

**HEALTH, SAFETY AND
ENVIRONMENTAL MANUAL**

**CHAINS, SLINGS AND RIGGING
PROGRAM**

Chains, Slings and Rigging Program

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1.0 OBJECTIVE

The following information is provided as minimum guidelines for the care and use of chains, slings and rigging equipment.

2.0 SCOPE

The provisions of this Policy are applicable to all B&B employees and those contracted to B&B Gas Well Services, LLC or any of its affiliates (“the Company”) where applicable. This Policy applies to all personnel who work with or whose job responsibilities require them to be familiar with the contents of this Policy, whether they work at any B&B or customer facility or field location.

As with all Company policies and procedures, should our client's policies or procedures be more stringent than B&B's, then the more stringent policy or procedure should be considered, subject to B&B's evaluation and written approval by the B&B manager and as reasonably practicable, so long as it does not endanger the employee's life or health, nor endanger the environment or general public.

Management and the Health, Safety and Environmental (HSE) Coordinator will review and evaluate this Policy on an ongoing basis, or when operational changes within a facility occur that require revision. Effective implementation of this Policy requires support from all levels of Management within the Company. This written Policy shall be communicated to all personnel that are affected by it, and supersedes any similar policy.

3.0 REFERENCES

Occupational Safety and Health Administration, Department of Labor; 29 CFR 1926.251 and 29 CFR 1910.184.

4.0 TRAINING

4.1 Initial training shall be completed prior to an employee's assignment to a job task requiring the use of chains, slings and rigging equipment.

4.2 Refresher Training

4.2.1 Refresher training shall be conducted at least annually or as needed as job tasks or equipment changes require.

4.2.2 Refresher training shall also be required immediately following any incident, near miss or operating violations involving the use of chains, slings and rigging equipment.

5.0 RESPONSIBILITIES

5.1 It is the responsibility of management to implement, support and enforce this program, to periodically review and evaluate its overall effectiveness and to make modifications as necessary.

- 5.2 B&B employees (as listed in Section 2.0) shall be familiar with and comply with the contents of this program.
- 5.3 The employee has the responsibility and authority to stop any unsafe job or unsafe task being conducted and should immediately request Supervisor/HSE Coordinator involvement to resolve the issue. The employee's judgment call, when made in good faith and using good judgment, shall be considered commendable even though the conclusion of the investigation might be found to the contrary.
- 5.4 Enforcement of this program is the responsibility of each and every employee of B&B. For any violation of this program, whether willful or through negligence, the Designated Person In Charge, Immediate Supervisor, HSE Coordinator and/or Company Manager shall have the responsibility as well as the authority to pursue corrective action in accordance with B&B's Disciplinary Action Program.

6.0 DEFINITIONS

Angle of Loading – The inclination of a leg or branch of a sling measured from a horizontal or vertical plane provided that an angle of loading of five degrees or less from the vertical may be considered a vertical angle of loading.

Basket Hitch – A sling configuration whereby the sling is passed under the load and has both ends, end attachments, eyes or handles on the hook or a single master link.

Braided Wire Rope – A wire rope formed by plaiting component wire ropes.

Bridle Wire Rope Sling – A sling composed of multiple wire rope legs with the top ends gathered in a fitting that goes over the lifting hook.

Choker Hitch – A sling configuration with one end of the sling passing under the load and through an end attachment, handle or eye on the other end of the sling.

Designated – Selected or assigned by the employer or the employer representative as being qualified to perform special duties.

Hitch – A sling configuration whereby the sling is fastened to an object or load either directly to it or around it.

Link – A single ring of a chain.

Master Link or Gathering Ring – A forged or welded steel link used to support all members (legs) of an alloy steel chain sling or wire rope sling.

Proof Load – The load applied in performance of a proof test.

Proof Test – A non-destructive tension test performed by a sling manufacturer or an equivalent entity to verify construction and workmanship of a sling.

Rated Capacity or Working Load Limit – The minimum working load permitted by the provisions of this program.

Reach – The effective length of an alloy steel chain sling measured from the top bearing surface of the upper terminal component to the bottom bearing surface of the lower terminal component.

Sling – An assembly which connects the load to the material handling equipment.

Vertical Hitch – A method of supporting a load by a single, vertical part or leg of the sling.

7.0 HAZARD DETERMINATION

Hazard determinations may include but are not limited to the following:

- 7.1 Overhead Power Lines – Warning: Never operate any crane near electrical power lines. Auto crane companies recommend that a crane, rigging and load being lifted never be moved any closer to a power line (including telephone lines) than 20 feet at any point. If it is necessary that the crane or equipment being lifted would come closer than 20 feet to any power line in order to complete the job, then the electrical company which owns or controls the power line shall be notified and the power line will be (de-energized) or (disconnected) for the duration of the lift.
- 7.2 Weight of the Load – Weight of load to be lifted shall be evaluated before lift is made. The weight of the load, center of load balance and attachment points for rigging should be reviewed before the lift is made. Refer to the weight tables found in Appendix VI.
- 7.3 Working Load Limit – All equipment and rigging must be rated for the load to be lifted.
- 7.4 Center of Gravity – Center of gravity and attachment points are important to ensure that the load is secure during the lift.
- 7.5 Sharp Edges and Tight Bends – Attachment points for rigging shall be made in order to prevent rigging from being cut. Improper attachment points on the equipment may also result in damages to equipment being lifted.
- 7.6 Pinch Points – Keep hands, fingers and feet from coming in contact with load and rigging that could result in an injury.
- 7.7 Weather Conditions – It is important to ensure that the crane or wench truck lifting a load is stable. Muddy or slick conditions could result in a sudden movement of the crane or wench truck, causing the rigging to slip and the load to fall.
- 7.8 Operating Temperatures – Manufacturers' recommendations for rigging are listed below:

- 7.8.1 Safe operating temperature is as follows: (Damaged or defective slings or rigging from excessive temperatures shall be immediately removed from service.)

Synthetic Nylon Slings 180 degrees;
 Polypropylene Slings 200 degrees;
 Wire Ropes – Fiber core 200 degrees;
 – Steel core 400 degrees.

Alloy Chain Heat Conditions

Temperature of Chain	Reduction in Working Load Limited Because of Chain Temperature	Performance Reduction in Working Load Limit Because of Chain Temperature
500 – degrees	None	None
600 – degrees	10%	None
700 – degrees	20%	None
800 – degrees	30%	None
900 – degrees	40%	10%
1000 – degrees	50%	15%

- 7.9 Chemicals – 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 liquid caustics are present. Aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.
- 7.10 Equipment Condition – All slings shall be removed from service if they are damaged or defective.
- 7.11 End Attachments – (e.g., homemade lifting devices) -Any homemade attachment devices will be engineered, load tested and certified.

8.0 ENGINEERING CONTROLS

Engineering controls may include but are not limited to the following:

- 8.1 Review the lifting process to ensure it is necessary to lift using chains and slings. Alternate lifting methods may be safer (forklift, etc.);
- 8.2 Review the lifting process to ensure it is feasible and reasonable to lighten the load;
- 8.3 Review process to ensure as few lifts as possible are made (less handling versus less weight);
- 8.4 Review the lifting process to ensure non-essential personnel are clear of the area; essential personnel shall be at a safe distance from the lifting object;

8.5 Review the lifting process to ensure loads are not lifted higher than necessary.

9.0 PROCEDURES

9.1 Operating Rules:

9.1.1. Know the weight of the load to be lifted and/or moved.

9.1.2 Use a sling with characteristics for the type of load hitch and environment.

9.1.3 Never load a sling in excess of its rated capacity.

9.1.4 Never tie a knot in a sling nor use a sling with a knot in it.

9.1.5 Protect the sling from being cut by sharp corners, edges, and abrasive surfaces by using wear pads, sleeves or "softeners" when necessary.

9.1.6 Ensure the sling is securely attached to the load.

9.1.7 Do not stand near or under a suspended load and keep it clear of other obstructions.

9.1.8 Do not drag a sling across the floor, over abrasive surfaces, or from under a load.

9.1.9 Do not shock load (jerk) when lifting.

9.1.10 Lift the load no higher than necessary to get the job done.

9.1.11 Remove damaged slings immediately.

9.1.12 Always refer to load chart when determining the proper rigging.

9.1.13 Always use tag lines when controlling a lifted load.

9.1.14 Rigging equipment should always be removed from the immediate work area and stored in the proper place.

9.2 All materials handling gear and equipment provided by the employer shall be inspected by the employer or an authorized representative before each use and when necessary, at intervals during its use, to ensure the safety of the equipment.

9.3 Inspection records are to be maintained on all material handling equipment and shall contain at least the following information: (Refer to Appendices I, II and III for sample Inspection Forms.)

9.3.1 Type of sling;

9.3.2 Serial number of sling;

- 9.3.3 Type of material (chain, wire rope, synthetic fiber, etc.);
 - 9.3.4 Date purchased;
 - 9.3.5 Date placed into service;
 - 9.3.6 Last date of inspection;
 - 9.3.7 Condition (wear, defects, deformation, increase in length);
 - 9.3.8 Date repaired;
 - 9.3.9 Date removed from service.
- 9.4 Since there are specific requirements regarding each type of sling, the inspection, use, storage and repair aspects are presented as follows in the discussion on each type of sling.
- 9.5 Chain Slings
- 9.5.1 General - Alloy-steel chain (grade 8 or above) is approximately twice as strong (size for size) as wrought iron chain. Alloy-steel chain has become the standard material for chain slings. Wrought iron should not be used.
 - 9.5.2 Purchase - Alloy-steel chain (grade 8 or above) slings should be purchased complete with load test certifications and certification tags.
 - 9.5.3 Construction and Component Parts - Alloy-steel slings consist of six parts:
 - 9.5.3.1 The master link;
 - 9.5.3.2 The master joiner (coupling) link;
 - 9.5.3.3 The coupling link;
 - 9.5.3.4 The leg (body, chain);
 - 9.5.3.5 The joiner (coupling) link;
 - 9.5.3.6 The sling hook/clamp.
 - 9.5.4 Types of Chain Slings - In addition to chain size, and component parts of a chain sling, the number of legs also determines the amount of weight that can be lifted safely. Sets of chains are often referred to by chain size and a set of initials. In addition to the size of the chain, the letters refer to the components of the sling.
 - 9.5.4.1 Master links are generally available in either:
 - 9.5.4.4.1 Oblong (O);

9.5.4.4.2 Circular (C); or

9.5.4.4.3 Pear-shaped (P).

9.5.4.2 A set of chains is referred to by the number of legs in the set as follows:

9.5.4.2.1 A one-leg sling is referred to as a single leg (S);

9.5.4.2.2 A set of chains with two legs is referred to as double (D);

9.5.4.2.3 A three legged set is referred to as triple (T); and

9.5.4.2.4 A four legged set is referred to as quadruple (Q).

9.5.4.3 The description of a set of chains combines the above:

9.5.4.3.1 SOS = Single leg with oblong master link sling;

9.5.4.3.2 QOS = Four legs of chain with an oblong master link;

9.5.4.3.3 DCS = Double legged sling with a circular master link;

9.5.4.3.4 DPS = Double legged sling with a pear-shaped master link.

9.5.5 Inspection -In addition to the visual inspection that is required prior to each use, all slings are to receive regular (monthly and annually) detailed inspections which are documented (Refer to Appendices I, II and III for sample Inspection Forms.)

9.5.5.1 The inspection shall include observation/measurement for:

9.5.5.1.1 Wear;

9.5.5.1.2 Defective welds;

9.5.5.1.3 Deformation; and,

9.5.5.1.4 Increase in length.

9.5.6 Interlink wear, not accompanied by stretch in excess of five percent, shall be noted and the chain removed from service when maximum allowable wear has occurred at any point of line. This varies from:

9.5.6.1 3/64 inch for 1/4-inch chain; to

9.5.6.2 3/16 inch for 1-inch chain; to

9.5.6.3 11/32 inch for 1 3/4 inch chain.

- 9.5.7 Chain slings shall be removed from service when, due to stretch, the increase in length of a measured section:
 - 9.5.7.1 Exceeds five percent;
 - 9.5.7.2 When a link is bent, twisted or otherwise damaged; or
 - 9.5.7.3 When raised or defective welds appear.
 - 9.5.7.4 Alloy steel chain slings shall be permanently removed from service if they are heated above 1000o F. When exposed to service temperatures in excess of 600o F, maximum working load limits permitted in Table N-184-1 (OSHA 29 CFR 1910.184) shall be reduced in accordance with the chain or sling manufacturer's recommendations.
- 9.5.8 Repairs shall be made only by persons trained and qualified to make repair to chains. Manufacturer's guidelines shall be observed.
- 9.5.9 Links or portions of the chain found to be defective shall be replaced by links having proper dimensions and made of material similar to that of the chain.
 - 9.5.9.1 Chains shall be proof tested to the test load recommended by the manufacturer PRIOR to returning the chains to service.
 - 9.5.9.2 Alloy chains shall not be annealed.
- 9.5.10 Attachments
 - 9.5.10.1 Chain attachments (rings, shackles, couplings, and end links) are to be made of the same material to which they are fastened.
 - 9.5.10.2 Hooks should be made of forged or laminated steel and should be equipped with safety latches. Hooks that have been overloaded or loaded on the tips and have a permanent set greater than 15 percent of the normal throat opening are to be replaced.
- 9.5.11 Practice and Use -The following general rules apply to the use of alloy-steel chain slings:
 - 9.5.11.1 A load shall not be lifted with a chain having a kink or knot in it;
 - 9.5.11.2 A chain shall not be shortened by bolting, wiring, or knotting;

9.5.11.3 Standard tables shall be used to determine the maximum safe working loads of various sizes of alloy steel chains and chain slings (29 CFR 926.251 and 29 CFR 1910.184);

9.5.11.4 Each chain shall be tagged to indicate its identification or serial number and load capacity;

9.5.11.5 The lifting capacity (i.e., 10,000 pounds) is based upon the recommended practice of lifting with the legs of the sling attached to the workload at a 60-degree angle. As the degree of the angle of hook-up is decreased, the lifting capacity is also decreased.

9.6 Wire Rope Slings

9.6.1 General -One of the most dependable and economical tools of the industry, wire rope is also one of the least understood. The following information is intended to increase understanding of this seemingly complex product.

9.6.2 Working Load -The safety working load recommended by the manufacturer shall be followed.

9.6.2.1 Wire Rope Terms - Explanation of a few basic terms are needed for understanding.

9.6.2.1.1 Class -Wire ropes having approximately the same number of wires in each strand, and having the same number of strands per rope; i.e., 6 X 19 Class is a six strand wire rope with 9-26 wires per strand.

9.6.2.1.2 Wire Strand - Strands are designated by the number of wires they contain. Thus, a 7-wire strand has six wires laid around a single, center wire.

9.6.3 Construction and Component Parts of Wire Rope Slings

9.6.3.1 The eyes of a sling must be formed or spliced in order to maintain the safe working load of the sling throughout its use. The type of end fastenings is also a factor in determining the safe working load of the sling.

9.6.3.2 Protruding ends of strands in splices on slings and bridles must be covered or blunted.

9.6.3.3 Where U-bolt wire rope fasteners are used to form eyes, the U-bolt shall be applied so that the U-section is in contact with the dead end of the rope. Clip fasteners shall be installed in the number recommended for the rope size:

9.6.3.3.1 1/4 to 5/6 inch 3 clips;

9.6.3.3.2 3/4/ to 1 inch 4 clips;

9.6.3.3.3 1 1/8 to 1-1/2 inch 5 clips;

9.6.3.3.4 1 3/8 to 1-1/2 inch 6 clips.

9.6.3.4 Clips shall be spaced a minimum distance of 6 times the rope diameter.

9.6.4 Inspection -Wire rope must be inspected often but not less that the following guidelines:

9.6.4.1 Wire rope slings shall be inspected before each use.

9.6.4.2 Wire rope slings shall be inspected and lubricated periodically (monthly and annually) or at first sign of corrosion.

9.6.4.3 Wire rope must not be used as load lifting gear if:

9.6.4.3.1 The reduction of rope diameter is below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires;

9.6.4.3.2 There are a number of broken outside wires and the degree of distribution or concentration of such broken wires, or the rope shows other signs of excessive wear, corrosion or defect such as:

- worn outside wires;
- corroded or broken wires at end connections;
- corroded, cracked, bent, worn, or improperly applied end connections;
- severe kinking, crushing, cutting, or unstranding;
- greater than 3 broken wires in a single lay of a strand; or
- greater than 6 broken wires in a single lay of the cable.

9.7 Webbing Slings

9.7.1 General. No one synthetic webbing can handle all jobs in all conditions, three kinds of synthetic webbing slings are generally available:

9.7.1.1 Nylon slings - Unaffected by grease or oil. Good chemical resistance to aldehydes, ethers, and strong alkalis. Do not use for acids and bleaching agents. Not suitable for use at temperatures exceeding 250o F. Stretch at rated capacity should not exceed 10%.

9.7.1.2 Polyester slings - Unaffected by common acids and hot bleaching solutions. Do not use with concentrated sulfuric acid or alkalis.

Not suitable for use at temperatures exceeding 250o F. Stretch at rated capacity is approximately 3%.

9.7.1.3 Polypropylene slings - Unaffected by acids and alkalis. Not suitable for use at temperatures exceeding 180o F. Stretch at rated capacity is approximately 10%.

9.7.2 Inspection - Always inspect a sling before you use it. Periodic detailed inspections should be conducted and recorded monthly and annually.

9.7.2.1 The identification tag should have:

9.7.2.1.1 The length;

9.7.2.1.2 The rated capacity for each type of hitch;

9.7.2.1.3 The type of material, and may have other information such as manufacturer's name; and

9.7.2.1.4 Sling serial number.

9.7.2.2 When inspecting webbing sling, the following common types of damage should be considered:

9.7.2.2.1 Melted or charred spots;

9.7.2.2.2 Acid or caustic burns;

9.7.2.2.3 Weld spatter holes;

9.7.2.2.4 Broken stitching;

9.7.2.2.5 Cuts or tears;

9.7.2.2.6 Damaged eyes or fittings;

9.7.2.2.7 Excessive abrasive wear; and,

9.7.2.2.8 Knots.

9.7.2.3 If a sling is found to be damaged, take it out of service immediately. Never attempt to make temporary repairs. End fittings may be salvaged for a new sling, provided they are still within tolerance.

9.7.2.4 Manufacturers make into slings red, green, or blue warning fibers. Where these are observed due to cuts or wear, the sling must be deemed out of service.

9.8 Lifting vessels without lifting lugs

- 9.8.1 When lifting vessels/bottles/scrubbers without lifting lugs, follow the procedure as in Appendix I, Job Safety Analysis.

10.0 CONTRACT AND/OR TEMPORARY EMPLOYEES

The provisions of this procedure apply to all contract and temporary employees of B&B.

11.0 DOCUMENTATION

11.1 Training Records

- 11.1.1 All training documentation required under this program will be retained in the HSE Department.

11.2 Inspection Records

- 11.2.1 Daily inspection records shall be retained for a period of 45 days.
- 11.2.2 Monthly inspection records shall be retained for a period of 13 months.

- 11.3 The HSE Coordinator responsible for all aspects of document maintenance and retention.

12.0 FORMS

Forms relative to this program may be found in the Appendices.