hebei Fulong Product QC sheet	Include	Hold	Surveillance	Surveillance	Verify							
3.11	Appearance/ visual defects/ cracks	Specification / Visual defects ASME RTP-1 2011 Table 6.1 Level 2	Each component	Hebei Fulong Product QC sheet	Include	Hold	Surveillance	Surveillance	Verify							
5 Final Inspection																
5.1	Identification and Marking	Specification/ drawings item numbers/ statutory requirements	All components							Include Photostat copy of name plate/label	Verify	Hold	Hold	Verify		
5.2	Prepare: Certificate of compliance & delivery note/ shipping docs	Specification/ contract requirements	Each Delivery							In accordance with terms of WesTech purchase order	Include	Verify	Hold	Verify	Verify	
5.4	Release note submission by customer and client and receipt of acceptance	Project requirement and format	Each Delivery							Release signed by WesTech	Include	Verify	Hold	Hold	Verify	
5.5	Security of Load, Protection and packaging	Logistics Pack. Specific specification requirements	Each batch 1/ delivery							Dispatch documents/ Packing list	Include	Verify	Hold	Surveillance	Verify	Verify
6 MDR																
6.1	Prepare MDR with all requirements	Per Contract Requirement	Per Decanter / contract requirement	Completed MDR and submit required number of copies						Complete and submit	Verify	Hold	Verify	Verify		
Manufacturer Approval																
Customer																
Name																
Position																
Signature																
Date																
Third Party Approval																
Name																
Position																
Name																
Position																
Date																
Date																
Client / End User Approval																
End User QA Representative																

o Hold Points (H)
 A step in design, fabrication, installation, construction, testing or maintenance beyond which the process may not proceed without checking, inspection and authorization by the authority who imposed the hold point.
 o Witness Point (W)
 A step in design, fabrication, installation, construction, testing or maintenance where the authority who imposed the witness point performs an inspection or surveillance.
 If such inspection or surveillance is not performed at the agreed time, after proper notification that the witness point will occur, or if such inspection is waived, processing may continue.
 o Verification Point (V)
 A step in design, fabrication, installation, construction, testing or maintenance where the authority who imposed the verification point reviews documentation applicable to the surveillance point to ensure correction compilation and acceptability of such documentation.
 o Surveillance Point (S)
 A step in design, fabrication, installation, construction, testing or maintenance where the authority who imposed the surveillance point is notified in advance of the activity to enable him to visit the location of the activity if required to conduct a general surveillance without delaying the activity.

INSPECTION AND TEST PLAN



FRP PRODUCTION TRACKING

PROGRESS REPORTING BASED ON CUSTOMER REQUIREMENTS:

Weekly Manufacturing Report

Week Ending: 7-May-18

Contract
Manufacture
r Hengshui Jrain FRP
Responsible
Contact Roger

Project
Name Laayoune
Project # _____
Equipment 20 Sets of FRP Tanks

Manufacturi
ng Manager _____
Required
Ship Date 6/5/2018

	All Raw Material Ordered	All Raw Material Onsite	All Buyouts Ordered by Supplier	All Buyout Parts Received by Supplier	All WesTech Parts Received by Supplier	All Parts Onsite	Fabrication Started	Assembly Started	Assembly Completed	Inspection and Testing Completed	Packaged and Ready for Shipment (RTSD)	Next Inspect Date
Original Est. Date	Mar.12.2018	19-Mar-18	2-May-18	10-May-18	N/A		23-Mar-18	6-Apr-18	28-May-18	31-May-18	5-Jun-18	
Current Est. Date			2-May-18	10-May-18			23-Mar-18	6-Apr-18	28-May-18	31-May-18	5-Jun-18	
% complete	100%	100%										
Actual Completion Date	ok	ok					23-Mar-18	5-Apr-18				

Explanation for Change in Original Packaged and Ready to Ship Date:

<p>Activities completed in the past 7 days</p> <ol style="list-style-type: none"> Bolts and gaskets arrived Prepared the hydraulic testing equipment Installed flanges on shell for one ATM tank 	<p>Activities scheduled for the next 7 days</p> <ol style="list-style-type: none"> To finish the installation of nozzles of 4 ATM tanks To install the nozzles of 6 DN1400 tanks To prepare the test of two moisture traps
<p>Recovery Plan (To be completed for any activity where current date exceeds original date)</p> <p>Current Issues, Risks, or Concerns We are still waiting for the drawings of 06J2-TK-01, 06K2-TK-01 about G nozzle changing, and also the nozzle projection issue. The moisture trap supports are required to change Last week, all workshops in Jizhou stopped production for 3 days because of mandatory order from government because of environment issue.</p>	<p>Resolution Plans</p>

WesTech Notes
Your comments as the Manufacturing Mgr.

PICTURES:





FRP INSPECTION

THIRD PARTY INSPECTIONS CAN BE ARRANGED THROUGH MOODY, VERITAS, TUV RHEINLAND, ABS CONSULTING OR OTHER INSPECTION SERVICES AS REQUIRED BY THE CUSTOMER. WE WELCOME INSPECTORS AT ANY TIME BEFORE OR DURING THE PRODUCTION PROCESS TO ENSURE THAT ALL REQUIREMENTS ARE UNDERSTOOD



Customer inspection



Third party Moody International inspection



Moody inspectors reviewing drawings and specifications

NO	DESCRIPTION	REMARKS	STATUS	DATE	INITIALS
1	GENERAL INFORMATION
2	INSPECTION SCOPE
3	INSPECTION METHOD
4	INSPECTION RESULTS
5	CONCLUSION
6	RECOMMENDATIONS
7	INSPECTION REPORT
8	INSPECTION REPORT
9	INSPECTION REPORT
10	INSPECTION REPORT
11	INSPECTION REPORT
12	INSPECTION REPORT
13	INSPECTION REPORT
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49	INSPECTION REPORT
50	INSPECTION REPORT

Signed inspection report



SHIPPING

UPON COMPLETION AND ACCEPTANCE OF FINAL QUALITY CONTROL REPORTS, THE PRODUCTS ARE PACKED IN SEAWORTHY SHIPPING FRAMES OR CRATES. BILLS OF LADING AND COMMERCIAL INVOICES ARE SUBMITTED TO THE APPROVED SHIPPER



FRP covers shipping to Madagascar



Tanks shipping to Vancouver



Piping being shipped to Morocco



Export crating on flat rack



Loading containers



CRIMAR INDUSTRIAL

We can help you from the beginning of the project through completion.

*We can assist with the design, fabrication, and shipping of the products sold.
Where appropriate we can also provide on site fabrication or assembly.*

*Once the installation is complete, we can provide ongoing support and
maintenance services.*

How can we help YOU?

*Offices & Fabrication facilities in the USA, Mexico and China
Sales agents in Canada, Chile and Peru*

www.crimar.com

President: Roger Beman rbeman@crimar.com