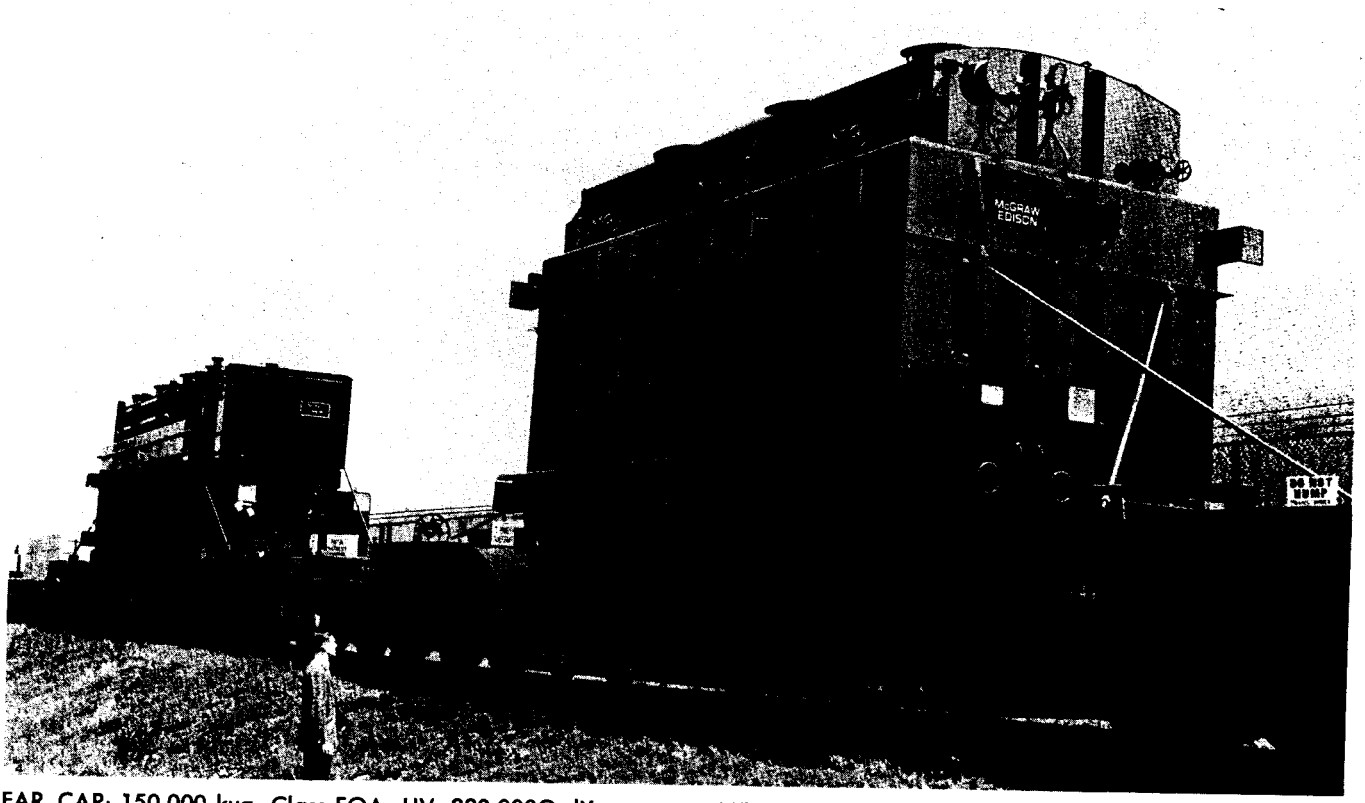
Replaces PTI 161-8
No Change in Text



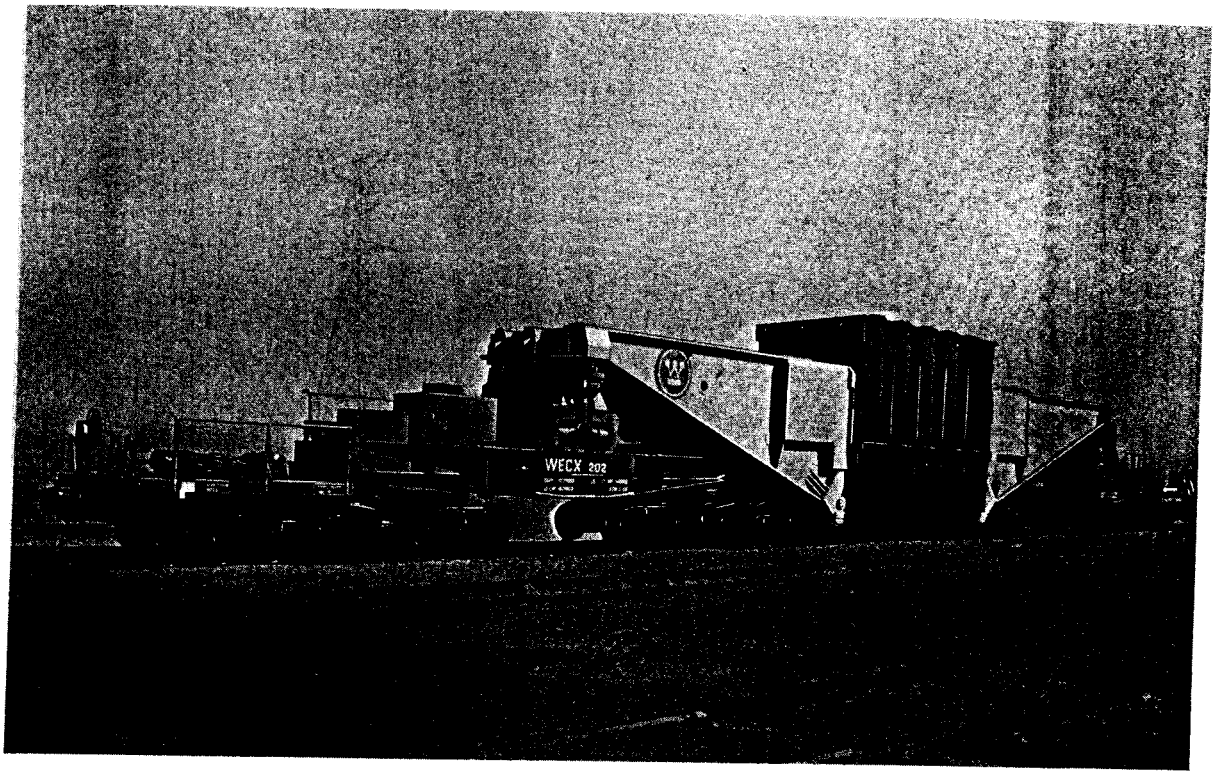
FAR CAR: 150,000 kva, Class FOA. HV: 220,000GrdY volts. LV: 69,000Y volts. TV:13,000 △ volts.

NEAR CAR: 315,000 kva, Class FOA. HV: 230,000GrdY volts. LV: 17,000 △ volts

FIGURE 1

Transformers ready for shipment with auxiliary parts loaded on other cars.

These instructions do not claim to cover all details or variations in the equipment, procedure, or process described, nor to provide directions for meeting every possible contingency during installation, operation, or maintenance. When additional information is desired to satisfy a problem not covered sufficiently for the user's purpose, please contact your McGraw-Edison Power Systems Division sales engineer.



1070

Schnabel Car Shipment

Westinghouse large power transformers are designed for shipment on the exclusive Schnabel railroad car. The transformer, loaded on the superstructure, is actually part of the car and rides within 6 inches of the top of the rail. By comparison the bed of a depressed center rail car is a minimum of 28 inches high, thus the effective shipping clearance height of a transformer is reduced 22 inches with Schnabel shipments.

This reduction in shipping clearance height eliminates the necessity of sectionalizing the tank for shipment and greatly reduces field assembly time. Since the tank need only be opened for installing and connecting bushings, the atmospheric exposure is minimized and the transformer's reliability is enhanced.

The pivot centers on the loaded Schnabel Car are the same as a standard railroad box car, therefore, it can negotiate standard railroad curves and does not require special routing.

The cars are equipped with power driven hydraulic system and their own jacking system, facilitating direct unloading of the transformer without using heavy mobile lifting equipment. After the transformer is skidded to the pad the two halves of the empty car are coupled together for return to the factory. The unloading operation and moving the transformer onto its own foundation pad from an adjacent rail siding can be completed in an 8 hour working shift with a minimum of labor.

Westinghouse has three cars available (500,000 pound, 750,000 pound and 1,000,000 pound capacities) for maximum flexibility in scheduling transformer shipments.

Supersedes PTI 205-2 dated 8/68

INTRODUCTION

The information in this manual is to be considered as a guide to those who are required to move large power transformers and who would like some guidance. The contents do not restrict experienced power company personnel or professional movers who have their own equipment and methods, except that the unique construction of each transformer base must be recognized so that rollers can be properly placed to avoid any damage to the transformer.

These instructions apply to transformers with unit shipping weights up to 1,000,000 pounds.

MOVING BY CRANE

Transformers may be moved by a crane if one is available. Use lifting equipment of a reputable manufacturer, within its rated capacity. Spreaders should be employed so that the lifting cables, bars or chains are vertical. Core-form transformers should be lifted only when the regular tank cover or the shipping cover is securely fastened in place.

Shell-form transformers, which have lift lugs low on the tank, should be lifted only when the regular tank cover or the shipping cover is securely fastened in place, and the slings are securely restrained by sling guides. Shell-form transformers should never be lifted without the use of sling guides. Beyond this, only standard precautions need to be taken.

MOVING BY ROLLING OR SKIDDING

Since cranes are infrequently available, the remainder of these instructions will be concerned with moving transformers along the ground.

First, when moving a transformer, it is necessary to provide a steady platform from which to work. This requires that the railroad car or trailer bed be jacked off its springs and firmly blocked.

Second, it is necessary to consider the shape and base design of the transformer that is to be moved. There are two main types:

(1) Tank with a base exterior to the bottom plate of the transformer.

(2) Tank with a flat bottom plate which conceals the reinforcing members of the bottom plate.

Each of these types of transformers may be moved by (a) skidding on greased plates, planks, or rails; or (b) rolling on wood or steel rollers.

Precautions

There are several general precautions which must be taken with all of the above methods. No large power transformer can be tilted more than 15 degrees from the vertical in any direction.

When moving a transformer, whether the ground is level or sloped, one winch should pull and another on the far side of the transformer should pay-out slack. This precaution is necessary where greased plates, planks or rails are being used, as the pull required to start the transformer moving is greater than that required to keep it moving. This tends to make the first movement of the transformer a rapid springing movement which could be uncontrollable and dangerous without the second winch.

The arrangement with two winches is also a requirement when rollers are being used on the level or on a slope. The better way to use rollers on a slope is to slant them inward in a chevron effect (Figure 1). This causes restraining friction so that, on a small slope, the transformer must be pulled down instead of being let down.

Another precaution which should be followed is to use all of the pulling lugs which are available on the transformer. This means that if two lugs are placed for pulling in one direction, both should be used to avoid dangerous overloading and structural failures, and to provide greater stability.

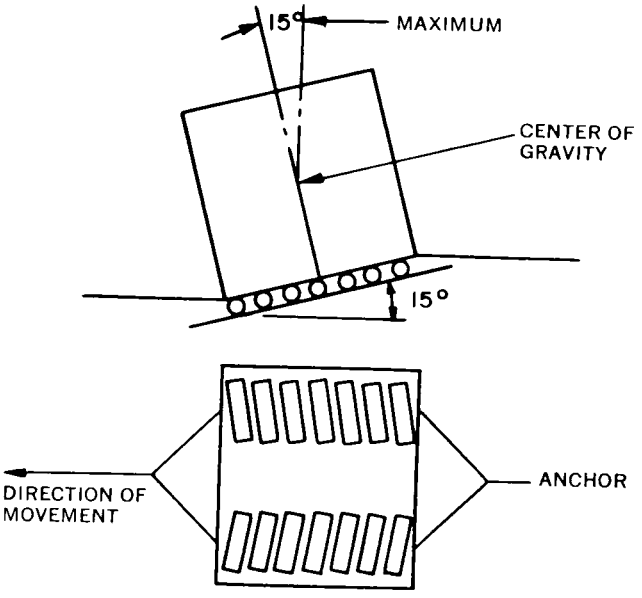


FIGURE 1

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Care should be taken to keep the surface over which the transformer is moved as level as possible. Any deflection of this surface when sliding a transformer will cause the leading edge of the base to "dig in" (Figure 2).

Such an occurrence will cause the winch, cables, shackles and pulling lugs to be stressed much higher than necessary. Any deflection in the member over which rollers are moving will overload outside rollers and the transformer (Figure 3).

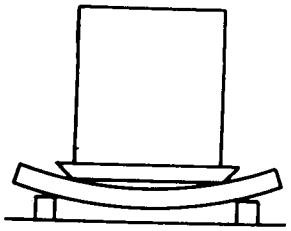


FIGURE 2

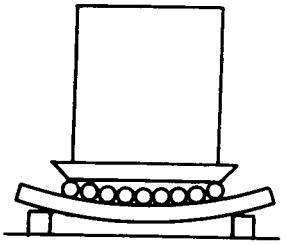


FIGURE 3

Tanks with Exterior Bases

To move a transformer which has a base exterior to the bottom plate, it is only necessary to provide adequate support under main outer members of the base that are parallel to the direction of movement (Figures 4 and 5).

Rectangular Tanks With Concealed Braces

Rectangular tanks with concealed brace members are McGraw-Edison's standard construction on shell-form and are an alternate construction on core-form transformers. The bottom plate, except under the tank walls, will *not* support rollers. Thus, for all rolling, blocking or skidding operations, the supporting members must be placed so that they are directly under the tank walls (Figures 6 and 7).

General Instructions

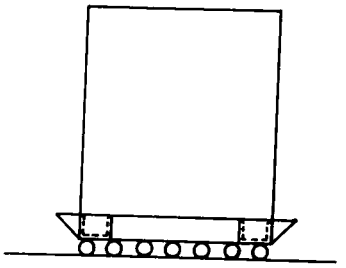
A satisfactory method of moving any large transformer might be as follows: Lay down a runway of 12 x 12 timbers, as nearly continually supported as possible, for each set of rollers to be used. Firmly attached to the top of each timber runway should be a ½-inch-thick mild steel plate which is wider than the rollers. With available winch trucks, the larger members can be winched into position.

The rollers may, for example, be 3-inch ips, with a 0.6-inch wall thickness, and may be about four feet long. The ends of the rollers should be tapered. This is to prevent a lip, having a greater diameter than the rest of the roller, from developing when the rollers are pounded into position with a sledge hammer.

The table shown below may be used as a guide for choosing rollers. These figures are for steel rollers, and will result in satisfactory bearing areas. Wooden rollers, also, may be used, but the number and the size of such rollers must depend on the experience of the mover.

The winches should be attached to the transformer as previously stated; that is, one to pull and one to act as an anchor. When attaching the cables to the pulling lugs, the

Shipping Weight In 1,000 Lbs.	Nominal Size and Number of Rollers of Double-Extra Strong, XXS, Standard Pipe					
	1-In.	2-In.	3-In.	4-In.	5-In.	6-In.
100-150	50	26	18	14	—	—
150-200	66	34	22	16	14	10
200-250	84	42	28	20	18	14
250-300	100	50	34	24	20	18
300-350	116	58	38	30	24	20
350-400	132	66	44	34	26	22
400-500	166	84	56	42	34	28
500-600	200	100	66	50	40	34
600-700	—	—	76	58	46	40
700-800	—	—	90	66	54	44
800-900	—	—	—	—	60	50
900-1000	—	—	—	—	68	56



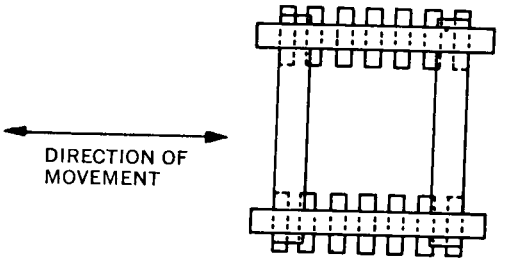
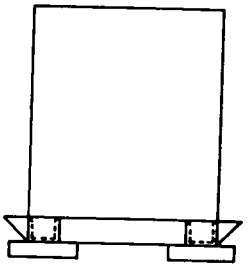


FIGURE 4



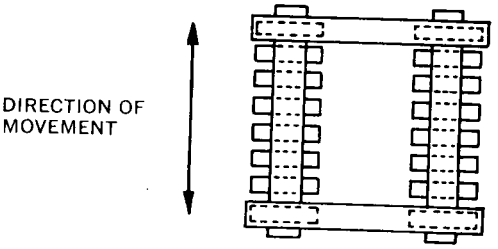


FIGURE 5

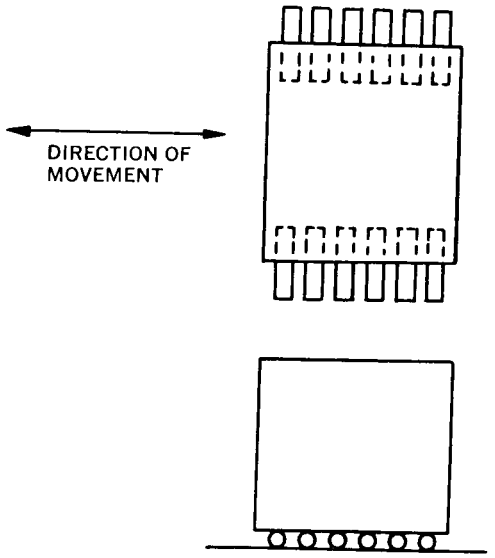


FIGURE 6

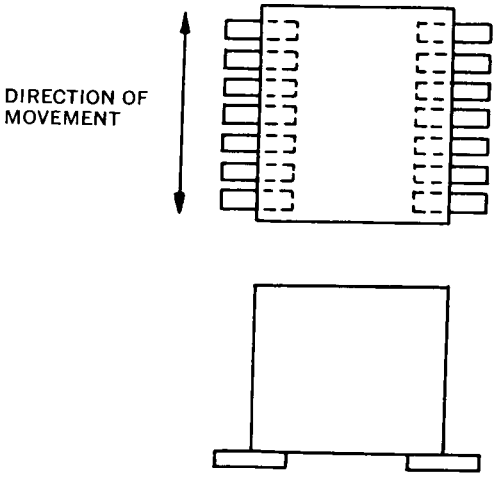


FIGURE 7

yoke must not be too short. A minimum is when A equals B (Figure 8). The force F gets larger as A gets smaller. If A is small enough, this sideways force will get large enough to cause a failure in the transformer pulling lugs or yoke cables. Therefore, if A must be smaller than B, a spreader illustrated in Figure 9 is necessary.

A transformer which is being moved must sometimes be turned. The maneuver can most easily be accomplished, whether skids or rollers are being used, by pulling on diagonally opposite lugs. When a transformer on rollers has to be turned, the roller should be kept as nearly perpendicular to the outside arc of the turn as possible. The rollers will then turn more easily and will remain under that section of the transformer where they were placed, through a longer distance.

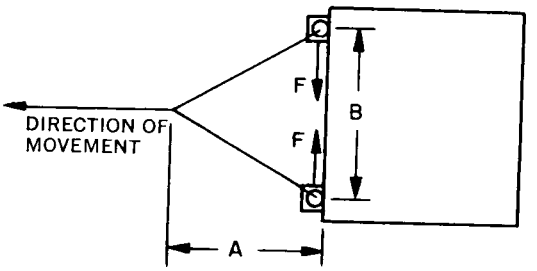


FIGURE 8

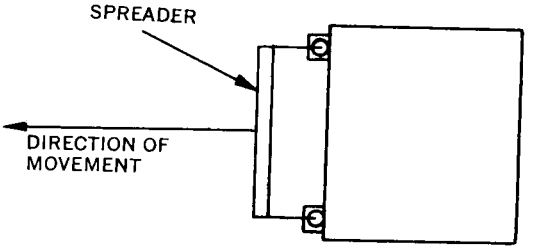


FIGURE 9