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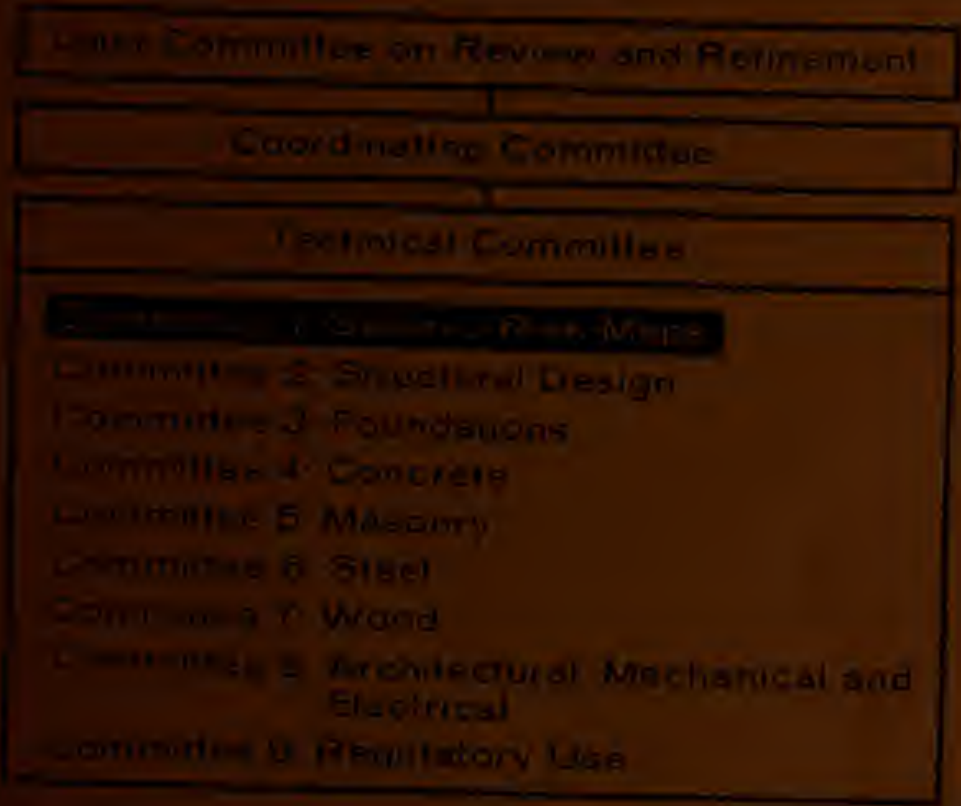


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# Review and Refinement of ATC 3-06 Tentative Seismic Provisions



## Report of Technical Committee 1 : Seismic Risk Maps

This report represents the membership of a group of professionals jointly sponsored by the Building Research Institute, Chicago, and the Federal Bureau of Investigation, Bureau of Building, Construction, and Engineering, Federal Bureau of Investigation, Department of Justice.

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Department of Commerce  
National Institute of Standards and Technology  
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October 1980



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REVIEW AND REFINEMENT OF ATC 3-06 TENTATIVE SEISMIC PROVISIONS

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REPORT OF TECHNICAL COMMITTEE 1: SEISMIC RISK MAPS

S. T. Algermissen, Chairman, United States Geological Survey  
Bruce R. Ellingwood, Secretary, National Bureau of Standards  
Riley Chung, Assistant Secretary, National Bureau of Standards  
William F. Marcuson, III, American Society of Civil Engineers  
Howard A. Spellman, Association of Engineering Geologists  
Jerry Harbour, Interagency Committee on Seismic Safety in Construction  
Robert Englekirk, Structural Engineers Association of California  
Neville C. Donovan, Applied Technology Council  
William LeMessurier, Building Seismic Safety Council

Prepared for use by the:

BUILDING SEISMIC SAFETY COUNCIL

Sponsored by:

FEDERAL EMERGENCY MANAGEMENT AGENCY

Center for Building Technology  
National Bureau of Standards  
Washington, D.C. 20234

October 1980

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U.S. DEPARTMENT OF COMMERCE, Phillip M. Klutznick, Secretary  
Luther H. Hodges, Jr., Deputy Secretary  
Jordan J. Baruch, Assistant Secretary for Productivity, Technology,  
and Innovation  
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, Director



## ABSTRACT

The TENTATIVE PROVISIONS FOR THE DEVELOPMENT OF SEISMIC REGULATIONS FOR BUILDINGS were developed by the Applied Technology Council to present, in one comprehensive document, current state-of-knowledge pertaining to seismic engineering of buildings. The TENTATIVE PROVISIONS are in the process of being assessed by the building community. This report is one of a series of reports that documents the deliberations of a group of professionals jointly selected by the Building Seismic Safety Council and the National Bureau of Standards and charged with reviewing the TENTATIVE PROVISIONS prior to the conduct of trial designs. The report contains the recommendations and records of the committee charged with review of the seismic risk maps. The committee made 4 recommendations for revisions to the TENTATIVE PROVISIONS. These recommendations were made to the parent group, the Joint Committee on Review and Refinement, and their action on these recommendations is documented in a companion report.

Keywords: Buildings; buildings (codes); buildings (design); earthquakes; seismic risk maps; standards; structural engineering



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## 1.0 INTRODUCTION

### 1.1 General

The Tentative Provisions for the Development of Seismic Regulations were developed by the Applied Technology Council in an effort that included a wide range of experts in the actual drafting of the provisions. Two external review drafts were circulated to a large portion of the interested and informed community of eventual users. However, because the Tentative Provisions were innovative, doubts about them existed. Consequently, an attempt was made to investigate these doubts and to improve the Tentative Provisions where possible before an expensive assessment of the Tentative Provisions was undertaken by conducting trial designs.

This review and refinement project was planned and conducted by the National Bureau of Standards with the advice and approval of the Building Seismic Safety Council, a private sector organization formed in 1979 for the purpose of enhancing public safety by providing a national forum to foster improved seismic safety provisions for use by the building community.

The assessment of the Tentative Provisions was performed using the committee structure shown in figure 1. Nine Technical Committees were formed with interests that collectively cover the Tentative Provisions. The Joint Committee on Review and Refinement consists of all voting members of the Technical Committees. The chairmen of the Technical Committees form a Coordinating Committee.

Membership of each Technical Committee is made up of representatives of organizations that have particular interest in the Tentative Provisions; the participants are listed in the committee membership section of this report.

In addition to the voting members, each Technical Committee includes a non-voting member from each of the following organizations: The Applied Technology Council (ATC), the Building Seismic Safety Council (BSSC) and the National Bureau of Standards (NBS). The ATC representative served as a technical resource to the committee since he was closely involved with the development of the provisions of interest to the committee. The NBS representative was the technical secretary throughout the effort. The BSSC representative provided a link with the Building Seismic Safety Council, which will be involved in trial designs and evaluations.

### 1.2 Committee Summary

Technical Committee No. 1 on Seismic Risk Maps had as its objective the determination of whether the provisions in Section 1.4.1 of the ATC Tentative Provisions, entitled Seismicity Index and Design Ground Motions, are adequate for the trial designs and impact assessment that must be made before they can be considered for regulatory documents.

Committee 1 held its first meeting on December 11, 1979, at the National Bureau of Standards. Various issues raised in connection with Section 1.4.1 and its commentary were discussed at some length at this meeting and the

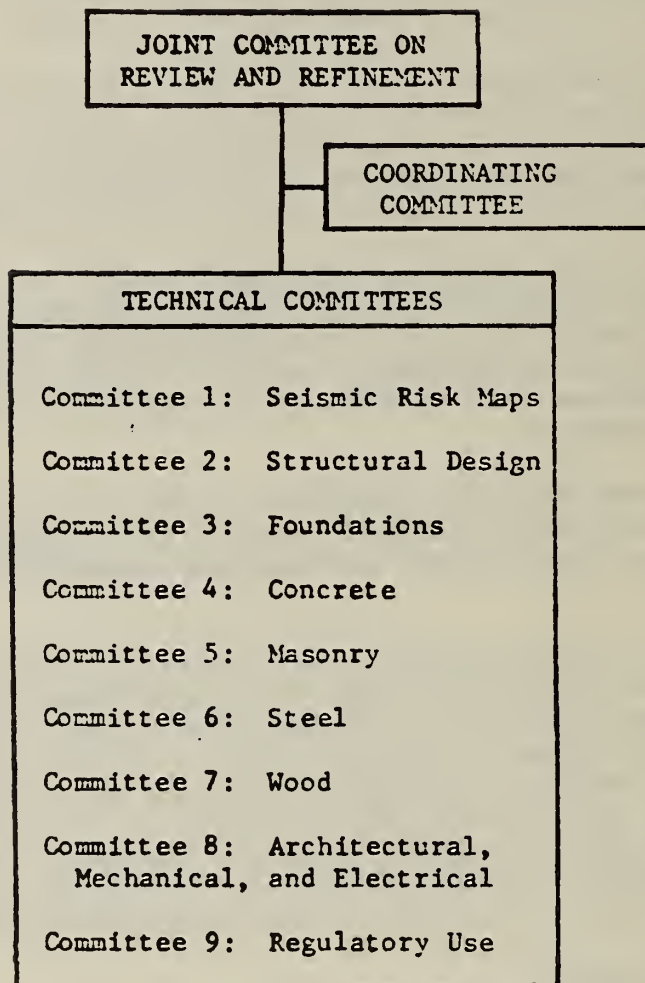


Figure 1: Committee Structure

minutes are included in Section 3.1 of this report. Following this meeting, each committee member was invited to submit proposals for possible revisions of the provisions that should be made before trial designs are conducted. At least one committee member solicited comments from his professional colleagues as well (see Section 3.3). These proposals for change, summarized in Table 1, were circulated for information among the committee membership by the Secretariat in January, 1980, and at the same time were sent to the ATC representative for his response.

Because of the small number of proposed changes originating within Committee 1 and the fact that the substantive issues had already been discussed at the December meeting, it was decided that a second committee meeting, originally scheduled for February 21, 1980, need not be held. Accordingly, a ballot was prepared and was distributed to the five voting members of the committee on April 10, 1980. The responses of the ATC representative to the proposals for change were received by the Secretariat about a week later and were also distributed to the voting committee (see Section 3.4). The final outstanding ballot was returned to the Secretariat June 4, 1980. The results of the ballot are shown in Table 2. Those items that were affirmed by a majority of voting members of Committee 1 are presented as recommendations to the Joint Committee in Section 2 of this report.

TABLE 1: SUMMARY OF TECHNICAL COMMITTEE 1 BALLOT ITEMS

Proposed Changes to ATC 3-06: April 1, 1980 Ballot

<u>Item</u>	<u>Proposed Change</u>
1.	Table 1-A: Change the Seismic Performance Category for Seismic Hazard Exposure III buildings located in areas with Seismicity Index of 1 <u>from A to B.</u>
2.	Table 1-B: Change Seismicity Index for Map Area 5 <u>from 4 to 3.</u>
3.	Table 1-B: Change Seismicity Index for Map Area 4 <u>from 3 to 2.</u>
4.	Table 1-B: Change Seismicity Index for Map Area 3 <u>from 2 to 1.</u>
5.	Table 1-B: Change Seismicity Index for Map Area 2 <u>from 2 to 1.</u>
6.	Table 1-B: Change Seismicity Index for Map Area 1 <u>from 1 to 0.</u>
7.	The accelerations should be represented by a contour map (in percent gravity) rather than by county boundaries.
8.	<u>Change</u> Section 1.4.4 to read: "No new building or existing building which is, because of change in use, assigned to Category D shall be sited on an active fault."  Add the following <u>definition</u> :  An active fault is one on which there is evidence of tectonic movement in the past 10,000 years, i.e., Holocene displacement.



TABLE 2 - TECHNICAL COMMITTEE 1 BALLOT RESULTS

Ballot Issued: April 10, 1980

Due: May 1, 1980

Item 1	Short name	Yes	No	Yes, with Reservations
1	Table 1-A	2	3	
2	Table 1-B (5)	2	3	
3	Table 1-B (4)	2	3	
4	Table 1-B (3)	2	3	
5	Table 1-B (2)	3	2	
6	Table 1-B (1)	3	2	
7	Acceleration map	3	2	
8	Sect. 1.4.4	2	2	1

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## 2.0 COMMITTEE ACTIONS

### 2.1 Recommendations for Change

Technical Committee 1 on Seismic Risk Maps recommends to the Joint Committee four changes to Section 1.4 of the ATC Tentative Provisions. The first two originated from within Committee 1.

(1) The design ground motions defined in terms of Effective Peak Acceleration or Effective Peak Velocity-Related Acceleration should be represented by contour maps (in percent gravity) rather than by counties.

Reason: Contours permit a degree of judgment by the user without penalizing the building industry in portions of the country where earthquake and fault records are not as abundant as in the western states and where the zone boundaries are not well defined. The increase in accelerations between zones is enough to penalize buildings in these border areas, some of which are areas of heavy construction. Contour lines are easier to relocate as additional data become available. Seismic risk in large counties close to zones of active faulting also could be treated more consistently.

Opposing points of view were that code administrators prefer a county-type map, and the specification of zones avoids the need to extrapolate ground acceleration at certain boundaries of the contiguous 48 states.

(2) Change Section 1.4.4 to read: "No new building or existing building which is, because of change in use, assigned to Category D shall be sited on an active fault." Add the following definition: "An active fault is one on which there is evidence of tectonic movement in the past 10,000 years, i.e., Holocene displacement."

Reason: Editorial improvement, includes definition of an active fault. However, one affirmative vote was cast with the reservation that the definition does not cover fault strands, conjugate faults, or associated faults for which no direct evidence of movement exists but which are so related to an active fault that activity on one may be as likely as on the other.

In addition to these proposals, several proposals for changing the values of Seismicity Index in Table 1-B of the ATC Tentative Provisions were sent to Committee 1 for ballot as well as to other Committees. The reasons advanced for the proposed changes are described in detail in Section 3.3, Correspondence. Briefly, it was felt that buildings located in map areas 1 and 2, and probably map area 3, would remain elastic under design ground accelerations and thus additional requirements for detailing to insure ductility over existing practice are not necessary. The view was also expressed that in map areas 4 and 5, the sudden additional requirements for detailing for ductility are not supported by adequate background studies. The ballot of Committee 1 on the proposed changes to the seismicity index classification resulted in the following proposed changes:

(3) In Table 1-B, change seismicity index for Map area 2 from 2 to 1.

(4) In Table 1-B, change seismicity index for Map area 1 from 1 to 0.

All other proposed changes to Table 1-B failed by a simple majority.

#### 2.2 Recommendations for Trial Design

None

#### 2.3 Recommendations for Commentary

None

#### 2.4 Other Recommendations

None

### 3.0 Committee Records

This section contains records of Committee 1 activities that relate to the review of Section 1.4.1 of the ATC Tentative Provisions. Section 3.1 contains committee meeting minutes; Section 3.2 lists membership; Section 3.3 contains copies of selected committee correspondence; Section 3.4 gives the ATC comments on the ballot items listed in Table 1.



### 3.1 Meeting Minutes

**Minutes of First Meeting**  
**Technical Committee 1 - Seismic Risk Maps**  
**Review and Refinement of Tentative Seismic**  
**Provisions (ATC-3-06)**

at

National Bureau of Standards

December 11, 1979

The meeting was called to order at 12 noon by the NBS secretary of the committee, Bruce Ellingwood. Those attending were:

<u>Name</u>	<u>Representative of</u>
Jerry Harbour	Interagency Committee on Seismic Safety in Construction
Howard Spellman	Association of Engineering Geologists
William LeMessurier	Building Seismic Safety Council
William Marcuson	American Society of Civil Engineers
Neville Donovan	Applied Technology Council
Robert Englekirk	Structural Engineers Association of California
S. T. Algermissen	United States Geological Survey
Riley Chung	National Bureau of Standards
Bruce Ellingwood	National Bureau of Standards

As a first order of business Ted Algermissen was elected chairman of the Technical Committee.

There was a period of discussion on whether Committee 1 should be represented on Committee 2: Structural Design. Most of Committee 1 felt that because of numerous problems in adapting ground motion information to structural design, that Committee 1 should be represented as a voting member on Committee 2. It was pointed out that the map accelerations are related to the control of force, deformation and damage. Therefore, Bob Englekirk was elected to be the voting representative of Committee 1 on Committee 2.

The remainder of the meeting was spent discussing a number of points raised by reviewers of earlier versions of ATC-3-06. These points may be summarized as follows:

1. Justification of level of probability of occurrence of ground motion.
2. The need for two maps and identification of parameters to be mapped.
3. The use of zones rather than contours and the selection of county lines for zones boundaries.
4. The number of zones versus the number of seismicity indices.
5. Lower ground motion in high-risk areas than the original Algermissen-Perkins open file report map.

Each of these points was discussed in some detail by the committee. With regard to levels of probability of exceeding the recommended ground motion, it was pointed out that the question of what probability to select cannot be answered outside the context of the problem. The 50-year time scale was selected as one being of interest to building codes. The selection of a ten percent exceedance probability in this 50-year period was a consensus of a number of experts and was consistent with values that were being assumed or were being recommended in several independent studies. The committee felt that the explanation given on page 302 of ATC-3-06 was a satisfactory explanation of the selection of a risk level.

With regard to the specification of two maps, the committee was in unanimous agreement that earthquake ground motion is much too complicated a problem to be specified by simply one parameter. While ground acceleration may not always be the best parameter to map, there was a consensus that it was the best parameter if one had to be selected. The committee recognized that while  $A_v$  penalizes low period buildings in some instances, it was necessary for this parameter to be included for longer period structures. The maps were drawn on the basis of historical seismicity of the sites. There was little data available on rate of occurrence at the time the maps were put together. It was not considered practical to have additional maps corresponding, for example, to different map parameters or to different durations of shaking.

With regard to the selection of zones rather than contours and the selection of county lines as the boundaries for the zones, it was pointed out that code administrators favored this approach. Moreover, the specification of zones avoids the need to extrapolate ground acceleration at certain areas of the boundary of the contiguous 48 states. However, it was also pointed out that the county zoning system does violence to the concept of ground motion and the contour lines are easier to relocate as additional data become available. Moreover, the increase in accelerations between zones 2 to 3 is enough to penalize buildings in these border areas, a problem because the placement of zone boundaries are not well defined. Some of these boundaries occur in areas of very heavy construction in the United States. No general agreement was obtained on whether the



trial designs should be based on the zone or contour concept of seismic risk mapping and this problem remains to be resolved in a later meeting.


The committee discussed the use of seven zones and four seismicity indices and sees no problem with this particular differentiation in ATC-3-06.

With regard to the lower ground motion in certain high risk areas, it was pointed out that the areas in which the effective peak acceleration exceeds 0.4g are very small and that specification of higher accelerations would require microzonation. The committee does recognize that this clipping of peaks higher than 0.4g as well as the smoothing of contours does alter the basic probability that the basic ground motion will be exceeded.

It was decided that the next meeting of Technical Committee 1 would be held Thursday, February 21, 1980, at the U.S. Geological Survey in Golden, Colorado. Each committee member is to review Section 1.4.1 and the related commentary of ATC-3-06 and make proposals for any revisions that should be made before trial designs and impact assessment is begun. These proposed revisions should be submitted in writing with supporting evidence and reasoning to the committee secretary and to the representative of ATC by January 11, 1980. The ATC representative will review the proposed revisions and transmit them to the secretary by January 30, 1980. The secretary will then distribute all proposed revisions and ATC responses to all members of Committee 1 prior to the February 21 meeting at which time issues raised will be deliberated by the committee members.

There being no other business, the committee meeting was adjourned at 4:00 p.m.

Respectfully submitted,



Bruce Ellingwood Secretary

Enclosure: Roster of Membership for Committee 1 including telephone numbers

### 3.2 Committee 1 Roster

#### COMMITTEE 1: Seismic Risk Maps

##### American Society of Civil Engineers

Mr. William F. Marcuson, III  
Waterways Experiment Station  
P.O. Box 631  
Vicksburg, Mississippi 38180

##### Association of Engineering Geologists

Howard A. Spellman  
Converse Ward David Dixon Association  
126 W. Delmar Boulevard  
Pasadena, CA 91105

##### Interagency Committee on Seismic Safety in Construction

Mr. Jerry Harbour  
Chief, Site Safety Research Branch  
U.S. Nuclear Regulatory Commission  
Mail Station 113055  
Washington, D.C. 20555

##### Structural Engineers Association of California

Dr. Robert Englekirk (representative to Committee 2:  
3242 West 8th Street Structural Design)  
Los Angeles, CA 90005

##### United States Geological Survey

S. T. Algermissen (Chairman)  
U.S. Geological Survey  
Denver Federal Center  
Box 25046 MS966  
Denver, CO 80225

##### Applied Technology Council

Mr. Neville C. Donovan  
Partner, Dames & Moore  
500 Sansome Street  
San Francisco, CA 94111

Committee 1 (continued)

Building Seismic Safety Council

Mr. William Le Messurier  
Chairman, Sippican Consultants  
International, Inc.  
1033 Massachusetts Ave.  
Cambridge, Massachusetts 02138

National Bureau of Standards

Dr. Bruce Ellingwood  
Dr. Riley Chung  
Secretariat  
Committee 1, Seismic Risk Maps  
National Bureau of Standards  
Rm. B-168, Bldg. 226  
Washington, D.C. 20234

### 3.3 Selected Committee Correspondence

This section contains a record of correspondence related to proposed changes in Section 1.4.1 of the ATC Tentative Provisions. Other committee correspondence has been retained by the Secretariat but is not included.

- Exhibit A) Letter from Marcuson soliciting comments on the Seismic Risk Maps from the ASCE Committee on Soil Dynamics.
- Exhibit B) Letter from Spellman on contours vs. county barriers in risk mapping.
- Exhibit C) Letter from Spellman suggesting a revision to site limitation provision 1.4.4.
- Exhibit D) A suggestion from Mark Fintel for revising Table 1-B.
- Exhibit E) A suggestion routed through Committee 5 on Masonry for revising Table 1-B; however, it should be noted that their suggestion to revise seismic performance categories falls outside the purview of Committee 1 and, in addition, contains an unintentional error (see note on exhibit E).
- Exhibit F) A suggestion routed through Committee 4 on Concrete for revising Table 1-B.





AMERICAN SOCIETY OF CIVIL ENGINEERS

GEOTECHNICAL ENGINEERING DIVISION

12 December 1979

To: Committee on Soil Dynamics  
SEE DISTRIBUTION

Subject: Review of Applied Technology Counsel's (ATC)"Tentative Provisions  
for the Development of Seismic Regulations for Buildings"

Gentlemen:

I have been asked to represent the American Society of Civil Engineers (ASCE) and serve on a committee to review and refine the subject seismic provisions. Specifically, I serve on a subcommittee charged with review of the seismic risk maps. The question that we are addressing is: "Are the seismic risk maps acceptable?"

The purpose of this letter is to bring your attention to the fact that this review is going on. Now is your time to criticize the subject tentative seismic provisions. If you do not have a copy of this document, one can be obtained from the National Science Foundation by ordering their publication #78-8, or from the National Bureau of Standards by ordering their Special Publication #5-10.

The specific area that our subcommittee is investigating can be found on pages 28 and 29 in section 1.41 and on pages 296 to 333 of the commentary. If you find anything unacceptable, please make specific recommended changes, for example: on page 28, the second paragraph of section 1.41, the fourth line down, the word "potential" should be deleted.

Please send your proposed changes to:

Mr. Bruce Ellingwood  
Technical Committee on Seismic Risk Maps  
Tentative Seismic Provision Project  
B168, Building 226  
National Bureau of Standards  
Washington, D.C. 20234

by January 11, 1980. If this deadline is unacceptable, proposed changes will be accepted on up into February.

To: Committee on Soil Dynamics

12 December 1979

Subject: Review of Applied Technology Counsel's (ATC) "Tentative Provisions for the Development of Seismic Regulations for Buildings"

Please send copies of your proposed changes to:

Mr. Neville Donovan  
Dames & Moore  
500 Sansome Street  
San Francisco, CA 94111

Mr. S. T. Algermissen  
U. S. Geological Survey  
Box 25046, MS 966  
Denver Federal Center  
Denver, Colorado 80225

Mr. T. Leslie Youd  
U. S. Geological Survey  
345 Middlefield Road, MS 98  
Menlo Park, CA 94025

and me.

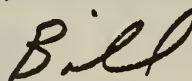
Your review and critique of the subject document is not limited to the seismic risk map portion. You are welcome to comment and make specific recommended changes on any portion of the document; however, I have been specifically charged with review of the seismic risk maps.

Now is the time to speak out if you have any "heartburn" whatsoever. As the saying goes, "Speak now, or forever hold your peace." Your efforts in this regard are very much appreciated.

Please pass this information on to any friends, colleagues or associates who you believe should be aware of this current review.

Let me take this opportunity to wish each of you a Very Joyous Holiday Season and a Healthy, Happy, Prosperous New Year.

Sincerely,



W. F. MARCUSON, III  
Research Civil Engineer  
Earthquake Engineering and  
Geophysical Division  
Geotechnical Laboratory



To: Committee on Soil Dynamics

12 December 1979

Subject: Review of Applied Technology Counsel's (ATC) "Tentative Provisions for the Development of Seismic Regulations for Buildings"

DISTRIBUTION:

D. G. Anderson

Ralph Brown

V. P. Drnevich

Maurice Power

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Marshall L. Silver

Kenneth H. Stokoe, II

John T. Christian

T. L. Youd

Ted Vincent

Lyman Heller

Harch Singh

Bob Pyke

CF

Neville Donovan

Ted Algermissen

Bruce Ellingwood ✓



# Association of Engineering Geologists

January 8, 1980

Please Reply to:

Howard A. Spellman, Past President  
c/o Converse Ward Davis Dixon, Inc.  
P.O. Box 2268D, Pasadena, CA 91105  
(213) 795-0461

Dr. Bruce Ellingwood, Secretariat  
Committee 1, Seismic Risk Maps  
National Bureau of Standards  
Room B168, Building 226  
Washington, D.C. 20234

Subject: Contours vs. County Boundaries  
"Map for Coefficient Aa" Figure 1-1

Dear Dr. Ellingwood:

The subject map is the very foundation for design ground motion for the "Tentative Provisions for the Development of Seismic Regulations for Buildings" (ATC-3-06). As such, it is the opinion of the Association of Engineering Geologists (AEG) that representation of Effective Peak Acceleration (Aa), as modified from USGS (Open-File Report 76-416 by Algermissen and Perkins (1976), is more practical if expressed by contours (in percent gravity), than the proposed county boundaries. Principal reason(s) follow.

Contours (as in Fig. C1-3, Page 316) permit a degree of judgment by the user without penalizing the building industry in portions of the country.

Example, one of many;

- the heavy construction areas in the eastern states (Pennsylvania, Virginia, New Jersey, New York; the New England states, etc.) where earthquake and fault records are not as abundant as in the western states.

Conversely, western states would have the flexibility to reduce or exceed 0.40g by documenting local microzonation.

Example:

- assigning a higher seismic risk to a zone of major active faults along the western boundary of Nevada; i.e., 0.30g to 0.40g rather than the 0.15g to 0.20g presently prescribed and lowering the seismic risk in central Nevada (Ryall and Van Wormer, 1979).

AEG is understood to believe county boundaries are preferred by code administrators, but we also believe county boundaries could be a disservice to the building industry and the design engineer.

Sincerely yours,

Howard A. Spellman, Jr.  
Committee Member

HAS:hlc

cc: N. C. Donovan  
J. B. Ivey



# Association of Engineering Geologists

Please Reply to:

Howard A. Spellman, Past President  
c/o Converse Ward Davis Dixon, Inc.  
P.O. Box 2268D, Pasadena, CA 91105  
(213) 795-0461

January 9, 1980

Mr. Ted Algermissen, Chairman  
Committee 1, Seismic Risk Maps  
U.S. Geological Survey  
Denver Federal Center  
Box 25046 MS 966

Subject: Revision of Section 1.4.4 and Definition of  
Active Fault

Dear Ted:

As promised December 11, 1979 at our Washington, D.C. meeting, The Association of Engineering Geologists suggests the following revision of Section 1.4.4 and a definition of active fault that could be applied nationwide. Considering the 28 definitions of "Active Fault" in the Corps of Engineers Miscellaneous Paper S-77-8 (Slemmons, 1977) there is no definition that will appeal to all entities. However, the following should stir up some beneficial discussion.

## 1.4.4 SITE LIMITATION FOR SEISMIC DESIGN PERFORMANCE CATEGORY D

No new building or existing building which is, because of change in use, assigned to Category D shall be sited where there is the potential for an active fault to cause rupture of the ground surface at the building on an active fault.

Definition:

An active fault is one on which there is evidence of tectonic movement in the past 10,000 years ie, Holocene displacement.

Am looking forward to our February 21, 1980 meeting in Golden, Colorado.

Best regards,

*Howard A. Spellman, Jr.*  
Howard A. Spellman, Jr.  
Member Committee 1

HAS/hg

XC: Dr. Bruce Ellingwood,  
Secretariat

Mr. John B. Ivey,

Submitted by  
Portland Cement Association  
Mark Fintel  
January 1980

TABLE 1-B - Page 35

REVISE THE "SEISMICITY INDEX" COLUMN OF TABLE 1-B TO READ AS SHOWN BELOW:

TABLE 1-B  
Coefficients  $A_a$  and  $A_v$  and Seismicity Index

<u>Coeff. <math>A_a</math></u> <u>Figure 1<sup>a</sup></u>	<u>Map Area</u> <u>Number</u>	<u>Coeff. <math>A_v</math></u> <u>Figure 2<sup>v</sup></u>	<u>Seismicity</u> <u>Index</u>
0.40	7	0.40	4
0.30	6	0.30	4
0.20	5	0.20	<del>4</del> 3
0.15	4	0.15	<del>3</del> 2
0.10	3	0.10	<del>2</del> 1
0.05	2	0.05	<del>2</del> 1
0.05	1	0.05	1

REASON: The seismicity indices were introduced as a device to relate the seven map areas (acceleration intensities) with the various levels of detailing requirements, as classified in the four seismic performance categories (A, B, C, and D). The indices and the performance categories have been apparently arbitrarily interrelated with the seismic hazard exposure groups (Table 1-A).

While there is little question about detailing requirements for the highest seismicity (4), and for the lowest seismicity (1), detailing requirements for seismicity index levels of 2 and 3 remain a gray area without adequate background information.



It is not acceptable to require arbitrarily the same level of ductility detailing for acceleration levels of .40 (map area 7) as for acceleration level 0.15 (map area 4).

Buildings located in the map areas 1 and 2, subjected to acceleration levels of 0.05, will undoubtedly always remain in the elastic range, requiring no additional ductility details. The acceleration level of 0.10 (map area 3) will, in all probability, create an elastic response in buildings designed in conformity with modern reinforced concrete and steel codes.

Regarding the acceleration levels of 0.15 and 0.20, (map areas 4 and 5), the major question is which structural members will be yielding and how much ductility will be required in them. It should also be considered that current codes (i.e., ACI 318) basically result in ductile members, as provisions over the last 20 years have been devised to eliminate brittleness. To suddenly require additional detailing (also adding 30% of forces in perpendicular direction) in cities like New York and Chicago, based largely on judgment, not necessarily supported by adequate background studies, seems questionable. Seismic code writers bear the responsibility to substantiate the need for any restrictive changes made to codes which have been developed in a consensus process over the last several decades. It is not for industries to prove that such changes are unnecessary and will increase the cost of buildings without adding to their safety. Added ductility requirements should be imposed only if seismicity vs ductility correlation studies for map areas with acceleration levels of 0.10, 0.85 and 0.20 indicate levels of ductility demands requiring such detailing.

Proposed change:

TABLE 1-B

COEFFICIENTS  $A_a$  and  $A_v$  and SEISMICITY INDEX

<u>Coefficient <math>A_a</math> Figure 1</u>	<u>Map Area Number</u>	<u>Coefficient <math>A_a</math> Figure 2</u>	<u>Seismicity Index</u>
0.40	7	0.40	4
0.30	6	0.30	4
0.20	5	0.20	3
0.15	4	0.15	2
0.10	3	0.10	1
0.05	2	0.05	1
0.00	1	0.00	0

The ATC says in their commentary that they assigned the arbitrary peak acceleration of 0.05 g to map area 1. The actual seismicity of map area 1 is actually zero. In addition, the peak acceleration of map area 2 is actually 0.00 to 0.05 as maximum.

It is the intention that any reasonably designed and built structure will survive a peak acceleration of 0.05 intact and all materials remain within the elastic range. Therefore, the Coefficients of Map Area 1 is reduced to 0.00 and the Seismicity Index for that area is reduced to 0. The other Seismicity Indices are adjusted accordingly.

Proposed change:

TABLE 1-A

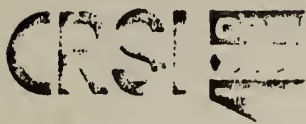
SEISMIC PERFORMANCE CATEGORY

<u>Seismicity Index</u>	<u>Seismic Hazard Exposure Group</u>		
	<u>III</u>	<u>II</u>	<u>I</u>
4	D	C	C
3	C	C	B
2	B	B	A
1	A	A	A

Suggested change from A to B was voted down by Committee 2. Error - should have been B

The reasoning for these proposed changes is as follows:

- .1 It is felt that Seismic Hazard Exposure Group III Buildings should be investigated and analyzed, even for Seismicity Index 1.
- .2 It is also felt that based on performance history, S.H.E.G. I Buildings in S.I. 2 need not be required to be reinforced masonry.



CONCRETE REINFORCING STEEL INSTITUTE

1499 BAYSHORE HIGHWAY ■ SUITE 112 ■ BURLINGAME, CA 94010 ■ TELEPHONE 415 697-1437

JOSEPH G. MANNING, Regional Director, CRSI Western Region

January 31, 1980

Members of Technical Committee 4:  
Concrete  
Review of ATC 3-06

Victor Bertero  
Edward Cohen  
Mark Fintel  
Neil Hawkins  
Eugene Holland

James Lefter  
Richard Marshall  
James Prendergast  
David Sheppard

10 FEB -6 PM 2:41

Gentlemen:

The following proposed revisions to ATC 3-06 are submitted for your consideration. These are written in code language, with appropriate reasons for each per instructions by the Committee Chairman.

Table 1-B Seismicity Index

Revise the "Seismicity Index" of table 1-B to read as follows:

<u>Map Area Number</u>	<u>Seismicity Index</u>
7	4
6	4
5	4 3
4	3 2
3	2
2	2 1
1	1

Reason: The seismicity index relates to various levels of detailing requirements through the seismic performance category. Under ATC 3-06, in some areas such as Phoenix, AZ., detailing requirements would be increased to the same level as that for say San Francisco. This obviously should not be required. It is therefore recommended to maintain current levels of detailing that have been determined by the local engineering profession.



April 9, 1980

Bruce Ellingwood  
Secretary Committee 1  
National Bureau of Standards  
Washington, D.C. 20234

Responses to Comments on ATC-3 Seismic Criteria

These responses are each keyed to the written comments as they are made:

- 1) Letter to Ellingwood from Spellman dated 1-8-80. This letter recommends contours instead of county boundaries on the seismic map. With the exception of the western states county boundaries do not present a hardship. The use of contours presents some difficulties in interpretation in coastal areas as presently drawn. Interpolation would require either closure or extensive continuation of contours. Recognition of the problems of large counties with varying seismicity was specifically allowed for in the ATC-3 guidelines with the alternate interpretation for section 1.4.1 on page 29. County boundaries also recognize human nature for what it is. Pressure may be brought to bear to reduce criteria (e.g. other comments on the provisions) but little will be brought to raise them. I feel sure that if ATC-3 were adopted eastern San Bernadino County, for example, would quickly adapt to the real seismic hazard by invoking the alternate 1.4.1.

Additional data will ultimately result in map changes but these must be represented by considering the potential activity and the associated risk rates. Maximum events are only a small part of the total input for the maps.

- 2) Letter to Algernissen from Spellman dated 1-9-80. I am opposed to this change. Fault activity using such a definition as that recommended makes no distinction between a fault which may move 20 feet in an event and one which may move a fraction of an inch. Controversial and insufficient definitions should not be part of a code-type document.

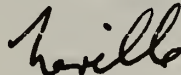


National Bureau of Standards  
April 10, 1980  
Page two

- 3) Portland Cement Association - Mark Fintel - January 1980. The PCA comments suggest that because the indices and the performance categories have been "arbitrarily interrelated" they can also be arbitrarily reduced. Codes developed by "consensus" are usually codes developed during quiescence and are unlikely to sufficiently represent rare hazards. The seismicity index numbers are to a large measure the province of Committee 2 but I do not see justification for their reduction.
- 4) Comments from committee on masonry - undated. These comments appear to be particularly abrasive. In addition they are incorrect. The seismicity of map area 1 ranges between an EPA at zero to 0.04. Admittedly large areas of some states have very low values. It was the ATC-3 viewpoint that any well designed structure can resist a lateral force based on the ATC-3 criteria with an Aa value of 0.05 without penalty. The masonry committee comments agree with this statement and want the requirements removed! The EPA value for map area is 0.05 or greater. As with item 3 the modifications to Table 1-A are the province of Committee 2.
- 5) Comments by Technical Committee 4 - dated January 31, 1980. My interpretation of the map places Phoenix in Maricopa County on Map Area Number 4 on Figure 2 or Seismicity Index 3. This requires the detailing for category C buildings. Detailing may well increase design costs while improving performance. It would appear that fee negotiation is more necessary than a reduction of criteria.

These comments represent my personal views but these have been considerably tempered by the years of active involvement in the development of and the innumerable compromises that had to be made before the ATC-3 guidelines were released.

Sincerely,



Neville C. Donovan

NCD:mb

cc: R.L. Sharpe  
S.T. Algermissen

U.S. DEPT. OF COMM. <b>BIBLIOGRAPHIC DATA SHEET</b> <i>(See instructions)</i>	<b>1. PUBLICATION OR REPORT NO.</b> NBSIR 80-2111.1	<b>2. Performing Organ. Report No.</b>	<b>3. Publication Date</b> October 1980
<b>4. TITLE AND SUBTITLE</b> REVIEW AND REFINEMENT OF ATC 3-06 TENTATIVE SEISMIC PROVISIONS Report of Technical Committee 1: Seismic Risk Maps			
<b>5. AUTHOR(S)</b> Bruce R. Ellingwood			
<b>6. PERFORMING ORGANIZATION</b> <i>(If joint or other than NBS, see instructions)</i>  NATIONAL BUREAU OF STANDARDS DEPARTMENT OF COMMERCE WASHINGTON, D.C. 20234		<b>7. Contract/Grant No.</b>	<b>8. Type of Report &amp; Period Covered</b> Final
<b>9. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS</b> <i>(Street, City, State, ZIP)</i> Federal Emergency Management Agency Washington, D.C. 20472			
<b>10. SUPPLEMENTARY NOTES</b>  <input type="checkbox"/> Document describes a computer program; SF-185, FIPS Software Summary, is attached.			
<b>11. ABSTRACT</b> <i>(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)</i>  The TENTATIVE PROVISIONS FOR THE DEVELOPMENT OF SEISMIC REGULATIONS FOR BUILDINGS were developed by the Applied Technology Council to present, in one comprehensive document, current state-of-knowledge pertaining to seismic engineering of buildings. The TENTATIVE PROVISIONS are in the process of being assessed by the building community. This report is one of a series of reports that documents the deliberations of a group of professionals jointly selected by the Building Seismic Safety Council and the National Bureau of Standards and charged with reviewing the TENTATIVE PROVISIONS prior to the conduct of trial designs. The report contains the recommendations and records of the committee charged with review of the seismic risk maps. The committee made 4 recommendations for revisions to the TENTATIVE PROVISIONS. These recommendations were made to the parent group, the Joint Committee on Review and Refinement, and their action on these recommendations is documented in a companion report.			
<b>12. KEY WORDS</b> <i>(Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)</i> Buildings; buildings (codes); buildings (design); earthquake; seismic risk maps; standards; structural engineering			
<b>13. AVAILABILITY</b>  <input checked="" type="checkbox"/> Unlimited <input type="checkbox"/> For Official Distribution. Do Not Release to NTIS <input type="checkbox"/> Order From Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.  <input checked="" type="checkbox"/> Order From National Technical Information Service (NTIS), Springfield, VA. 22161		<b>14. NO. OF PRINTED PAGES</b> 28  <b>15. Price</b>	



