Editor
EERI Newsletter
11972 Chalon Road
Los Angeles, California 90049

Editor:

I send you a copy of an internal report entitled "Assessment of Seismic Hazards within Occupied Work Areas" written by Jeffrey Y. Chung of the Environmental Health and Safety Office of the University of California, Santa Barbara.

The report gives the results of a survey to determine the nature of internal non-structural damage sustained by the University as a result of the 13 August 1978 Santa Barbara earthquake.

The survey, which represents a response level of about 85%, details the failure, collapse, and felling of such things as loaded bookcases, filing cabinets, and light fixtures. The statistics are sobering, especially the number of tall loaded bookcases that fell, typically upon a desk or chair that would normally have been occupied during a regular University workday. In fact, the earthquake occurred at 4 p.m. local time on a Sunday afternoon when very few people were on campus. The statistics together with numerous photographs of the internal damage support my estimate that as many as twenty-four people would have been seriously injured if not killed had that earthquake occurred on a normal workday.

The statistics and photographs should be studied by all responsible people who have to deal with damage to facilities on the scale of a university. I submit the statistics here for inclusion in the EERI Newsletter. The photographs may be seen by contacting Mr. Larry Parsons, Environmental Health and Safety, University of California, Santa Barbara, California 93106, telephone (805) 961-2040.

Sincerely,

[Signature]
Arthur G. Sylvester
Associate Professor

Enclosure
AGS:dm
ASSESSMENT OF SEISMIC HAZARDS WITHIN OCCUPIED WORK AREAS

13 December 1978

I. Introduction/Background
The Santa Barbara/Goleta area was struck by a destructive earthquake, measuring between 5.1 to 5.9 on the Richter scale, which occurred at 3:34 p.m. on Sunday, August 13, 1978. The time and date of the event (Sunday afternoon during the summer period of low campus activity) and the resulting presence of few personnel at campus facilities in all probability contributed to the fortunate lack of personal injuries at the Santa Barbara campus.

Primary publicity and interests were centered in structural stability of buildings. Surveys of damage sustained by structures were reported to be in the generalized categories of cracked shear walls and other structural elements, cracked and fallen plaster, displaced ceiling systems and lighting fixtures, damaged and dislodged cabinets, damaged mechanical systems and equipment, including severe damage to elevators, broken and damaged utilities such as gas and water lines, and damage to building contents such as research and instructional equipment.

II. Purpose of Study
As funds have become available to return the campus to pre-earthquake status, many overlooked and hidden seismic hazards are still in existence within the immediate work areas of campus personnel. Things taken for granted such as free standing bookcases, storage cabinets, lockers, side-opening (lateral) file cabinets as well as improperly anchored above mentioned items, along with compressed gas cylinders, unguarded chemical shelving, and high storage of heavy equipment, pose immediate dangers to campus personnel in the event another earth
quake of equal or greater magnitude rocks the campus.

In assessing the magnitude of the project associated with correcting the lack of earthquake preparedness within campus buildings, Environmental Health and Safety devised and distributed a questionnaire, which requested thorough self-inspections, to compile an inventory of potential problems.

III. Results of Study

Campus-wide survey results received from over 150 departments revealed some vital statistics. There were over 3,600 free standing/unsecured 72" to 84" bookcases tabulated, and of these over 400 fell over, most of which were at storage capacity and located over desk tops and doorways. Sixty-seven (67) doors of department offices jammed while another 139 had difficulty in opening. Over 100 ventilation grills, weighing from 2 to 5 pounds and located near ceiling level of rooms popped out and fell to the ground. Also, close to 800 light fixtures/diffusers broke loose from their supports and fell.

Quite a number of pressurized gas cylinders were reported to have fallen due to failure of the safety chains and/or clamps that were supposed to be earthquake resistant. Several wall cabinets containing toxic chemicals pulled out of the walls in the Biological Sciences 2 building, causing considerable hazard and mess that could have resulted in serious injury if some of the chemicals had interacted/mixed. Similar cabinets containing glassware also pulled out of the supports. The staples used to attach the backs and sides of the cabinets to the support braces were quite weak and substandard, as were the wall attachments.
These were some of the more critical data coming from the questionnaire. The appendix contains the complete results of the survey. It is urgent that funds will be requested using the data obtained from this study.

V. Conclusion/Recommendations

From discussions with Facilities Management personnel, the approximate cost for seismic bracing of an individual bookcase, file cabinet or other appurtenance is estimated to be within the range of $5 to $20. It appears to be a fairly simple task of drilling and attaching screws and brackets to the wall and object in an approved manner. Materials are inexpensive; labor would be the primary cost. Costs should be lower on a volume basis. Departments having machinists or technicians may be able to do their own.

A campus policy on seismic safety should also be adopted and put into effect prior to project initiation so that complete compliance will occur. A draft of the policy by Environmental Health and Safety is included in the appendix.

For the future, we must insure that all new installations of equipment and furniture, as well as existing ones, comply with seismic safety recommendations. We were extremely fortunate that the earthquake occurred during an "off time." Earthquake "proofing" work areas to mitigate potential injuries must be accomplished as rapidly as possible.

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**EARTHQUAKE DAMAGE AND UPGRADING QUESTIONNAIRE—Page 2**

D. VENT GRILLS/LIGHTING FIXTURES
1. No. vent grills in departmental offices/rooms 1,697
2. No. that fell, loosened, and/or popped out 108
3. No. ceiling light fixtures 14,327
4. No. that fell or broke loose from supports 286+
5. No. of light fixture covers or diffusers that fell 500+

E. DOORS
1. No. of doors that jammed 67
2. No. of doors having difficulty in opening 139

F. OTHER APPURTENANCES AND FURNITURE
1. Did any other appurtenances, kitchen equipment, furniture, etc., not mentioned above fall, shift or tilt over hazardously?
2. If yes, please list below:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>LOCATION</th>
<th>WHAT OCCURRED</th>
<th>SECURED TO WHAT</th>
<th>NOT SECURED</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Compressed Gas Cylinders</td>
<td>Science Buildings</td>
<td>Fell over</td>
<td>Cabinets, Desks, Pipes</td>
<td>Free standing too</td>
</tr>
<tr>
<td>b. Art Kilns</td>
<td>Arts</td>
<td>Shifted/fell over</td>
<td>Bricks and chimneys fall</td>
<td>Free standing on table tops</td>
</tr>
<tr>
<td>c. Instrumentation</td>
<td>Science Building</td>
<td>Shifted when full</td>
<td>Free standing/unsecured</td>
<td></td>
</tr>
<tr>
<td>d. Card Catalogs</td>
<td>Library</td>
<td>Fell over</td>
<td>Free movement must be restricted</td>
<td></td>
</tr>
<tr>
<td>e. Metal vats, hot liquids</td>
<td>Res. Hall Kitchens</td>
<td>Pulled off wall mounting</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>