SAFETY CONCERNS AT THE ORANGE COUNTY EMERGENCY OPERATIONS CENTER

SUMMARY

The County, as owner and occupant of the Orange County Emergency Operations Center at Loma Ridge, has taken too few steps to reduce the risks of nonstructural earthquake damage at that facility. According to the Governor's Office of Emergency Services, there is approximately a 10% chance within 50 years that Loma Ridge will experience a severe earthquake. The building itself is designed to withstand 90% of the earthquake shocks expected in 100 years. Yet many of the contents and furnishings of the Emergency Operations Center would not withstand the tremors that the building itself could easily tolerate. Such conditions could lead to personal injuries and the lack of operating capability at a critical time. The Emergency Operations Center may not function when it is needed most.

The Grand Jury observed that:

- In each separate Command, Support and Operations Center, personal computers (PCs), tape players, facsimile machines, printers, and copiers are not fastened nor restrained. Also, certain large, heavy cabinets are not restrained.

- Large, heavy electronic boxes sit unsecured on top of dispatchers' desks in the Sheriff's Emergency Communications Bureau.

- Large, heavy soft drink vending machines are unconstrained throughout the Emergency Operations Center

The Emergency Operations Center may be unable to function because of damage to furnishings and concomitant injury to personnel in the building during and after a serious earthquake.

INTRODUCTION AND PURPOSE

The focus of this report was to assess the ability of the Emergency Operations Center to perform its function during and after an earthquake. This report calls attention to the lack of preparedness for nonstructural earthquake damage to the furnishings and equipment and concomitant injury risk to people of the Emergency Operations Center.

METHOD OF STUDY

The Grand Jury inspected the Emergency Operations Center on several occasions in 1998 and 1999. Information was extracted from documentation generated by the Governor's Office of Emergency Services, the Federal Emergency Management Agency and various certifications listed in the Bibliography.

BACKGROUND

Emergency Operations Center

The Loma Ridge Emergency Operation Center was designed and built under provisions of the Unified Building Code, Year 1988 Edition, and was considered an essential facility. Therefore it was inspected on a continuous basis during construction. Appropriate certifications for the building, grading, and the road were made available to the Grand Jury. The Emergency Operations Center was issued a certificate of occupancy in October 1992 and opened in 1993. It is stocked with a two-week supply of food, water and backup power and fuel. The 30,000 square foot building is designed and built to withstand 90% of the seismic events that can be expected in 100 years.

The Emergency Operations Center facility is subdivided into several operating areas in which personnel are expected to operate before, during and after Orange County emergencies. Among them are the Sheriff's Emergency Communication Bureau, and separate Command, Support and Operations Centers to be staffed with on-call specialists and "policy leaders." The Sheriff's Emergency Communications Bureau operates 24 hours per day while the other areas are utilized on an as-needed basis for actual emergencies or training.

Earthquake Terms

Two important terms are defined: structural and nonstructural portions of a building. This report focuses on the nonstructural portions of the Emergency Operations Center.

Structural portions of a building are those that resist gravity, wind, earthquake and other types of loads. They include columns, posts, beams, braces, slabs, load-bearing walls, and foundations. The Emergency Operations Center structure was designed, analyzed, and inspected by a structural engineer and complies with the Unified Building Code.

Nonstructural portions of a building include every part of the building and all its contents except the structure. Common nonstructural components include ceilings; windows; office equipment; computers; shelved inventory; file cabinets; heating, ventilating and air-conditioning equipment; furnishings; lights; etc. Nonstructural items are not analyzed by engineers, but may be specified by architects, mechanical engineers, electrical engineers and interior designers. Typically, they are purchased and installed by the owners and occupants after the building is occupied.

Nonstructural Damage

Three types of earthquake risks are associated with nonstructural components: life safety, interruption or loss of essential function and property loss.

Life Safety

People could be killed or injured by damaged or falling nonstructural components. For example, the falling of a tall and heavy cabinet has high potential for severely injuring a person, as would the falling of a heavy box of electronic equipment falling from a desk.

Loss of Function

Nonstructural damage may make it difficult or impossible to carry out the functions normally performed in the facility. For example, after the Loma Prieta quake, damage to data processing equipment caused 13 out of 32 units to be out of operation from 4 to 56 hours. The primary sources of outages included: loss of outside power, overturned of equipment and movement of large pieces of computer equipment over distances ranging from a few inches to 4 feet. Loss of outside power would probably not affect the Emergency Operations Center’s PCs because the backup generators would come on line. However, a PC's dropping 3 feet to the floor from a table would be as disruptive as loss of power.

Property Loss

Damage to nonstructural elements and contents of a building can be costly. Immediate property losses attributable to nonstructural elements have been estimated to be one third of the total earthquake losses. If the structural elements are earthquake resistant and the nonstructural elements are not, the percentage of property loss to nonstructural elements can often be higher.

Causes of Nonstructural Damage

Earthquakes affect non-structural elements in three ways: inertial or shaking effects on the elements themselves, distortions imposed on nonstructural components when the building structure sways, and separation and pounding at the interface between adjacent structures.

Inertial Forces

When a building is shaken during an earthquake, the base of the building moves in synch with the ground. However, the building itself and its contents above the base will experience inertial forces. These inertial forces tend to operate in opposition to the earthquake forces in nonstructural items as a function of their weight. File cabinets, electrical equipment boxes, freestanding bookshelves, cabinets, office equipment like copiers, and items stored on tables or shelves can all be damaged by inertial forces. When unrestrained items are shaken by a quake, inertial forces may cause them to slide, swing, strike other objects, or overturn. Items may slide off shelves and tables and drop to the floor. Inertial forces are proportional to the mass or weight of an object, so a heavy object would require stronger restraints than a light object to keep it from sliding.

Building Distortion

Building structures distort, or bend from side to side in response to earthquake forces. Windows, partitions, and other items that are tightly locked to the structure have to go along for the ride. As the walls or columns distort and become out of alignment or square, the attached items have to distort the same amount. Brittle materials like glass, plaster, masonry infill or veneer, and rigid cabinets mounted to the walls cannot stand significant distortion and will crack or shatter when the building structure pushes on the brittle elements.

Building Separations

Another source of nonstructural damage involves pounding or movement across separation joints between adjacent structures. A seismic gap separation joint is the

distance between two different building structures and is provided to accommodate relative lateral movement during an earthquake.

Methods for Reducing Nonstructural Hazards

The California Governor's Office of Emergency Services, in a cooperative agreement with the Federal Emergency Management Agency, has prepared a comprehensive document entitled "Reducing the Risks of Nonstructural Earthquake Damage—A Practical Guide," dated September 1994. The guide explains the sources of nonstructural damage and provides information on effective methods of reducing potential risks. Methods for reducing nonstructural hazards include facility survey, commonsense mitigation measures, upgrade details, and organizational planning programs.

FINDINGS

Under *California Penal Code* §933 and §933.05, responses are required to all findings.

The Grand Jury observed, during several visits to the Emergency Operations Center in the Fall of 1998 and the Winter of 1999, that many of the nonstructural items present in the Emergency Operations Center failed to meet the criteria for reducing damage from earthquakes.

1. In each separate Command, Support and Operations Center, personal computers, tape players, facsimile machines, printers, and copiers are not fastened nor restrained. Additionally, large, heavy cabinets are not restrained.

2. Large, heavy electronic boxes sit unrestrained on top of dispatchers' desks in the Sheriff's Emergency Communications Bureau.

3. Throughout the Emergency Operations Center, large and heavy soft drink vending machines are unrestrained.

The **Board of Supervisors** is required to respond to the findings.

RECOMMENDATIONS

Under *California Penal Code* §933 and §933.05, the Grand Jury requires responses from the appropriate agencies and officials to the following recommendation.

The Grand Jury recommends that the Board of Supervisors issue instructions to Emergency Operations Center support and operations personnel that risk reductions be made at once to nonstructural elements in accordance with the guidelines outlined in the Practical Guide referenced above (Findings 1 through 3).

The **Board of Supervisors** is required to respond to the recommendation.

BIBLIOGRAPHY

California Governor’s Office of Emergency Services. "Reducing the Risks of Nonstructural

Earthquake Damage—A Practical Guide." FEMA 74/September 1994. Loma Ridge Emergency Operations Center. "Construction Criteria and Observation." November 23, 1998.

a) Letter RE: Loma Ridge Communications Center-Final Essential Facilities Certification 0168-420-429, Smith-Emery Company—Testing Laboratory, Anaheim, CA, dated August 27, 1992.

b) Letter Subject: Loma Ridge Communications Center (EMA Permit #NR–STB Job 88–89) STB Structural Engineers Inc., Newport Beach, CA, dated July 28, 1992.

c) Letter Subject: Certification of Final Grading; Reference Project: Grading Permit No. 90-07-13-001, George Polycrates & Associates, Consulting Civil Engineers, Dated 8/12/92.

d) Certificate of Use and Occupancy, County of Orange, Environmental Agency, Project #0168-429, File Code 7.0, dated 10/12/92.