

ELECTRICAL SYSTEM REPORT

"VOICE OF PEACE"

1. This report is written from an engineering point of view.

The facts stated herein are based on direct observation of the conditions that presently exist, along with notations of changes made to the system at the time of writing. No attempt has been made to find fault with any individual either past or present, but rather to simply state the obvious as indicated by observable facts.

PART 1 SHIP SYSTEM INSTALLED AT TIME OF CONSTRUCTION

The writer has been led to believe that the ship MV. Peace is now some forty years old. Some of the original wiring dating from the original installation is still in use, primarily in the Direct Current circuits. Both the wiring itself and most of fittings are badly corroded by a combination of salt air and age, along with the movement of the ship. Many changes have been made to this system by various engineers, and as a result there is no longer any recognisable standardisation in the original system and in the direct current system. The D.C. system is presently used to provide lighting in the event of A.C. generator failure, and also to power the ship's radar and other marine devices. The D.C. system is put into use every ten days when the main generator is shut down for maintenance.

PART 2 ELECTRICAL SYSTEM INSTALLED AT THE TIME OF RE-FITTING IN 1972

The generators on the ship turn out 220 Volts on a three wire system. This current is routed via a distributor panel to the main breaker panel. This main breaker panel provides power to all of the electrical systems on the ship.

Within the main breaker panel various faults were observed. The neutral leg of the electrical system was grounded to the case of the breaker panel by means of a large copper grounding lug. By grounding the neutral to the case and hence to the hull, the potential for electrical shock, was very high at all points on the ships' hull. Also, the grounding lug was badly corroded by the action of the salt air. This has been remedied by isolating, the lug from the case of the breaker box, cleaning of the corrosion, and covering the installation with grease. This removes some portion of the observed shock hazard. The repair is of a temporary nature.

It should be noted at this point that there is no effective and complete grounding system on the ship. No proper grounding system was installed to match up with the generation of AC power at the time of refitting, and the parts and facilities required to remedy this significant omission are not available at this time, the lack of a correct grounding system creates electrical shock hazards as well as fire hazards. The lack of a ground system creates hum and other noises in both studios which affect the quality of the transmitted signals from the transmitters. Attempts have been made to correct the hum and buzz situation by past engineers, but only, limited success has been met with due to the lack of a proper ground system required by any standard electrical installation - particularly a radio station.

Inside the main breaker panel various gauges of cable have been used; to make the required connections. This is contrary to electrical standards and could result in overheating, system failure or fire. At the present time the main breaker is running warm at all times. There is no way to remedy this problem at this time,

Three large distribution transformers are wired in such a way as to take one leg of the basic 220 Volt supply and distribute it through the ship to operate the 110 Volt system. These transformer are running warm at all times, indicating an overload condition. The intent of these transformers appears to be to change the 220 Volt supply to 110 volt. This is not done The transformers are wired in such a manner as to have 220 volts on the input side, and 220 volts on the output side. It should be noted that we cannot dismantle the system while in operation to verify this since the ship must operate non stop. The output of the three transformers is routed through a fused knife switch box to three breaker boxes that supply 110 volts to the various parts of the ship. The 110 volt supply for the lower deck *has an* additional switch box located next to the main panel. This use of switch boxes is incorrect. The required method as used in USA standard installations is as follows: 220 Volts is taken from a splitter box after the main breaker panel and sent to the three 110 Volt breaker boxes, each of which has a switch box located no more than one foot away from the related breaker box. The present method creates an imbalance on the system with overloading in one area and incorrect use of capacities in two other areas. Another imbalance is that the three transformers are operating at various loads.

The three breaker panels that supply 110 volts are not the correct type. They have no ground connections. Attempts are being made to correct this fault, but there are no parts, and in any event, the breaker boxes are not the correct type additions have been made to the system and these additions have been done by people who have no knowledge of USA standards Incoming cable runs have had the grounds tied to the neutral bus bar creating an extreme shock hazard, this has been remedied. Incorrect phasing appears to be common in both the refitting and subsequent additions. Some of this condition has been remedied, as much as can be done with the parts of the system not in use.

The cable runs to the 110 volt system are in the most part of the incorrect type and gauge. It is not possible to correct this at this time. The cables have been fastened to the walls and bulkheads, with a form of wire staple that has not been allowed in the USA for many years. This staple requires a hammer to drive them in. This system breaks the insulation, and causes short circuits. This cannot be repaired at this time.

The 220 volt system operates directly from the main breaker panel. The current is distributed through the switching portion of the main breaker panel to two breaker panels. There is a third run of the 220 volt system which has a correct knife-switch mounted near the relevant breaker panel on the lower deck. The other two breaker panels have no knife switches - a dangerous method. The three 220 volt breaker panels have no grounds. This cannot be remedied at this time. The wiring in the 220 volt system is a mixture of various types of cables, most of which are underrated. Colour coding has not been properly observed resulting in a shock hazard to users and particularly to service personnel. This cannot be remedied at this time. Included in the 220 volt system is a mixture of U.S., British, and Israeli wiring runs. This creates a problem of various wire gauges and colour codes, all without grounds. The result is very hazardous. The 220 volt system is in poorer condition than the 110 volt system in many respects. This situation cannot be remedied at this time.

PART 3 ADDITIONS TO THE ELECTRICAL SYSTEM

It is very apparent that from time to time additions have been made to the system by people who have had no knowledge of USA standards originally employed on the ship. The results have to make the ship a more dangerous place to live and work in. The most obvious faults are in the grounding and phasing. This has been remedied wherever possible, but only in a very limited manor

Cables of various gauges and types have been used in combinations that do not match correct standards.

The most obvious fault is in the additions made to the cables located on the middle deck, including the telex room. The basic supply starts at the breaker panel located in the centre of the deck. All of the cable runs have been added to a breaker panel that was already operating at capacity. The new cable runs in all cases were laid over top of the runs into the various breakers resulting in two or three runs coming from each and every breaker completely contrary to USA standards. This method is also contrary to the standards used anywhere in the western world. This has been partially corrected at this time.

The wire used to feed the cabins is of the type use to make up lamp extension cords, and must never be used for mains wiring or wiring buried in walls. The wire is made of soft rubber and has no ground. In some cases light gauge lamp cord has been used, this entire group of cabins represents an ongoing hazard for shocks and fire. This problem cannot be remedied at this time.

PART 4 SUMMARY

There are virtually no spare parts on the ship. Since the wiring is done to USA standards, there is almost no possibility that parts can be obtained on this side of the Atlantic. There are very few tools of any kind on board the ship, and there are no tools or test instruments for electrical work.

Fuel vapour is always present on the ship, and there seems to be no provision in the electrical system to prevent arcing which could ignite the fuel vapour with disastrous results. Aside from the forty year old wiring, there is no provision for marine conditions.

Corrosion is highly visible everywhere in the electrical system, running the gamut from staples used to hold cable runs to the walls through to the receptacle and switch boxes.

This report has covered all of the faults observed. Examples include the use of plastic covered cable to supply 220 volts to the fuel separator. This cable is covered with oil and is becoming saturated and dangerous. This should be replaced with armoured cable of the correct type. The 220 volt supply to the main extractor fan of the transmitters is rubber covered flexible cable exposed to the outside deck and held in place with electricians tape. This should be replaced with the correct type of armoured waterproof cable with the appropriate connectors. There are dozens more like the two quoted above. Parts do not exist to correct these faults.

PART 5 RECOMMENDATIONS:

The general of the ships' electrical system is to a poor domestic level. There are numerous shock and fire hazards everywhere. The situation will run downhill as salt air, vibration from the generators, and ship movement eats away at the system. For some five years now the ship has been functioning with various members of the crew receiving minor shocks but no major injuries or deaths. The potential for injury and fire is growing; the past does not exist at this time. The future is what must be planned for.

The first question to be resolved is not whether the ship should be rewired and new panels be installed, but to what standards should the work be done. Is it possible to continue the operations of the Voice of Peace with at least a commercial level of electrical system, or should marine standards be observed throughout. There is no question that USA standards should be used since all of the broadcast equipment is of USA manufacture.

In order to safeguard the people employed on the ship, a primary consideration and in order to assure a proper continuation of the ships' operations, the following changes should be made:

1. Parts be obtained to repair the main breaker panel properly and institute a ground system in the main breaker panel and throughout the ship.
2. New breaker panels be installed to replace the present inadequate system. Along with the new breaker panels the related switch boxes should be installed to make up for the complete lack at this time. Planning should take into consideration the expansion that has taken place since the ship was refitted plus possible future expansion.
3. ALL of the ships' wiring should be replaced with the correct types and gauges, and this should be replaced inside box and pipe conduits to withstand salt corrosion and ship movements.
4. ALL of the receptacles and switches now in use for 110 volt and 220 volt should be replaced with types suitable for use in this environment.
5. There are at present no tools of the type used for electrical work on the ship, Proper tools are needed firstly for repairs and maintenance, and also for the proposed renovations.
6. Parts should be brought on the ship for future repairs, changes and additions, and that parts supply should be maintained at the proper level knowing the long distance involved in obtaining spares.
7. A detailed plan should be made of the wiring system and future additions and changes be noted on the plans as they occur
8. In the past, the engineering staff have not been familiar with the USA standards of electrical systems. New people coming on board from parts of the world other than the USA or Canada should be trained in the U.S System and be required to stick to the correct methods

This report is written with the aid of over twenty-three years experience in the use of U.S. electrical standards, starting with a degree from the Ryerson Institute of Technology in Toronto.

Submitted without prejudice by Bruce Sabsay.