



**Fermilab**  
ES&H Section

## MICROWAVE OVEN SAFETY PROCEDURES

11/93

### **OBJECTIVE**

To provide guidance in the conduct of the annual microwave oven safety survey.

### **DISCUSSION**

Microwave ovens are surveyed at Fermilab to assure they do not present a present electrical and sanitation problems as well as possible microwave radiation leakage. The emission limit for microwave ovens is  $5 \text{ mW/cm}^2$  at any point on a surface 5 cm from the cabinet, measured with the probe normal to the surface at the point of contact with the spacer cone. The microwave oven survey form parallels the survey procedures and will help you complete the survey properly. After completion of the survey, the information will be entered into a computer file called MICRO to facilitate retrieval, manipulation, and report generation.

### **EQUIPMENT**

- Narda 8200 or Holiday 1501 Survey Meter
- Survey forms
- Styrofoam cup
- Microwave Oven Survey Stickers
- Permanent Marker

### **PROCEDURE**

#### **Preparation for Survey**

1. Approximately 2-3 weeks before the survey, place a notification in Ferminews. The article should state the time frame of the survey and the purpose of the survey. It should also notify employees, users, and

subcontractors to notify the H&S Group if ovens have been moved, removed, or added.

2. Print microwave survey forms for the sequence numbers you are about to survey. In order to get the forms preprinted:
  - a. Enter FOCUS from account B92732
  - b. Type EX MICRO. Enter
  - c. Type I. Enter.
  - d. Enter the first sequence number you are interested in and last sequence number. (This program creates a form including oven identification and location information from the previous survey and writes the forms into a temporary file titles MICRO FORM).
  - e. Exit FOCUS
  - f. Type PRINT8 MICRO FORM
  - g. Pick up forms at IBM printer.
3. Identify the oven you are about to survey. Verify sequence number, make, model number, etc. . If it is a new oven, assign it the next sequence number. This will greatly facilitate proper tracking of microwave ovens on site.

### **Survey Procedures**

4. Enter the survey date, the two letter code for the division/section controlling the oven, as well as the property location code and room where the oven is located.
5. Visually inspect the oven for signs of a compromised seal. Is the door loose? Are there dented or broken components? Are there burn marks from arcing? If any damage or looseness is apparent, exercise care to avoid possible over exposure.<sup>2</sup>
6. Check to see that the oven is free of encrusted grease deposits and other accumulated soil. Don't forget the top side of the cavity. The cavity should be cleaned at the end of each day's use.
7. Is the oven electrically grounded? Is the electrical cord provided with three prongs? If so, are all three used?
8. Check the battery on the microwave meter.
9. Fill a Styrofoam cup with water and place it in the center of the load-bearing surface. During the test, change the water as necessary to minimize boiling. The cup of water has a dual purpose: a) some ovens are damaged when no load is present; b) the amount of leakage is inversely

proportional to the amount of contents in the oven, therefore, only a small load is recommended for leakage testing.

10. Prepare the survey meter in accordance with the IH Manual instructions. Set meter to the  $2\text{mW}/\text{cm}^2$  scale. Adjust the zero with the zero knob. If the meter goes off scale adjust to the  $10\text{mW}/\text{cm}^2$  scale.

11. NOTE: If at anytime the leakage exceeds  $20\text{mW}/\text{cm}^2$ , immediately terminate the survey and prohibit use of the oven. This level may be harmful to health and can be immediately damaging to the instrument.

12. CLOSED DOOR LEAK RATE TEST

If selectable, set the power to the maximum power output. Activate the oven and begin the closed door tests. Notate the values and locations of maximum readings on the diagram at the bottom of the page. Also, draw in the position of the handle. If no leakage is detected, mark the diagram with a  $<0.1\text{ mW}/\text{cm}^2$ .

**Door Seal** - Probe the entire periphery of the door with the tip of the spacer cone in contact with the oven.

**Door Screen** - Probe the entire surface of the door screen with the tip of the spacer cone in contact with the screen.

**Cabinet** - Probe the cabinet at all points of possible leakage. corners, seams (welded, riveted, and bolted), ventilation louvers and power cords.

Circle the position which has the greatest power density reading for the oven. If the maximum occurs in more than one position, all such positions should be circled.

13. FAILED INTERLOCK TEST

This test is intended to detect complete failure of the interlock system. Follow the instructions carefully to minimize possible personal exposure.

If selectable, set the power to the lowest available continuous setting. Use the shortest available timer setting that will allow the oven to reach full power. With the oven off, open the door approximately 2", blocking it open with a nonconductive object if necessary. Position yourself out of direct line possible emission through the door gap, and as far from the oven as possible that you are still able to reach the controls. Locate the probe in line with the door gap but 1-2 ft from the oven. Position the test meter so that it can be read while activating the oven. Activate the oven. If the

instrument meter starts to deflect upscale, turn the oven off immediately. If no upscale deflection occurs, the probe should be moved closer to the door gap to verify that the oven is not operating.

**If the oven operates with the door open, prohibit its use immediately.**

14. DOOR OPENING LEAK RATE TEST

If selectable, set the power to the maximum possible output. Activate the oven. Place the probe near the door latch with the tip of the spacer cone in contact with the oven. Slowly open the door until the oven turns off or until an emission level of  $20\text{mW}/\text{cm}^2$  is observed, whichever comes first. If the leakage is less than  $20\text{ mW}/\text{cm}^2$ , open the door to a point just prior to interlock cutoff and scan the door seal to find the point of maximum leakage. If the door opening leakage rate(s) are greater than the closed door rates, note the value(s), location(s), and door position(s) of maximum readings.

15. Remove the old microwave oven survey sticker and attach it to the survey form. Fill out a new sticker including the oven sequence number (in the • • space above the symbol on the right). Attach the new sticker to the oven in a location which is conspicuous but will not interfere with the operation or cleaning of the oven.

16. Check the box of the survey instrument which was used. Note the date the unit was calibrated. Include comments in the space provided and sign the form.

**Report**

17. Enter the results of the survey into the IBM mainframe computer file called MICRO using the EX MICRO command. File survey forms in appropriate three-ring binder.

18. Summarize results and send report to all Division/Section Safety Officers and the Property Office.

19. See previous survey reports for guidance on format, content, etc. The following items should be included:

- Dates during which the survey was conducted.
- Total number of ovens found and number of ovens surveyed. If the number of ovens surveyed is less than the total number found, then give a reason(s) for not surveying that oven (i.e. electrical malfunction, broken, etc.)

- Range and mean (geometric) of maximum closed door leak values.
- Variance test to see if leakage depends on make.
- A table listing all surveyed ovens sorted by Division/Section. This table should include: Div./Sec., location, room, sequence #, make, model, serial #, sanitary condition (acceptable/unacceptable), and maximum closed door leak values. NOTE: this table can be made by using the information entered into the IBM.