

Rigging & Lifting Metal Enclosed Capacitor Banks

Introduction

Due to size, Northeast Power Systems, Inc. (NEPSI) metal enclosed capacitor banks and harmonic filter banks are often shipped on a flatbed trailer to their final destination. These banks are typically off-loaded with either a forklift or crane, which is usually dependent on their size and/or weight.

A contractor with access to the proper equipment and expertise is typically hired to rig and lift the bank into place and perform the installation when in-house expertise and equipment is not available. Rigging and hoisting the bank into place is a simple matter, with the technical details typically left to the contractor.

This technical note provides a basic overview of rigging and hoisting NEPSI's metal enclosed banks with a forklift or a crane and recommends actions that can be taken to ensure the safety of personnel and equipment. Since a crane is commonly used and is more complex than a forklift in terms of rigging and hoisting, crane use and the associated rigging is discussed in greater detail.

This technical note is not intended to serve as a complete guide to rigging and hoisting. Federal, state, and local regulations must be complied with, which are beyond the scope of this technical note. Only qualified personnel who have adequate training in the operation and use of rigging and lifting equipment should perform these operations.

How NEPSI Equipment is Shipped

NEPSI's capacitor and harmonic filter banks are shipped on wood supports, called dunnage, (usually 4" x 4") or are placed directly on the bed of a flatbed trailer (see pictures below). This is primarily dependent on the size and weight of the equipment, with larger banks being placed directly on the bed of the truck. All banks are chained and strapped to the trailer, and then fully tarped.



Picture above shows multiple NEPSI banks on a flat-bed truck prior to securing and tarping. These banks are placed on wood dunnage for ease of off-loading by either a forklift or crane.



Above picture shows a NEPSI bank, prior to securing and tarping, placed directly on the bed of a truck (no dunnage). A crane is usually required for hoisting these larger units.

Rigging & Lifting NEPSI Metal Enclosed Banks

Lifting and Offloading with a Forklift

Lifting and offloading NEPSI's capacitor and harmonic filter banks from a flatbed or covered van with a forklift is a common and relatively simple task. When using a forklift, keep these points in mind:

- Only qualified, trained, and experienced operators should use a forklift. Many of these requirements are contained in OSHA regulation 29 CFR 1910.178.
- Make sure the forklift has adequate lift capacity (refer to equipment nameplate). Forklift equipment is rated for a maximum lifting capacity at the load center on the forks. If the weight center of the load is further out on the forks, lifting capacity is reduced. Charts showing load capacity versus weight center distance are usually posted on the forklift.
- Survey the path the forklift will take, look for terrain conditions or obstacles that pose a safety risk. Use extreme caution on grades or ramps.
- Prior to lifting or transporting the equipment, forks should be spread as wide apart as practical. "Square up" to the load. The forks should extend completely under the equipment, with the load as far back on the forks as possible. Lift the equipment just high enough to clear the trailer. The back wheels of the forklift should be in firm contact with the ground, if not lift capacity may have been exceeded. Make sure the equipment is stable, and then tilt the mast back for better stability.
- Once clear of the trailer, immediately lower the equipment to the lowest height possible while still maintaining enough clearance above the ground for driving (2-6 inches). Do not raise or lower the load while you are traveling. Go slow as rough terrain can causing bouncing which can lead to dynamic load conditions that may exceed your forklift capacity.



Above picture shows a NEPSI capacitor bank being transported with a forklift. Forks are spread apart as wide as possible under the load and the load is centered and positioned as far back on the forks as possible. The mast is tilted slightly back to better stabilize the load and the load is as close to the ground as possible while still maintaining clearance above the ground.

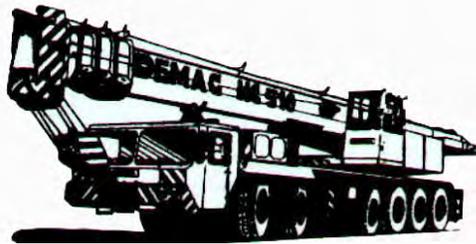
Rigging and Hoisting with a Crane

Planning & Safety

Before the capacitor or harmonic filter bank equipment arrives on-site, it is important to consider and plan for the following:

- Conduct a site survey to access safety concerns and ensure there aren't any restrictions or conditions that may impede the use of a crane. Before the crane arrives, determine where it will sit and where it will travel. Look for overhead lines and structures and ensure adequate clearance. See table below for minimum clearances for power lines. This clearance applies to all areas around the power line, above, below, and to either side. Note rough terrain conditions such as ditches, trenches, excavations, holes, rises, and railroad tracks.

Minimum Power Line Clearance	
Power Line Voltage	Minimum Clearance
up to 50k	10 feet
50k to 75k	11 feet
75k to 125k	13 feet
125k to 175k	15 feet
175k to 250k	17 feet
250k to 370k	21 feet
370k to 550k	27 feet
550k to 1,000k	42 feet



- Be aware of underground vessels and storage tanks that may pose a risk for heavy equipment.
- If a crane will be used, determine how close the crane can get to the equipment to be hoisted. As the horizontal reach of a crane increases, crane capacity decreases rapidly.
- Most cranes companies charge by the hour with a minimum of two to four hours (for budgeting purposes, assume \$400 to \$600). Others may charge for an entire day regardless of time actually spent. Charges are typically based on crane time from port-to-port, so select a reputable company that is local and keep track of your equipment while it is in transit to minimize unforeseen delays.
- In general, NEPSI provides the trucker delivering the equipment with customer contact information. NEPSI can inform the driver to contact the customer 24 or 48 hours in advance to help crane scheduling. It is important that this request be made to NEPSI on the equipment purchase order or prior to shipment.
- To minimize crane cost and unanticipated delays, NEPSI recommends that the customer monitor the shipment once it has left our manufacturing site. NEPSI provides trucking company contact information and when available the mobile phone number of the driver that will deliver the equipment. NEPSI provides the best estimate of when the equipment will arrive, but due to circumstances beyond our control (e.g., weather, traffic), delays can occur.
- In order to minimize crane charges, provide NEPSI drawings of the equipment to be lifted prior to the crane arriving on site. NEPSI provides drawings with various views, including lift points, weight, and dimensional information. Providing these in advance will help ensure that a crane and rigging equipment of the correct capacity arrives. **USE ALL AVAILABLE LIFTING EYES WHEN RIGGING!**

Rigging & Lifting NEPSI Metal Enclosed Banks

- Lift equipment slightly off ground until slings are taunt, examine rigging (shackles or hooks, lifting eyes, wire rope) to ensure there are no problems. Visually examine for structural damage. Always know....never guess. No one should be positioned under a suspended load. Use tag or guy lines to guide the unit into position.

Basic Rigging Equipment & Definitions

The following are some definitions and pictures related to rigging and rigging hardware. All rigging hardware has a rated capacity that must not be exceeded.



Lifting Eye – a point of attachment on the enclosure, having a looped head designed to accommodate a shackle or hook. Above picture shows removable lifting eye and chain used to secure the equipment on a flat-bed truck.



Shackle and Hook– Both a type of clevis normally used for lifting. Above picture at left shows screw pin anchor shackle fastened through lifting eye, with wire rope sling. A hook with a throat latch is shown in above right picture.



Spreader Bar- Often adjustable, a frame, forming part of the boom suspension, used to assist in rigging a load. Picture above shows two adjustable spreader bars with wire rope slings and shackles.



Wire Rope Slings – Made from various grades of steel, used to secure load. Synthetic web slings are also be used.

Typical Rigging Configurations

The pictures below show rigging configurations that are typically utilized when lifting NEPSI capacitor and harmonic filter banks with a crane. The rigging configuration used is usually determined by the crane operator.

Rig 1



Rig 2



Rig 3



Above Rig 1 and Rig 2 pictures show rigging hitch utilizing two adjustable spreader bars with straps (top picture) and wire cable sling (bottom picture) connected to each of the lifting eyes located at the bottom corners of the enclosure. Note protective pad used above each lifting eye to keep the wire rope away from the enclosure to prevent paint scratching and sling damage.

Above Rig 3 picture shows rigging hitch utilizing a single adjustable spreader bar and wire cable sling connected to each of the lifting eyes located at the bottom corners of the enclosure.

Rigging & Lifting NEPSI Metal Enclosed Banks

Typical Rigging Configurations (Continued)

The pictures below show some additional rigging configurations that are typically utilized when lifting NEPSI capacitor and harmonic filter banks with a crane. The rigging configuration used is usually determined by the crane operator.

Rig 4



Rig 5



Above Rig 4 and Rig 5 pictures show rigging hitch utilizing two adjustable spreader bars and a pulley system. Note there are qty (8) lifting eyes on the above pictured equipment. **ALL LIFTING EYES MUST BE UTILIZED FOR ANY LIFT.** In some cases, there are qty (6) lifting eyes provided. In this case, the two inner cables are connected to the same center lifting eye, seen below in Rig 6.



Rig 6

Conclusion

Rigging and lifting NEPSI metal enclosed capacitor and harmonic filter banks with a forklift or a crane is a simple matter, but should only be performed by qualified individuals. Planning in advance of equipment arrival can minimize costs involved and reduce the risk to personnel and equipment.

Northeast Power Systems, Inc.
66 Carey Road
Queensbury, NY 12804

Phone: 518-792-4776
Fax: 518-792-5767
Website: www.nepsi.com
Email: sales@nepsi.com