"Documento original en mal estado"

SEISMIC QUALIFICATION APPROACH

- Equivalent static coefficient analysis.
  - Base anchorage for urns (Figure 3.74) that are provided with drilled base plates by manufacturers.
- Design team judgment.
  - Provide flexible electrical and gas lines.
  - Provide base anchorage for urns that are not provided with base plates by manufacturers.

REFERENCE FOR INSTALLATION DETAILS

- Appendix 3.

RELATIVE DEGREE OF DAMAGE OF INADEQUATELY PROTECTED EQUIPMENT

- Minor.

MOST LIKELY TYPE OR CONSEQUENCE OF DAMAGE FOR INADEQUATELY PROTECTED EQUIPMENT

- Toppled urns.
- Spilled contents.
- Potential for personnel injury.
- General cleanup required.

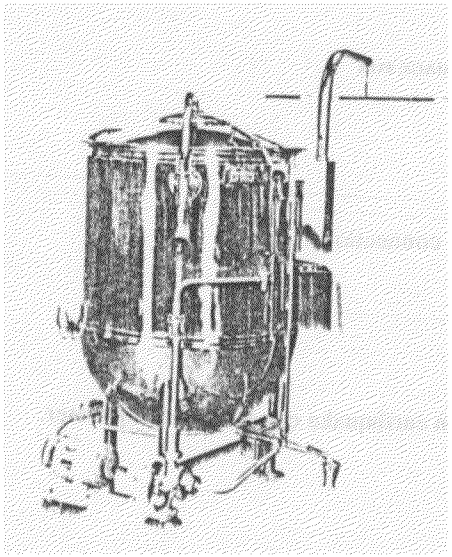

FIGURE 3.74. Urn with base anchorage provisions. Photograph courtesy of Groen, A Division of the Dover Corporation.

Kitchen Systems

Utility Carts

Whether wheeled or stationary, utility carts (Figure 3.75) are highly susceptible to earthquakes. Even if the carts do not topple, items stored on them are commonly spilled. Wheel locks do not prevent toppling or spilled equipment.

EQUIPMENT SEISMIC CATEGORY

- "D" or "E" miscellaneous equipment.

SEISMIC SPECIFICATION

- SDS-2.

SEISMIC QUALIFICATION APPROACH

- Equivalent static coefficient analysis.
  - Base anchorage and top bracing for stationary equipment.
- Design team judgment.
  - Restraints for wheeled equipment when not in use.
  - Where practical, parapets or shelf restraints for shelved items.

REFERENCE FOR INSTALLATION DETAILS

- Appendix 3.

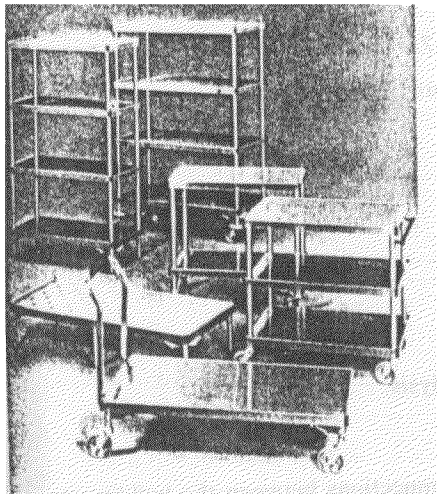

FIGURE 3.75. Examples of various utility carts and racks. Photograph courtesy of Precision Metal Products, Incorporated.

RELATIVE DEGREE OF DAMAGE OF INADEQUATELY PROTECTED EQUIPMENT

- Minor.

MOST LIKELY TYPE OR CONSEQUENCE OF DAMAGE FOR INADEQUATELY PROTECTED EQUIPMENT

- Toppled carts.
- Spilled dishes, food, and so on.
- General cleanup required

Kitchen Systems

Ventilators

Overhead ventilators (Figure 3.76) are generally attached to the building structure. Their anchorage should conform to the expected earthquake environment to prevent their collapse

EQUIPMENT SEISMIC CATEGORY

- "C" support equipment.

SEISMIC SPECIFICATION

- SDS-2.

SEISMIC QUALIFICATION APPROACH

- Equivalent static coefficient analysis.
  - Anchorage to the building structure.
- Design team judgment.
  - Review fasteners for louvers, and so on

REFERENCE FOR INSTALLATION DETAILS

- Appendix 3.

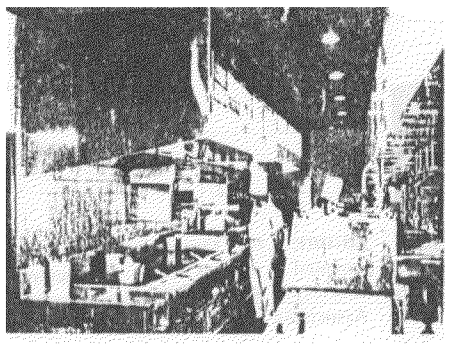

FIGURE 3.76. Ventilating unit Photograph courtesy of Gaylord Industries, Inc

RELATIVE DEGREE OF DAMAGE OF INADEQUATELY PROTECTED EQUIPMENT

- Minor to major.

MOST LIKELY TYPE OR CONSEQUENCE OF DAMAGE FOR INADEQUATELY PROTECTED EQUIPMENT

- Dislodged hoods.
- Dislodged vent plates.
- Potential for personnel injury.
- General cleanup required.

Kitchen Systems

Wheeled Equipment

Wheel locks (Figure 3.77), if set, keep equipment from extensive rolling. They do not, however, prevent sliding or toppling.

EQUIPMENT SEISMIC CATEGORY

- "D" support equipment.

SEISMIC SPECIFICATION

- SDS-2.

SEISMIC QUALIFICATION APPROACH

- Design team judgment.
  - Provide modular anchors for all wheeled equipment.

REFERENCE FOR INSTALLATION DETAILS

- Appendix 3.

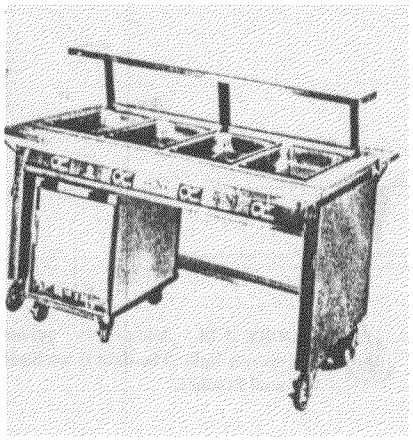

FIGURE 3.77. Portable steam table Photograph courtesy of Precision Metal Products, Incorporated

RELATIVE DEGREE OF DAMAGE OF INADEQUATELY PROTECTED EQUIPMENT

- Minor to moderate

MOST LIKELY TYPE OR CONSEQUENCE OF DAMAGE FOR INADEQUATELY PROTECTED EQUIPMENT

- Rolling equipment—potential for collision.
- Toppled equipment.
- Spilled grease, and so on
- Potential for personnel injury.
- General cleanup required.

Lighting Systems

Most facilities can only operate on a limited basis if general lighting failures should occur. Because of its geometry, fluorescent lighting generally tends to be more vulnerable to earthquakes than incandescent lighting

SYSTEM SEISMIC CATEGORY

- "B" support equipment.

SYSTEM FOUND IN

- All building types

Lighting Systems

Emergency Lights

All essential facilities require emergency light capabilities. Other types of required light capabilities exist, depending on the type of facility. Emergency lights (see Figure 3.78) are all too often left unanchored on shelves, and so on.

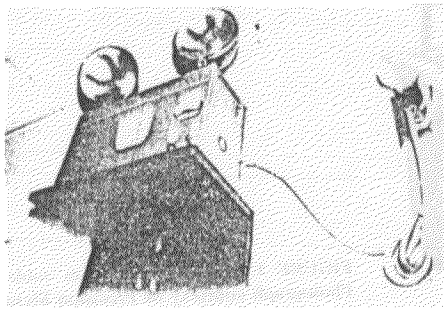

FIGURE 3.78 Adequately protected emergency light. The light is anchored to the wall bracket

EQUIPMENT SEISMIC CATEGORY

- "A" critical equipment.

SEISMIC SPECIFICATION

- SDS-1.

SEISMIC QUALIFICATION APPROACH

- Equivalent static coefficient analysis.
  - Anchorage of bracket to wall.
  - Anchorage of emergency light to bracket.

REFERENCE FIGURE FOR INSTALLATION DETAILS

- 4.48.

RELATIVE DEGREE OF DAMAGE OF INADEQUATELY PROTECTED EQUIPMENT

- Moderate.

MOST LIKELY TYPE OR CONSEQUENCE OF DAMAGE FOR INADEQUATELY PROTECTED EQUIPMENT

- If not correctly supported, emergency lights will fall from their perches.
- Lights are likely to be inoperative if they fall.
- General cleanup required.

Lighting Systems

Fluorescent Lighting

Fluorescent lighting (Figure 3.79) is especially susceptible to dynamic motions. Suspended fixtures sway wildly, diffusers fall, and tubes dislodge from their holders.

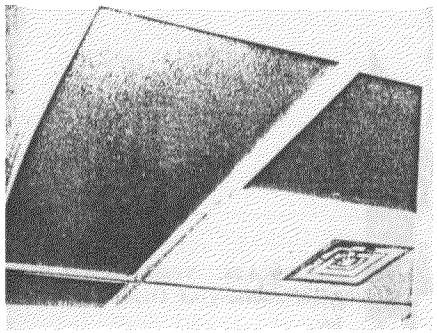

FIGURE 3.79. Fluorescent lighting mounted in a T-bar ceiling. Photograph courtesy of Ruhnau Evans Ruhnau Associates

EQUIPMENT SEISMIC CATEGORY

- "B" support equipment.

SEISMIC SPECIFICATION

- SDS-1.

SEISMIC QUALIFICATION APPROACH

- Design team judgment.
  - Provide for bracing and safety wires.
- Equivalent static coefficient analysis.
  - For main supports and bracing
- Dynamic analysis.
  - If swaying is likely to preclude possible collisions.

REFERENCE FIGURES FOR INSTALLATION DETAILS

- 4.49, 4.50, 4.51

RELATIVE DEGREE OF DAMAGE OF INADEQUATELY PROTECTED EQUIPMENT

- Moderate to major

MOST LIKELY TYPE OR CONSEQUENCE OF DAMAGE FOR INADEQUATELY PROTECTED EQUIPMENT

- Collapse of lighting fixtures.
- Collapse of fixture subcomponents (tubes, diffusers, etc.).
- Collision of swaying fixtures.
- Potentially inoperative lights.
- Potential for personnel injury.
- General cleanup required.

REFERENCE FIGURES FOR EXAMPLE OF DAMAGED EQUIPMENT

- 3.165, 3.166, 3.167.

Lighting Systems

Incandescent Lighting

If fixed, incandescent lighting (Figure 3.80) generally is not susceptible to damage. Suspended lights, unless restrained, may sway violently with the potential for collision with other lights, walls, and so on.

EQUIPMENT SEISMIC CATEGORY

- "B" support equipment.

SEISMIC SPECIFICATION

- SDS-1

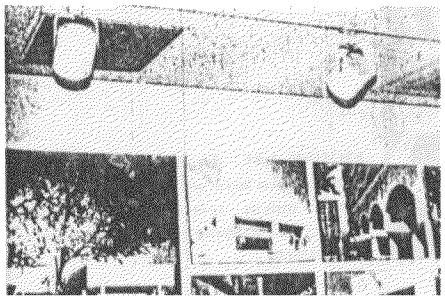

FIGURE 3.80 Incandescent ceiling lighting. Photograph courtesy of Ruhnau Evans · Ruhnau · Associates

SEISMIC QUALIFICATION APPROACH

- Design team judgment.
  - For lightweight units.
- Equivalent static coefficient analysis.
  - For heavier units.
- Dynamic analysis.
  - To determine possible collisions if swaying cannot be avoided.

REFERENCE FIGURES FOR INSTALLATION DETAILS

- 4.49, 4.50, 4.51, 4.52.

RELATIVE DEGREE OF DAMAGE OF INADEQUATELY PROTECTED EQUIPMENT

- Minor.

MOST LIKELY TYPE OR CONSEQUENCE OF DAMAGE FOR INADEQUATELY PROTECTED EQUIPMENT

- Dislodged fixtures.
- Possibly inoperative.

REFERENCE FIGURE FOR EXAMPLE OF DAMAGED EQUIPMENT

- 3.168

Lighting Systems

Table and Desk Lighting

Table lamps such as reading lamps can be expected to fall unless restrained. Drafting lamps (Figure 3.81) will likely sway.

EQUIPMENT SEISMIC CATEGORY

- "E" miscellaneous equipment.

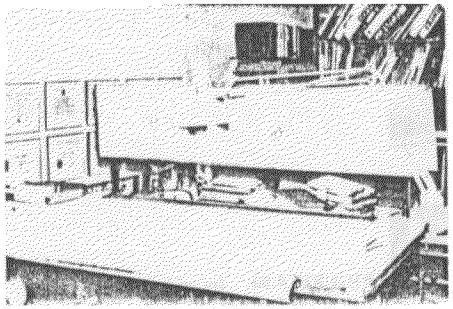

FIGURE 3.81. Drafting lamps such as those shown here are likely to sway violently unless restrained. Photograph courtesy of Rubinau • Evans • Rubinau • Associates.

SEISMIC SPECIFICATION

- SDS-2

SEISMIC QUALIFICATION APPROACH

- Design team judgment.
  - Provide base anchorage if possible.
  - Provide swing arm restraint.

REFERENCE FIGURE FOR INSTALLATION DETAILS

- 4.52.

RELATIVE DEGREE OF DAMAGE OF INADEQUATELY PROTECTED EQUIPMENT

- Minor

MOST LIKELY TYPE OR CONSEQUENCE OF DAMAGE FOR INADEQUATELY PROTECTED EQUIPMENT

- Upset lamps.
- General cleanup required.

Medical Systems

Medical systems vary from complex critical and life support equipment to ad hoc storage. Seismic qualification programs for medical facilities must never be neglected in earthquake prone areas. Hospitals and medical clinics are facilities likely to suffer the greatest adverse effects of an earthquake. They have daily duties that keep personnel from maintaining an ever present guard against potential aseismic deficiencies. Therefore, it is the design team's charge to provide a mechanism whereby hospital equipment is automatically protected from damaging earthquakes whenever possible. If this is not done, after an earthquake we can expect an essential facility that is unable to function because much of its equipment is left lying broken and twisted on the floor after the shaking stops, which is certainly not conducive to performing essential functions.

SYSTEM SEISMIC CATEGORY

- Varies with subsystems—critical to miscellaneous systems

SYSTEM FOUND IN

- Hospitals/clinics

Medical Systems

Anesthesia Cart

Anesthesia carts (Figure 3.82) are highly complex pieces of equipment that are sensitive to earthquake motions and can cause adverse secondary effects should they be damaged.

EQUIPMENT SEISMIC CATEGORY

- "A" critical equipment.

SEISMIC SPECIFICATION

- SDS-1.

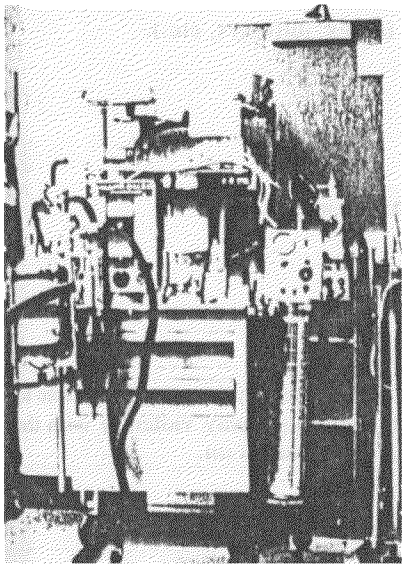

FIGURE 3.82. Unrestrained operating room anesthesia cart.