Purpose

This program is intended to ensure the safety of employees who use and/or work near slings and other rigging equipment. This program applies to rigging material handling and slings used in conjunction with other material handling equipment for the movement of material by hoisting, in employments covered by this part. The types of slings covered are those made from alloy steel chain, wire rope, metal mesh, natural or synthetic fiber rope (conventional three strand construction), and synthetic web (nylon, polyester, and polypropylene).

Administration

The Operations Manager is responsible to the implementation and maintenance of this program. A copy of the Rigging-Offshore Safety Program is located in the Operations office.

Safe Operating Practices

Whenever any sling is used, the following practices shall be observed:

- Defective rigging should not be used and removed from service immediately.
- Rigging equipment should not be loaded beyond its recommended safe working load and load identification should be attached to the rigging.
- Rigging equipment not in use should be removed from the immediate work area so as not to present a hazard to employees.
- Tag lines should be used unless their use creates an unsafe condition.
- Hooks on overhaul ball assemblies, lower load blocks, or other attachment assemblies should be of a type that can be closed and locked, eliminating the hook throat opening. Alternatively, an alloy anchor type shackle with a bolt, nut and retaining pin may be used.
- All employees should be kept clear of loads about to be lifted and of suspended loads.
- Slings that are damaged or defective shall not be used.
- Chain or wire rope slings shall not be shortened with knots or bolts or other makeshift devices.
- Sling shall not be kinked, or knotted.
- Slings shall not be loaded in excess of their rated capacities.
- Slings used in a basket hitch shall have the loads balanced to prevent slippage.
- Slings shall be set to avoid slippage.
- Slings shall be padded or protected from the sharp edges of their loads.
- Suspended loads shall be kept clear of all obstructions.
- All employees shall be kept clear of loads about to be lifted and of suspended loads.
- Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load.
- Shock loading is prohibited.
- A sling shall not be pulled from under a load when the load is resting on the sling and damage to the sling may result.

- Tables S-1 and S-2 shall be used to determine the maximum safe working loads of various sizes of wrought iron and alloy steel chains and chain slings, except that higher safe working loads are permissible when recommended by the manufacturer for specific, identifiable products. Proof coil steel chain, also known as common or hardware chain, or other chain not recommended for slinging or hoisting by the manufacturer, shall not be used for hoisting purposes.
- Wrought iron chains in constant use shall be annealed or normalized at intervals not exceeding 6 months when recommended by the manufacturer. The chain manufacturer shall be consulted for recommended procedures for annealing or normalizing. Alloy chains shall not be annealed.
- Only personnel with training and experience who have completed a rigger training program are permitted to attach or detach lifting equipment to loads or lifting loads. This includes crane operators and inspectors.

Inspections

Each day before being used, on each shift and as necessary during use to ensure safety, the rigging equipment for material handling and all fastenings and attachments shall be inspected for damage or defects by a competent person designated by the employer. All Slings, fastenings and attachments will be inspected by a competent person designated by the company with written records maintained in the Operations office. Damaged or defective slings shall be immediately removed from service.

Alloy Steel Chain Slings

Alloy steel chain slings shall have permanently affixed durable identification stating size, grade, and rated capacity. Hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links or other attachments shall have a rated capacity at least equal to that of the alloy steel chain with which they are used or the sling shall not be used in excess of the rated capacity of the weakest component. Makeshift links or fasteners formed from bolts or rods, or other such attachments, shall not be used. In addition to the inspection required by other applicable sections of the OSHA regulation, a thorough periodic inspection of alloy steel chain slings in use shall be made on a regular basis, to be determined on the basis of:

- Frequency of sling use;
- Severity of service conditions;
- Nature of lifts being made; and
- Experience gained on the service life of slings used in similar circumstances.

Such inspections shall in no event be at intervals greater than once every 12 months.

Each employer shall make and maintain, for the service life of the sling, a record of the most recent month in which each alloy steel chain sling was thoroughly inspected, and shall make such record available for examination by the Division upon request. The thorough inspection of alloy steel chain slings shall be performed by a qualified person designated by the employer,

and shall include a thorough inspection for wear, defective welds, deformation and increase in link length. Where such defects or deterioration reduce the rated capacity the sling shall be immediately removed from service. The employer shall ensure that before use, each new, repaired, or reconditioned alloy steel chain sling, including all welded components in the sling assembly, shall be proof tested in accordance with the sling manufacturer's recommendations. The employer shall retain a certificate of the proof test, for the service life of the sling, and shall make it available for examination by the Division upon request. Minimum proof loads for alloy steel chain shall be equal to twice the working load limit values shown for single slings. Alloy steel chain slings shall not be used with loads in excess of the rated capacities prescribed in the OSHA regulation. Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations.

Alloy steel chain slings shall be permanently removed from service if they are heated above 1000^{o} F When exposed to service temperatures in excess of 600^{o} F maximum working load limits permitted in the OSHA regulation shall be reduced in accordance with the chain or sling manufacturer's recommendations. Worn or damaged alloy steel chain slings or attachments shall not be used until repaired. When alloy steel chain slings are repaired or reconditioned and welding or heat treating is involved, such slings shall be proof tested by the manufacturer or equivalent entity. Mechanical coupling links or low carbon steel repair links shall not be used to repair broken lengths of chain. If the chain size at any point of any links is less than that stated in the OSHA regulation, the sling shall be removed from service.

Alloy steel chain slings with cracked or deformed master links, coupling links or other components shall be removed from service. Slings shall be removed from service if hooks are cracked, have been opened more than 15 percent of the normal throat opening measured at the narrowest point or twisted more than 10 degrees from the plane of the unbent hook.

Wire Rope Slings

Wire rope slings shall not be used with loads in excess of the rated capacities shown in the OSHA regulation. Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations. Cable laid and 6 x 19 and 6 x 37 slings shall have a minimum clear length of wire rope 10 times the component rope diameter between splices, sleeves or end fittings. Braided slings shall have a minimum clear length of wire rope 40 times the component rope diameter between the loops or end fittings. Cable laid grommets, strand laid grommets and endless slings shall have a minimum circumferential length of 96 times their body diameter. Fiber core wire rope slings of all grades shall be permanently removed from service if they are exposed to temperatures in excess of 200^{o} F. When nonfiber core wire rope slings of any grade are used at temperatures above 400^{o} F, or below minus 60^{o} F, the sling manufacturer's recommendations shall be followed.

Welding of end attachments, except covers to thimbles, shall be performed prior to the assembly of the sling. A prototype of each welded end attachment shall be proof tested by the manufacturer or equivalent entity to check the design and welding method at twice the rated capacity before production is started. Subsequent tests of random samples shall be made. The

manufacturer or equivalent entity shall provide a certificate of such tests which the employer shall retain and make available for examination by the Division upon request. Where rope clip attachments are used, they shall be made with U-bolts on the dead or short end of the rope and the saddle on the live end. The minimum number of clips for end attachments shall be not less than indicated in manufacturer's tables, but in no case shall be less than three for any permanent installation. Clips shall be drop-forged steel. The clips shall be spaced at a distance equal to at least six times the diameter of the rope. All clip or clamp bolts shall be kept tight after tightening while rope is under tension.

Wire rope slings shall be immediately removed from service if any of the following conditions are present:

- Six randomly distributed broken wires in one rope lay, or 3 broken wires in one strand in one rope lay.
- Wear or scraping of one-third the original diameter of outside individual wires.
- Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure.
- Evidence of heat damage.
- End attachments that are cracked, deformed or worn to the point where the rated capacity is reduced.
- Hooks that have been opened more than 15 percent of the normal throat opening measured at the narrowest point or twisted more than 10 degrees from the plane of the unbent hook.
- Corrosion that is of such severity or extent as to reduce the rated load capacity of the rope or end attachment.
- One or more broken wires within one rope lay of the end attachments.

Eyes in wire rope slings shall not be formed by using knots.

Metal Mesh Slings

Each metal mesh sling shall have permanently affixed durable identification stating the following:

- Manufacturer's name or trademark.
- Rated capacity in vertical basket hitch and choker hitch.

Handles shall have a rated capacity at least equal to the metal fabric and exhibit no deformation after proof testing. The fabric and handles shall be joined so that:

- The rated capacity of the sling is not reduced.
- The load is evenly distributed across the width of the fabric.
- Sharp edges will not damage the fabric.

Coatings which diminish the rated capacity of a sling shall not be applied. All new and repaired metal mesh slings, including handles, shall not be used unless proof tested by the manufacturer or equivalent entity at a minimum of 1 1/2 times their rated capacity. Elastomer impregnated

slings shall be proof tested before coating. Metal mesh slings shall not be used to lift loads in excess of their rated capacities as prescribed in the OSHA regulation. Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations.

Metal mesh slings which are not impregnated with elastomers may be used in a temperature range from minus 20° F. to plus 550° F. without decreasing the working load limit. Metal mesh slings impregnated with polyvinyl chloride or neoprene may be used only in a temperature range from zero degrees to plus 200° F. For operations outside these temperature ranges or for metal mesh slings impregnated with other materials, the sling manufacturer's recommendations shall be followed.

Metal mesh slings which are repaired shall not be used unless repaired by a metal mesh sling manufacturer or an equivalent entity. Once repaired, each sling shall be permanently marked or tagged, or a written record maintained, to indicate the date and nature of the repairs and the person or organization that performed the repairs. Records of repairs shall be made available for examination by the Division upon request. Metal mesh slings shall be immediately removed from service if any of the following conditions are present:

- A broken weld or broken brazed joint along the sling edge.
- Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion.
- Lack of flexibility due to distortion of the fabric.
- Distortion of the female handle so that the depth of the slot is increased more than 10 percent.
- Distortion of either handle so that the width of the eye is decreased more than 10 percent.
- A 15 percent reduction of the original cross sectional area of metal at any point around the handle eye.
- Distortions of either handle out of its plane.

Natural & Synthetic Fiber Rope Slings

Fiber rope slings made from conventional three strand construction fiber rope shall not be used with loads in excess of the rated capacities prescribed in the OSHA regulation. Fiber rope slings shall have a diameter of curvature meeting at least the minimums specified in the OSHA regulation. Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations.

Natural and synthetic fiber rope slings, except for wet frozen slings, may be used in a temperature range from minus 20° F to plus 180° F without decreasing the working load limit. For operations outside this temperature range and for wet frozen slings, the sling manufacturer's recommendations shall be followed. Spliced fiber rope slings shall not be used unless they have been spliced in accordance with the following minimum requirements and in accordance with any additional recommendations of the manufacturer:

- In manila rope, eye splices shall consist of at least three full tucks, and short splices shall consist of at least six full tucks, three on each side of the splice center line.
- In synthetic fiber rope, eye splices shall consist of at least four full tucks, and short splices shall consist of at least eight full tucks, four on each side of the center line.
- Strand end tails shall not be trimmed flush with the surface of the rope immediately adjacent to the full tucks. This applies to all types of fiber rope and both eye and short splices. For fiber rope under one inch in diameter, the tail shall project at least six rope diameters beyond the last full tuck. For fiber rope one inch in diameter and larger, the tail shall project at least six inches beyond the last full tuck. Where a projecting tail interferes with the use of the sling, the tail shall be tapered and spliced into the body of the rope using at least two additional tucks (which will require a tail length of approximately six rope diameters beyond the last full tuck).
- Fiber rope slings shall have a minimum clear length of rope between eye splices equal to 10 times the rope diameter.
- Knots shall not be used in lieu of splices.
- Clamps not designed specifically for fiber ropes shall not be used for splicing.
- For all eye splices, the eye shall be of such size to provide an included angle of not greater than 60 degrees at the splice when the eye is placed over the load or support.

Fiber rope slings shall not be used if end attachments in contact with the rope have sharp edges or projections. Natural and synthetic fiber rope slings shall be immediately removed from service if any of the following conditions are present:

- Abnormal wear;
- Powdered fiber between strands;
- Broken or cut fibers;
- Variations in the size or roundness of strands;
- Discoloration or rotting;
- Distortion of hardware in the sling.

Repairs shall only be made by the manufacturer or equivalent entity. Only fiber rope slings made from new rope shall be used. Use of repaired or reconditioned fiber rope slings is prohibited.

Synthetic Web Slings

Each sling shall be marked or coded to show the rated capacities for each type of hitch and type of synthetic web material. Synthetic webbing shall be of uniform thickness and width and selvage edges shall not be split from the webbing's width. Fittings shall be:

- Of a minimum breaking strength equal to that of the sling; and
- Free of all sharp edges that could in any way damage the webbing.

Stitching shall be the only method used to attach end fittings to webbing and to form eyes. The thread shall be in an even pattern and contain a sufficient number of stitches to develop the full breaking strength of the sling. Synthetic web slings illustrated in Figure S-6 shall not be used

with loads in excess of the rated capacities specified in Tables S-22 through S-24. Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations. When synthetic web slings are used, the following precautions shall be taken:

- Nylon web slings shall not be used where fumes, vapors, sprays, mists or liquids of acids or phenolics are present.
- Polyester and polypropylene web slings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.
- Web slings with aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.

Synthetic web slings of polyester and nylon shall not be used at temperatures in excess of 180o F. Polypropylene web slings shall not be used at temperatures in excess of 150o F. Synthetic web slings which are repaired shall not be used unless repaired by a sling manufacturer or an equivalent entity. The employer shall retain a certificate of proof test, for the service life of the sling, and make it available for examination by the Division upon request. Slings, including webbing and fittings, which have been repaired in a temporary manner shall not be used. Synthetic web slings shall be immediately removed from service if any of the following conditions are present:

- Acid or caustic burns;
- Melting or charring of any part of the sling surface;
- Broken or worn stitches;
- Distortion of fittings;
- Snags, punctures, tears or cuts; or
- Those slings with other apparent defects shall be referred to the manufacturer or equivalent entity for determination of rated capacity and safety for continued use.

Synthetic web slings shall be stored in an area or facility where they are not subject to heat above 150o F or exposed to direct sunlight. Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendation.

Defective Hoist or Sling Hooks & Rings

Deformed or defective hooks or rings shall not be used. Deformed hooks or rings shall be replaced or repaired and reshaped under proper metallurgical control and proof tested. Annealing or normalizing shall be done only in accordance with the chain manufacturer's specifications. Hooks and shackles shall be used in accordance with manufacturer's recommendations. All hooks for which no applicable manufacturer's recommendations are available shall be tested to twice the intended safe working load before they are initially put into use. The employer shall maintain and keep readily available a certification record which includes the date of the test, the signature of the person who performed the test, and an identifier of the hook which was tested. Special custom design grabs, hooks, clamps, or other lifting accessories for such units as modular panels, prefabricated structures and similar materials,

shall be marked to indicate the safe working loads and shall be proof-tested to 125 percent of the rated load prior to use.

Rigger Qualifications

Training incorporates familiarization with rigging, hardware, slings and safety issues associated with rigging, lifting loads and lift planning. Training includes classroom, hands-on training and exams. Hands-on includes proper inspection, use, selection and maintenance of loose gears (slings, shackles, hooks, etc.)

Attachments

HSE-BF-021 Sling Inspection Report