



# Radiators



**Fig. 1. Method of loading radiators for shipment**

## DESCRIPTION

Transformer radiators consist of a number of cooling tubes welded into a removable assembly. The upper and lower headers are flanged to permit attaching to the shut-off valves or in the case of forced-oil cooled units to the tank manifolds. Each radiator is provided with lifting eyes, a vent plug at the top, and a drain plug at the bottom. Radiators are normally removed for shipment in order to reduce the overall shipping dimensions of the transformer and the oil required for refilling them is placed in separate drums. The radiators will be mounted in a horizontal manner for shipment as shown in Fig. 1.

## VALVES

On self-cooled/forced-air cooled transformers each radiator is mounted on a pair of four-inch shut-off valves. The butterfly type valve, Fig. 2, is designed to permit the use of a single set of mounting studs for bolting both the valve and the radiator to the transformer. The valve handle is provided with a threaded hole and a stainless steel bolt which can be screwed into holes in the valve body to lock the valve in either the OPEN or CLOSED position. Opening or closing the valve requires turning the operating handle through 90 degrees.

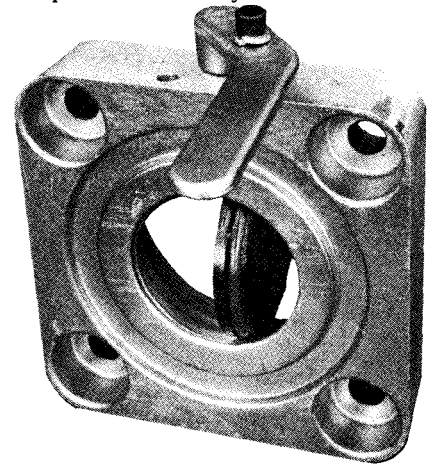
On transformers with a forced-oil-cooled rating, the radiators are mounted

directly on the top and bottom tank manifolds. Instead of individual shut-off valves for each radiator, larger valves are used between the manifolds, tank, and pump to permit isolating the entire cooling bank at one time as explained in separate instructions furnished with that equipment.

## INSTALLATION

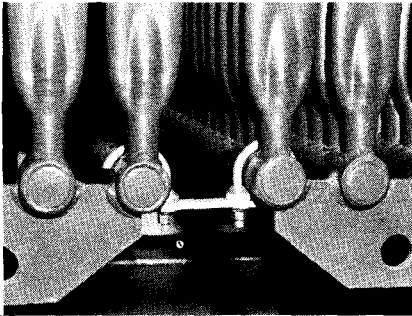
Gasketed shipping plates are placed over all openings when the transformer and its radiators leave the factory. The gaskets used on the valves or manifolds are to be re-used when installing the radiators. Keep each set of gasketed plates bolted to the tank flanges to protect the valves and seal the openings until ready to install the corresponding radiator. If the transformer has been shipped gas filled, its internal pressure should be relieved by venting to the atmosphere before attempting to remove any of its shipping plates.

To assemble a radiator make sure the valves are closed, remove the corresponding pair of shipping plates, and clean the gasket surfaces. Lift the radiator into position using a cable attached to each lifting eye. This will facilitate vertical alignment of the flange holes and mounting studs and thus minimize thread damage during assembly. When bolting in place, use care to obtain uniform gasket compression. Normally the radiators fur-



**Fig. 2. Four-inch radiator valve**

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**Fig. 3. J-bolt brace assembly**

nished with each transformer are interchangeable and can be mounted in any location on the unit. If for some reason they need to be mounted in a particular sequence, each radiator will be match marked to identify it with its mating valve or mounting flange. To complete the installation, attach J-bolt brace assemblies between the first and second tubes at both the top and bottom of adjacent radiators as shown in Fig 3.

**OIL FILLING**

The radiators have been designed for full vacuum and therefore can be filled with or without vacuum along with the main tank if desired. Lock all shut-off valves in the OPEN position and fill the transformer as explained in the instructions on "Installation and Maintenance." If the transformer tank was received oil-filled or has been filled prior to adding the radiators, the following method can be used.

Radiators can be filled from the main tank by opening the top and bottom valves. Be sure the transformer windings and end insulation are not exposed to the atmosphere. Add make-up oil through the top of the tank as required to restore the liquid to its proper level. Radiators installed on forced-oil-cooled transformers become part of a cooling system which can be filled or drained separately if preferred. Refer to the instructions entitled "Forced-Air/Forced-Oil Cooling Equipment." After filling, check to see that all valves are bolted in the OPEN position.

**DISASSEMBLY**

If one or more radiators are to be removed without draining the oil from the transformer, proceed as follows:

1. Provide clean storage containers to accommodate the oil in the radiator(s). The total number of gallons of oil in the radiators is given on the transformer nameplate.

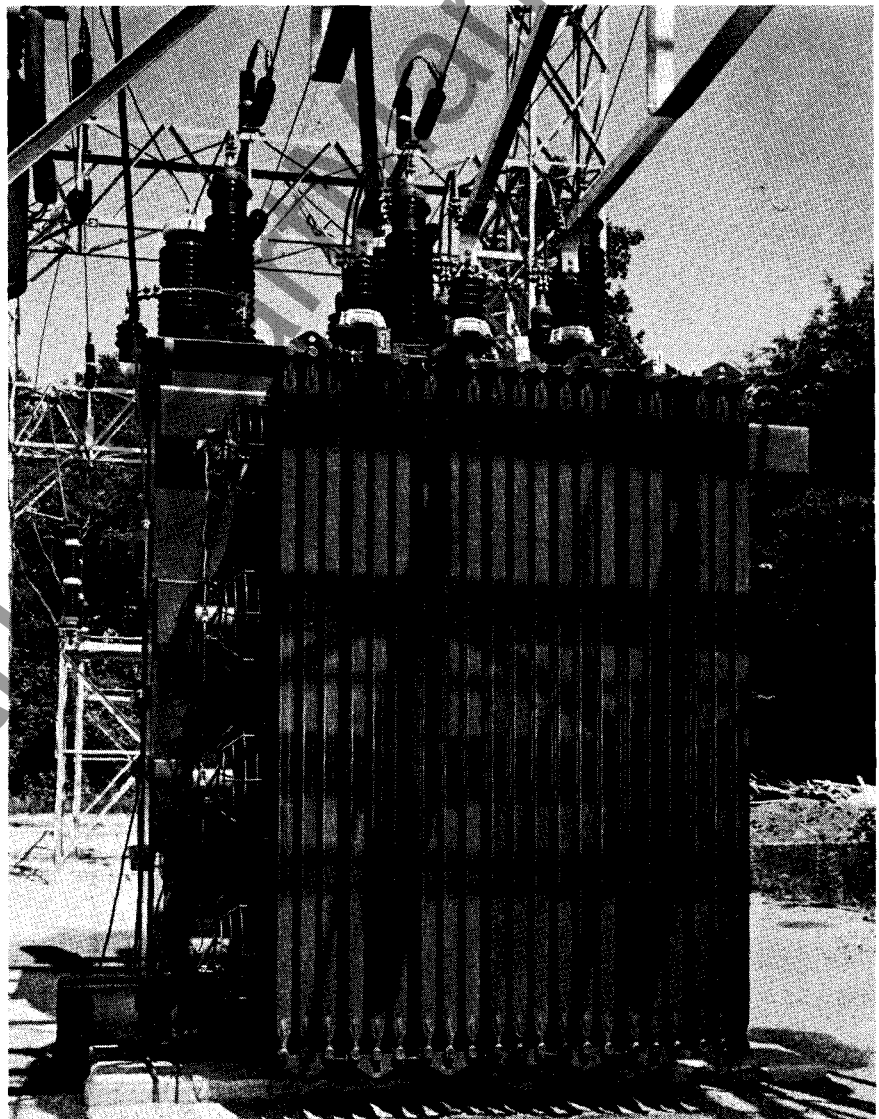
- 2. Close the appropriate valves.
- 3. Make piping or hose connections between the radiator or manifold drain and the storage container. If available, an oil pump will aid in removal of the oil.
- 4. Remove the vent plug in the top header to permit the oil to drain from the radiator.

Radiators mounted on individual shut-off valves can be drained by forcing the oil into the main tank with gas pressure if there is space in the main tank for the extra oil. This method should be used only when the transformer is de-energized. The following procedure is recommended:

- 1. Close the top and bottom radiator

- valves.
- 2. Attach a nitrogen gas bottle to the top radiator vent opening.
- 3. Open the bottom radiator valve.
- 4. Apply gas pressure to the radiator (not to exceed 25 psi). When gas bubbles appear inside the tank, stop the gas and close the bottom radiator valve.
- 5. Place a clean pail under the bottom drain and open the drain to remove the oil which is left in the bottom header.
- 6. Remove radiator from tank.

Reassemble the radiator in accordance with the procedure previously outlined. Clean the drain and vent plugs, as well as the gaskets and gasket surfaces before assembly.



**Fig. 4. Typical radiator installation**



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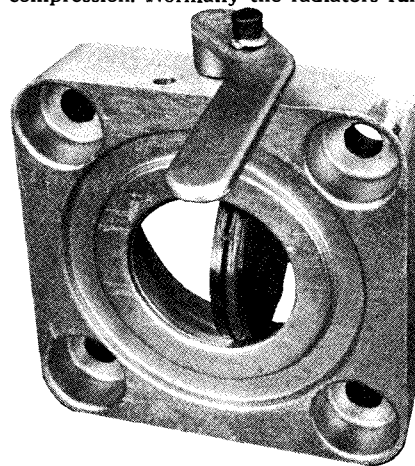
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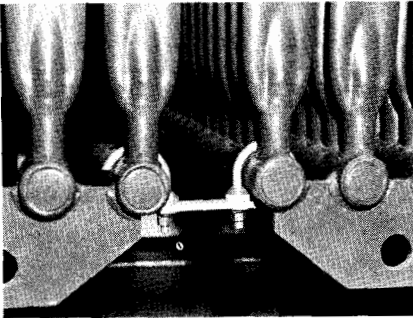
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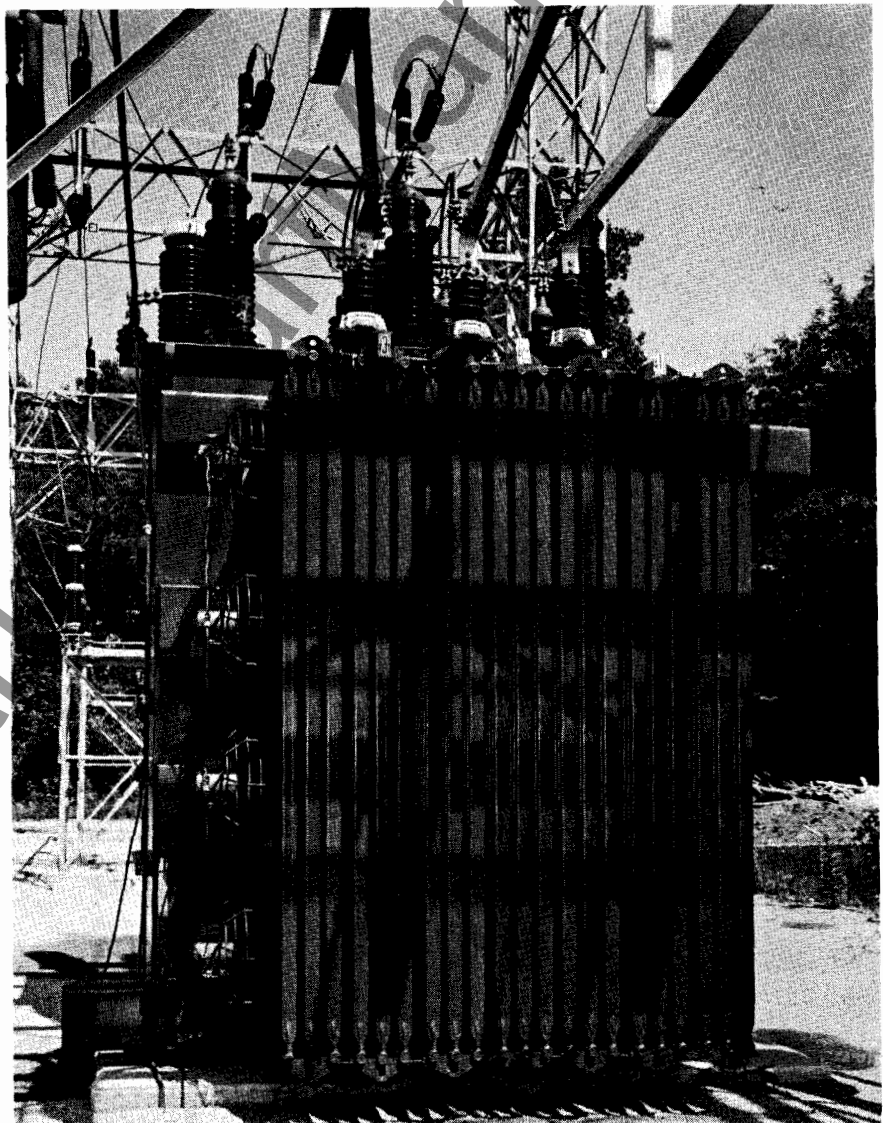
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