

Expedient Pile Repair Solicitation Number: W912HZ-5316-2373

Repair and protective technologies for damaged and/or deteriorated timber, concrete and steel marine piles

Prepared for: U.S. Army Corps of Engineers

> Submitted by: Five Star Products, Inc.

> > April 1, 2016

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INTRODUCTION

The Corps of Engineers requires product/system information for expedient repair technologies for damaged and/or deteriorated timber, concrete and steel piles that are part of overwater pier/wharf structures.

Any variety of outside influences such as marine organisms, rot, and impact can result in reduced load allowances and usability for pier structures. This white paper will provide background, insights, and technical information to address these marine pile concerns through proven solutions that are cost effective and practical.

OVERVIEW

Five Star® marine products are field-tested by experienced commercial divers and engineers; the very construction professionals who depend upon these products to work. Five Star develops systems and products designed for the rehabilitation and stabilization of marine facilities and underwater structures. All products in this category are engineered to meet the many challenges in the marine environment; variations in tidal heights, currents, and a range of marine environments. Five Star marine product solutions are easy to install, and assure reliability and consistency. To support these products, Five Star maintains a field engineering support group and a research laboratory available to customize products for unique applications. While commercial off-the-shelf (COTS) technologies such as pile jacketing can provide a quick and less costly alternative to pile replacement in these situations, other technologies can expediently reinforce a pile back to its original structural capacity. This white paper will address the alternatives as well as:

- Ability to rapidly restore the pile's axial- and flexural capacities
- Speed and ease of installation
- Low logistics for tools and materials
- Time from installation to achieving full pile capacity
- Functional in both fresh- and saltwater environments
- Adaptability of the repair method to varied pile sizes, shapes, materials, and levels of degradation
- Shelf life of repair materials

Unique aspects required for military expeditionary operations include:

- Repair of damage required for a 3- to 10-feet length of pile within the surf zone; i.e. full-length repair to the mud line is not required however the system can be used for full length encapsulations.
- Restitution of structural capacity is the priority. Protection from deleterious effects such as water penetration, rot, or marine borers is secondary priority.
- Longevity of the repair beyond 3 months is not a priority.

<u>Section A – Contact Information:</u>

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Contacts:

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Section B – Company Information:

About Five Star Products

Five Star Products, Inc. is a team of professional specialists who inspire practical and creative industrial construction and rehabilitation solutions. Built on over five decades of innovative leadership, Five Star Products, Inc. holds a singular focus to provide solutions that meet the everincreasing demands of modern industrial construction. When it comes to harsh conditions and environments, your installations must perform. Professionals in the industrial, infrastructure, marine, and commercial industries depend on our product solutions every day across the world. Five Star Products, Inc. provides a comprehensive support system including technical, specification and customer support with an unsurpassed record in the industry. Customers can be confident they will be supported every step of the way with superb expert technical service and by a network of certified distributors and licensees.

Our proprietary formulations include high-performance cement and epoxy-based products developed specifically for challenging environments and applications. Our renowned high performance, precision, non-shrink Five Star® machinery grouts, structural repair mortars, and anchoring and foundation systems have proven to be the products of choice among engineers and specifiers who are responsible for significant projects and cannot afford to be anything but successful.

It's not just a fact that we have been serving industry since 1955; it's that we've done so with a superior record of achievement for our customers. A great deal has happened since the inception of Five Star Products, Inc. Today, our products are produced worldwide in strategically located manufacturing facilities under a strict quality control system that conforms to the ISO9001-2008 standard.

Since the company began as The Nash Babcock Engineering Company in 1955, founded by H. Nash Babcock, the company's focus has been to develop products that industrial and commercial customers can trust. Mr. Babcock steered the engineering consulting firm into product development and received more than 100 patents worldwide. As a result of 30 years of growth and an expanding international customer base, the company was renamed Five Star Products, Inc. in 1985 and began marketing an array of precision grouting, waterproofing and concrete restoration products for industrial use. Five Star Products Inc. continues its seamless commitment to provide technically advanced products of quality and reliability to meet customer needs. *Advanced Technology from Advanced Thinking*.TM

International

The Five Star® global network assures a broad international presence. The customer advantages are hands-on assistance for international project specifications, on-site technical support and product availability to all points overseas.

Five Star® provides products and technical support to many of the most demanding industries throughout the world, including power generation, petrochemical, oil and gas production and transmission, pulp and paper, mining and metals, heavy industry and infrastructure. Five Star® customers benefit from our dedicated engineering and technical support teams. We believe the importance of technical expertise is of the greatest value to customers. Five Star® also understands the vital importance of fostering creative know-how to assure innovative solutions

across our spectrum of products. As a result, Five Star® machinery grouts and concrete repair products have been used in some of the world's most recognizable and prominent projects.

Five Star Products is Proud to be ISO 9001 - 2008 Certified Quality Policy

Five Star Products goal is to continuously improve the quality of our products and services in order to meet the needs of our customers and other interested parties. We insist that this goal be achieved in a professional and ethical manner.

Each employee is responsible and accountable for the quality of his/her work and we favor suppliers who have outstanding quality assurance programs.

<u>Section C – Product Description:</u>

Based on the scope of this RFI, Five Star Products are proposing six products from our Marine line that when used together as a system provide pile rehabilitation and protection timber, concrete, and steel piles. Please see attached Technical Data Sheets, SDS sheets, Design-A-Spec (installation sheets) at the end of this white paper. General descriptions of these products are as follows:

1. <u>PileFormTM F Fiberglass Reinforced Plastic (FRP) Pile Jacket:</u>

Five Star PileForm F fiberglass reinforced plastic (FRP) pile rehabilitation jackets meet and exceed marine engineering specifications for use in hostile marine environments where exposure to ice, floating debris, chemical pollution, oils, acids, salt water and where tidal action may occur. Five Star PileForm F jackets are available in translucent or may be gel coated to any specified color. PileForm[™] F fiberglass pile jackets are manufactured in 1' to 20' long sections with wall thickness up to 1/2" as required; custom sizes outside these ranges are available. PileForm[™] F pile jackets are manufactured under a strict 16-point quality control procedure using the highest quality raw materials, ensuring consistent product quality and long working life.

2. Five Star® Pile Jacket Epoxy Grout LPL:

Long Pot Life Underwater Epoxy Grout System. Five Star® Pile Jacket Epoxy Grout LPL is a high-performance epoxy system designed for underwater grouting and pile encapsulation where a longer pot life system is required. Five Star® Pile Jacket Epoxy Grout LPL is a low viscosity epoxy which is mixed with graded sand aggregate to encapsulate concrete, timber, or steel pilings. It may be pumped or poured in place.

3. <u>Five Star® Underwater High-Strength Grout:</u>

Cementitious Pile Jacket Grout. Five Star® Cementitious Underwater High-Strength Grout is an underwater pump grade, cement-based, non-shrink grout for pile restoration and similar applications. It is designed for applications including pile repair, rehabilitation and restoration, grouting of underwater structures, grouting areas subject to freshwater, saltwater or brackish exposure, and the installation of anchors and dowels. Contains migrating corrosion inhibitors for superior corrosion resistance.

4. Five Star Structural Concrete® Underwater PG (pump grade):

High Early Strength Pump Grade Underwater Repair. Five Star Structural Concrete Underwater PG is a high early strength, single component, permanent concrete repair material designed for pumping underwater. This concrete repair material features excellent pumping properties and minimal washout during large volume placements underwater and is designed for placement in tidal zones and underwater. Five Star Structural Concrete® Underwater PG provides increased corrosion protection of steel reinforced structures with migrating corrosion inhibitor.

5. <u>Structural Concrete® Underwater HP (Hand Pack):</u>

Hand Pack Underwater Repair. Five Star Structural Concrete Underwater HP is a rapid strength gain, permanent concrete repair material intended for underwater application by hand or trowel. This concrete repair material allows small volume underwater hand placements with minimal washout. It is designed for placement in tidal zones and underwater where application thickness may range from one-half inch (13 mm) to several inches in a single installation.

6. Five Star Marine® Pile Jacket Grout HP:

Underwater Pile Jacket Epoxy Grout. Five Star® Pile Jacket Grout HP is a three component, 100% solids epoxy grout system specifically designed to cure underwater. Pile Jacket Grout HP has excellent flowability and exhibits outstanding physical properties when placed in wet or dry environments. Moisture insensitive before, during, and after cure, Pile Jacket Grout HP also exhibits excellent adhesion to masonry, concrete, wood, steel and most structural materials; it is designed to encapsulate and provide corrosion protection for concrete, timber, or steel pilings.

<u>Section C-1 – Structural Capacity Restoration:</u>

Structural repairs of deteriorated timber, concrete and steel piles have been accomplished with varying methods and technologies over the years. In the case of timber piles some university testing and state department of transportation testing has been done. To date we have not conducted or authorized a third party to perform a comprehensive testing program. We are in the process of drafting a program and will be soliciting quotations from test agencies and universities to perform the testing. The testing that we aware of was performed by Rutgers University in 2003. Multiple manufacturers' products were tested in a variety of different configurations. The repaired piles were tested in a cantilever type condition by fixing one end of the pile while applying a lateral load at the other end. The repaired piles used Fiber Reinforced Plastic jackets or forms with epoxy grout placed in the annulus between the existing pile and the interior surface of the FRP jacket. In most cases, some type of reinforcement was used to improve the strength of the system. The reinforcement came in the form of reinforcing steel, carbon fiber rods, and carbon mesh.

Among all repair techniques, piles repaired with FRP jackets and epoxy grout annulus reinforced with steel rebar performed the best. The performance improvement in bending was about 50% greater in capacity compared to an unrepaired existing timber pile of the same size.

Texas A & M University has also conducted testing on timber piles that had experienced reduction in cross sectional area due the "hour glassing" effect. In this study, the repaired piles used FRP jackets, epoxy or cementitious grout in the annulus, a reinforcement grid comprised of a carbon fiber material. One of the repaired piles used cementitious grout in the annulus with steel reinforcement and FRP jackets. In this study, the piles were tested in bending. The piles were placed horizontally and simply supported at the ends. Equal loads were applied at equal distances from the mid-point of the pile. The results of this testing indicated that the repaired piles exceeded the bending strength of a control pile, (100% of cross sectional area intact), by at least 2 times.

<u>Section C-2 – Installation:</u>

The typical installation of the FSM PileForm F System requires the following steps.

- 1. Determine pile dimensions; diameter and length
- 2. Add the required annulus. Typically 1" Example: Pile diameter is 14" +1" annulus = 16" Pile Encasement.
- 3. Clean piles of marine growth and all unsound materials.
- 4. Select proper size PileForm F Encasement based on information collected in Item 2.
- 5. Please FSM Joint Compound into female grooved side of PileForm F Encasement
- 6. Please PileForm F Encasement around the cleaned pile
- 7. Engage Tongue into Groove using ratchet straps
- 8. Secure with Stainless Steel Screws at 6" O.C. along the length of the Tongue and Groove Closure
- 9. Install temporary bottom seal
- 10. Fill annulus between existing pile and FSM PileForm F Encasement with FSM Pile Jacket Epoxy Grout; HP, LV or LPL
- 11. Allow approximately 24 hours to cure. Note: This is assuming 72 degrees F

Section C-3 – Shelf Life of Repair Materials:

Shelf life of the FSM Epoxy Grouts is 1 year in un-opened containers. However this may be extended providing samples are sent to the FSM Lab for evaluation.

The shelf life of the FSM PileForm F Encasements is as much as 20 years.

Section C-4 – Adaptability:

- FSM PileForm F ROUND Encasements can be designed to allow for a change in diameter of 1". Example: A 16" PileForm F ROUND Encasement can be reduced to 15" diameter (possibly smaller) and increase to 17" diameter.
- 2. FSM PileForm F SQUARE Encasements can be reduced in dimension by cutting the sides and overlapping. These encasements can converted to rectangles using the same technique.
- 3. FSM can also provide 90 degree corner pieces and flat panels that can be cut to fit many different pile conditions.

<u>Section D – Technical Data:</u>

Typical material costing is dependent on size of jacket (diameter, thickness, shape, and length) and type and annular size of material fill (cementitious or epoxy). In very general terms material costs typically range from \$90 to \$120 per linear foot for system consisting of rehabilitation jacket and fill material. Installed or In-Place costs tend to run 2 to 3 times that estimate. Five Star technical team can consult with USACE personnel to determine the optimal solution based on both utility performance specifications and cost.

<u>Section E – Environmental & Safety:</u>

For the six products that are inclusive with this RFI, the following is a general discussion of the safety requirements for Personal Protective Equipment required and disposal considerations for each product. Please also see the SDS sheets for each product, except for the PileForm F Jackets which do not require a SDS sheet, attached at the end of this report:

- 1. <u>PileForm[™] F Fiberglass Reinforced Plastic (FRP) Pile Jacket:</u>
 - Tight fitting eye protection as well as impervious gloves and impervious clothing should be worn. Handle in accordance with good industrial hygiene and safety practice.

2. Five Star® Pile Jacket Epoxy Grout LPL consisting of 3 Components:

- **Component A (resin).** Face shield and safety glasses. Use equipment for eye protection that meets the standards referenced for OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment. Wear protective gloves. Rubber or polyethylene material is recommended. Consult manufacturer specifications for further information. Wear protective clothing. Clothing with full length sleeves and pants should be worn. Handle according to established industrial hygiene and safety practices. Provide readily accessible eye wash stations and safety showers. Wash at end of shift and before eating, smoking, or using the toilet. Remove contaminated clothing and launder or discard. The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.
- Component B (hardener). Wear chemical safety goggles and full face shield. Ensure that evewash stations and safety showers are close to the workstation location. Use equipment for eve protection that meets the standards referenced for OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment. Wear protective gloves. Rubber or polyethylene material is recommended. Consult manufacturer specifications for further information. Wear protective clothing. Clothing with full length sleeves and pants should be worn. Wear protective clothing. Clothing with full length sleeves and pants should be worn. Wear respiratory protection. If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved airpurifying respirator with organic vapor cartridge, or self-contained breathing apparatus must be sued when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators. The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

• **Component C (aggregate).** Tight fitting eye protection as well as impervious gloves and impervious clothing should be worn. Handle in accordance with good industrial hygiene and safety practice. Always wash your hands immediately after handling this product, and once again before leaving the workplace. Wear suitable protective clothing. Wash contaminated clothing before reuse. If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations. This material as supplied is not a hazardous waste according to Federal regulations (40CFR261). This material could become a hazardous waste if it is mixed with or otherwise comes in contact with a hazardous waste, if chemical additions are made to this material, or if the material is processed or otherwise altered.

3. Five Star® Underwater High-Strength Grout:

• Tightly fitting safety goggles, impervious gloves, and impervious clothing should be worn when using product. If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations. Handle according to established industrial hygiene and safety practices.

4. <u>Five Star Structural Concrete® Underwater PG (pump grade)</u>:

Tightly fitting safety goggles, impervious gloves, and impervious clothing should be worn when using product. If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations. Handle according to established industrial hygiene and safety practices.

5. <u>Structural Concrete® Underwater HP (Hand Pack):</u>

Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Do not breathe dust. Prevent contact with skin, eyes, and clothing. Wash thoroughly after handling.

6. Five Star Marine® Pile Jacket Grout HP:

Face shield and safety glasses. Use equipment for eye protection that meets the standards referenced for OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment. Wear protective gloves. Rubber or polyethylene material is recommended. Consult manufacturer specifications for further information. Wear protective clothing. Clothing with full length sleeves and pants should be worn. Handle according to established industrial hygiene and safety practices. Provide readily accessible eye wash stations and safety showers. Wash at end of shift and before eating, smoking, or using the toilet. Remove contaminated clothing and launder or discard.

<u>Section F – Transportation:</u>

For transport of the jackets, the pallets are custom built for the jackets and usually about 6 inches longer than the longest length of the jacket. The width and height depend on sizes and quantities. They are not shrink wrapped. To secure the jackets we add outside braces at the corners of the pallets much like an open crate. None of our pallets are stackable and we use 40" x 48" pallets when not being custom built. All bagged items are 56 bags per pallet on 40" x 48" pallets and they are shrink wrapped with a pallet cover. This would be the UW HS Grout, FSSC UW PG, and the FSSC UW HP. All epoxy products (pailed resins and bagged aggregates) would be palletized as follows:

- LPL Epoxy Grout & HP Pile Jacket Epoxy Grout
- Resin 36 pails per pallet
- Hardener 36 pails per pallet
- Sand/aggregate 60 bags per pallet

The packaging meets with DOT requirements and the Bill of Ladings are marked accordingly.

Section G – Availability:

At the request of the United States Government and in the interest of National Security; Five Star Products / Five Star Marine will put orders for materials on a Priority Build List. This will include operating the production facility overtime to accommodate the requirements of the project. If needed we will also work with other suppliers of these materials to outsource and increase production capacity.

The typical production timeline for FSM PileForm F Encasements is 14 - 21 days from receipt of order.

FSM Pile Jacket Epoxy Grouting Materials are in stock and available upon request.

<u>Section H – Federal Contracts:</u>

NWS Yorktown, Yorktown, VA. Seaward Marine Corp. *Contact:* Bill Spallina, Phone: 757-558-3939 *Products:* FSM PileForm F Encasements FSM Pile Jacket Epoxy Grouts

Groton Submarine Base, Groton, CT. Triton Marine Corp.*Contact:* Paul Johnson, Phone: 360-731-6495*Products:* FSM PileForm F EncasementsFSM Cementitious Underwater High Strength Grout

Intrepid Pier Museum, NY, NY. Spearin, Preston, Burroughs. *Contact:* Patrick Cumiskey, Phone: (973) 902-6754 (Note: Patrick is now with

Schiavone Construction.)

Products: FSM PileForm F Encasements

Pier Charlie at Guantanamo Bay, Cuba - Orion Contracting

Products: FSM PileForm F Encasements/Soffits

<u>Section I – Past Performance References:</u>

NWS Earle, Colts Neck, NJ. Seaward Marine Corp. Contact: Bill Spallina, Phone: 757-558-3939 Products: FSM PileForm F Encasements FSM Pile Jacket Epoxy Grouts

Philadelphia Naval Ship Yard, Philadelphia, PA. Triton Marine Corp. *Contact:* Paul Johnson, Phone: 360-731-6495 *Products:* FSM PileForm F Encasements

SCSPA (South Carolina State Ports Authority) Cape Romain Constructors.

Contact: Sonny DuPre, Phone: 843-884-5167 Products: FSM PileForm F Encasements FSM Pile Jacket Epoxy Grouts

Jose D. Leon Guerrero Commercial Port, Guam - BME & Sons

Products: FSM PileForm F Encasements FSM Pile Jacket Epoxy Grouts Section J – Literature:



Five Star Products, Inc. is the industry leader in the development of systems and products designed for the rehabilitation and stabilization of marine facilities and underwater structures. All of our products are designed and field-tested by experienced commercial divers and engineers with an emphasis on ease of installation, reliability, safety and consistency.



From preventive measures to full structural rehabilitation, Five Star's comprehensive range of products and services has the solution you need for today's harsh marine environments. With an outstanding track record of customer satisfaction, our staff of committed, experienced personnel is available for job site assistance whenever you need it.

Five Star Products, Inc. has been a toptier supplier of high-performance cement and epoxy-based products for the industrial, infrastructure, commercial and marine markets since 1955.

FIVE STAR PRODUCTS, INC.

60 Parrott Drive Shelton, CT 06484-4733 Phone: 800-243-2206 Fax: 203-336-7913 FiveStarProducts.com



MARINE PILE Encapsulation & Protection Systems





FIVE STAR PRODUCTS, INC. FiveStarProducts.com Toll Free: 1-800-243-2206

Permanent Repair of Steel, Timber, or Concrete Marine Piles; Offshore Platform Risers and Platform Legs



Five Star Marine, Inc. brings to market over 25 years of developing systems and products designed for the rehabilitation and stabilization of

marine facilities and underwater structures.

Product offerings from Five Star Marine are designed and field-tested by experienced commercial divers and engineers. Products are produced with a keen awareness of the importance of ease of installation, reliability and consistency.

Products and systems offered by Five Star Marine range from initial preventative measures to full structural rehabilitation. Whether rehabilitating one pile or an entire structure, Five Star Marine is the only manufacturer which provides a total solution.

Committed to maintaining an outstanding track record in customer satisfaction and meeting all project needs, Five Star Marine maintains a staff of experienced personnel available for job site assistance in the use of our products.



Full concrete pile rehabilitation using the PileForm[™] F system on the Savannah River Bridge-Georgia DOT.

Five Star Marine produces industry-leading pile jackets which meet engineering specifications in severely hostile marine environments.

The **PileForm™ F** fiberglass pile jacket system provides superior protection against ice, floating debris, chemical pollution, oils, acids, salt water and tidal pumping. Epoxy gels and cement or epoxy fill materials available from Five Star Marine complete the rehabilitation.







PileFormTM F fiberglass pile jackets can be manufactured in 1' to 20' long sections with a wall thickness up to 1/2" as required. Basic jacket material is roven and fiberglass mat woven in a polyester resin plastic matrix. The longevity and strength of **PileFormTM F** jackets are derived from long glass fibers interlocked in sheets during production and from the resin system which is then rolled thoroughly into this weave.





Product Line Card

An affiliate of Five Star Products, Inc., a company with a rich history of over 60 years offering high performance cement and epoxy-based solutions for the industrial, infrastructure and commercial markets, Five Star Marine, Inc. is a worldwide provider of high-performance marine pile encapsulation and protection systems specifically designed for the rehabilitation and stabilization of marine facilities and underwater structures. Our Systems provide piling restoration, corrosion protection and pile rehabilitation jackets. In addition, Five Star Marine[®] also offers cementitious and epoxy fill materials, plus protective gels and adhesives, providing a total solution to pile repair needs.

PRECISION NON-SHRINK PILE JACKET GROUTS

Cementitious Underwater Grout (Pumpable Underwater Grout)

Underwater pump grade, cement-based, non-shrink grout for pile restoration and similar applications.

USES: pile repair and restoration; grouting underwater; grouting areas subject to saltwater exposure; installation of anchors and dowels

Underwater High-Strength Grout (Cementitious Pile Jacket Grout)

Underwater pump grade, cement-based, non-shrink grout for pile restoration and similar applications.

USES: pile repair, rehabilitation and restoration; grouting underwater structures and as a pile jacket fill material; grouting areas subject to freshwater, saltwater or brackish exposure; installation of anchors and dowels

Pile Jacket Epoxy Grout (Low Viscosity Underwater Epoxy Grout System)

Underwater grouting and marine pile encapsulation.

USES: marine pile repair and restoration when used with Five Star Marine® PileForm[™] F Fiberglass (FRP) Jackets; engineered epoxy grouting system for corrosion protection of concrete, steel and wood marine piles; excellent adhesion to masonry, concrete, wood, steel and most marine structural materials

Pile Jacket Epoxy Grout LPL (Long Pot Life Underwater Epoxy Grout System)

Underwater grouting and marine pile encapsulation where a longer pot life system is required.

USES: marine pile repair and restoration when used with Five Star Marine® PileForm™ F Fiberglass (FRP) Jackets; engineered epoxy grouting system for corrosion protection of concrete, steel and wood marine piles; excellent adhesion to masonry, concrete, wood, steel and most marine structural

Pile Jacket Epoxy Grout HP (Underwater)

Multi-purpose, moisture insensitive epoxy grout specifically designed to cure underwater. Can be pumped or poured into place.

USES: Encapsulation material for concrete, steel and wood; corrosion protection for concrete, steel, and wood; pile repair and restoration

CONCRETE REPAIR PRODUCTS

Structural Concrete® Underwater Handpack (Hand Applied, Rapid Strength)

Rapid strength gain, permanent concrete repair for underwater application by hand or trowel.

USES: Underwater repair of concrete tanks, dams and hydraulic structures; underwater repair of concrete piles, piers, seawalls and marine structures; filling underwater concrete cavities and voids

Structural Concrete® Underwater PG (Pump Grade Repair)

High early strength, permanent concrete repair material designed for pumping underwater.

USES: large volume underwater concrete repairs; tanks, dams, marine and hydraulic structure repairs; filling underwater concrete cavities and voids

ADHESIVES AND SEALANTS

Underwater Epoxy Gel (Adhesive)

Multi-purpose, moisture insensitive structural epoxy adhesive used in filling cracks up to 1/2 inch (13 mm).

USES: sealing jacket seams; pressure injection of cracks in structural concrete, masonry, wood and other substrates; surface repair of non-moving cracks on new or existing structures; anchoring of bolts, dowels, pins and special fasteners; general purpose gel adhesive; re-pointing concrete block and timber drydocks

Epoxy Adhesive LV (Low-Viscosity)

Moisture insensitive, structural epoxy adhesive used in filling cracks and voids. **USES**: gravity feed cracks or voids in horizontal concrete and masonry; pressure injection of cracks in structural concrete, masonry, wood and other substrates up to 1/4 inch (6 mm) wide; sealing tunnels, cable vaults, tanks and basements; gravity feed or pressure inject as void filler under equipment; binder for epoxy patching mortar of horizontal surfaces

HP Anchor Gel (High-Performance Epoxy Underwater Anchoring Adhesive)

High early strength, solvent-free structural epoxy acrylate anchoring adhesive.

USES: heavy-duty anchoring of rebar, threaded rods and epoxy-coated smooth dowels in all concrete, brick or stone masonry; best choice for structural bonding of heavy loads; grouting bolts, dowels, or pins where extremely rapid setting and fast turn-around times are needed; performs in damp or water-filled holes

RS Anchor Gel (Rapid Set Epoxy Gel Adhesive)

Rapid setting, non-sag, moisture insensitive, structural epoxy for anchoring rods, bars and bolts in concrete, as well as filling cracks and setting ports for epoxy injection.

USES: heavy-duty anchoring of rebar, threaded rods and epoxy-coated smooth dowels in all concrete, brick or stone masonry; best choice for structural bonding of heavy loads; grouting bolts, dowels, and pins where extremely rapid setting and fast turn-around times are needed; performs in dry, damp, or wet holes. Can be used for both horizontal and vertical applications.

Continued on Next Page.

Most trusted to provide the total solution.

Phone: +1-336-7900 Toll-Free: 1-800-243-2206 (U.S.) FiveStarProducts.com

Product Line Card

MARINE

Adhesives and Sealants, Continued

Splash Zone™ Compound (Underwater Epoxy Mastic Coating)

Epoxy compound used to protect metal, wood and concrete against corrosion and deterioration from salt or fresh water.

USES: repair and protect concrete, steel, wood, fiberglass, and aluminum from salt and fresh water in splash zone, tidal zone, and waterline applications

PileForm™ Joint Filler (Underwater Joint and Seam Filler)

Solvent-free adhesive and void filler for use on multiple substrates in continuous contact with fresh or saltwater. Five Star Marine[®] PileForm^{IM} Joint Filler can be used to fill voids or gaps of up to 3/4".

USES: fill and repair voids up to 3/4" in multiple substrates above or below the waterline; PileForm™ F Tongue-and-Groove closures; can be used as emergency water stop above or below the waterline; concrete, fiberglass, galvanized metals, pressure-treated lumber, masonry, steel, wood, wood piles; underwater mechanical penetrations; detailing filler for underwater applications

STRUCTURAL REHABILITATION AND CORROSION CONTROL PRODUCTS

PileForm™ F (FRP) Pile Rehabilitation Jackets

Fiberglass reinforced plastic (FRP) pile rehabilitation jackets for use in hostile marine environments where exposure to ice, floating debris, chemical pollution, oils, acids, salt water and where tidal action may occur.

USES: can be used around timber, steel or concrete piles. PileForm^M F is available in permanent and reusable varieties that can be assembled topside or in the water.

PileForm™ N Nylon Pile Jacket System

Nylon pile jackets for use in severe hostile marine environments where exposure to chemical pollution, oils, acids, salt water and tidal action may occur.

USES: can be used around timber, steel or concrete piles. PileForm[™] N is made of high-strength synthetic ballistic nylon and woven to create a water-permeable fabric that can serve as both a filter and fabric form.

Concrete System by Pilecap, Inc.® (Concrete Piling Restoration)

100% structural jacket designed to repair severely spalled and damaged sections. Can be injected with Five Star® Grout or Five Star® Epoxy to fill voids and damaged areas.

USES: long-term repair of concrete marine piles

HP System by Pilecap, Inc.® (H-Pile Restoration)

Rather than remove and replace damaged piles, this system will resection piling to fully restore its load bearing integrity.

USES: long-term repair of steel marine piles

Structural Rehabilitation and Corrosion Control Products, Continued

Steel System by Pilecap, Inc.® (Steel Pile Restoration)

Structural jacket designed to repair severely corroded or damaged steel piling. The structural jacket becomes a permanent form for strength and durability by bearing the pile's intended load while eliminating corrosion and preventing further damage to the pile.

USES: long-term repair of steel marine piles

Timber System by Pilecap, Inc.® (Wood Pile Restoration)

Brings wood piles back to 100% structural integrity by removing a portion of damaged or deteriorated piling and installing new sections without adding additional weight or causing further stress to the wood pile.

USES: long-term restoration of wood marine piles

PileForm™ W Retrowrap™ Corrosion Control System by Corrosion Control International

Wrap around corrosion protection system used for inshore splash zone and underwater corrosion protection for piles, pipelines and risers. Totally encapsulates and protects the substrate without the use of primers, fillers or tapes.

USES: easily installed retrofit installation for corrosion protection of subsea pipelines and jetty piles

PileForm™ W Retrowrap™ HD (Heavy Duty) Corrosion Control System by Corrosion Control International

Heavy-duty, multi-scrim wrap around corrosion protection system used for inshore splash zone and underwater corrosion protection for piles, pipelines and risers or where heavy duty resistance to floating debris or ice flow is required. Totally encapsulates and protects the substrate without the use of primers, fillers or tapes.

USES: easily installed retrofit installation for corrosion protection of subsea pipelines and jetty piles

EROSION CONTROL PRODUCTS

PileForm™ ABM (Articulating Block Mat)

Superior geo-fabric articulating block mats for use in severely hostile marine environments. These erosion control revetments flex (articulate) with changing soil and water conditions and can be cast as easily under water as in-the-dry.

USES: underpinning and scour protection where the erosion of foundation materials results in the undercutting of bridge piers and abutments.

PileForm™ SPB (Scour Protection Bags)

Superior geo-fabric grout bags for use in severely hostile marine environments where ice, floating debris, chemical pollution, oils, acids, salt water and tidal pumping and wave action are a threat.

USES: underwater forms for void repair; rip rap to prevent undermining; pipeline support to fill scour areas; channel lining to prevent future scouring; cable protection to cover cable and providing anchoring; waterfront protection to dissipate wave action along riverfronts, canals or beaches.

FIVE STAR MARINE, INC. 60 Parrott Drive Shelton, CT 06484-4733 U.S.A. Phone: +1 203-336-7900 Toll-Free: 1-800-243-2206 (U.S.) Fax: +1 203-336-7913 FiveStarProducts.com

Specifications subject to change.

Most trusted to provide the total solution.

PileForm[™] is a registered trademark of Five Star Marine, Inc. PILECAP[®] is a registered trademark of PILECAP, Inc. Retrowrap[™] and Geon[™] are registered trademarks of Corrosion Control International.



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<u>Appendix</u>

Product Data Sheets



<u>PILEFORM™ F</u>

FRP Pile Rehabilitation Jackets

DESCRIPTION

Five Star[®] **PileFormTM F** fiberglass reinforced plastic (FRP) pile rehabilitation jackets meet and exceed marine engineering specifications for use in hostile marine environments where exposure to ice, floating debris, chemical pollution, oils, acids, salt water and where tidal action may occur. Five Star[®] PileFormTM **F** jackets are available in translucent or may be gel coated to any specified color.

<u>USES</u>

- Used around timber, steel or concrete piles
- Available in permanent reusable varieties that can be assembled topside or in the water

ADVANTAGES

- Easy installation
- Lightweight for easy maneuvering by divers
- Non-corrosive

- High strength
- Excellent solvent and chemical resistance
- High abrasion and impact resistance

SIZING & CONFIGURATION

Five Star[®] PileForm[™] F jackets are available in lengths of 1 to 20 feet (.30 to 6.1m) with wall thicknesses of 1/8 inch (.32cm) to 1/2 inch (1.27cm). Custom sizes are also available. Consult Five Star[®] for further details.

Typical Properties				
Flexural Strength, ASTM D 790	34,000 psi (230 MPa)			
Flexural Modulus, ASTM D 790	1.0 x 10 ⁶ psi (6.9 GPa or 6,900 MPa)			
Ultimate Tensile Strength, ASTM D 638	20,000 psi (137.9 MPa)			
Tensile Modulus, ASTM C 638	1.5 x 10 ⁶ psi (10,342.1 MPa)			
Elongation, ASTM D 638	1.6%			
Izod Impact (Notched), ASTM D 256	20 ft lbs/inch			
Barcol Hardness, ASTM D 2583	40-50			
Water Absorption, ASTM D 570	< 0.3%			
Standard Color	Translucent			
Wall Thickness	1/8" to 1/2"			
UV Resistance, Carbon Arc Weathering, ASTM G153-04				
500 Hours	Pass (No Detrimental Effect)			

INSTALLATION GUIDELINES

SURFACE PREPARATION:

Concrete, steel, or timber piles must be thoroughly clean and sound prior to installation of Five Star[®] PileForm[™] F fiberglass reinforced plastic (FRP) jackets. Clean existing pilings using a minimum of 4,000 psi high-pressure washer or other mechanical means of clearing pile caps of marine growth, rust, scaling, and other contaminants.

PLACEMENT:

Five Star[®] PileForm[™] F jackets may be of one or two-piece construction. Place PileForm[™] F pile jackets to desired elevation and secure. Apply epoxy gel to all vertical or horizontal seams and secure using stainless steel self-tapping/drilling screws if joining more than one section. Establish a suitable bottom seal for jacket that will withstand the pressures developed during the placement or pumping of filler material. Bottom seal may be closed foam, oakum and expanding resin or other appropriate material. Once the end is sealed, begin filling the pile jackets with repair material using one of two methods.

- 1. Use a pressure pump and start pumping from the bottom via pumping ports. Space evenly and move from one end to the other as the jacket fills.
- Use the pour method by pouring the material from the top of the jacket starting at one end and moving to the other. In many cases
 pouring from both sides is used to ensure even filling. Continue filling the jackets until repair material reaches within 1 inch of the tops
 and then stop.

(Note: Larger jackets may require external bracing and strapping on the outside of the jacket to prevent bulging during placement of filler material into jacket. Place strapping system every 18 to 24 inches (45.72 to 60.96cm) along jacket length.)

After the initial set of the repair material, fill the remaining 1 inch (2.54cm) with a Five Star[®] Cementitious or Epoxy Grout product. This will seal the top of the jackets preventing any water from getting between jackets and fill or pile cap and fill and will prevent any problems as a result of the freeze/thaw cycle. Then, using Five Star[®] Splash Zone Compound, create a 45° bevel from the top of the filled jackets to the existing piles. This will create a run-off and additional seal so that no water gets trapped on the tops of the jackets.

For additional Installation instructions, please refer to Five Star[®] PileForm™ F Installation Guide or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

SKU / PRODUCT CODE	DESCRIPTION	UNIT SIZE
32509	Square, Single Piece, Tongue and Groove, Translucent, 3/16", SLS	Call
32527	Square, Single Piece, Tongue and Groove, Translucent, 1/8", SLS	Call
32510	Round, Single Piece, Tongue and Groove, Translucent, 3/16", SLS	Call
32528	Round, Single Piece, Tongue and Groove, Translucent, 1/8", SLS	Call
32511	Rectangle, Single Piece, Tongue and Groove, Translucent, SLS	Call
32512	Octagon, Single Piece, Tongue and Groove, Translucent, SLS	Call
32513	Hexagon, Single Piece, Tongue and Groove, Translucent, SLS	Call
32514	H-Beam, Single Piece, Tongue and Groove, Translucent, SLS	Call
32515	T-Beam, Single Piece, Tongue and Groove, Translucent, SLS	Call

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FIVE STAR PRODUCTS, INC.

www.FiveStarProducts.com 1-800-243-2206 (in the US) +1 203-336-7900 (outside US)

$\text{DESIGN-A-SPEC}^{^{\text{\tiny M}}}\text{ GUIDELINES}$

PILEFORM[™] F PILE JACKET

CONTENTS



This document is provided as a general guideline for consideration by contractors and engineers. While every reasonable effort has been made to ensure that this information is accurate and authoritative, Five Star Products does not warrant the accuracy or completeness of this information or for its appropriateness for any particular purpose. The user of this document remains solely responsible for the specification of all methods, materials and practices.

PART A - GENERAL CONDITIONS

1.01 SCOPE

The work covered by this document consists of furnishing all materials and performing all operations required for pile repair / encapsulation using fiberglass pile jackets.

These repairs can include, but are not limited to, chipping out loose concrete, exposing rebar, cleaning rebar, replacing or adding rebar and filling the repaired area with grout.

1.02 QUALITY ASSURANCE

The manufacturer shall have a 10 year history of use in the manufacture of fiberglass pile jackets. The manufacturer shall provide on site technical service at no cost to the engineer or contractor when sufficient advance notice is provided.

1.03 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered to the jobsite in their original, unopened packages, clearly labeled with the product identification, printed instructions and batch code.
- B. Store the fiberglass jackets at 60°F to 80°F (16°C to 27°C) for at least 24 hours prior to use. Refer to the product data sheet for more information.
- C. For handling instructions, refer to the Safety Data Sheet.

1.04 PROJECT / SITE CONDITIONS

A. Refer to Part C – PREPARATION, ENVIRONMENTAL CONDITIONS, or contact the manufacturer directly for any physical or environmental limitations required by the product.

PART B - MATERIAL SPECIFICATIONS

2.01 MATERIALS (FIBERGLASS PILE JACKET)

A. The pile jacket shall consist of a fiberglass mat woven in a polyester resin matrix. Wall thickness of jacket shall be 1/8 inch (+/- manufacturing tolerances) unless otherwise specified. Jacket closures shall be tongue and groove. The manufacturer shall have at least 10 years experience in the manufacture of fiberglass jackets. The manufacturer shall offer technical services and provide a representative at the job site for product training prior to product installation.

B. The fiberglass jacket shall meet all the following typical performance criteria:

1. Flexural Strength, ASTM D 790	34,000 psi (230 MPa)
2. Flexural Modulus, ASTM D 790	1.0 x 10 ⁶ psi (6.9 GPa or 6,900 MPa)
3. Ultimate Tensile Strength, ASTM D 638	20,000 psi (137.9 MPa)
4. Tensile Modulus, ASTM D 638	1.5 x 10 ⁶ psi (10,342.1 MPa)
5. Elongation, ASTM D 638	1.6%
6. Barcol Hardness, ASTM D 2583	40-50
7. UV Resistance, Carbon Arc Weathering ASTM G 153, 500 hours	Pass (No Detrimental Effect)

C. An acceptable product that meets this criteria is: Five Star[®] PileForm[™] F as manufactured by Five Star Products, Inc. Shelton, CT 06484. p

Diagram A: Ty	pical Five Star [®]	PileForm[™] F	Configurations
---------------	------------------------------	-------------------------------	----------------

H Pile Encapsulation Option 1	H Pile Encapsulation Option 2	Square or Rectangular Pile	Round Pile
	Cementi or Epoxy	tious / Fill	
	H		

PART C – PREPARATION

3.01 CONCRETE SURFACES

- A. Completely remove all loose, delaminated and weak concrete, oil, grease, laitance, marine growth and other contaminants. Prepare concrete using acceptable mechanical means and concrete cleaners and degreasers as necessary to obtain clean, sound and rough surfaces. Coarse aggregate shall be exposed and all marine growth removed. High pressure water blasting is a minimum recommendation for conditioning surfaces.
- B. All cracks shall be brought to the attention of the engineer and a determination made of whether the cracks are subject to movement. The cracks shall be repaired as directed prior to installation of fiberglass jacket and grout.
- C. For more detailed information, refer to the following publication: "Selecting and Specifying Concrete Surface Preparation for Coating Polymers and Concrete Repair, ICRI Technical Guideline 310.2R."

3.02 REINFORCEMENT

A. All reinforcing steel that has lost bond with the concrete or has more than one-half of its circumference exposed shall be undercut by at least 3/4 inch (18 mm) or two times the maximum aggregate size.





- B. If more than 20% of the diameter of a reinforcing bar has been deteriorated, the bar may require replacement or will need to be spliced as directed by the engineer.
- C. All reinforcement shall be rigidly secured and supported.

D. All exposed reinforcing steel shall be free of all loose scale, rust, oxidation and other contaminants. Exposed reinforcing steel may be sealed or primed if a delay occurs between surface preparation and epoxy grout placement.

3.03 JACKET PLACEMENT

- A. One piece jackets are typically full circle and will fully cover the pile. Two piece jackets are typically used on square or H piles. Spacers / stand offs inside jackets are placed at regular intervals to provide the maximum support and maintain the annular space between the jacket and the pile. Spacers / standoffs may be pre-molded into jackets or an applied at job site. Spacers can be made of wood, plastic or metal. When placing spacers in the field, use a fast setting epoxy adhesive suitable for exposure to water such as Five Star[®] RS Anchor Gel.
- B. For pumping applications, secure suitable pump ports to jacket. Mount port approximately 12 inches from the bottom of the pile. Additional ports may be needed for jacket lengths over 5 feet. Where necessary, place an additional port approximately three feet above the first port and 180° opposite the first port. If additional ports are needed alternate the placement 180° from the previous port and three feet above.
- C. Use epoxy adhesive to fill the groove side of the opening. Five Star[®] RS Anchor Gel is an excellent rapid setting epoxy gel adhesive that can be used to seal the tongue and groove joint. RS Anchor Gel is packaged in a dual cartridge system with a static mixer tip. Insert the mixer tube into the groove and inject a generous amount of epoxy in the entire length of the groove. Hold the jacket up right next to the pile. Pull open the jacket and slip it around the pile. Allow the tongue to slip into the groove. Position the jacket to cover the area desired. Press the jacket closed and the tongue into the groove as far as it will go. Use ratcheting straps around the jacket to secure it.
- D. Wooden braces, battens or strong backs, should be placed on the outside of the jacket to prevent bulging during filling. Use 2 x 4 or 2 x 6 that is about the same length as the jacket and attach one with screws to the middle of each jacket face. Place straps 12 to 18 inches apart vertically and around the braces to insure that the jacket is secure. When the jacket is in position and the straps tight use stainless steel self drilling/tapping screws to secure the tongue and groove joint. Locate the screws so that they go through both sides of the groove and the tongue. Use screws that are long enough to penetrate the jacket but not long enough to extend to the pile itself. Place screws three to six inches apart for the entire length of the jacket.

3.04 JACKET SEALING

A. Pile jackets need a seal at the bottom of the jacket to prevent the grout from leaking out of the bottom of the jacket. The choice of bottom seal can be determined by environmental restrictions, owner preference or contractor experience. The most common types include closed foam strips, oakum and resin, nylon retainers and epoxy packing. Depending on the type used it will be put in place before or after the positioning of the jacket around the pile.

- B. High density foam should be placed around the interior bottom of the jacket before the jacket is placed around the pile. The foam should be of sufficient height and thickness to form a tight seal. Foam should be three to four times the thickness of the annular space and three to five inches in height. Be sure that the ends of the strips overlap when in place to prevent leaks. Secure the bottom seal with stainless steel strapping or nylon ratchet straps.
- C. Jackets can also be sealed with an integral nylon sleeve. This sleeve is molded into the bottom of the jacket at the time of manufacture of the jacket. It has a water tight zipper closure and is attached to the pile below the jacket with stainless steel straps or nylon zip strapping.

3.05 FILL MATERIAL

- A. Mix and place cementitious or epoxy fill material in accordance with manufacturer's guidelines.
- B. Check jacket seams, joints, ports and bottom seal for leaks during filler material installation. Seal all leaks immediately.

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PILE JACKET EPOXY GROUT LPL

Long Pot Life Underwater Epoxy Grout System

PRODUCT DESCRIPTION

Five Star[®] Pile Jacket Epoxy Grout LPL is a three-component, 100% solids epoxy system specifically designed for underwater grouting and marine pile encapsulation where a longer pot life system is required. Five Star[®] Pile Jacket Epoxy Grout LPL is a low viscosity resin and hard-ener system which is mixed with aggregate to encapsulate concrete, timber, or steel pilings in hostile marine environments.

ADVANTAGES

- Pumpable and pourable, with adjustable aggregate
- High strength
- 100% solids, no solvents

USES

- Marine Pile repair and restoration when used with Five Star[®] PileForm[™] F Fiberglass Jackets
- Engineered epoxy grouting system offers corrosion protection for concrete, steel and wood marine piles

PACKAGING AND YIELD

- Long pot life for hot weather placement
- Low odor formulation
- Excellent adhesion to masonry, concrete, wood, steel and most marine structural materials

Five Star[®] Pile Jacket Epoxy Grout is a three-component system consisting of partially filled containers of resin and hardener, and polyethylene lined bags of sand or aggregate. Product yield is approximately 1.57 cubic feet (44.5 L) of plastic with 2.5 bags 125 lbs. (56.7 kg) of aggregate, or approximately 1.85 cubic feet (52.84 L) of plastic with 3 bags 150 lbs. (68.0 kg) of aggregate.

SHELF LIFE

Two years in original unopened packaging when stored in dry conditions; high relative humidity will reduce shelf life.

TYPICAL PROPER	TYPICAL PROPERTIES AT 70°F (21°C) WITH 125 LBS. OF AGGREGATE				
Compressive Strength, ASTM C 579 B*					
1 Day	2,000 psi (13.8 MPa)				
7 Days	8,500 psi (58.6 MPa)				
28 Days	9,500 psi (65.5 MPa)				
Tensile Strength, ASTM C 307					
7 Days	2,000 psi (13.8 MPa)				
Bond to Concrete, ASTM C 882					
7 Days	2,200 psi (15.2 MPa)				
Linear Shrinkage, ASTM C 531	0.0%				
Water Absorption, ASTM C 413	0.0%				
Flexural Strength, (ASTM C 580)	3,000 psi (20.7 MPa)				
Bond Strength to Steel, (ASTM C 882)	2,000 psi (13.8 MPa)				
Working Time at 70°F (21°C)	90 minutes				

*Materials tested per ASTM C 579 B. Rate of loading 0.25 inches per minute.

Materials tested per ASTM C 579 B. Rate of loading 0.25 inches per minute. The data shown above reflects typical results based on laboratory testing under controlled conditions. Reasonable variations from the data shown above may result. Test methods are modified where applicable.

PLACEMENT GUIDELINES

- 1. **SURFACE PREPARATION:** All surfaces to be in contact with Five Star[®] Pile Jacket Epoxy Grout LPL shall be free of marine growth, oil, grease, laitance, and other contaminants. Concrete must be clean, sound, and roughened to ensure a good bond.
- 2. MIXING: For optimum performance, all components should be conditioned between 65°F and 85°F (18°C and 29°C) prior to use. Pour all Component B (hardener) into pail containing Component A (resin). Mix thoroughly by hand with a paddle or with a slow speed drill and paddle mixer to avoid air entrapment. Pour mixed liquids into mortar mixer (stationary barrel with moving blades). While mixing, slowly add Component C (aggregate) and mix only until aggregate is completely wet. Add Component C (aggregate) immediately after mixing Component A (resin) and Component B (hardener). Do not mix more material than can be placed in 90 minutes.
- METHODS OF PLACEMENT: Five Star[®] Pile Jacket Epoxy Grout LPL may be pumped or poured into place. For vertical flow applications simply pour or pump from the top of the opening, or pump into ports. For horizontal applications, pour or pump from one side to the other. A peristaltic pump is required for pumping applications.
- 4. **POST PLACEMENT PROCEDURES:** In-service operation may begin immediately after minimum required grout strength and modulus have been achieved.
- 5. **CLEAN UP**: Use a solvent or water and strong detergent solution on tools and equipment before material hardens. Use power washer on pump and mixing equipment. Sand may be used as an abrasive to aid in cleaning.

NOTE: PRIOR TO APPLICATION, READ ALL PRODUCT PACKAGING THOROUGHLY. For more detailed placement procedures, refer to Five Star[®] Design-A-Spec[™] installation guidelines or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

CONSIDERATIONS

- Minimum temperature of substrate is 40°F (4°C) and rising.
- Do not add solvents to increase flowability.
- Minimum age of concrete must be 5 7 days, depending on curing and drying conditions.
- Do not seal slabs on grade with product. Five Star® Pile Jacket Epoxy Grout LPL is a vapor barrier.

CAUTION

Component A - Irritant · Component B - Corrosive

Product is a strong sensitizer. Use of safety goggles and chemical resistant gloves are recommended. Use of a NIOSH/MSHA organic vapor respirator is recommended if ventilation is inadequate. Avoid breathing vapor. Avoid skin contact. **PRIOR TO USE, REFER TO SAFETY DATA SHEET.**

FIRST AID

Eye Contact: Flush immediately with water for at least 15 minutes. Contact Physician immediately. **Respiratory Problems:** Remove person(s) to fresh air. **Skin Contact**: Remove any contaminated clothing. Remove epoxy immediately with a dry cloth or paper towel. Solvents should not be used as they carry irritant into the skin. Wash skin thoroughly with soap and water. Cured epoxy resins are innocuous.

For worldwide availability, additional product information and technical support, contact your local Five Star[®] distributor, local sales representative, or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

SKU / PRODUCT CODE	DESCRIPTION	#UNITS/PALLET	UNIT SIZE
32180	Pile Jacket Epoxy Grout LPL System	36 (A) 36 (B) 60 (C)	Resin (A): 28.5 lb. (12.9 kg) Hardener (B): 8.0 lb. Sand Aggregate (C) 3 50 lb. (22.7 kg) bags

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Date Revised: 5/21/2015

Supersedes:

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name(s):	Five Star [®] Epoxy Adhesive LV / Component A Resin Five Star [®] Pile Jacket Epoxy Grout HP / Component A Resin Five Star [®] Pile Jacket Epoxy Grout LV / Component A Resin Five Star [®] Pile Jacket Epoxy Grout LPL / Component A Resin
Synonyms:	Epoxy Resin, Component A
Product Use:	Construction and repair of marine structures
Restrictions on Use:	To be used with specific Five Star [®] systems.
Manufacturer/Supplier	Five Star Products, Inc. 60 Parrott Drive Shelton, CT 06484 USA
Phone #:	203-336-7900
Emergency Phone #:	CHEM-TEL 1-800-255-3924 (Outside the U.S. 1-813-248-0585)

SECTION 2: HAZARD(S) IDENTIFICATION-GHS INFORMATION

Classification:	Skin Irritation, Category 2 Eye Irritation, Category 2A Skin sensitization, Category 1 Acute aquatic toxicity, Category 2 Chronic aquatic toxicity, Category 2
Label Elements/Hazard Pictograms:	
Signal Word:	Warning
Hazard Statements:	Causes skin irritation, H315 May cause an allergic skin reaction, H317 Caused serious eye irritation, H319 Toxic to aquatic life with long lasting effects, H411
Precautionary Statements/Prevention:	Avoid breathing dust/fume/gas/mist/vapors/spray, P261 Wash skin thoroughly after handling, P264 Contaminated work clothing should not be allowed out of the workplace, P272 Avoid release to the environment, P273 Wear protective gloves/eye protection/face protection, P280

FIVE STAR	Safaty Data Shoot	Date Revised: 5/21/2015
	Salety Data Sileet	Supersedes:
Response:	If in eyes: Rinse cautiously with wat Remove contact lenses, if present a P338, P305, P351 If eye irritation pr attention/advice, P337, P313	ter for several minutes, P351. nd easy to do. Continue rinsing, ersists: Get medical
	If on skin (or hair): Wash with plen	ty of soap and water, P302, P352
	If swallowed: Rinse mouth. Do NOT	induce vomiting, P330, P331.
	If skin irritation or rash occurs, P33 P313.	3: Get medical advice/attention,
	Take of contaminated clothing and	wash before reuse, P362
	Collect spillate, P391	
	Get medical advice/attention if you	feel unwell, P314
Storage:	Keep container tightly closed and in	a dry well-ventilated space.
Disposal:	Dispose of contents/container in acc national, and local laws and regulat	cordance with applicable regional, ions.
Hazards Not Otherwise Classified:	Not applicable	
Ingredients with Unknown	Not applicable	

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS			
Hazardous Ingredient(s)	Common Name/Synonyms	CAS No.	% wt/wt
Bisphenol A Diglycidyl Ether Resin Mixture	n/a	25068-38-6	80-90
C8 and C10 Alkyl Glycidly Ethers	n/a	68609-96-1	10-20

SECTION 4: FIRST AID MEASURES	
Inhalation:	If inhaled: Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Consult a physician.
Eye Contact:	If in eyes: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Consult a physician.
Skin Contact:	If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower for at least 15 minutes. Immediately call a poison center or doctor if irritation develops. Wash contaminated clothing before reuse.

Toxicity:

Five Star S	afety Data Sheet	Date Revised: 5/21/2015 Supersedes:
Ingestion:	If swallowed: Rinse mouth. Call POIS information. Do NOT induce vomiting or doctor. If vomiting occurs natural reduce the risk of aspiration. Never of unconscious person.	SON CENTER for most current g. Immediately call a poison center ly, have victim lean forward to give anything by mouth to an
General Advice:	In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible). First Aid responders should pay attention to self-protection and use recommended protective clothing (chemical resistant gloves, splash protection).	
Note to Physicians:	Symptoms may not appear immedia	tely. Treat symptomatically.

SECTION 5: FIRE-FIGHTING MEASURES	
Flammability and Explosion Information:	Not available
Sensitivity to Mechanical Impact:	Not available
MEANS OF EXTINCTION	
Suitable Extinguishing Media:	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Unsuitable Extinguishing Media:	Not available
Protection of Firefighters:	Wear self-contained breathing apparatus for fire-fighting if necessary.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures:	Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel. Eliminate all ignition sources.
Personal Precautions:	Use personal protective equipment. Avoid breathing vapors, mist, or gas. Ensure adequate ventilation. When respirators are required, select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.
Environmental Precautions:	Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
Methods for Containment:	Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.
Other Information:	See Section 13 for disposal considerations.



Supersedes:

SECTION 7: HANDLING AND STORAGE Handling: Avoid contact with skin and eyes. Avoid inhalation of vapor or mist. Storage: Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Component	CAS No.	ACGIH	OSHA
Bisphenol A Diglycidyl Ether Resin Mixture	25068-38-6	n/a	n/a
C8 and C10 Alkyl Glycidil Ethers	68609-96-1	n/a	n/a

PEL: Permissible Exposure Limit TLV: Threshold Limit Value

Engineering Controls: Not normally required.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection:	Face shield and safety glasses. Use equipment for eye protection that meets the standards referenced for OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.
Hand Protection:	Wear protective gloves. Rubber or polyethylene material is recommended. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear protective clothing. Clothing with full length sleeves and pants should be worn.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices. Provide readily accessible eye wash stations and safety showers. Wash at end of shift and before eating, smoking, or using the toilet. Remove

contaminated clothing and launder or discard.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES	
Appearance:	Clear light amber liquid.
Color:	Light amber.
Odor:	Semi Sweet
Odor Threshold:	N/A
Physical State:	Liquid
pH:	Not available



Supersedes:

Melting Point / Freezing Point:	Not available
Initial Boiling Point:	Not available
Boiling Point:	Not available
Flash Point:	93.4 °C, 200 °F Setaflash Closed Cup ASTM D 3828
Evaporation Rate:	N/A
Flammability (solid, gas):	N/A
Lower Flammability Limit:	N/A
Upper Flammability Limit:	N/A
Vapor Pressure:	1.33 mbar
Vapor Density:	1 [Air = 1]
Relative Density:	1.10
Solubility:	Slightly
Partition Coefficient: n-Octanol/Water:	N/A
Auto-ignition Temperature:	Not available.
Decomposition Temperature:	Not available
Viscosity:	1000 cps
Percent Volatile, wt.%:	0%
VOC Content, wt.%:	0%
Density:	N/A
Coefficient of Water/Oil Distribution:	N/A

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability:	Stable under normal conditions.
Hazardous decomposition byproducts:	CO, CO ₂ , smoke, toxic vapors
Conditions to Avoid:	Amine compounds under uncontrolled conditions.
Incompatible Materials:	Strong oxidizing agents.

SECTION 11: TOXICOLOGICAL INFORMATION

Acute Toxicity:

Primary Irritant Effect	
On the Skin:	Irritant to skin and mucous membranes.
Primary Irritant Effect	
On the Eye:	Irritating effect.



Date Revised: 5/21/2015

Supersedes:

Swallowing:	Can cause abdominal irritation, nausea, vomiting, and diarrhea.
Additional Toxicological Information:	This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA, or ACGIH as of this date, greater or equal to 0.1%

SECTION 12: ECOLOGICAL INFORMATION

Toxicity:	All work practices must be aimed at eliminating environmental contamination.
Aquatic Toxicity:	This material is harmful to the environment.
Persistence and Degradability:	The product is partially biodegradable. Significant residue remains.
Bio-accumulative Potential:	Does not accumulate in organisms.
Mobility in Soil:	No further relevant information available
Ecotoxical Effects Remark:	Toxic for fish. Due to mechanical actions of the product damages may occur. The declared action may be partly caused by lack of oxygen.
Additional Ecological Information	No further relevant information available
General Notes:	No further relevant information available
PBT Assessment:	N/A
vPvB Assessment:	N/A
Other Adverse Effects:	No further relevant information available

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Treatment Methods

Recommendation: The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. Care should be taken when handling emptied containers t h a t have not been cleaned or rinsed out. Empty containers and liners may retain some product residues. Vapor from some product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Processing, use or contamination may change the waste disposal requirements. Do not dispose of on land, in surface waters, or in storm



Supersedes:

ALL DISPOSAL MUST BE IN ACCORDANCE WITH ALL FEDERAL, STATE, PROVINCIAL, AND LOCALREGULATIONS. IF IN DOUBT, CONTACT PROPER AGENCIES.

Uncleaned Packaging Empty containers may contain residue and may be dangerous. Do not attempt to refill or clean without proper instructions. Empty drums should be drained and stored safely for reconditioning or recycling.

Recommendation: Disposal must be made according to official regulations.

SECTION 14: TRANSPORT INFORMATION		
US DEPARTMENT of TRANSPORTATION (DOT) Proper Shipping Name:	NOT REGULATED	
Class:	NONE	
UN #:	NONE	
Packing Group:	NONE	
INTERNATIONAL AIR TRANSPORTATION Proper Shipping Name (ICAO/IATA):	UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, NOS (BISPHENOL-A EPOXY RESIN), 9, PG III	
Class:	9	
UN #:	3082	
Packing Group:	III	
WATER TRANSPORTATION Proper Shipping Name (IMO/IMDG):	UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, NOS (BISPHENOL-A-EPOXY RESIN), 9, PG III	
Class:	9	
UN#:	3082	
Packing Group:		
Marine Pollutant:	Bisphenol-A EpOXY Resin	

SECTION 15: REGULATORY INFORMATION

CHEMICAL INVENTORIES	
US (TSCA):	The components of this product are in compliance with the chemical notification requirements of TSCA.
CANADA (DSL):	The components of this product are in compliance with the chemical notification requirements of NSN Regulations under CEPA, 1999.
FEDERAL REGULATIONS	
CANADA:	n/a



Supersedes:

WHMIS Classification:	n/a
UNITED STATES:	This SDS has been prepared to meet the US OSHA Hazard Communication Standard, 29 CFR 1910.1200
SARA Title III:	No components are listed.
STATE REGULATIONS	
Massachusetts	US Massachusetts Commonwealth's Right-to-Know Las (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)
New Jersey	US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)
Pennsylvania	US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)
California California Prop 65:	This product does not contain chemicals known to the State of California to be Carcinogenic.

SECTION 16: OTHER INFORMATION

Disclaimer:

The information contained in this document applies to the specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for one's own particular use.


Supersedes: 7/24/2015

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name(s):	Five Star [®] Pile Jacket Epoxy Grout LV/Component B Hardener Five Star [®] Pile Jacket Epoxy Grout LPL/Component B Hardener Five Star [®] Epoxy Adhesive LV/Component B Hardener
Synonyms:	Pile Jacket LPL Epoxy Hardener, Pile Jacket LV Epoxy Hardener, LV Adhesive Hardener
Product Use:	Pile Jacket Epoxy Grout LV, Pile Jacket Epoxy Grout LPL, Epoxy Adhesive LV
Restrictions on Use:	To be used with specific Five Star [®] systems.
Manufacturer/Supplier	Five Star Products, Inc. 60 Parrott Drive Shelton, CT 06484
Phone #:	203-336-7900
Emergency Phone #:	CHEM-TEL 1-800-255-3924 (Outside the U.S. 1-813-248-0585)

SECTION 2: HAZARD(S) IDENTIFICATION-GHS INFORMATION

Classification:	Acute Toxicity – Oral, Category 4 Acute Toxicity – Dermal, Category 3 Skin Corrosion – Category 1 Eye Damage – Category 1 Sensitization – Respiratory, Category 1 Sensitization – Skin, Category 1	
Label Elements/Hazard Pictograms:		
Signal Word:	Danger	
Hazard Statements:	Harmful if swallowed, H302 Toxic in contact with skin, H311 Causes severe skin burns and eye damage, H314 May cause respiratory irritation, H335 May cause an allergic skin reaction, H317	
Precautionary Statements/Prevention:	Do not breathe dust, fume, gas, mist, vapors, or spray, P260 Wash thoroughly after handling, P264 Do not eat, drink or smoke when using this product, P270 Contaminated work clothing should not be allowed out of the workplace, P272	

ENVE STAD	Safaty Data Shoat	Date Revised: 7/29/2015	
TIVE SIAK	Salety Data Sheet	Supersedes: 7/24/2015	
	Wear protective gloves, protective protection, P280	clothing, eye protection and face	
	Wear respiratory protection, P284		
Response:	If swallowed: Rinse mouth. Do NO	T induce vomiting, P330, P331.	
	If on skin (or hair): Take off imme Rinse skin with water/shower, P36	diately all contaminated clothing. 1, P353.	
	If inhaled: Remove person to fresh breathing, P340.	If inhaled: Remove person to fresh air and keep comfortable for breathing, P340.	
	If in eyes: Rinse cautiously with wa Remove contact lenses, if present P338.	ater for several minutes, P351. and easy to do. Continue rinsing,	
	Immediately call a poison center o	r doctor, P310.	
	If skin irritation or rash occurs, P3 P313.	33: Get medical advice/attention,	
	If experiencing respiratory sympto doctor, P310. Wash contaminated	ms, P342: Call a poison center or clothing before reuse, P363.	
Storage:	Store locked up.	Store locked up.	
Disposal:	Dispose of contents/container in ac national, and local laws and regula	Dispose of contents/container in accordance with applicable regional national, and local laws and regulations.	
Hazards Not Otherwise Classified:	Not applicable		
Ingredients with Unknown Toxicity:	20-50% of this product mixture co acute toxicity.	nsists of ingredients of unknown	

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS			
Hazardous Ingredient(s)	Common Name/Synonyms	CAS No.	% wt/wt
Aliphatic amine	Not applicable (N/A)	Trade Secret	30-50
Cycloaliphatic hydroxide	N/A	Trade Secret	15-35
Aliphatic amine	N/A	Trade Secret	15-30
Amine catalyst	N/A	Trade Secret	1-5

SECTION 4: FIRST AID MEASURES

Inhalation:

If inhaled: Remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a poison center or doctor.

Acute and delayed symptoms and effects: May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause respiratory irritation. Signs/symptoms may include burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema.



Date Revised: 7/29/2015

Supersedes: 7/24/2015

Eye Contact:	If in eyes: Rinse cautiously with water for at least 30 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.	
	Acute and delayed symptoms and effects: Causes serious eye damage. Signs/symptoms may include cloudy appearance of the cornea, chemical burns, severe pain, tearing, ulcerations, significantly impaired vision or complete loss of vision.	
Skin Contact:	If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower for at least 15 minutes. Immediately call a poison center or doctor. Wash contaminated clothing before reuse.	
	Acute and delayed symptoms and effects: Toxic in contact with skin. May cause an allergic skin reaction. Causes severe skin burns. Signs/symptoms may include localized redness, swelling, itching, intense pain, and blistering, ulceration, and tissue destruction.	
Ingestion:	If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Never give anything by mouth to an unconscious person.	
	Acute and delayed symptoms and effects: Harmful if swallowed. Causes burns to nose, mouth, throat, and digestive tract. Signs/symptoms may include severe mouth, throat and abdominal pain, nausea, vomiting, and diarrhea, blood in the feces and/or vomitus may also be seen.	
General Advice:	In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible). First Aid responders should pay attention to self-protection and use recommended protective clothing (chemical resistant gloves, splash protection).	
Note to Physicians:	Symptoms may not appear immediately. Treat symptomatically.	

Suitable Extinguishing Media:	Small Fire: Dry chemical, CO2 or water spray.	
	Large Fire: Dry chemical, CO2, alcohol-resistant foam or water spray Move containers from fire area if you can do it without risk. Dike fire- control water for later disposal; do not scatter the material.	
Unsuitable Extinguishing Media:	Not available	
Products of Combustion:	Oxides of carbon, oxides of nitrogen, ammonia	



Date Revised: 7/29/2015

Supersedes: 7/24/2015

Protection of Firefighters: TOXIC; inhalation, ingestion or skin contact with material may cause severe injury or death. Contact with molten substance may cause severe burns to skin and eyes. Avoid any skin contact. Effects of contact or inhalation may be delayed. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution. Wear positive pressure self- contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures:	As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet). Stay upwind. Keep out of low areas. Ventilate enclosed areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
Personal Precautions:	Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Use personal protection recommended in Section 8.
Environmental Precautions:	Prevent entry into waterways, sewers, basements or confined areas.
Methods for Containment:	Stop leak if you can do it without risk.
Methods for Clean-Up:	Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
Other Information:	See Section 13 for disposal considerations.

Handling:	Do not swallow. Do not breathe mist, vapors, or spray. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Contaminated work clothing should not be allowed out of the workplace. See Section 8 for information on Personal Protective Equipment.
Storage:	Store locked up. Store away from incompatible Materials. See Section 10 for information on
	Incompatible Materials. Keep out of the reach of children.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Component	CAS No.	ACGIH	OSHA
Aliphatic amine	Trade Secret	No TLV established.	No PEL established.



Date Revised: 7/29/2015

Supersedes: 7/24/2015

Cycloaliphatic hydroxide	Trade Secret	No TLV established.	No PEL established.
Aliphatic amine	Trade Secret	No TLV established.	No PEL established.
Amine catalyst	Trade Secret	No TLV established.	No PEL established.
PEL: Permissible Exposure Li	mit TLV: Threshold Li	mit Value	
Engineering Controls:	Not normally requ	uired.	
PERSONAL PROTECTIVE E	QUIPMENT (PPE)		
Eye/Face Protection:	Wear chemical sa eyewash stations location. Use equi referenced for OS Protective Equipm	Ifety goggles and full face shield. Ensure that and safety showers are close to the workstation ipment for eye protection that meets the standards SHA regulations in 29 CFR 1910.133 for Personal nent.	
Hand Protection:	Wear protective g recommended. Co information.	loves. Rubber or polyethyle onsult manufacturer specific	ne material is ations for further
Skin and Body Protection:	: Wear protective c should be worn.	lothing. Clothing with full le	ngth sleeves and pants
Respiratory Protection:	Wear respiratory not sufficient to c appropriate NIOS organic vapor car sued when oxyge exceed the limits	Wear respiratory protection. If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator with organic vapor cartridge, or self-contained breathing apparatus must be sued when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.	
General Hygiene Considerations:	Handle according practices,	Handle according to established industrial hygiene and safety practices.	

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES		
Appearance:	Liquid	
Color:	Light yellow	
Odor:	Slight ammoniacal	
Odor Threshold:	Not available	
Physical State:	Liquid	
pH:	Alkaline	
Melting Point / Freezing Point:	Not available	
Initial Boiling Point:	Not available	
Boiling Point:	> 260°C (500°F)	
Flash Point:	124°C (255°F)	
Evaporation Rate:	Not available	



Date Revised: 7/29/2015

Supersedes: 7/24/2015

Flammability (solid, gas):	Not available
Lower Flammability Limit:	Not available
Upper Flammability Limit:	Not available
Vapor Pressure:	Not available
Vapor Density:	Not available
Relative Density:	1.01
Solubility:	Partial
Partition Coefficient: n-Octanol/Water:	Not available
Auto-ignition Temperature:	Not available
Decomposition Temperature:	Not available
Viscosity:	50-150 cps
Percent Volatile, wt.%:	0
VOC Content, wt.%:	0
Density:	1.01
Coefficient of Water/Oil Distribution:	Not available

SECTION 10: STABILITY AND REACTIVITY			
Chemical Stability:	Stable under normal conditions.		
Hazardous decomposition byproducts:	Oxides of carbon, oxides of nitrogen, ammonia.		
Conditions to Avoid:	Can auto-ignite in air at approximately 572°F (300°C)		
Incompatible Materials:	Epoxy resins under uncontrolled conditions, acid, oxidizing material, halogenated, organic compounds.		

SECTION 11: TOXICOLOGICAL INFORMATION		
Acute Toxicity:	LD50 oral 1,100 mg/kg(rat); LD50 dermal 1,550 mg/kg(rabbit)	
Primary Irritant Effect On the Skin:	Irritant to skin and mucous membranes.	
Primary Irritant Effect On the Eye:	Irritating effect.	
Swallowing:	Can cause abdominal irritation, nausea, vomiting, and diarrhea.	
Additional Toxicological Information:	This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA, or ACGIH as of this date, greater or equal to 0.1%	



SECTION 12: ECOLOGICAL INFORMATION		
Toxicity:	All work practices must be aimed at eliminating environmental contamination.	
Aquatic Toxicity:	Fresh water LC50 0.446 mg/l/4d Fathead minnow Fresh water LC50 0.436 mg/l/4d Bluegill Salt water LC50 0.458 mg/l/4d Sheepshead minnow	
Persistence and Degradability:	The product is partially biodegradable. Significant residue remains.	
Bio-accumulative Potential:	Not available.	
Mobility in Soil:	No further relevant information available	
Ecotoxical Effects Remark:	No known significant effects or critical hazards	
Additional Ecological Information:	No further relevant information available	
General Notes:	No further relevant information available	
PBT Assessment:	Not available	
vPvB Assessment:	Not available.	
Other Adverse Effects:	No further relevant information available	

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Treatment Methods

Recommendation:The generation of waste should be avoided or minimized wherever
possible. Dispose of surplus and non-recyclable products via a licensed
waste disposal contractor. Waste should not be disposed of untreated
to the sewer unless fully compliant with the requirements of authorities
with jurisdiction. Waste packaging should be recycled. Incineration or
landfill should only be considered when recycling is not feasible.
Care should be taken when handling emptied containers t h a t have

not been cleaned or rinsed out. Empty containers and liners may retain some product residues. Vapor from some product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Processing, use or contamination may change the waste disposal requirements. Do not dispose of on land, in surface waters, or in storm drains. Waste should be recycled or disposed of in accordance with regulations. Large amounts should be collected for reuse or consigned to licensed hazardous waste haulers for disposal.

ALL DISPOSAL MUST BE IN ACCORDANCE WITH ALL FEDERAL, STATE, PROVINCIAL, AND LOCAL REGULATIONS. I F IN DOUBT, CONTACT PROPER AGENCIES.



Date Revised: 7/29/2015

Supersedes: 7/24/2015

Uncleaned Packaging:	Empty containers may contain residue and may be dangerous. Do not attempt to refill or clean without proper instructions. Empty drums should be drained and stored safely for reconditioning or recycling.
Recommendation:	Disposal must be made according to official regulations.

SECTION 14: TRANSPORT INFORMATION

US DEPARTMENT of TRANSPORTATION (DOT) Proper Shipping Name:	Amines liquid corrosive nos(Alinhatic amines)
Class:	δ
UN #:	2735
Packing Group:	III
Air Transport: ICAO- IATA/DGR (Cargo) Proper Shipping Name:	Amines, liquid, corrosive, nos(Aliphatic amines)
Class:	8
UN#:	2735
Packing Group:	III
Sea Transport: (IMDG- Code/GGVSee):	Amines, liquid, corrosive, nos(Aliphatic amines)
Class:	8
UN #:	2735
Packing Group:	III
Marine Pollutant:	Not listed.
CANADA Transportation of Dangerous Goods (TDG) Proper Shipping Name:	Amines, liquid, corrosive, nos(Aliphatic amines)
Class:	8
UN #:	2735
Packing Group:	III

SECTION 15: REGULATORY INFORMATION

CHEMICAL INVENTORIES

US (TSCA):	The components of this product are in compliance with the chemical notification requirements of TSCA.
CANADA (DSL):	The components of this product are in compliance with the chemical notification requirements of NSN Regulations under CEPA, 1999.



Supersedes: 7/24/2015

FEDERAL REGULATIONS				
CANADA:	n/a	n/a		
WHMIS Classification:	n/a	n/a		
UNITED STATES:	This SDS has been prep Communication Standa	This SDS has been prepared to meet the US OSHA Hazard Communication Standard, 29 CFR 1910.1200		
SARA Title III:	No components are liste	ed.		
STATE REGULATIONS				
Massachusetts:	US Massachusetts Com 105 Code of Massachus	US Massachusetts Commonwealth's Right-to-Know Las (Appendix A to 105 Code of Massachusetts Regulations Section 670.000).		
Component:	CAS No.	RTK List:		
Aliphatic amine	TS	Listed		
New Jersey:	US New Jersey Worker Statute Annotated Sect	US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5).		
Component:	CAS No.	RTK List:		
Aliphatic amine	TS	Listed		
Pennsylvania:	US Pennsylvania Worke Code Chap. 301-323).	US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323).		
Component	CAS No.	RTK List:		
Aliphatic amine	TS	Listed		
California California Prop 65:	This product does not control to be Carcinogenic.	This product does not contain chemicals known to the State of California to be Carcinogenic.		

SECTION 16: OTHER INFORMATION				
HMIS (Hazardous Material	Health	Flammability	Physical Hazard	Personal Protection
Information System:	3	1	1	E
Disclaimer:	This information is furnished without warranty of any kind, expressed or implied. Five Star Products. Inc. bases the information and			

implied. Five Star Products, Inc. bases the information and recommendations in this document on data believed to be current and accurate.



Date Revised: 3/23/2016

Supersedes: 7/29/2015

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name(s):	Five Star [®] Pile Jacket Epoxy Grout LV / Component C Aggregate Five Star [®] Pile Jacket Epoxy Grout LPL/Component C Aggregate Five Star [®] Epoxy Chock EX / Component C Aggregate
Synonyms:	Pile Jacket Silica Sand
Product Use:	Aggregate for reactive polymer construction products. Designed for use with appropriate hardener and resin.
Restrictions on Use:	N/A
Manufacturer/Supplier	Five Star Products, Inc. 60 Parrott Drive Shelton, CT 06484 USA
Phone #:	203-336-7900
Emergency Phone #:	CHEM-TEL 1-800-255-3924 (Outside the U.S. 1-813-248-0585)

SECTION 2: HAZARD(S) IDENTIFICATION-GHS INFORMATION

Classification:	Carcinogenicity – Category 1A Specific Target Organ Toxicity (Single Exposure) – Cat 3 Specific Target Organ Toxicity (Repeated Exposure) – Cat 2	
Label Elements/Hazard Pictograms:		
Signal Word:	Danger	
Hazard Statements:	May cause respiratory irritation H335 May cause cancer by inhalation H350 Causes damage to organs through prolonged or repeat exposure H372	
Precautionary Statements/Prevention:	Do not breathe dust, fume, gas, mist, vapors, or spray, P260. Wash thoroughly after handling, P264. Do not eat, drink or smoke when using this product, P270. Obtain special instructions before use, P201. Do not handle until all safety precautions have been read and understood, P202. Wear protective gloves, protective clothing, eye protection and face protection, P280. Use only outdoors or in a well-ventilated area, P271.	
Response:	If swallowed: Rinse mouth. Do NOT induce vomiting, P330, P331.	

EIVE STAD	Safety Data Sheet	Date Revised: 3/23/2016	
****		Supersedes: 7/29/2015	
	If inhaled: Remove person to fresh breathing, P340. Call a POISON CENTER/doctor if you Get medical advice and attention if If in eyes: Rinse cautiously with wat Remove contact lenses, if present a P338.	air and keep comfortable for I feel unwell, P312. you feel unwell, P314. er for several minutes, P351. nd easy to do. Continue rinsing,	
Storage:	Store locked up. Store in a well-ver tightly closed.	ntilated place. Keep container	
Disposal:	Dispose of contents/container in accordance with applicable regional national, and local laws and regulations.		
Hazards Not Otherwise Classified:	Not applicable		

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS			
Hazardous Ingredient(s)	Common Name/Synonyms	CAS No.	% wt/wt
Quartz	Silicon Dioxide, Silica Sand, Crystalline Silica	14808-60-7	99-100

SECTION 4: FIRST AID MEASURES		
Inhalation:	If inhaled: Remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms call poison center or doctor.	
Eye Contact:	If in eyes: Immediately rinse with water for a prolonged period while holding the eyelids wide open. Seek medical attention if material is embedded in eye. If eye irritation persists: Get medical advice and attention.	
Skin Contact:	Rinse immediately with plenty of water. Gently wash with plenty of soap and water. Obtain medical attention if irritation persists.	
Ingestion:	If swallowed: Do not induce vomiting: seek medical advice immediately and show this container or label. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Never give anything by mouth to an unconscious person.	
General Advice:	If medical advice is needed, have product container or label at hand. In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).	
Note to Physicians:	Symptoms may not appear immediately. Treat symptomatically.	



Date Revised: 3/23/2016

SECTION 5: FIRE-FIGHTING MEASURES

Flammability and Explosion Information:	Not flammable or combustible by OSHA/WHMIS criteria.
Sensitivity to Mechanical Impact:	This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge:	This material is not sensitive to static discharge.
MEANS OF EXTINCTION	
Suitable Extinguishing Media:	Small Fire: Dry chemical, CO2, or water spray. Large Fire: Dry chemical, CO2, alcohol-resistant foam or water spray. Move containers from fire area if you can do it without risk. Dike fire- control water for later disposal; do not scatter the material.
Unsuitable Extinguishing Media:	None known
Product of Combustion:	Non-combustible
Protection of Firefighters:	As in any fire, wear self-contained breathing apparatus pressure- demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES		
Emergency Procedures:	Use personal protective equipment. Ensure adequate ventilation. Keep people from spill. Avoid dust formation.	
Personal Precautions:	Avoid inhalation of dust. Do not get into eyes, on skin, or clothing.	
Environmental Precautions:	The environmental impact of this product has not been fully investigated.	
Methods for Containment:	Cover powder spill with plastic sheet or tarp to minimize spreading. Collect this material into a disposal container by sucking or sweeping up.	
Methods for Cleanup:	Pick up and transfer to properly labeled containers.	
Other Information:	See Section 13 for disposal considerations.	

SECTION 7: HANDLING AND STORAGE

Handling:	Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Do not breathe dust. Prevent contact with skin, eyes, and clothing. Wash thoroughly after handling.
Storage:	Keep containers tightly closed in a cool, dry, and well-ventilated place. Store locked up.



Supersedes: 7/29/2015

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION			
Exposure Guidelines			
Component	CAS No.	ACGIH TLV	OSHA PEL
Quartz	14808-60-7	TWA: 0.025mg/m ³ respirable fraction	30/(%SiO2+2) mg/m³ TWA, Total Dust;250/%SiO2+5) mppcf TWA, respirable fraction; 10/(%SiO2+2) mg/m³ TWA, respirable TWA: 0.1 mg/m³ (vacated)
PEL: Permissible Exposure	Limit TLV: Threshold Li	imit Value	
Engineering Controls:	Ensure adequate protection.	ventilation, especially in cor	nfined areas. Avoid dust
PERSONAL PROTECTIVE	EQUIPMENT (PPE)		
Eye/Face Protection:	Tightly fitting safe	ety goggles	
Hand Protection:	Impervious glove	s. Impervious clothing.	
Skin and Body Protectio	n: Impervious glove good industrial hy immediately after the workplace. W clothing before re	s. Impervious clothing. Han ygiene and safety practice. r handling this product, and Vear suitable protective cloth euse.	dle in accordance with Always wash your hands once again before leaving hing. Wash contaminated
Respiratory Protection:	If exposure limits NIOSH/MSHA app pressure supplied contaminant conc in accordance wit	are exceeded or irritation is proved respiratory protection l air respirators may be requised centrations. Respiratory prot ch current local regulations.	s experienced, n should be worn. Positive- uired for high airborne fection must be provided
General Hygiene Considerations:	Handle according	to established industrial hy	giene and safety practices.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES		
Appearance:	Granular	
Color:	Gray, Tan	
Odor:	None	
Odor Threshold:	None	
Physical State:	Solid	
pH:	Not Applicable	
Melting Point / Freezing Point:	Not Applicable	
Initial Boiling Point:	Not Applicable	
Boiling Point:	Not Applicable	



Supersedes: 7/29/2015

Flash Point:	Not Applicable
Evaporation Rate:	Not Applicable
Flammability (solid, gas):	Not Applicable
Lower Flammability Limit:	Not Applicable
Upper Flammability Limit:	Not Applicable
Vapor Pressure:	Not Applicable
Vapor Density:	Not Applicable
Relative Density:	2.5-2.8
Solubility:	Negligible
Partition Coefficient: n-Octanol/Water:	Not Applicable
Auto-ignition Temperature:	Not Applicable
Decomposition Temperature:	>3,000°F (1649°C)
Viscosity:	Not Applicable
Percent Volatile, wt.%:	Not Applicable
VOC Content, wt.%:	Not Applicable
Density:	2.5-2.8 g/cc
Coefficient of Water/Oil Distribution:	Not Applicable

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability:	Stable under recommended storage conditions.
Possibility of Hazardous Reactions:	None under normal processing.
Conditions to Avoid:	Exposure to water – product may harden on contact with water.
Incompatible Materials:	Strong oxidizers.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Acute Toxicity:	LD50 Oral: 500 mg/kg (Rat) estimated
Skin corrosion/irritation:	Not classified
Serious eye damage/irritation:	Not classified
Respiratory or skin sensitization:	Not classified



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Germ cell mutagenicity:	Not classified
Component information:	Not classified
Carcinogenicity:	May cause cancer (inhalation of respirable fraction); not anticipated as $< 0.1\%$ of product is respirable. If hardened material should be ground or cut, then respiratory issues should be considered.
Chemical Name: Quartz	ACGIH: A2 – Suspected Human Carcinogen
IARC: Group 1 – Carcinogenic to humans OSHA: X-present	

Delayed and immediate effects and also chronic effects from short and long term exposure.

SECTION 12: ECOLOGICAL INFORMATION		
Toxicity		
Aquatic Toxicity:	Not applicable	
Persistence and Degradability:	Not applicable	
Bio-accumulative Potential:	Not applicable	
Mobility in Soil:	No further relevant information available	
Ecotoxical Effects Remark:	Not applicable	
Additional Ecological Information:	Not applicable	
General Notes:	No ecological effects are known other than to occupy volume as fill.	
PBT Assessment:	Not applicable	
vPvB Assessment:	Not applicable	
Other Adverse Effects:	No further relevant information known	

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Treatment Methods

Recommendation:	This material as supplied is not a hazardous waste according to Federal regulations (40CFR261). This material could become a hazardous waste if it is mixed with or otherwise comes in contact with a hazardous waste, if chemical additions are made to this material, or if the material is processed or otherwise altered.
Uncleaned Packaging Recommendation:	Disposal must be made according to official regulations. Do not re-use empty containers.



Supersedes: 7/29/2015

SECTION 14: TRANSPORT INFORMATION		
US DEPARTMENT of TRANSPORTATION (DOT) Proper Shipping Name:	Not regulated	
Class:	N/A	
UN #:	N/A	
Packing Group:	N/A	
Air Transport: ICAO- IATA/DGR (Cargo) Proper Shipping Name:	Not regulated	
Class:	N/A	
UN#:	N/A	
Packing Group:	N/A	
Sea Transport: (IMDG- Code/GGVSee):	Not regulated	
Class:	N/A	
UN #:	N/A	
Packing Group:	N/A	
CANADA Transportation of Dangerous Goods (TDG) Proper Shipping Name:	Not regulated	
Class:	N/A	
UN #:	N/A	
Packing Group:	N/A	
Other:	Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code.	

SECTION 15: REGULATORY INFORMATION

CHEMICAL INVENTORIES	
US (TSCA):	The components of this product are in compliance with the chemical notification requirements of TSCA.
CANADA (DSL):	The components of this product are in compliance with the chemical notification requirements of NSN Regulations under CEPA, 1999.
U.S. FEDERAL REGULATIONS	Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the CFR, Part 372.



Disclaimer:

Safety Data Sheet

Date Revised: 3/23/2016

Supersedes: 7/29/2015

UNITED STATES:	This SDS has been prepared to meet the US OSHA Hazard Communication Standard, 29 CFR 1910.1200						
SARA 311/312 Hazard Categories:	Acute health hazard – Yes Chronic Health hazard – Yes Fire Hazard – No Sudden Release of Pressure – No Reactive Hazard - No						
US STATE Right to Know Regulations	Chemica Name	al NJ	MA	PA	IL	RI	
	Quartz	X	X	X		X	
California California Prop 65:	This product contains the following Proposition 65 chemicals. Chemical Name: Quartz CAS-No: 14808-60-7 CA Prop. 65: Carcinogen						
SECTION 16: OTHER INFORMATION							
HMIS (Hazardous Material	Health	Flammability	Physic	cal Hazard	Perso	nal Prote	ction
Information System:	1	0		0		E	

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FIVE STAR MARINE, INC.

www.5Star-Marine.com 1-800-338-3145

DESIGN-A-SPEC™ GUIDELINES FIVE STAR MARINE[®] PILE JACKET EPOXY GROUT LPL

CONTENTS

PART A - GENERAL CONDITIONS
PART B - MATERIAL SPECIFICATIONS
PART C -PREPARATION
PART D - APPLICATION
PART E - FINISHING AND CURING

This document is provided as a general guideline for consideration by contractors and engineers. While every reasonable effort has been made to ensure that this information is accurate and authoritative, Five Star Marine[®] does not warrant the accuracy or completeness of this information or for its appropriateness for any particular purpose. The user of this document remains solely responsible for the specification of all methods, materials and practices.

PART A - GENERAL CONDITIONS

1.01 SCOPE

The work covered by this document consists of furnishing all materials and performing all operations required for pile repair/encapsulation using moisture insensitive epoxy grout in conjunction with fiberglass jackets as formwork.

If it is determined that structural repairs to the pile are needed they must be performed in conjunction with the repairs described in this document. These repairs can include, but are not limited to, chipping out loose concrete, exposing rebar, cleaning rebar, replacing or adding rebar and filling the repaired area with grout.

1.02 QUALITY ASSURANCE

The manufacturer shall have a minimum 15 year history in the manufacture of epoxy grout systems. The manufacturer shall provide on site technical service at no cost to the engineer or contractor when sufficient advance notice is provided.

1.03 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered to the jobsite in their original, unopened packages, clearly labeled with the product identification, printed instructions and batch code.
- B. Store and condition all components (resin, hardener and aggregate) between 60°F and 85°F (16°C and 29°C) for at least 24 hours prior to use. Refer to the product data sheet for more information.
- C. For safe handling instructions, refer to the Material Safety Data Sheet.

1.04 PROJECT / SITE CONDITIONS

Refer to Part C – PREPARATION, ENVIRONMENTAL CONDITIONS, or contact the manufacturer directly for any physical or environmental limitations required by the product.

PART B - MATERIAL SPECIFICATIONS

2.01 MATERIALS

- A. The pile encapsulation epoxy grout material shall be a 100% solids, premeasured, pre-packaged epoxy system containing thermosetting epoxy resins and inert fillers. The material shall be suitable for placement underwater via pouring or pumping. The manufacturer shall have at least 15 years experience in the manufacture of epoxy grout systems. The manufacturer shall offer technical services and provide a representative at the job site for product training prior to product installation with reasonable advance notice.
- B. The pile repair/encapsulation material shall meet the following performance criteria at 70°F:

	1 Day	2,000 psi (13.8MPa)
	7 Days	8,500 psi (58.6MPa)
	28 Days	9,500 psi (65.5MPa)
2.	Tensile Strength, ASTM C 307	2,000 psi (13.8MPa)
3.	Bond to Concrete, ASTM C 882	2,200 psi (15.2MPa)
4.	Linear Shrinkage, ASTM C 531	0.0%
5.	Water Absorption, ASTM C 413	0.0%
6.	Working Time	90 minutes

1. Compressive Strength, ASTM C579 B

C. An acceptable product that meets this criteria is:

Five Star Marine[®] Pile Jacket Epoxy Grout LPL

As manufactured by Five Star Marine, Inc. Fairfield, CT 06825

2.02 AGGREGATE LOADING

Five Star Marine[®] Pile Jacket Epoxy Grout LPL may be used with 3 or 2.5 bags of supplied aggregate. Do not use less than 2.5 bags of aggregate.

2.03 CLEARANCES

A. The grout shall be placed from ½ to 4 inches (12 mm to 100 mm) around piles when used with a jacket and standoff system.

PART C – PREPARATION

3.01 CONCRETE SURFACES

- A. Completely remove all loose, delaminated and weak concrete, oil, grease, laitance, marine growth and other contaminants. Prepare concrete using high pressure water blasting or other suitable mechanical means to obtain sound, clean and roughened surfaces.
- B. All cracks shall be brought to the attention of the engineer and a determination made of whether the cracks are subject to movement. The cracks shall be repaired as directed prior to installation of fiberglass jacket and epoxy grout.
- C. For more detailed information, refer to the following publication: "Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion", Guideline No. 03730, prepared by the Technical Guidelines Committee of ICRI, March 1995.

3.02 REINFORCEMENT

A. All exposed reinforcing steel that has lost bond with the concrete or has more than one-half of its circumference exposed should be undercut by at least 1/2 inch (12 mm).



Diagram D: Reinforcement Profile Example

- B. If more than 25% of the diameter of a reinforcing bar has been deteriorated, the bar may require replacement or need to be spliced as directed by the engineer.
- C. All reinforcement shall be rigidly secured and supported.

D. All exposed reinforcing steel shall be free of all loose scale, rust, oxidation and other contaminants. Blast steel to an SSPC – SP6 commercial finish or better. Exposed reinforcing steel may be sealed or primed if a delay occurs between surface preparation and epoxy grout placement.

3.03 JACKET PLACEMENT

- A. Fiberglass jackets may be one or two piece and should include standoffs that maintain specified annular space. Spacers/standoffs may be pre-molded into jackets or applied at job site. Spacers can be made of wood, plastic or metal. When placing spacers at job site use a fast- setting epoxy adhesive suitable for exposure to water such as Five Star[®] RS Anchor Gel.
- B. For pumping applications, secure suitable pump ports to jacket. Mount port approximately 12 inches from the bottom of the pile. Additional ports may be needed for jacket lengths over 5 feet. Where necessary, place an additional port approximately three feet above the first port and 180° opposite the first port. If additional ports are needed alternate the placement 180° from the previous port and three feet above.
- C. Use a suitable sealing compound to fill the groove side of the jacket opening. Hold the jacket up right next to the pile. Pull open the jacket and slip it around the pile. Allow the tongue to slip into the groove. Position the jacket to cover the area desired. Press the jacket closed. Press tongue into groove as far as it will go. Use ratcheting straps to secure jacket.
- D. Wooden braces, battens or strong backs, should be placed on the outside of the jacket to prevent bulging. Use 2 x 4's or 2 x 6's that are about the same length as the jacket and attach with screws to the middle of each jacket face. Place straps 12 to 18 inches apart vertically and around the braces to insure that the jacket is secure. When the jacket is in position and the straps tight use stainless steel self drilling/tapping screws to secure the tongue and groove joint. Locate screws so they go through both sides of the groove and the tongue. Use screws that are long enough to penetrate the jacket but not long enough to extend to the pile itself.

3.04 JACKET SEALING

A. The choice of bottom seal should be determined by environmental restrictions, owner preference or contractor experience. Typical bottom seals include closed foam strips, oakum and resin, nylon retainers and epoxy packing.

3.05 MIXING

Mortar Mixer (Stationary Barrel Mixer with Moving Paddles)

- A. Provide an adequate number of mortar mixers in good operating condition for uninterrupted placement. Do not exceed one-half the maximum capacity of the mortar mixer. A concrete mixer (spinning barrel mixer) is not acceptable for mixing epoxy grout.
- B. Pour all Component B (hardener) into the pail containing Component A (resin). Mix thoroughly for 2 minutes by hand with paddle or slow speed mixer to avoid air entrapment. Pour mixed liquids into the mortar mixer. While mixing, slowly Component C (aggregate) and mix until aggregate is completely wet. Add 2.5 to 3 bags Component C depending upon placement conditions and temperatures.
- C. Do not mix more material than can be placed within the working time of the grout.
- D. Place grout immediately after mixing.

PART D – APPLICATION

4.01 APPLICATION

Pumping

- A. A peristaltic type pump is recommended for pumping epoxy grout. Peristaltic Pumps manufactured by Blastcrete (<u>www.blastcrete.com</u>) and Quikspray (<u>www.quikspray.com</u>) may be used to pump Five Star Marine[®] Pile Jacket Epoxy Grout LPL.
- B. Prime pump and lines with a suitable primer that will not contaminate epoxy grout. Ensure material used for priming is discarded and not used for jacket filling.
- C. Attach the pump hose to the bottom port and commence pumping. For tremie pumping, insert hose into jacket to bottom and commence pumping. Keep pump hose submerged in epoxy grout and slowly raise pump hose as jacket fills with epoxy grout.
- D. When the grout in the jacket rises to the level of the next port stop the pump, remove the hose and close the port with a plug. Then attach the hose to the next higher port and continue pumping. Repeat this until the jacket is full of grout.
- E. When the jacket is full, the top of the jacket can be topped off with additional grout placed by hand or by a later placement of suitable marine mastic such as Five Star Marine[®] Splash Zone.

- F. Do not mix more material than can be placed within the working time of the grout.
- G. All tools and equipment may be cleaned with high pressure water and a strong detergent prior to hardening. Sand may be used as an abrasive to aid clean up.

Pouring

- A. Use a headbox or ramp at top of jacket opening to facilitate pouring of epoxy grout into jacket.
- B. Mixing and pouring of epoxy grout should be a continuous process to minimize air entrapment. Headbox or ramp used for pouring may be moved or alternated from side to side to also help reduce air entrapment.
- C. Continue pouring epoxy grout until jacket is full. Grout level may be topped off using additional material placed by hand or by a later placement of suitable marine mastic such as Five Star Marine[®] Splash Zone.
- D. Do not mix more material than can be placed in the working time of the epoxy grout.
- E. All tools and equipment may be cleaned with high pressure water and a strong detergent prior to hardening. Sand may be used as an abrasive to aid clean up.

PART E – FINISHING AND CURING

5.01 FINISHING

- A. Prior to hardening, epoxy grout can be finished with a solvent wiped steel trowel. Maintaining a sufficient solvent coat is important as epoxy grout will adhere to a dry trowel.
- B. Epoxy grouts cannot be trimmed after set except by mechanical means. Final level in the forms should be brought to the finished elevation before curing.

5.02 CURING

A. Protect the grout from temperatures below 40°F (4°C) for 24 hours or until required minimum compressive strength is achieved.



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Specifications Subject to Change.

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Pile Jacket Grout HP

Underwater Pile Jacket Epoxy Grout

Description

Five Star Marine[®] Pile Jacket Grout HP is a multi-purpose, three-component, 100% solids, moisture insensitive epoxy grout specifically designed to cure underwater. Five Star Marine[®] Pile Jacket Grout HP has excellent flowability, may be pumped or poured into place and exhibits outstanding physical properties when placed in wet or dry environments.

Uses

- Encapsulation material for concrete, steel and wood
- Corrosion protection for concrete, steel, and wood
- Pile repair and restoration

Benefits

- Excellent wet and dry physical properties
- Adjustable aggregate loading
- Moisture insensitive before, during, and after cure
- Excellent adhesion to masonry, concrete, wood, steel and most structural materials
- Pumpable

Packaging and Yield

Five Star Marine[®] Pile Jacket Grout HP is a three component system consisting of partially filled containers of resin and hardener, and polyethylene lined bags of aggregate and is available in a unit yielding approximately 1.75 cubic feet (49.6 liters) of hardened material.

Shelf Life

Two years in original unopened packaging when stored in dry conditions; high relative humidity will reduce shelf life.

*TYPICAL PROPERTIES AT 70°F (21°C)				
Compressive Strength (ASTM C 579)**	DRY	WET		
1 Day	2,000 psi (13.8 MPa)	1,200 psi (13.8 MPa)		
7 Days	10,000 psi (68.9 MPa)	5,000 psi (55.3 MPa)		
28 Days	11,500 psi (79.3 MPa)	8,800 psi (61.2 MPa)		
Tensile Strength (ASTM C 307)				
7 Days	2,300 psi (15.9 MPa)	1,500 psi (10.3 MPa)		
Tensile Bond Strength to green concrete (ASTM C 1583)				
28 Days	> 250 psi (1.7 MPa)	> 250 psi (1.7 MPa)		
Bond to Concrete (ASTM C 882)				
7 Days	3,500 psi (24.1 MPa)	1,500 psi (10.3 MPa)		
Linear Shrinkage (ASTM C 531)	0.01%	0.01%		
Water Absorption (ASTM C 413)	0.00%	0.00%		
Working Time at 70°F (21°C)	90 minutes	90 minutes		
Increase in Flexural Strength (ASTM C 78) 1/4 " Layer, 5000 psi concrete	Concrete Control	Concrete with Pile Jacket Epoxy Grout HP		
3" x 3" x 12" Bars	800 psi (5.5 MPa)	2,500 psi (17.2 MPa)		

^{*} The data shown above reflects typical results based on laboratory testing under controlled conditions. Reasonable variations from the data shown may result. Test methods are modified where applicable.

^{**} Materials tested per ASTM C 579 B. Rate of loading 0.25 inches per minute.



Pile Jacket Grout HP

PLACEMENT GUIDELINES

- 1. **SURFACE PREPARATION:** All surfaces to be in contact with Five Star Marine[®] Pile Jacket Grout HP shall be free of marine growth, oil, grease, laitance, and other contaminants. Concrete must be clean, sound, and roughened to ensure a good bond. Exposed steel should be sandblasted and coated with an appropriate anti-corrosion coating.
- 2. MIXING: For optimum performance, all components should be conditioned to between 65°F and 85°F (18°C and 29°C). Pour all of Component A (resin) and all of Component B (hardener) into a mortar mixer (stationary barrel mixer with rotating internal paddles) and mix for approximately 2 ½ minutes. Mix at slow speed to avoid entrapping air in liquids. Follow by adding Component C (aggregate), one bag at a time and mix until all aggregate is completely wetted with liquids. Add Component C (aggregate) immediately after mixing Component A (resin) and Component B (hardener). Do not mix more material than can be placed in 90 minutes.
- METHODS OF PLACEMENT: Five Star Marine[®] Pile Jacket Grout HP may be pumped or poured into place. For vertical flow
 applications simply pour or pump from the top of the opening, or pump into ports. For horizontal applications, pour or pump from one
 side to the other. Contact the Five Star Marine Engineering and Technical Service Center at (800) 338-3145 for pump
 recommendations.
- 4. **Post Placement Procedures:** In-service operation may begin immediately after minimum required grout strength and modulus have been achieved.
- 5. Clean Up: Use a solvent or water and strong detergent solution on tools and equipment before material hardens. Use power washer on pump and mixing equipment. Sand may be used as an abrasive to aid in cleaning.

NOTE: PRIOR TO APPLICATION, READ ALL PRODUCT PACKAGING THOROUGHLY. For more detailed placement procedures, refer to Design-A-Spec[™] installation guidelines or you may call Five Star's Engineering and Technical Service Center at (800) 243-2206.

CONSIDERATIONS

- Minimum application temperature of substrate is 40°F (4°C) and rising.
- Strength gain and flowability are adversely affected by lower temperatures.
- Do not thin with solvents.

CAUTION

Irritant, toxic, strong sensitizer. Contains epoxy resin and amine. This product may cause skin irritation. Do not inhale vapors. Provide adequate ventilation. Protect against contact with skin and eyes. Wear rubber gloves, long sleeve shirt, goggles with side shields. Prior to use, refer to Material Safety Data Sheet.

FIRST AID

Eye Contact: Flush immediately with water for at least 15 minutes. Contact Physician immediately. **Respiratory Problems:** Remove person(s) to fresh air. **Skin Contact**: Remove any contaminated clothing. Remove epoxy immediately with a dry cloth or paper. Solvents should not be used as they carry irritant into the skin. Wash skin thoroughly with soap and water. Cured epoxy resins are innocuous.

For worldwide availability, additional product information and technical support, contact your local sales representative, or you may call Five Star's Engineering and Technical Service Center at (800) 243-2206.

Warranty

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Date Revised: 5/11/2015

Supersedes:

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name(s):	Five Star® Pile Jacket Epoxy Grout / Component A Resin Five Star® Pile Jacket Epoxy Grout LPL / Component A Resin Five Star® Pile Jacket Epoxy Grout HP / Component A Resin
Synonyms:	Epoxy Resin, Component A
Product Use:	Construction and repair of marine structures
Restrictions on Use:	To be used with specific Five Star [®] systems.
Manufacturer/Supplier	Five Star Products, Inc. 750 Commerce Drive Fairfield, CT 06825 USA
Phone #:	203-336-7900
Emergency Phone #:	CHEM-TEL 1-800-255-3924 (Outside the U.S. 1-813-248-0585)

SECTION 2: HAZARD(S) IDENTIFICATION-GHS INFORMATION

Classification:	Skin Irritation, Category 2 Eye Irritation, Category 2A Skin sensitization, Category 1 Acute aquatic toxicity, Category 2 Chronic aquatic toxicity, Category 2
Label Elements/Hazard Pictograms:	
Signal Word:	Warning
Hazard Statements:	Causes skin irritation, H315 May cause an allergic skin reaction, H317 Caused serious eye irritation, H319 Toxic to aquatic life with long lasting effects, H411
Precautionary Statements/Prevention:	Avoid breathing dust/fume/gas/mist/vapors/spray, P261 Wash skin thoroughly after handling, P264 Contaminated work clothing should not be allowed out of the workplace, P272 Avoid release to the environment, P273 Wear protective gloves/eye protection/face protection, P280

FIVE STAD	Safaty Data Shoot	Date Revised: 5/11/2015	
X TIVESIAK	Salety Data Sheet	Supersedes:	
Response:	If in eyes: Rinse cautiously with wa Remove contact lenses, if present P338, P305, P351 If eye irritation p attention/advice, P337, P313	ater for several minutes, P351. and easy to do. Continue rinsing, persists: Get medical	
	If on skin (or hair): Wash with pler	nty of soap and water, P302, P352	
	If swallowed: Rinse mouth. Do NO	T induce vomiting, P330, P331.	
	If skin irritation or rash occurs, P33 P313.	33: Get medical advice/attention,	
	Take of contaminated clothing and	wash before reuse, P362	
	Collect spillate, P391		
	Get medical advice/attention if you	ı feel unwell, P314	
Storage:	Keep container tightly closed and i	n a dry well-ventilated space.	
Disposal:	Dispose of contents/container in ac national, and local laws and regula	ccordance with applicable regional, tions.	
Hazards Not Otherwise Classified:	Not applicable		
Ingredients with Unknown	Not applicable		

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS				
Hazardous Ingredient(s)	Common Name/Synonyms	CAS No.	% wt/wt	
Bisphenol A Diglycidyl Ether Resin Mixture	n/a	25068-38-6	80-90	
C8 and C10 Alkyl Glycidly Ethers	n/a	68609-96-1	10-20	

SECTION 4: FIRST AID MEASURES	
Inhalation:	If inhaled: Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Consult a physician.
Eye Contact:	If in eyes: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Consult a physician.
Skin Contact:	If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower for at least 15 minutes. Immediately call a poison center or doctor if irritation develops. Wash contaminated clothing before reuse.

Toxicity:

Five Star S	afety Data Sheet	Date Revised: 5/11/2015 Supersedes:
Ingestion:	If swallowed: Rinse mouth. Call POIS information. Do NOT induce vomiting or doctor. If vomiting occurs natural reduce the risk of aspiration. Never of unconscious person.	SON CENTER for most current g. Immediately call a poison center ly, have victim lean forward to give anything by mouth to an
General Advice:	In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible). First Aid responders should pay attention to self-protection and use recommended protective clothing (chemical resistant gloves, splash protection).	
Note to Physicians:	Symptoms may not appear immedia	tely. Treat symptomatically.

SECTION 5: FIRE-FIGHTING MEASURES	
Flammability and Explosion Information:	Not available
Sensitivity to Mechanical Impact:	Not available
MEANS OF EXTINCTION	
Suitable Extinguishing Media:	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Unsuitable Extinguishing Media:	Not available
Protection of Firefighters:	Wear self-contained breathing apparatus for fire-fighting if necessary.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures:	Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel. Eliminate all ignition sources.
Personal Precautions:	Use personal protective equipment. Avoid breathing vapors, mist, or gas. Ensure adequate ventilation. When respirators are required, select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.
Environmental Precautions:	Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
Methods for Containment:	Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.
Other Information:	See Section 13 for disposal considerations.



Supersedes:

SECTION 7: HANDLING AND STORAGE Handling: Avoid contact with skin and eyes. Avoid inhalation of vapor or mist. Storage: Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Component	CAS No.	ACGIH	OSHA
Bisphenol A Diglycidyl Ether Resin Mixture	25068-38-6	n/a	n/a
C8 and C10 Alkyl Glycidil Ethers	68609-96-1	n/a	n/a

PEL: Permissible Exposure Limit TLV: Threshold Limit Value

Engineering Controls: Not normally required.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection:	Face shield and safety glasses. Use equipment for eye protection that meets the standards referenced for OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.
Hand Protection:	Wear protective gloves. Rubber or polyethylene material is recommended. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear protective clothing. Clothing with full length sleeves and pants should be worn.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices. Provide readily accessible eye wash stations and safety showers. Wash at end of shift and before eating, smoking, or using the toilet. Remove contaminated clothing and launder or discard.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES	
Appearance:	Clear light amber liquid.
Color:	Light amber.
Odor:	Semi Sweet
Odor Threshold:	N/A
Physical State:	Liquid
pH:	Not available



Date Revised: 5/11/2015

Supersedes:

Melting Point / Freezing Point:	Not available
Initial Boiling Point:	Not available
Boiling Point:	Not available
Flash Point:	93.4 °C, 200 °F Setaflash Closed Cup ASTM D 3828
Evaporation Rate:	N/A
Flammability (solid, gas):	N/A
Lower Flammability Limit:	N/A
Upper Flammability Limit:	N/A
Vapor Pressure:	1.33 mbar
Vapor Density:	1 [Air = 1]
Relative Density:	1.10
Solubility:	Slightly
Partition Coefficient: n-Octanol/Water:	N/A
Auto-ignition Temperature:	Not available.
Decomposition Temperature:	Not available
Viscosity:	1000 cps
Percent Volatile, wt.%:	0%
VOC Content, wt.%:	0%
Density:	N/A
Coefficient of Water/Oil Distribution:	N/A

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability:	Stable under normal conditions.
Hazardous decomposition byproducts:	CO, CO ₂ , smoke, toxic vapors
Conditions to Avoid:	Amine compounds under uncontrolled conditions
Incompatible Materials:	Strong oxidizing agents.

SECTION 11: TOXICOLOGICAL INFORMATION

Acute Toxicity:

Primary Irritant Effect	
On the Skin:	Irritant to skin and mucous membranes.
Primary Irritant Effect	
On the Eye:	Irritating effect.



Date Revised: 5/11/2015

Supersedes:

Swallowing:	Can cause abdominal irritation, nausea, vomiting, and diarrhea.
Additional Toxicological	This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA, or
Information:	ACGIH as of this date, greater or equal to 0.1%

SECTION 12: ECOLOGICAL INFORMATION

Toxicity:	All work practices must be aimed at eliminating environmental contamination.
Aquatic Toxicity:	This material is harmful to the environment.
Persistence and Degradability:	The product is partially biodegradable. Significant residue remains.
Bio-accumulative Potential:	Does not accumulate in organisms.
Mobility in Soil:	No further relevant information available
Ecotoxical Effects Remark:	Toxic for fish. Due to mechanical actions of the product damages may occur. The declared action may be partly caused by lack of oxygen.
Additional Ecological Information	No further relevant information available
General Notes:	No further relevant information available
PBT Assessment:	N/A
vPvB Assessment:	N/A
Other Adverse Effects:	No further relevant information available

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Treatment Methods

Recommendation: The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. Care should be taken when handling emptied containers t h a t have not been cleaned or rinsed out. Empty containers and liners may retain some product residues. Vapor from some product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Processing, use or contamination may change the waste disposal requirements. Do not dispose of on land, in surface waters, or in storm

requirements. Do not dispose of on land, in surface waters, or in storm drains. Waste should be recycled or disposed of in accordance with regulations. Large amounts should be collected for reuse or consigned to licensed hazardous waste haulers for disposal.



Supersedes:

ALL DISPOSAL MUST BE IN ACCORDANCE WITH ALL FEDERAL, STATE, PROVINCIAL, AND LOCALREGULATIONS. IF IN DOUBT, CONTACT PROPER AGENCIES.

Uncleaned Packaging Empty containers may contain residue and may be dangerous. Do not attempt to refill or clean without proper instructions. Empty drums should be drained and stored safely for reconditioning or recycling.

Recommendation: Disposal must be made according to official regulations.

SECTION 14: TRANSPORT INFORMATION **US DEPARTMENT of** NOT REGULATED **TRANSPORTATION (DOT) Proper Shipping Name:** Class: NONE UN #: NONE **Packing Group:** NONE **INTERNATIONAL AIR TRANSPORTATION Proper** UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, NOS Shipping Name (ICAO/IATA): (BISPHENOL-A EPICHLORHYDRIN RESIN), 9, PG III 9 Class: UN #: 3082 **Packing Group:** III WATER TRANSPORTATION **Proper Shipping Name** UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, NOS (IMO/IMDG): (BISPHENOL-A-EPOXY RESIN), 9, PG III 9 Class: UN#: 3082 Packing Group: III **Marine Pollutant:** Bisphenol-A Epichlorhydrin Resin

SECTION 15: REGULATORY INFORMATION

CHEMICAL INVENTORIES	
US (TSCA):	The components of this product are in compliance with the chemical notification requirements of TSCA.
CANADA (DSL):	The components of this product are in compliance with the chemical notification requirements of NSN Regulations under CEPA, 1999.
FEDERAL REGULATIONS	
CANADA:	n/a



Supersedes:

WHMIS Classification:	n/a
UNITED STATES:	This SDS has been prepared to meet the US OSHA Hazard Communication Standard, 29 CFR 1910.1200
SARA Title III:	No components are listed.
STATE REGULATIONS	
Massachusetts	US Massachusetts Commonwealth's Right-to-Know Las (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)
New Jersey	US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)
Pennsylvania	US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)
California California Prop 65:	This product does not contain chemicals known to the State of California to be Carcinogenic.

SECTION 16: OTHER INFORMATION

Disclaimer:

The information contained in this document applies to the specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for one's own particular use.

Date Revised: 1/19/2016



Safety Data Sheet

Supersedes:

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name(s):	Five Star [®] Pile Jacket Grout HP/Component B Hardener
Synonyms:	Pile Jacket HP Hardener
Product Use:	For use with Pile Jacket Epoxy Resin and Pile Jacket Epoxy Grout HP Aggregate
Restrictions on Use:	To be used with specific Five Star [®] systems.
Manufacturer/Supplier	Five Star Products, Inc. 60 Parrot Drive Shelton, CT 06484
Phone #:	203-336-7900
Emergency Phone #:	CHEM-TEL 1-800-255-3924 (Outside the U.S. 1-813-248-0585)

SECTION 2: HAZARD(S) IDENTIFICATION-GHS INFORMATION

Classification:	Acute Toxicity – Oral, Category 4
	Acute Toxicity – Dermal, Category 3
	Skin Corrosion – Category 1
	Eye Damage – Category 1
	Flammable Liquids – Category 4
	Sensitization – Respiratory, Category 1
	Sensitization – Skin, Category 1
Label Elements/Hazard Pictograms:	
Signal Word:	Danger
Hazard Statements:	Harmful if swallowed, H302
	Toxic in contact with skin, H311
	Causes severe skin burns and eye damage, H314
	May cause respiratory irritation, H335
	May cause an allergic skin reaction, H317
Precautionary	Do not breathe dust, fume, gas, mist, vapors, or spray, P260
Statements/Prevention:	Wash thoroughly after handling, P264
	Do not eat, drink or smoke when using this product, P270
	Contaminated work clothing should not be allowed out of the workplace, P272
	Wear protective gloves, protective clothing, eye protection and face protection, P280

Wear respiratory protection, P284


Date Revised: 1/19/2016

Supersedes:

Response:	If swallowed: Rinse mouth. Do NOT induce vomiting, P330, P331.
	If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower, P361, P353.
	If inhaled: Remove person to fresh air and keep comfortable for breathing, P340.
	If in eyes: Rinse cautiously with water for several minutes, P351. Remove contact lenses, if present and easy to do. Continue rinsing, P338.
	Immediately call a poison center or doctor, P310.
	If skin irritation or rash occurs, P333: Get medical advice/attention, P313.
	If experiencing respiratory symptoms, P342: Call a poison center or doctor, P310. Wash contaminated clothing before reuse, P363.
Storage:	Store locked up.
Disposal:	Dispose of contents/container in accordance with applicable regional, national, and local laws and regulations.
Hazards Not Otherwise Classified:	Not applicable
Ingredients with Unknown Toxicity:	70% of this product mixture consists of ingredients of unknown acute toxicity.

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS			
Hazardous Ingredient(s)	Common Name/Synonyms	CAS No.	% wt/wt
Aromatic Alcohol	Not Applicable	Trade Secret	10-30
Aliphatic Amine	Not Applicable	Trade Secret	60-90
Amine Catalyst	Not Applicable	Trade Secret	0-15

SECTION 4: FIRST AID MEASURES		
Inhalation:	If inhaled: Remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a poison center or doctor.	
	Acute and delayed symptoms and effects: May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause respiratory irritation. Signs/symptoms may include burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema.	
Eye Contact:	If in eyes: Rinse cautiously with water for at least 30 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.	

Five Star
Five Star

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	Acute and delayed symptoms and effects: Causes serious eye damage. Signs/symptoms may include cloudy appearance of the cornea, chemical burns, severe pain, tearing, ulcerations, significantly impaired vision or complete loss of vision.
Skin Contact:	If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower for at least 15 minutes. Immediately call a poison center or doctor. Wash contaminated clothing before reuse.
	Acute and delayed symptoms and effects: Toxic in contact with skin. May cause an allergic skin reaction. Causes severe skin burns. Signs/symptoms may include localized redness, swelling, itching, intense pain, and blistering, ulceration, and tissue destruction.
Ingestion:	If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Never give anything by mouth to an unconscious person.
	Acute and delayed symptoms and effects: Harmful if swallowed. Causes burns to nose, mouth, throat, and digestive tract. Signs/symptoms may include severe mouth, throat and abdominal pain, nausea, vomiting, and diarrhea, blood in the feces and/or vomitus may also be seen.
General Advice:	In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible). First Aid responders should pay attention to self-protection and use recommended protective clothing (chemical resistant gloves, splash protection).
Note to Physicians:	Symptoms may not appear immediately. Treat symptomatically.

SECTION 5: FIRE-FIGHTING MEASURES		
Flammability and Explosion Information:	Flammable or combustible by OSHA/WHMIS criteria.	
Sensitivity to Mechanical Impact:	This material is not sensitive to mechanical impact.	
MEANS OF EXTINCTION		
Suitable Extinguishing Media: Small Fire: Dry chemical, CO2 or water spray.		
	Large Fire: Dry chemical, CO2, alcohol-resistant foam or water spray. Move containers from fire area if you can do it without risk. Dike fire- control water for later disposal; do not scatter the material.	
Unsuitable Extinguishing Media:	Not available	
Products of Combustion:	Oxides of carbon, oxides of nitrogen, ammonia	
Protection of Firefighters:	TOXIC; inhalation, ingestion or skin contact with material may cause severe injury or death. Contact with molten substance may cause severe burns to skin and eyes. Avoid any skin contact. Effects of	

SECTION 5: FIRE-FIGHTING MEASURES



Date Revised: 1/19/2016

Supersedes:

contact or inhalation may be delayed. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution. Wear positive pressure self- contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures:	As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet). Stay upwind. Keep out of low areas. Ventilate enclosed areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
Personal Precautions:	Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Use personal protection recommended in Section 8.
Environmental Precautions:	Prevent entry into waterways, sewers, basements or confined areas.
Methods for Containment:	Stop leak if you can do it without risk.
Methods for Clean-Up:	Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
Other Information:	See Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

Handling:	Do not swallow. Do not breathe mist, vapors, or spray. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Contaminated work clothing should not be allowed out of the workplace. See Section 8 for information on Personal Protective Equipment.
Storage:	Store locked up. Store away from incompatible Materials. See Section 10 for information on Incompatible Materials. Keep out of the reach of children.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Component	CAS No.	ACGIH	OSHA
Aromatic Alcohol	Trade Secret	No TLV Established	No PEL Established
Aliphatic Amine	Trade Secret	No TLV Established	No PEL Established



Date Revised: 1/19/2016

Supersedes:

Amine Catalyst	Trade Secret	No TLV Established	No PEL Established
PEL: Permissible Exposure Limit TLV: Threshold Limit Value			
Engineering Controls:	Not normally requ	uired.	
PERSONAL PROTECTIVE E	QUIPMENT (PPE)		
Eye/Face Protection:	Wear chemical sa eyewash stations location. Use equ referenced for OS Protective Equipn	Wear chemical safety goggles and full face shield. Ensure that eyewash stations and safety showers are close to the workstation location. Use equipment for eye protection that meets the standards referenced for OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.	
Hand Protection:	Wear protective <u>c</u> recommended. Co information.	gloves. Rubber or polyethyle onsult manufacturer specific	ne material is ations for further
Skin and Body Protection	Wear protective of should be worn.	clothing. Clothing with full le	ngth sleeves and pants
Respiratory Protection:	Wear respiratory not sufficient to c appropriate NIOS organic vapor car sued when oxyge exceed the limits	protection. If engineering control exposure to below th H/MSHA approved air-purify tridge, or self-contained breen concentrations are low or of the air-purifying respirat	ontrols and ventilation are e allowable limits then an ying respirator with eathing apparatus must be if airborne concentrations ors.
General Hygiene Considerations:	Handle according practices.	to established industrial hy	giene and safety

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES		
Appearance:	Liquid	
Color:	Light yellow to amber	
Odor:	Slight ammoniacal	
Odor Threshold:	Not Available	
Physical State:	Liquid	
pH:	Not Applicable; Alkaline – 10% solution 10-12	
Melting Point / Freezing Point:	Not Available	
Initial Boiling Point:	Not Available	
Boiling Point:	Not Available	
Flash Point:	76°C (169°F) Closed Cup	
Evaporation Rate:	Not Applicable	
Flammability (solid, gas):	Not Applicable	
Lower Flammability Limit:	Not Applicable	



Supersedes:

Upper Flammability Limit:	Not Applicable
Vapor Pressure:	Not Available
Vapor Density:	Not Available
Relative Density:	1.01
Solubility:	Partial
Partition Coefficient: n-Octanol/Water:	Not Available
Auto-ignition Temperature:	300°C (572°F)
Decomposition Temperature:	>150°C (>302°F)
Viscosity:	700-2000 cps
Percent Volatile, wt.%:	0
VOC Content, wt.%:	0
Density:	1.01 g/cc
Coefficient of Water/Oil Distribution:	Not Available

SECTION 10: STABILITY AND REACTIVITY		
Chemical Stability:	Stable under normal conditions.	
Hazardous decomposition byproducts:	Hazardous polymerization may occur.	
Conditions to Avoid:	Can auto-ignite in air at approximately 572°F (300°C)	
Incompatible Materials:	Epoxy resins under uncontrolled conditions, acid, oxidizing material, halogenated, organic compounds.	

SECTION 11: TOXICOLOGICAL INFORMATION

Acute Toxicity:	LD50 Oral >2000 mg/kg (rat) LD50 Dermal >2000 mg/kg (rabbit)
Primary Irritant Effect On the Skin:	Irritant to skin and mucous membranes.
Primary Irritant Effect On the Eye:	Irritating effect.
Swallowing:	Can cause abdominal irritation, nausea, vomiting, and diarrhea.
Additional Toxicological Information:	This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA, or ACGIH as of this date, greater or equal to 0.1%



Supersedes:

SECTION 12: ECOLOGICAL INFORMATION

Toxicity:	All work practices must be aimed at eliminating environmental contamination.				
Aquatic Toxicity:	This material is harmful to the environment in unreacted form.				
Persistence and Degradability:	The product is partially biodegradable. Significant residue remains.				
Bio-accumulative Potential:	Does not accumulate in organisms.				
Mobility in Soil:	No further relevant information available				
Ecotoxical Effects Remark:	No known significant effects or critical hazards.				
Additional Ecological Information:	No further relevant information available				
General Notes:	No further relevant information available				
PBT Assessment:	N/A				
vPvB Assessment:	N/A				
Other Adverse Effects:	No further relevant information available				

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Treatment Methods

Recommendation:	The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.
	Care should be taken when handling emptied containers t h a t have not been cleaned or rinsed out. Empty containers and liners may retain some product residues. Vapor from some product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
	Processing, use or contamination may change the waste disposal requirements. Do not dispose of on land, in surface waters, or in storm drains. Waste should be recycled or disposed of in accordance with regulations. Large amounts should be collected for reuse or consigned to licensed hazardous waste haulers for disposal.
	ALL DISPOSAL MUST BE IN ACCORDANCE WITH ALL FEDERAL, STATE, PROVINCIAL, AND LOCAL REGULATIONS. I F IN DOUBT, CONTACT PROPER AGENCIES.
Uncleaned Packaging:	Empty containers may contain residue and may be dangerous. Do not attempt to refill or clean without proper instructions. Empty drums should be drained and stored safely for reconditioning or recycling.



Date Revised: 1/19/2016

Supersedes:

Recommendation:

Disposal must be made according to official regulations.

SECTION 14: TRANSPORT INFO	RMATION
US DEPARTMENT of TRANSPORTATION (DOT) Proper Shipping Name:	Amines, liquid, corrosive, n.o.s. (aliphatic amines, aromatic amine)
Class:	8
UN #:	UN2735
Packing Group:	II
CANADA Transportation of Dangerous Goods (TDG) Proper Shipping Name:	Amines, liquid, corrosive, n.o.s. (aliphatic amines, aromatic amine)
Class:	8
UN #:	UN2735
Packing Group:	II
Air Transport (ICAO- IATA/DGR) Proper Shipping Name:	Amines, liquid, corrosive, N.O.S. (aliphatic amines, aromatic amine)
Class:	8
UN #:	UN2735
Packing Group:	II
Sea Transport (IMDG- Code/GGVSee) Proper Shipping Name:	Amines, liquid, corrosive, N.O.S. (aliphatic amines, aromatic amine)
UN #:	UN2735
Class:	8
Packing Group:	II
Marine Pollutant:	Yes
Special Provision(s):	None

SECTION 15: REGULATORY INFORMATION

CHEMICAL INVENTORIES

US (TSCA):	The components of this product are in compliance with the chemical notification requirements of TSCA.
CANADA (DSL):	The components of this product are in compliance with the chemical notification requirements of NSN Regulations under CEPA, 1999.



Date Revised: 1/19/2016

Supersedes:

FEDERAL REGULATIONS							
CANADA:	At least one c	omponen	t is not liste	ed.			
WHMIS Classification:	Class B-3 Combustible liquid (flash point 100°F – 200°F) Class D-2B Material causing other toxic effects Class E Corrosive Material						
UNITED STATES:	This SDS has been prepared to meet the US OSHA Hazard Communication Standard, 29 CFR 1910.1200						
SARA Title III:	No components are listed.						
STATE REGULATIONS							
US STATE Right to Know Regulations	Chemical Name	ΓN	MA	ΡΑ	IL	RI	
	Aromatic Alcohol	x		x			
California	This product of	does not c	ontain chei	micals kno	own to the	e State of C	alifornia

SECTION 16: OTHER INFORMATION				
HMIS (Hazardous Material	Health	Flammability	Reactivity	Personal Protection
Information System:	3	2	0	В
Disclaimer:	This information implied. Fi recommendation	on is furnished with ve Star Products ions in this docume	nout warranty c s, Inc. bases ent on data be	of any kind, expressed or the information and lieved to be current and

accurate.



Date Revised: 3/3/2016

Supersedes: 2/1/2016

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name(s):	Five Star [®] DP Epoxy Grout / Component C Aggregate Five Star [®] DP Epoxy Grout PG / Component C Aggregate Five Star [®] DP Epoxy Grout High Flow / Component C Aggregate Five Star [®] Elastomeric Grout / Component C Aggregate Five Star [®] Epoxy Grout N / Component C Aggregate Five Star [®] Epoxy Grout Red N / Component C Aggregate Five Star [®] Epoxy Novolac Grout / Component C Aggregate Five Star [®] Epoxy Novolac Grout / Component C Aggregate Five Star [®] Pile Jacket Epoxy Grout HP/Component C Aggregate Five Star [®] HP Epoxy Grout / Component C Aggregate Five Star [®] RailForm [™] HPG / Component C Aggregate Five Star [®] Rapid Epoxy Grout /Component C Aggregate Five Star [®] Rapid Epoxy Grout / Component C Aggregate Five Star [®] Rapid Surface Repair Easy Mix/Component C Aggregate Five Star [®] SP Epoxy Grout / Component C Aggregate Five Star [®] SP Epoxy Grout / Component C Aggregate
Synonyms:	Aggregate, Component C
Product Use:	Aggregate for reactive polymer construction products. Designed for use with appropriate hardener and resin.
Restrictions on Use:	N/A
Manufacturer/Supplier	Five Star Products, Inc. 60 Parrott Drive Shelton, CT 06484 USA
Phone #:	203-336-7900
Emergency Phone #:	CHEM-TEL 1-800-255-3924 (Outside the U.S. 1-813-248-0585)

SECTION 2: HAZARD(S) IDENTIFICATION-GHS INFORMATION

Classification:	Eye Damage/Irritation – Category 1				
	Sensitization – Respiratory, Category 1				
	Carcinogenicity – Category 1A				
	Specific Target Organ Systemic Toxicity (Single Exposure) – Cat 3				
	Specific Target Organ Toxicity (Repeated Exposure) – Cat 2				
Label Flomente (Harard					

Label Elements/Hazard Pictograms:



Signal Word:

Warning



Hazard Statements:	Harmful if swallowed H302 May cause respiratory irritation H335 May cause cancer by inhalation H350 May cause damage to organs through prolonged or repeat exposure H373
Precautionary Statements/Prevention:	Do not breathe dust, fume, gas, mist, vapors, or spray, P260. Wash thoroughly after handling, P264. Wear protective gloves, protective clothing, eye protection and face protection, P280. Wear respiratory protection, P284.
Response:	If swallowed: Rinse mouth. Do NOT induce vomiting, P330, P331. If inhaled: Remove person to fresh air and keep comfortable for breathing, P340. If in eyes: Rinse cautiously with water for several minutes, P351. Remove contact lenses, if present and easy to do. Continue rinsing, P338. Immediately call a poison center or doctor, P310. If skin irritation or rash occurs, P333: Get medical advice/attention, P313. If experiencing respiratory symptoms, P342: Call a poison center or doctor, P310. Wash contaminated clothing before reuse, P363.
Storage:	Store locked up.
Disposal:	Dispose of contents/container in accordance with applicable regional, national, and local laws and regulations.

Hazards Not Otherwise	
Classified:	Not applicable

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS			
Hazardous Ingredient(s)	Common Name/Synonyms	CAS No.	% wt/wt
Quartz	Silicon Dioxide, Silica Sand, Crystalline Silica	14808-60-7	65-90
Amorphous Silica Mixture	n/a	TS	10-35

SECTION 4: FIRST AID MEASURES

Inhalation:

If inhaled: Remove person to fresh air and keep comfortable for breathing.

If experiencing respiratory symptoms call poison center or doctor.



Date Revised: 3/3/2016

Supersedes: 2/1/2016

Eye Contact:	If in eyes: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Skin Contact:	Wash skin thoroughly.
Ingestion:	If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Never give anything by mouth to an unconscious person.
General Advice:	In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).
Note to Physicians:	Symptoms may not appear immediately. Treat symptomatically.

SECTION 5: FIRE-FIGHTING MEASURES		
Flammability and Explosion Information:	Not flammable or combustible by OSHA/WHMIS criteria.	
Sensitivity to Mechanical Impact:	This material is not sensitive to mechanical impact.	
Sensitivity to Static Discharge:	This material is not sensitive to static discharge.	
MEANS OF EXTINCTION		
Suitable Extinguishing Media:	Small Fire: Dry chemical, CO2, or water spray. Large Fire: Dry chemical, CO2, alcohol-resistant foam or water spray. Move containers from fire area if you can do it without risk. Dike fire- control water for later disposal; do not scatter the material.	
Unsuitable Extinguishing Media:	Not available	
Product of Combustion:	Non-combustible	
Protection of Firefighters:	As in any fire, wear self-contained breathing apparatus pressure- demand, MSHA/NIOSH (approved or equivalent) and full protective gear.	

SECTION 6: ACCIDENTAL RELEASE MEASURES		
Emergency Procedures:	Use personal protective equipment. Ensure adequate ventilation. Keep people from spill. Avoid dust formation.	
Personal Precautions:	Avoid inhalation of dust. Do not get into eyes, on skin, or clothing.	
Environmental Precautions:	The environmental impact of this product has not been fully investigated.	



Date Revised: 3/3/2016

Supersedes: 2/1/2016

Methods for Containment:	Cover powder spill with plastic sheet or tarp to minimize spreading. Collect this material into a disposal container by sucking or sweeping up.
Methods for Cleanup:	Pick up and transfer to properly labeled containers.
Other Information:	See Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE	
Handling:	Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Do not breathe dust. Prevent contact with skin, eyes, and clothing. Wash thoroughly after handling.
Storage:	Keep containers tightly closed in a cool, dry, and well-ventilated place. Store locked up.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Component	CAS No.	ACGIH TLV	OSHA PEL
Quartz	14808-60-7	TWA: 0.025mg/m ³ respirable fraction	30/(%SiO2+2) mg/m ³ TWA, Total Dust;250/%SiO2+5) mppcf TWA, respirable fraction; 10/(%SiO2+2) mg/m ³ TWA, respirable TWA: 0.1 mg/m ³ (vacated)

PEL: Permissible Exposure Limit TLV: Threshold Limit Value

Engineering Controls: Not normally required.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection:	Tightly fitting safety goggles
Hand Protection:	Impervious gloves. Impervious clothing.
Skin and Body Protection:	Impervious gloves. Impervious clothing.
Respiratory Protection:	If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive- pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.



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Supersedes: 2/1/2016

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES		
Appearance:	Granular Powder	
Color:	Gray, Tan, Pink	
Odor:	None	
Odor Threshold:	None	
Physical State:	Solid, powder	
pH:	1:1 W/O Water=12	
Melting Point / Freezing Point:	n/a	
Initial Boiling Point:	n/a	
Boiling Point:	n/a	
Flash Point:	n/a	
Evaporation Rate:	n/a	
Flammability (solid, gas):	n/a	
Lower Flammability Limit:	n/a	
Upper Flammability Limit:	n/a	
Vapor Pressure:	n/a	
Vapor Density:	n/a	
Relative Density:	2.5-2.8	
Solubility:	Negligible	
Partition Coefficient: n-Octanol/Water:	n/a	
Auto-ignition Temperature:	n/a	
Decomposition Temperature:	n/a	
Viscosity:	n/a	
Percent Volatile, wt.%:	n/a	
VOC Content, wt.%:	n/a	
Density:	n/a	
Coefficient of Water/Oil Distribution:	n/a	

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability:	Stable under recommended storage conditions.
Possibility of Hazardous Reactions:	None under normal processing.
Conditions to Avoid:	Exposure to water – product may harden on contact with water.



Incompatible Materials: Strong acids.

SECTION 11: TOXICOLOGICAL INFORMATION		
Information on likely routes of exposure		
Product information:		
Inhalation:	Irritating to respiratory system. Irritating to mucous membranes.	
Eye contact:	Risk of serious damage to eyes.	
Skin contact:	Irritating to skin. May cause allergic skin reaction.	
Ingestion:	Harmful if swallowed.	
Component information:		
Chemical Name: Quartz	LD50 Oral: 500 mg/kg (Rat) ACGIH: A2 – Suspected Human Carcinogen	
IARC: Group 1 – Carcinogenic to humans OSHA: X-present		

Delayed and immediate effects and also chronic effects from short and long term exposure.

SECTION 12: ECOLOGICAL INFORMATION

Toxicity:

Aquatic Toxicity:	The environmental impact of this product has not been fully investigated.
Persistence and Degradability:	No information available.
Bio-accumulative Potential:	Does not accumulate in organisms
Mobility in Soil:	No further relevant information available
Ecotoxical Effects Remark:	No information available.
Additional Ecological Information:	No information available.
General Notes:	This statement was deduced from products with a similar structure or composition. Due to available data on eliminability/decomposition and bio-accumulation potential prolonged term damage of the environment cannot be excluded. Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system. Poisonous for fish and plankton in water bodies and toxic for aquatic organisms until alkaline pH is neutralized.
PBT Assessment:	N/A
vPvB Assessment:	N/A
Other Adverse Effects:	No further relevant information available



Supersedes: 2/1/2016

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Treatment Methods

Recommendation:	This material as supplied is not a hazardous waste according to Federal regulations (40CFR261). This material could become a hazardous waste if it is mixed with or otherwise comes in contact with a hazardous waste, if chemical additions are made to this material, or if the material is processed or otherwise altered.
Uncleaned Packaging Recommendation:	Disposal must be made according to official regulations. Do not re-use empty containers.

SECTION 14: TRANSPORT INFORMATION

US DEPARTMENT of TRANSPORTATION (DOT)	
Proper Shipping Name:	Not regulated
Class:	None
UN #:	None
Packing Group:	None
CANADA Transportation of Dangerous Goods (TDG) Proper Shinning Name:	Not regulated
	None
	None
Packing Group:	None
Air Transport (ICAO- IATA/DGR) Proper Shipping	None
Name:	Not regulated
Class:	None
UN #:	None
Packing Group:	None
Sea Transport (IMDG- Code/GGVSee) Proper	
Shipping Name:	Not regulated
UN #:	None
Class:	None
Packing Group:	None
Marine Pollutant:	None
Special Provision(s):	None



Date Revised: 3/3/2016

SECTION 15: REGULATORY INFORMATION

CHEMICAL INVENTORIES							
US (TSCA):	The compone notification re-	nts of this quirements	product of TSCA.	are in co	mpliance	with the	chemical
CANADA (DSL):	The compone notification re-	nts of this quirements	product of NSN F	are in co Regulation	ompliance s under C	with the EPA, 1999	chemical
U.S. FEDERAL REGULATIONS	Section 313 or Reauthorization chemicals white and Title 40 or 10	f Title III of on Act of 19 ch are subj f the CFR, F	the Supe 86 (SARA ect to the Part 372.	erfund Am A). This pr e reporting	endments oduct doe J requirem	and s not cont nents of the	ain any e Act
UNITED STATES:	This SDS has been prepared to meet the US OSHA Hazard Communication Standard, 29 CFR 1910.1200						
SARA 311/312 Hazard Categories	Acute health hazard – Yes Chronic Health hazard – Yes Fire Hazard – No Sudden Release of Pressure – No Reactive Hazard - No						
US STATE Right to Know Regulations	Chemical Name	Ŋ	MA	ΡΑ	IL	RI	
	Quartz	X	X	X		X	
California California Prop 65:	This product c Chemical Nam	contains the ne: Quartz	following CAS-No:) Propositi 14808-60	on 65 che I-7 CA Pro	micals. p. 65: Car	cinogen

SECTION 16: OTHER INFORMATION				
HMIS Rating:	Health	Flammability	Physical Hazard	Personal Protection
	1	0	0	E
Disclaimer:	This inforn	nation is furnishe	d without warranty o	f any kind, expressed or

This information is furnished without warranty of any kind, expressed or implied. Five Star Products, Inc. bases the information and recommendations in this document on data believed to be current and accurate.



FIVE STAR MARINE, INC.

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DESIGN A SPEC GUIDELINES FIVE STAR PILE JACKET GROUT HP

CONTENTS

PART A - GENERAL CONDITIONS
PART B - MATERIAL SPECIFICATIONS
PART C -PREPARATION
PART D - APPLICATION
PART E - FINISHING AND CURING

This document is provided as a general guideline for consideration by contractors and engineers. While every reasonable effort has been made to ensure that this information is accurate and authoritative, Five Star Marine does not warrant the accuracy or completeness of this information or for its appropriateness for any particular purpose. The user of this document remains solely responsible for the specification of all methods, materials and practices.

PART A - GENERAL CONDITIONS

1.01 SCOPE

The work covered by this document consists of furnishing all materials and performing all operations required for pile repair / encapsulation using fiberglass pile jackets and moisture insensitive epoxy grout.

If it is determined that structural repairs to the pile are needed they must be performed in conjunction with the repairs described in this document. These repairs can include, but are not limited to, chipping out loose concrete, exposing rebar, cleaning rebar, replacing or adding rebar and filling the repaired area with grout.

1.02 QUALITY ASSURANCE

The manufacturer shall be ISO 9001 certified and have a 15 year history of use in the manufacture of epoxy grout systems. The manufacturer shall provide on site technical service at no cost to the engineer or contractor when sufficient advance notice is provided.

1.03 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered to the jobsite in their original, unopened packages, clearly labeled with the product identification, printed instructions and batch code.
- B. Store and condition the fiberglass jackets and pile jacket grout at 60°F to 80°F (16°C to 27°C) for at least 24 hours prior to use. Refer to the product data sheet for more information.
- C. For handling instructions, refer to the Material Safety Data Sheet.

1.04 PROJECT / SITE CONDITIONS

A. Refer to Part C – PREPARATION, ENVIRONMENTAL CONDITIONS, or contact the manufacturer directly for any physical or environmental limitations required by the product.

1.05 MEASURMENT AND PAYMENT

- **A.** Measurement for pile repair / encapsulation shall be on a linear foot / cubic foot basis of material in place.
- **B.** Payment for pile repair / encapsulation shall be at the unit price bid on a linear foot/cubic foot basis. This payment shall constitute full compensation for all labor, materials, tools, equipment and other items as necessary to complete the work bid. Progress payments may be made on the percentage of work satisfactorily completed during each payment period in accordance with the contract provisions.

PART B - MATERIAL SPECIFICATIONS

2.01 MATERIALS (EPOXY GROUT)

- A. The pile encapsulation epoxy grout material shall be 100% solids, premeasured, prepackaged epoxy system containing thermosetting epoxy resins, expansive additives and inert fillers. The material shall be nonshrink and suitable for placement underwater via pouring or pumping. The manufacturer shall have at least 10 years experience in the manufacture of epoxy grout systems and be ISO 9001 certified. The manufacturer shall offer technical services and provide a representative at the job site for product training prior to product installation.
- B. The pile repair / encapsulation material shall meet the following performance criteria:

1.	Compressive Strengt ASTM C 579 B	th,
	1 Day 7 Days 28 Days	psi (MPa) 2000 (13.8) 10,000 (69.0) 11,500 (79.3)
2.	Tensile Strength, ASTM C 307	2300 (15.9)
3.	Bond to Concrete, ASTM C 882	3500 (24.1)
4.	Linear Shrinkage ASTM C 531	0.00%
5.	Water Absorption ASTM C 413	0.0%
6.	Working Time	90 minutes

C. An acceptable product that meets this criteria is:

Five Star Pile Jacket Grout HP

As manufactured by Five Star Marine, Inc. Fairfield CT 06825

2.02 AGGREGATE REDUCTION

Do not reduce aggregate loading beyond manufacturer's recommendations.

2.03 CLEARANCES

A. The grout shall be placed from $\frac{1}{2}$ to 6 inches (12 mm to 150 mm) around piles when used with a jacket retainer system.

B. The maximum annular area of grout around piles shall be 6 inches.

2.01 MATERIALS (PILE JACKET)

- **A.** The pile jacket shall consist of a fiberglass mat woven in a polyester resin matrix. Wall thickness of jacket shall be 1/8 inch unless otherwise specified. Jacket closures shall be tongue and groove. The manufacturer shall have at least 10 years experience in the manufacture of fiberglass jackets. The manufacturer shall offer technical services and provide a representative at the job site for product training prior to product installation.
- **B.** The fiberglass jacket shall meet all the following typical performance criteria:

1. Flexural Strength ASTM D 790	40,000 psi (275.8 MPa)
2. Flexural Modulus ASTM D 790	1.4 x 10 ⁶ psi (9,931 MPa)
3. Ultimate Tensile Strength ASTM D 638	21,000 psi (145 MPa)
4. Tensile Modulus ASTM D 638	1.7 x 10 ⁶ psi (11,724 MPa)
5. Water Absorption ASTM D 570	0.09%
6. Barcol Hardness	50
7. UV Resistance ASTM G 153 500 hours	No chipping, flaking or peeling

C. An acceptable product that meets this criteria is:

Five Star Marine Pile Form F

As manufactured by Five Star Marine, Fairfield CT 06825



Diagram A: Examples of pile jackets



Diagram B: Tongue and Grove Joint Detail

PART C – PREPARATION

3.01 CONCRETE SURFACES

- A. Completely remove all loose, delaminated and weak concrete, oil, grease, laitance, marine growth and other contaminants. Prepare concrete using acceptable mechanical means and concrete cleaners and degreasers as necessary to obtain clean, sound and rough surfaces. Coarse aggregate shall be exposed.
- B. All cracks shall be brought to the attention of the engineer and a determination made of whether the cracks are subject to movement. The cracks shall be repaired as directed prior to installation of fiberglass jacket and epoxy grout.
- C. For more detailed information, refer to the following publication: "Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion", Guideline No. 03730, prepared by the Technical Guidelines Committee of ICRI, March 1995.

3.02 REINFORCEMENT

A. All reinforcing steel that has lost bond with the concrete or has more than one-half of its circumference exposed shall be undercut by at least 3/4 inch (18 mm) or two times the maximum aggregate size.



Diagram D: Reinforcement Profile Example

- B. If more than 20% of the diameter of a reinforcing bar has been deteriorated, the bar may require replacement or will need to be spliced as directed by the engineer.
- C. All reinforcement shall be rigidly secured and supported.
- D. All exposed reinforcing steel shall be free of all loose scale, rust, oxidation and other contaminants. Blast steel to an SSPC SP6 commercial finish or better. Exposed

reinforcing steel may be sealed or primed if a delay occurs between surface preparation and epoxy grout placement.

3.03 JACKET PLACEMENT

- A. One piece jackets are typically full circle and will fully cover the pile. Two piece jackets are typically used on square or H piles. Spacers / stand offs inside jackets are placed at regular intervals to provide the maximum support and maintain the annular space between the jacket and the pile. Spacers / standoffs may be pre-molded into jackets or a applied at job site. Spacers can be made of wood, plastic or metal. When placing spacers, use a fast setting epoxy adhesive suitable for exposure to water such as Five Star RS Anchor Gel.
- B. For pumping applications, secure suitable pump ports to jacket. Mount port approximately 12 inches from the bottom of the pile. Additional ports may be needed for jacket lengths over 5 feet. Where necessary, place a additional port approximately three feet above the first port and 180° opposite the first port. If additional ports are needed alternate the placement 180° from the previous port and three feet above.
- C. Piles should be cleaned with a high pressure water jet blast to remove all loose material and marine growth.
- A. Use a sealing compound to fill the groove side of the opening. Five Star RS Anchor Gel is an excellent rapid setting epoxy gel adhesive that can be used to seal the tongue and groove joint. RS Anchor Gel is packaged in a dual cartridge system with a static mixer tip. Insert the mixer tube into the groove and inject a generous amount of epoxy in the entire length of the groove. Hold the jacket up right next to the pile. Pull open the jacket and slip it around the pile. Allow the tongue to slip into the groove. Position the jacket to cover the area desired. Press the jacket closed and the tongue into the groove as far as it will go. Use ratcheting straps around the jacket to secure it.
- B. Wooden braces, battens or strong backs, should be placed on the outside of the jacket to prevent bulging. Use 2 x 4 or 2 x 6 that is about the same length as the jacket and attach one with screws to the middle of each jacket face. Place straps 12 to 18 inches apart vertically and around the braces to insure that the jacket is secure. When the jacket is in position and the straps tight use stainless steel self drilling/tapping screws to secure the tongue and groove joint. Locate the screws so that they go through both sides of the groove and the tongue. Use screws that are long enough to penetrate the jacket but not long enough to extend to the pile itself. Place screws three to six inches apart for the entire length of the jacket.

3.04 JACKET SEALING

A. Pile jackets need a seal at the bottom of the jacket to prevent the grout from leaking out of the bottom of the jacket. The choice of bottom seal can be determined by environmental restrictions, owner preference or contractor experience. The most common types include closed foam strips, oakum and resin, nylon retainers and epoxy packing. Depending on the type used it will be put in place before or after the positioning of the jacket around the pile.

- B. Foam strips should be placed around the interior bottom of the jacket before the jacket is placed around the pile. The foam should be of sufficient height and thickness to form a tight seal. Foam should be three to four times the thickness of the annular space and three to five inches in height. Be sure that the ends of the strips overlap when in place to prevent leaks. Secure the bottom seal with stainless steel strapping or nylon ratchet straps.
- C. Oakum is placed after the jacket is in place and secured to the pile. Oakum can be used alone or with an expanding resin. The oakum alone or with the resin should be packed up into the jacket annular space to insure a full seal. The resin will expand upon contact with water and completely fill the annular space at the bottom of the jacket. Working time of the oakum-resin is about five minutes.
- D. Jackets can also be sealed with an integral nylon sleeve. This sleeve is molded into the bottom of the jacket at the time of manufacture of the jacket. It has a water tight zipper closure and is attached to the pile below the jacket with stainless steel straps or nylon zip strapping.

3.05 MIXING

Mortar Mixer (Stationary Barrel Mixer with Moving Paddles)

- A. Provide an adequate number of mortar mixers in good operating condition for uninterrupted placement. Do not exceed one-half the maximum capacity of the mortar mixer. A concrete mixer (spinning barrel mixer) is not recommended for mixing epoxy grout.
- B. Pour all Component B (hardener) into the pail containing Component A (resin). Mix thoroughly for 2 minutes by hand with paddle or slow speed mixer to avoid air entrapment. Pour mixed liquids into the mortar mixer. While mixing, slowly Component C (aggregate) and mix until aggregate is completely wet.
- C. Do not mix more material than can be placed within the working time of the grout.
- D. Pour the mixed grout into a suitable wheelbarrow or carrier to transport it to the work site.

4.01 APPLICATION

Pumping

- A. A peristaltic type pump is recommended for pumping epoxy grout. When using any other type of pump, consult epoxy grout manufacturer first to ensure the epoxy grout is pumpable with another type of pump.
- B. Prime pump and lines with a suitable primer that will not contaminate epoxy grout. Ensure material used for priming is discarded and not used for jacket filling.

- D. Attach the pump hose to the bottom port and commence pumping. For tremie pumping, insert hose into jacket to bottom and commence pumping. Keep pump hose submerged in epoxy grout and slowly raise pump hose as jacket fills with epoxy grout.
- E. When the grout in the jacket rises to the level of the next port stop the pump, remove the hose and close the port with a plug. Then attach the hose to the next higher port and continue pumping. Repeat this until the jacket is full of grout.
- F. When the jacket is full, the top of the jacket can be topped off with additional grout placed by hand or by a later placement of a suitable marine mastic such as Five Star Splash Zone.
- G. Do not mix more material than can be placed within the working time of the grout.
- H. All tools and equipment may be cleaned with high pressure water and a strong detergent prior to hardening. Sand may be used as an abrasive to aid clean up.

Pouring

- A. Use a headbox or ramp at top of jacket opening to facilitate pouring of epoxy grout into jacket.
- B. Mixing and pouring of epoxy grout should be a continuous process to minimize air entrapment. Headbox or ramp used for pouring may be moved or alternated from side to side to also help reduce air entrapment.
- C. Continue pouring epoxy grout until jacket is full. Grout level may be topped off using additional material placed by hand or by a later placement of a suitable marine mastic such as Five Star Splash Zone.
- D. Do not mix more material than can be placed in the working time of the epoxy grout.
- E. All tools and equipment may be cleaned with high pressure water and a strong detergent prior to hardening. Sand may be used as an abrasive to aid clean up.

PART E – FINISHING AND CURING

5.01 FINISHING

- A. Prior to hardening, epoxy grout can be finished with a solvent wiped steel trowel. Maintaining a sufficient solvent coat is important as epoxy grout will adhere to a dry trowel.
- B. Epoxy grouts cannot be trimmed after set except by mechanical means. Final level in the forms should be brought to the finished elevation before curing.

5.02 CURING

A. Protect the grout from temperatures below 40°F (4°C) for 24 hours or until required minimum compressive strength is achieved.

Warranty

Five Star Marine warrants that at the time and place we make shipment, our materials will be of good quality and will conform to our published specifications in force on the date of acceptance of the order. THE FOREGOING WARRANTY SHALL BE EXCLUSIVE AND IN LIEU OF ANY OTHER WARRANTY, EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL OTHER WARRANTIES OTHERWISE ARISING BY OPERATION OF LAW, COURSE OF DEALING, CUSTOM OR TRADE OR OTHERWISE. As the exclusive remedy for breach of this Warranty, we will replace defective materials, provided, however, that the buyer examines the materials when received and promptly notify in writing of any defect before the materials are used or incorporated into a structure. Twelve (12) months after Five Star® Marine, Inc. has shipped the materials, all our Warranty and other duties with respect to the quality of the materials delivered shall conclusively be presumed to have been satisfied, all liability therefore terminates, and not acting for breach of any duties may thereafter commence. Five Star® Marine, Inc. shall in no event be liable for consequential damages. Unless otherwise agreed to in writing, no warranty is made with respect to materials not made by Five Star® Marine, Inc. We cannot warranty or in any way guarantee any particular method of use of application or the performance of materials under any particular condition. Neither this Warranty nor our liability may be extended or amended by our sales people, distributors or representatives or by any sales information or drawings.



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A FIVE STAR[®] PRODUCTS, INC. AFFILIATE R.42110



STRUCTURAL CONCRETE® UNDERWATER HAND PACK

Hand Applied, Rapid Strength Underwater Repair

Underwater repair of concrete piles, piers, seawalls and marine

PRODUCT DESCRIPTION

Five Star Structural Concrete[®] Underwater Hand Pack is a rapid strength gain, single component, permanent concrete repair material intended for underwater application by hand or trowel. This concrete repair material allows small volume hand placements with minimal underwater washout. Designed for placement in tidal zones and underwater, application thickness may range from one-half inch (13 mm) to several inches in a single installation. Five Star Structural Concrete[®] Underwater Hand Pack provides corrosion protection of steel reinforced structures with migrating corrosion inhibitor technology and very low chloride ion permeability.

ADVANTAGES

- Rapid set underwater placement
- Minimal washout
- Saltwater resistant
- Chloride and sulfate resistant

High early strength

structures

- Variable application thickness
- One component for reliability and ease of use
- Migrating corrosion inhibitor technology

<u>USES</u>

- Underwater repair of concrete tanks, dams and hydraulic structures
- Filling underwater concrete cavities and voids

PACKAGING AND YIELD

Five Star Structural Concrete[®] Underwater Hand Pack is packaged in heavy-duty polyethylene lined bags or plastic pails and is available in 36 lb. (16.3 kg) units yielding approximately 0.35 cubic feet (9.9 liters) at maximum water.

SHELF LIFE

One year in original unopened packaging when stored in dry conditions; high relative humidity will reduce shelf life.

TY	PICAL PROPERTIES AT 70°F (21°C)	
Compressive Strength, ASTM C 109		
3 Hours	3,000 psi (20.7 MPa)	
1 Day	4,000 psi (27.6 MPa)	
7 Days	5,000 psi (34.5 MPa)	
28 Days	5,500 psi (37.9 MPa)	
Underwater Bond Strength, ASTM C 882		
7 Days	1,150 psi (7.9 MPa)	
Length Change, ASTM C 157		
28 Days Wet	+0.02%	
Working Time at 70°F (21°C)	10 minutes	

PLACEMENT GUIDELINES

- SURFACE PREPARATION: All horizontal and vertical concrete surfaces in contact with Five Star Structural Concrete[®] Underwater Hand Pack shall be free of marine growth, laitance, and other contaminants. All horizontal and vertical concrete surfaces must be clean, sound and rough to ensure a good bond. Presoak concrete surfaces in tidal zone areas. A perimeter edge and minimum depth of 1/2 inch (13 mm) should be provided for a durable repair. Featheredging is not desirable. Repair surfaces shall be between 45°F and 90°F (7°C and 32°C) at time of placement. For cold and hot weather placement refer to Five Star[®] Design-A-Spec[™] or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.
- 2. MIXING: Five Star Structural Concrete[®] Underwater Hand Pack is designed for small volume underwater repairs. Mix thoroughly with a drill and paddle mixer to a uniform consistency. Start by adding the minimum amount of potable water followed by repair material and mix for two to three minutes. Adjust consistency as necessary. Do not mix more material than can be placed in 10 minutes.
- 3. PLACEMENT PROCEDURES: Firmly work Five Star Structural Concrete[®] Underwater Hand Pack into concrete surface with a trowel or by hand, taking care not to leave air pockets. Application is from one side of the repair to the other, filling the repair to the desired level. For multiple lift application instructions, contact Five Star Products' Engineering and Technical Service Center. Finish as necessary.

SPECIAL CONDITIONS: For use in cold temperatures, Five Star Structural Concrete® Underwater Hand Pack must be maintained at a temperature of at least 45°F (7°C). Protect from freezing until a compressive strength of 1,000 psi (6.9 MPa) is obtained. In hot temperatures, Five Star Structural Concrete® Underwater Hand Pack should be kept as cool as possible, but not exceeding 90°F (32°C). Cold water should be used for mixing to help maintain sufficient working time. Five Star® Summerset® may also be used if necessary to provide more working time.

4. **POST-PLACEMENT PROCEDURES:** In tidal zones, Five Star Structural Concrete[®] Underwater Hand Pack shall be kept wet continuously for 30 minutes after hardening.

NOTE: PRIOR TO APPLICATION, READ ALL PRODUCT PACKAGING THOROUGHLY. For more detailed placement procedures, refer to Five Star[®] Design-A-Spec[™] installation guidelines or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

CONSIDERATIONS

- Never exceed the maximum water content stated on the package or add an amount that will cause segregation.
- Repair material shall be protected from freezing until it reaches a compressive strength of 1,000 psi (6.9 MPa).

CAUTION

Contains cementitious material and crystalline silica. International Agency for Research on Cancer has determined that there is sufficient evidence for the carcinogenicity of inhaled crystalline silica to humans. Take appropriate measures to avoid breathing dust. Avoid contact with eyes and contact with skin. In case of contact with eyes, immediately flush with plenty of water for at least 15 minutes. Immediately call a physician. Wash skin thoroughly after handling. Keep product out of reach of children. **PRIOR TO USE, REFER TO SAFETY DATA SHEET.**

For worldwide availability, additional product information and technical support, contact your local Five Star® distributor, local sales representative, or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

SKU / PRODUCT CODE	DESCRIPTION	#UNITS/PALLET	UNIT SIZE
29215	Structural Concrete [®] Underwater Hand Pack	36	36 lb. (16.3 kg) pail

WARRANTY: "FIVE STAR PRODUCTS, INC. (FSP) PRODUCTS ARE MANUFACTURED TO BE FREE OF MANUFACTURING DEFECTS AND TO MEET FSP'S CURRENT PUBLISHED PHYSICAL PROPERTIES WHEN APPLIED IN ACCORDANCE WITH FSP'S DIRECTIONS AND TESTED IN ACCORDANCE WITH ASTM AND FSP STANDARDS. HOWEVER, SHOULD THERE BE DEFECTS OF MANUFACTURING OF ANY KIND, THE SOLE RIGHT OF THE USER WILL BE TO RETURN ALL MATERIALS ALLEGED TO BE DEFECTIVE, FREIGHT PREPAID TO FSP, FOR REPLACEMENT. THERE ARE NO OTHER WARRANTIES BY FSP OF ANY NATURE WHATSOEVER, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IN CONNECTION WITH THIS PRODUCT. FSP SHALL NOT BE LIABLE FOR DAMAGES OF ANY SORT, INCLUDING PUNITIVE, ACTUAL, REMOTE, OR CONSEQUENTIAL DAMAGES, RESULTING FROM ANY CLAIMS OF BREACH OF CONTRACT, BREACH OF ANY WARRANTY, WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR FROM ANY OTHER CAUSE WHATSOEVER. FSP SHALL ALSO NOT BE RESPONSIBLE FOR USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT HELD BY OTHERS."

Five Star Products, Inc. Corporate Headquarters 60 Parrott Drive Shelton, CT 06484 USA Tel: 203-336-7900 • Fax: 203-336-7930 FiveStarProducts.com Specifications Subject to Change. For most current version of datasheet, go to FiveStarProducts.com

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Date Revised: 4/8/2015

Supersedes: n/a

SECTION 1: PRODUCT AND COM	PANY IDENTIFICATION
Product Name(s):	Five Star Structural Concrete [®] Underwater HP
Synonyms:	SC UWHP (Hand Pack)
Product Use:	High early strength, single component, permanent concrete repair material.
Restrictions on Use:	N/A
Manufacturer/Supplier	Five Star Products, Inc. 750 Commerce Drive Fairfield, CT 06825 USA
Phone #:	203-336-7900
Emergency Phone #:	CHEM-TEL 1-800-255-3924 (Outside the U.S. 1-813-248-0585)

SECTION 2: HAZARD(S) IDENTIFICATION-GHS INFORMATION

Skin Corrosion/Irritation – Category 2 Acute Toxicity – Dermal, Category 2 Eye Damage/Irritation – Category 1 Sensitization – Respiratory, Category 1	
Acute Toxicity – Dermal, Category 2 Eye Damage/Irritation – Category 1 Sensitization – Respiratory, Category 1	
Eye Damage/Irritation – Category 1 Sensitization – Respiratory, Category 1	
Sensitization – Respiratory, Category 1	
Carcinogenicity – Category 1A	
Specific Target Organ Systemic Toxicity (Single Exposur	e) – Cat 3
Specific Target Organ Toxicity (Repeated Exposure) – C	at 2
Label Elements/Hazard Pictograms:	
Signal Word: Danger	
Hazard Statements: Harmful if swallowed H302	
Hazard Statements:Harmful if swallowed H302May cause skin irritation H317	
Hazard Statements:Harmful if swallowed H302May cause skin irritation H317Causes severe skin burns and eye damage H314	
Hazard Statements:Harmful if swallowed H302May cause skin irritation H317Causes severe skin burns and eye damage H314May cause respiratory irritation H335	
Hazard Statements:Harmful if swallowed H302May cause skin irritation H317Causes severe skin burns and eye damage H314May cause respiratory irritation H335May cause an allergic skin reaction H317	
Hazard Statements:Harmful if swallowed H302May cause skin irritation H317Causes severe skin burns and eye damage H314May cause respiratory irritation H335May cause an allergic skin reaction H317May cause cancer by inhalation H350	



Date Revised: 4/8/2015

Supersedes: n/a

Precautionary	Do not breathe dust, fume, gas, mist, vapors, or spray, P260.				
Statements/Prevention:	Wash thoroughly after handling, P264.				
	Do not eat, drink or smoke when using this product, P270.				
	Contaminated work clothing should not be allowed out of the workplace, P272.				
	Wear protective gloves, protective clothing, eye protection and face protection, P280.				
	Wear respiratory protection, P284.				
Response:	If swallowed: Rinse mouth. Do NOT induce vomiting, P330, P331.				
	If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower, P361, P353.				
	If inhaled: Remove person to fresh air and keep comfortable for breathing, P340.				
	If in eyes: Rinse cautiously with water for several minutes, P351. Remove contact lenses, if present and easy to do. Continue rinsing, P338.				
	Immediately call a poison center or doctor, P310.				
	If skin irritation or rash occurs, P333: Get medical advice/attention, P313.				
	If experiencing respiratory symptoms, P342: Call a poison center or doctor, P310. Wash contaminated clothing before reuse, P363.				
Storage:	Store locked up.				
Disposal:	Dispose of contents/container in accordance with applicable regional, national, and local laws and regulations.				
Hazards Not Otherwise	Not applicable				

nazai	us	1100	other	~~
Classi	fie	d:		

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS			
Hazardous Ingredient(s)	Common Name/Synonyms	CAS No.	% wt/wt
Blended Hydraulic Cement	n/a	TS	70-90
Quartz	Silicon Dioxide, Silica Sand	14808-60-7	10-30

SECTION 4: FIRST AID MEASURES		
Inhalation:	If inhaled: Remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms call poison center or doctor.	
Eye Contact:	If in eyes: Rinse cautiously with water for at least 30 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.	

Five Star S	afety Data Sheet	Date Revised: Supersedes:	4/8/2015 n/a
Skin Contact:	If on skin (or hair): Take off immedi Rinse skin with water/shower for at a poison center or doctor if irritation clothing before reuse.	ately all contamin least 15 minutes develops. Wash	nated clothing. . Immediately call contaminated
Ingestion:	If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor. If vomiting occurs naturally, have victim lear forward to reduce the risk of aspiration. Never give anything by mouth to an unconscious person.		
General Advice:	In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).		
Note to Physicians:	Symptoms may not appear immediately. Treat symptomatically.		

SECTION 5: FIRE-FIGHTING MEASURES		
Flammability and Explosion Information:	Not flammable or combustible by OSHA/WHMIS criteria.	
Sensitivity to Mechanical Impact:	This material is not sensitive to mechanical impact.	
Sensitivity to Static Discharge:	This material is sensitive to static discharge at temperatures at or above the flash point.	
MEANS OF EXTINCTION		
Suitable Extinguishing Media:	Small Fire: Dry chemical, CO2, or water spray. Large Fire: Dry chemical, CO2, alcohol-resistant foam or water spray. Move containers from fire area if you can do it without risk. Dike fire- control water for later disposal; do not scatter the material.	
Unsuitable Extinguishing Media:	Not available.	
Product of Combustion:	Non-combustible	
Protection of Firefighters:	As in any fire, wear self-contained breathing apparatus pressure- demand, MSHA/NIOSH (approved or equivalent) and full protective gear.	



Date Revised: 4/8/2015

Supersedes: n/a

SECTION 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures:	Use personal protective equipment. Ensure adequate ventilation. Keep people from spill. Avoid dust formation.
Personal Precautions:	Avoid inhalation of dust. Do not get into eyes, on skin, or clothing.
Environmental Precautions:	The environmental impact of this product has not been fully investigated.
Methods for Containment:	Cover powder spill with plastic sheet or tarp to minimize spreading. Collect this material into a disposal container by sucking or sweeping up.
Methods for Cleanup:	Pick up and transfer to properly labeled containers.
Other Information:	See Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE		
Handling:	Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Do not breathe dust. Prevent contact with skin, eyes, and clothing. Wash thoroughly after handling.	
Storage:	Keep containers tightly closed in a cool, dry, and well-ventilated place. Store locked up.	

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Component	CAS No.	ACGIH TLV	OSHA PEL
Blended Hydraulic Cement	TS	TWA: 1mg/m ³ particulate matter containing no asbestos and <1% crystalline silica, respirable fraction	TWA: 15 mg/m ³ total dust TWA: 5 mg/m ³ respirable fraction (vacated) TWA: 10 mg/m ³ total dust (vacated) TWA: 5 mg/m ³ respirable fraction TWA: 50 mppcf <1% Crystalline silica
Quartz	14808-60-7	TWA: 0.025mg/m ³ respirable fraction	30/(%SiO2+2) mg/m ³ TWA, Total Dust;250/%SiO2+5) mppcf TWA, respirable fraction; 10/(%SiO2+2) mg/m ³ TWA, respirable TWA: 0.1 mg/m ³ (vacated)



PEL: Permissible Exposure Limit T	LV: Threshold Limit Value
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Engineering Controls: Not normally required.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection:	Tightly fitting safety goggles
Hand Protection:	Impervious gloves. Impervious clothing.
Skin and Body Protection:	Impervious gloves. Impervious clothing.
Respiratory Protection:	If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive- pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES	
Appearance:	Solid powder
Color:	Gray, tan, brown
Odor:	Mild
Odor Threshold:	n/a
Physical State:	Solid, powder
pH:	Approximately 12 when mixed with water.
Melting Point / Freezing Point:	n/a
Initial Boiling Point:	n/a
Boiling Point:	n/a
Flash Point:	n/a
Evaporation Rate:	n/a
Flammability (solid, gas):	n/a
Lower Flammability Limit:	n/a
Upper Flammability Limit:	n/a
Vapor Pressure:	n/a
Vapor Density:	n/a



Date Revised: 4/8/2015

Supersedes: n/a

Relative Density:	n/a
Solubility:	Slight, 0.2-0.5%
Partition Coefficient: n-Octanol/Water:	n/a
Auto-ignition Temperature:	n/a
Decomposition Temperature:	n/a
Viscosity:	n/a
Percent Volatile, wt.%:	n/a
VOC Content, wt.%:	n/a
Density:	n/a
Coefficient of Water/Oil Distribution:	n/a

SECTION 10: STABILITY AND REACTIVITY			
Chemical Stability:	Stable under recommended storage conditions.		
Possibility of Hazardous Reactions:	None under normal processing.		
Conditions to Avoid:	Exposure to water – product may harden on contact with water. Manage dust formation during use.		
Incompatible Materials:	Strong acids.		

SECTION 11: TOXICOLOGICAL INFORMATION

Information on likely routes of exposure.

Product information:	
Inhalation:	Irritating to respiratory system. Irritating to mucous membranes.
Eye contact:	Risk of serious damage to eyes.
Skin contact:	Irritating to skin. May cause allergic skin reaction
Ingestion:	Harmful if swallowed.
Component information:	
Chemical Name: Quartz	LD50 Oral: 500 mg/kg (Rat) ACGIH: A2 – Suspected Human Carcinogen

IARC: Group 1 – Carcinogenic to humans OSHA: X-present

Delayed and immediate effects and also chronic effects from short and long term exposure.

SECTION 12: ECOLOGICAL INFORMATION

Toxicity:

Aquatic Toxicity:	The environmental impact of this product has not been ful investigated.					
Persistence and Degradability:	No information available.					



Supersedes: n/a

Bio-accumulative Potential:	Does not accumulate in organisms				
Mobility in Soil:	No further relevant information available				
Ecotoxical Effects Remark:	No information available.				
Additional Ecological Information	No information available.				
General Notes:	This statement was deduced from products with a similar structure or composition. Due to available data on eliminability/decomposition and bio-accumulation potential prolonged term damage of the environment cannot be excluded. Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system. Also poisonous for fish and plankton in water bodies. Toxic for aquatic organisms.				
PBT Assessment:	N/A				
vPvB Assessment:	N/A				
Other Adverse Effects:	No further relevant information available				

SECTION 13: DISPOSAL CONSIDERATIONS			
Waste Treatment Methods	May be disposed of in an unrestricted sanitary landfill.		
Recommendation:	This material as supplied is not a hazardous waste according to Federal regulations (40CFR261). This material could become a hazardous waste if it is mixed with or otherwise comes in contact with a hazardous waste, if chemical additions are made to this material, or if the material is processed or otherwise altered.		
Uncleaned Packaging			
Recommendation:	Disposal must be made according to official regulations. Do not re-use empty containers.		

SECTION 14: TRANSPORT INFORMATION		
US DEPARTMENT of TRANSPORTATION (DOT) Proper Shipping Name:	Not regulated.	
Class:	n/a	
UN #:	n/a	
Packing Group:	n/a	
CANADA Transportation of Dangerous Goods (TDG) Proper Shipping Name:	Not regulated	



Supersedes: n/a

Class:	n/a
UN #:	n/a
Packing Group:	n/a

SECTION 15: REGULATORY INFORMATION							
CHEMICAL INVENTORIES							
US (TSCA):	The components of this product are in compliance with the chemica notification requirements of TSCA.						
CANADA (DSL):	The components of this product are in compliance with the chemical notification requirements of NSN Regulations under CEPA, 1999.						
U.S. FEDERAL REGULATIONS	Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the CFR, Part 372.						
UNITED STATES:	This SDS has been prepared to meet the US OSHA Hazard Communication Standard, 29 CFR 1910.1200						
SARA 311/312 Hazard Categories	Acute health hazard – Yes Chronic Health hazard – Yes Fire Hazard – No Sudden Release of Pressure – No Reactive Hazard - No						
US STATE Right to Know Regulations	Chemical Name	Ŋ	MA	PA	IL	RI	
	Quartz	X	X	X		X	

California This product contains the following Proposition 65 chemicals. **California Prop 65:** Chemical Name: Quartz CAS-No: 14808-60-7 CA Prop. 65: Carcinogen

SECTION 16: OTHER INFORMATION

Disclaimer:

The information contained in this document applies to the specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for one's own particular use.


STRUCTURAL CONCRETE® UNDERWATER PG

High Early Strength Pump Grade Underwater Repair

PRODUCT DESCRIPTION

Five Star Structural Concrete[®] Underwater PG (pump grade) is a high early strength, single component, permanent concrete repair material designed for pumping underwater. This concrete repair material features excellent pumping properties and minimal washout during large volume placements underwater and is designed for placement in tidal zones and underwater. Five Star Structural Concrete[®] Underwater PG provides increased corrosion protection of steel reinforced structures with migrating corrosion inhibitor.

ADVANTAGES

- Pumpable
- Large volume placements
- Saltwater resistant
- High 6-hour strength
- Adjustable working time

- Course aggregate extension
- Variable application thickness
- Chloride and sulfate resistant
- Outstanding corrosion resistance for protection and rehabilitation

<u>USES</u>

- Large volume underwater concrete repairs
- Tanks, dams, marine and hydraulic structure repairs
- Filling underwater concrete cavities and voids

PACKAGING AND YIELD

Five Star Structural Concrete[®] Underwater PG is packaged in heavy-duty polyethylene lined bags or plastic pails and is available in 50 lb. (22.7 kg) units yielding approximately 0.42 cubic feet (11.9 liters) at maximum water.

SHELF LIFE

One year (packaged in bags) or two years (packaged in pails) in original unopened packaging when stored in dry conditions; high relative humidity will reduce shelf life.

Compressive Strength, ASTM C 109	
6 Hours	2,500 psi (17.3 MPa)
1 Day	5,000 psi (34.5 MPa)
7 Days	6,000 psi (41.4 MPa)
28 Days	7,500 psi (51.7 MPa)
Underwater Bond Strength, ASTM C 882	
1 Day	1,000 psi (6.9 MPa)
7 Days	1,500 psi (10.3 MPa)
Length Change, ASTM C 157	
28 Days Wet	+0.02%
Thermal Coefficient of Expansion, ASTM C 531	5. x 10 ⁻⁶ in/in/°F (9.0 x 10 ⁻⁶ mm/mm/°C)
Chloride ion Permeability, ASTM C 1202	
28 Days	Negligible (<100 Coulumbs)
Working Time at 70°F (21°C)	20 minutes

The data shown above reflects typical results based on laboratory testing under controlled conditions. Reasonable variations from the data shown above may result. Test methods are modified where applicable.

PLACEMENT GUIDELINES

- SURFACE PREPARATION: All horizontal and vertical concrete surfaces in contact with Five Star Structural Concrete[®] Underwater PG shall be free of marine growth, laitance, and other contaminants. All horizontal and vertical concrete surfaces must be clean, sound and rough to ensure a good bond. Presoak concrete surfaces prior to application in tidal zones. A perimeter edge and minimum depth of one inch (25 mm) should be provided for a durable repair. Featheredging is not desirable. Repair surfaces shall be between 45°F and 90°F (7°C and 32°C) at time of placement. For cold and hot weather placement refer to Five Star[®] Design-A-Spec[™] or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.
- 2. MIXING: Mix Five Star® Structural Concrete® Underwater PG thoroughly for approximately three to four minutes to a uniform consistency with a mortar mixer (stationary barrel with moving blades). A drill and paddle mixer is acceptable for single bag mixes. With the mixer running add approximately 80% of the pre-measured potable water (total water content is 3 to 4 quarts potable water per 50 lb. unit) to the mixer. Adjust consistency if necessary, but do not exceed maximum water content stated on the package or an amount that will cause segregation. Addition of coarse aggregate meeting ASTM C 33, may be required for large volume pours. Do not mix more material than can be placed in 20 minutes. Follow printed instructions on the package.
- 3. PLACEMENT PROCEDURES: Five Star Structural Concrete[®] Underwater PG is designed to be tremie poured or pumped in place underwater. When pumping, a positive displacement type pump is recommended. Consult pump manufacturer for specific pumping guidelines before proceeding with installation. Installation shall be continuous to prevent cold joints. In tidal zones, Five Star Structural Concrete[®] Underwater PG shall be kept wet for a minimum of 30 minutes.

SPECIAL CONDITIONS: For use in cold temperatures, Five Star Structural Concrete[®] Underwater PG must be maintained at a temperature of at least 45°F (7°C). Protect from freezing until a compressive strength of at least 1,000 psi (6.9 MPa) is obtained. In hot temperatures, Five Star Structural Concrete[®] Underwater PG should be kept as cool as possible, but not exceeding 90°F (32°C). Cold water should be used for mixing to help maintain sufficient working time. Summerset[®] may also be used if necessary to provide more working time.

NOTE: PRIOR TO APPLICATION, READ ALL PRODUCT PACKAGING THOROUGHLY. For more detailed placement procedures, refer to Five Star[®] Design-A-Spec[™] installation guidelines or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

CONSIDERATIONS

- Never exceed the maximum water content stated on the package or add an amount that will cause segregation.
- Repair material shall be protected from freezing until it reaches a compressive strength of 1,000 psi (6.9 MPa).

CAUTION

Contains cementitious material and crystalline silica. International Agency for Research on Cancer has determined that there is sufficient evidence for the carcinogenicity of inhaled crystalline silica to humans. Take appropriate measures to avoid breathing dust. Avoid contact with eyes and contact with skin. In case of contact with eyes, immediately flush with plenty of water for at least 15 minutes. Immediately call a physician. Wash skin thoroughly after handling. Keep product out of reach of children. **PRIOR TO USE, REFER TO SAFETY DATA SHEET.**

For worldwide availability, additional product information and technical support, contact your local Five Star[®] distributor, local sales representative, or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

29230 Structural Concrete® Underwater Pump Grade 56 50 lb. (22.7 kg) bag	SKU / PRODUCT CODE	DESCRIPTION	#UNITS/PALLET	UNIT SIZE
	29230	Structural Concrete [®] Underwater Pump Grade	56	50 lb. (22.7 kg) bag

WARRANTY: "FIVE STAR PRODUCTS, INC. (FSP) PRODUCTS ARE MANUFACTURED TO BE FREE OF MANUFACTURING DEFECTS AND TO MEET FSP'S CURRENT PUBLISHED PHYSICAL PROPERTIES WHEN APPLIED IN ACCORDANCE WITH FSP'S DIRECTIONS AND TESTED IN ACCORDANCE WITH ASTM AND FSP STANDARDS. HOWEVER, SHOULD THERE BE DEFECTS OF MANUFACTURING OF ANY KIND, THE SOLE RIGHT OF THE USER WILL BE TO RETURN ALL MATERIALS ALLEGED TO BE DEFECTIVE, FREIGHT PREPAID TO FSP, FOR REPLACEMENT. THERE ARE NO OTHER WARRANTIES BY FSP OF ANY NATURE WHATSOEVER, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IN CONNECTION WITH THIS PRODUCT. FSP SHALL NOT BE LIABLE FOR DAMAGES OF ANY SORT, INCLUDING PUNITIVE, ACTUAL, REMOTE, OR CONSEQUENTIAL DAMAGES, RESULTING FROM ANY CLAIMS OF BREACH OF CONTRACT, BREACH OF ANY WARRANTY, WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR FROM ANY OTHER CAUSE WHATSOEVER. FSP SHALL ALSO NOT BE RESPONSIBLE FOR USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT HELD BY OTHERS."

> Specifications Subject to Change. For most current version of datasheet, go to FiveStarProducts.com

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Date Revised: 9/2/2015

Supersedes: 5/21/2015

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION		
Product Name(s):	Five Star Structural Concrete [®] Five Star Structural Concrete [®] V/O Five Star Structural Concrete [®] Gunite Five Star Structural Concrete [®] UW PG Five Star Structural Concrete [®] ES Five Star [®] Instant Grout	
Synonyms:	SC, IG	
Product Use:	High early strength, single component, permanent concrete repair material.	
Restrictions on Use:	N/A	
Manufacturer/Supplier	Five Star Products, Inc. 60 Parrott Drive Shelton, CT 06484 USA	
Phone #:	203-336-7900	
Emergency Phone #:	CHEM-TEL 1-800-255-3924 (Outside the U.S. 1-813-248-0585)	

SECTION 2: HAZARD(S) IDENTIFICATION-GHS INFORMATION

Classification:	Acute Oral Toxicity – Category 4 Skin Corrosion/Irritation – Category 2 Acute Toxicity – Dermal, Category 2 Eye Damage/Irritation – Category 1 Sensitization – Respiratory, Category 1 Carcinogenicity – Category 1A Specific Target Organ Systemic Toxicity (Single Exposure) – Cat 3 Specific Target Organ Toxicity (Repeated Exposure) – Cat 2
Label Elements/Hazard Pictograms:	
Signal Word:	Danger
Hazard Statements:	Harmful if swallowed H302 May cause skin irritation H317 Causes severe skin burns and eye damage H314 May cause respiratory irritation H335 May cause an allergic skin reaction H317

Five Star	Safety Data Sheet Date Revised: 9/2/2015 Supersedes: 5/21/2015	
	May cause cancer by inhalation H350 May cause damage to organs through prolonged or repeat exposu H373	re
Precautionary Statements/Prevention:	Do not breathe dust, fume, gas, mist, vapors, or spray, P260. Wash thoroughly after handling, P264. Do not eat, drink or smoke when using this product, P270. Contaminated work clothing should not be allowed out of the work P272. Wear protective gloves, protective clothing, eye protection and fac protection, P280. Wear respiratory protection, P284.	place, ce
Response:	 If swallowed: Rinse mouth. Do NOT induce vomiting, P330, P331. If on skin (or hair): Take off immediately all contaminated clothing Rinse skin with water/shower, P361, P353. If inhaled: Remove person to fresh air and keep comfortable for breathing, P340. If in eyes: Rinse cautiously with water for several minutes, P351. Remove contact lenses, if present and easy to do. Continue rinsing P338. Immediately call a poison center or doctor, P310. If skin irritation or rash occurs, P333: Get medical advice/attention P313. If experiencing respiratory symptoms, P342: Call a poison center or doctor, P310. Wash contaminated clothing before reuse, P363.).], n, or
Storage:	Store locked up.	
Disposal:	Dispose of contents/container in accordance with applicable region national, and local laws and regulations.	ıal,
Hazards Not Otherwise	Not applicable	

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS			
Hazardous Ingredient(s)	Common Name/Synonyms	CAS No.	% wt/wt
Portland Cement	Hydraulic cement	65997-15-1	30-60
Blended Hydraulic Cement	n/a	TS	30-60
Quartz	Silicon Dioxide, Silica Sand	14808-60-7	40-60

SECTION 4: FIRST AID MEASURES

Classified:



Date Revised: 9/2/2015

Supersedes: 5/21/2015

Inhalation:	If inhaled: Remove person to fresh air and keep comfortable for breathing.
Eye Contact:	If experiencing respiratory symptoms call poison center or doctor. If in eyes: Rinse cautiously with water for at least 30 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.
Skin Contact:	If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower for at least 15 minutes. Immediately call a poison center or doctor if irritation develops. Wash contaminated clothing before reuse.
Ingestion:	If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Never give anything by mouth to an unconscious person.
General Advice:	In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).
Note to Physicians:	Symptoms may not appear immediately. Treat symptomatically.

SECTION 5: FIRE-FIGHTING MEASURES	
Flammability and Explosion Information:	Not flammable or combustible by OSHA/WHMIS criteria.
Sensitivity to Mechanical Impact:	This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge:	This material is sensitive to static discharge at temperatures at or above the flash point.
MEANS OF EXTINCTION	
Suitable Extinguishing Media:	Small Fire: Dry chemical, CO2, or water spray. Large Fire: Dry chemical, CO2, alcohol-resistant foam or water spray. Move containers from fire area if you can do it without risk. Dike fire- control water for later disposal; do not scatter the material.
Unsuitable Extinguishing Media:	Not available
Product of Combustion:	Non-combustible
Protection of Firefighters:	As in any fire, wear self-contained breathing apparatus pressure- demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES	
Emergency Procedures:	Use personal protective equipment. Ensure adequate ventilation. Keep people from spill. Avoid dust formation.
Personal Precautions:	Avoid inhalation of dust. Do not get into eyes, on skin, or clothing.



Date Revised: 9/2/2015

Supersedes: 5/21/2015

Environmental Precautions:	The environmental impact of this product has not been fully investigated.
Methods for Containment:	Cover powder spill with plastic sheet or tarp to minimize spreading. Collect this material into a disposal container by sucking or sweeping up.
Methods for Cleanup:	Pick up and transfer to properly labeled containers.
Other Information:	See Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

Handling:	Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Do not breathe dust. Prevent contact with skin, eyes, and clothing. Wash thoroughly after handling.
Storage:	Keep containers tightly closed in a cool, dry, and well-ventilated place. Store locked up.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Component	CAS No.	ACGIH TLV	OSHA PEL
Portland cement	65997-15-1	TWA: 1mg/m ³ particulate matter containing no asbestos and <1% crystalline silica, respirable fraction	TWA: 15 mg/m ³ total dust TWA: 5 mg/m ³ respirable fraction (vacated) TWA: 10 mg/m ³ total dust (vacated) TWA: 5 mg/m ³ respirable fraction TWA: 50 mppcf <1% Crystalline silica
Blended Hydraulic Cement	TS	TWA: 1mg/m ³ particulate matter containing no asbestos and <1% crystalline silica, respirable fraction	TWA: 15 mg/m ³ total dust TWA: 5 mg/m ³ respirable fraction (vacated) TWA: 10 mg/m ³ total (vacated) TWA: 5 mg/m ³ respirable fraction TWA: 50 mppcf <1% Crystalline silica
Quartz	14808-60-7	TWA: 0.025mg/m ³ respirable fraction	30/(%SiO2+2) mg/m ³ TWA, Total Dust;250/%SiO2+5) mppcf TWA, respirable fraction; 10/(%SiO2+2) mg/m ³ TWA, respirable TWA: 0.1 mg/m ³ (vacated)

PEL: Permissible Exposure Limit TLV: Threshold Limit Value



Engineering Controls:	Not normally required.				
PERSONAL PROTECTIVE EQUIPM	1ENT (PPE)				
Eye/Face Protection:	Tightly fitting safety goggles				
Hand Protection:	Impervious gloves. Impervious clothing.				
Skin and Body Protection:	Impervious gloves. Impervious clothing.				
Respiratory Protection:	If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive- pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.				
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.				

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES				
Appearance:	Solid powder			
Color:	Gray, tan, brown			
Odor:	Mild			
Odor Threshold:	n/a			
Physical State:	Solid, powder			
pH:	Approximately 12 when mixed with water.			
Melting Point / Freezing Point:	n/a			
Initial Boiling Point:	n/a			
Boiling Point:	n/a			
Flash Point:	n/a			
Evaporation Rate:	n/a			
Flammability (solid, gas):	n/a			
Lower Flammability Limit:	n/a			
Upper Flammability Limit:	n/a			
Vapor Pressure:	n/a			
Vapor Density:	n/a			
Relative Density:	n/a			



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Solubility:	Slight, 0.2-0.5%
Partition Coefficient: n-Octanol/Water:	n/a
Auto-ignition Temperature:	n/a
Decomposition Temperature:	n/a
Viscosity:	n/a
Percent Volatile, wt.%:	n/a
VOC Content, wt.%:	n/a
Density:	n/a
Coefficient of Water/Oil Distribution:	n/a

SECTION 10: STABILITY AND REACTIVITY				
Chemical Stability:	Stable under recommended storage conditions.			
Possibility of Hazardous Reactions:	None under normal processing.			
Conditions to Avoid:	Exposure to water – product may harden on contact with water. Manage dust formation during use.			
Incompatible Materials:	Strong acids.			

SECTION 11: TOXICOLOGICAL INFORMATION

Information on likely routes of exposure.

Product information:	
Inhalation:	Irritating to respiratory system. Irritating to mucous membranes.
Eye contact:	Risk of serious damage to eyes.
Skin contact:	Irritating to skin. May cause allergic skin reaction
Ingestion:	Harmful if swallowed.
Component information:	

Chemical Name: Quartz LD50 Oral: 500 mg/kg (Rat) ACGIH: A2 – Suspected Human Carcinogen IARC: Group 1 – Carcinogenic to humans OSHA: X-present

Delayed and immediate effects and also chronic effects from short and long term exposure.

SECTION 12: ECOLOGICAL INFORMATION				
Toxicity:				
Aquatic Toxicity:	The environmental impact of this product has not been fully investigated.			
Persistence and Degradability:	No information available.			
Bio-accumulative Potential:	Does not accumulate in organisms			



Mobility in Soil:	No further relevant information available				
Ecotoxical Effects Remark:	No information available.				
Additional Ecological Information	No information available.				
General Notes:	This statement was deduced from products with a similar structure or composition. Due to available data on eliminability/decomposition and bio-accumulation potential prolonged term damage of the environment cannot be excluded. Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system. Also poisonous for fish and plankton in water bodies. Toxic for aquatic organisms.				
PBT Assessment:	N/A				
vPvB Assessment:	N/A				
Other Adverse Effects:	No further relevant information available				

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Treatment Methods	May be disposed of in an unrestricted sanitary landfill.			
Recommendation:	This material as supplied is not a hazardous waste according to Federal regulations (40CFR261). This material could become a hazardous waste if it is mixed with or otherwise comes in contact with a hazardous waste, if chemical additions are made to this material, or if the material is processed or otherwise altered.			
Uncleaned Packaging				
Recommendation:	Disposal must be made according to official regulations. Do not re-use empty containers.			

SECTION 14: TRANSPORT INFORMATION			
US DEPARTMENT of TRANSPORTATION (DOT) Proper Shipping Name:	Not regulated.		
Class:	n/a		
UN #:	n/a		
Packing Group:	n/a		
CANADA Transportation of Dangerous Goods (TDG) Proper Shipping Name:	Not regulated.		
Class:	n/a		



UN #:	n/a
Packing Group:	n/a

SECTION 15: REGULATORY INFORMATION

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CHEMICAL INVENTORIES									
US (TSCA):	The components of this product are in compliance with the chemical notification requirements of TSCA.								
CANADA (DSL):	The components of this product are in compliance with the chemical notification requirements of NSN Regulations under CEPA, 1999.								
U.S. FEDERAL REGULATIONS	Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the CFR, Part 372.								
UNITED STATES:	This SDS has been prepared to meet the US OSHA Hazard Communication Standard, 29 CFR 1910.1200								
SARA 311/312 Hazard Categories	Acute health hazard – Yes Chronic Health hazard – Yes Fire Hazard – No Sudden Release of Pressure – No Reactive Hazard - No								
US STATE Right to Know Regulations	Chemical Name	NJ	MA	ΡΑ	IL	RI]		
-	Portlant Cement	x	x	x		x			

CaliforniaThis product contains the following Proposition 65 chemicals.California Prop 65:Chemical Name: Quartz CAS-No: 14808-60-7 CA Prop. 65: Carcinogen

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Quartz

SECTION 16: OTHER INFORMATION

Disclaimer:

This information is furnished without warranty of any kind, expressed or implied. Five Star Products, Inc. bases the information and recommendations in this document on data believed to be current and accurate.

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