TO: Members of the Advisory Committee on Engineering Seismology

19 April 1954

The Earthquake Division of the Pacific Fire Rating Bureau has requested that if possible vibration observations be made on six elevated steel water tanks that were effected by the 21 July 1952 and subsequent Kern County California earthquakes. The Pacific Fire Rating Bureau would cooperate in making the observations, several of which would be so called pull-back tests.

Assuming that the observations could be made at odd times without seriously interfering with the basic strong-motion program, would you advise for or against the Seismological Field Survey attempting the project? Individual replies at an early date would be appreciated.

Sincerely,

William K. Cloud
WILLIAM K. CLOUD, Chief
Seismological Field Survey

Cc: Director USC&GS WashDC
Supervisor WestDist SF
APR 28 1954

Mr. William K. Cloud, Chief
Seismological Field Survey
Old Mint Building
Fifth and Mission Streets
San Francisco 3, California

Dear Mr. Cloud:

If the vibration measurements on the elevated water tanks could be made without serious interference with the basic strong motion program I believe it would be worthwhile to make them.

The value of the results, for the ultimate purpose of code revision, would be enhanced if an analysis of the results could be made. A study similar to that described in the California Institute of Technology Earthquake Research Laboratory Report of September 1952 on "Response of a Structure to an Explosive-generated Ground Shock" would help to clarify the nature of the response of elevated water tank structure to ground motions. An experimental study by Arthur C. Ruge, A.S.C.E., is already available.

Sincerely yours

(SIGNED)

Robert E. Glover

REGlover:cah-s
April 27, 1954

Mr. Robert E. Glover  
Design & Construction Branch  
U. S. Bureau of Reclamation  
Denver, Colorado

Dear Mr. Glover:

We have felt it desirable to write to you and each other member of the Advisory Committee on Engineering-Seismology to express our warm thanks for your generous and effective services as members of the Committee. Undoubtedly, much of the technical value of our work has been due to your competent advice and we thank you most sincerely.

Although the Committee now has no legal status, owing to administrative circumstances outside our control, please know that we consider you just as much a fundamental part of our organization as though you were actual officials of the Bureau.

For your information, I am enclosing a new list of the Committee members.

Yours very truly,

[Signature]

Robert W. Kim
Acting Director

Enclosure
ADVISORY COMMITTEE ON ENGINEERING
SEISMOLOGY

Chairman
Prof. Lydik S. Jacobsen
Head, Dept. of Mechanical Engineering
Stanford University
Palo Alto, California

Secretary
Mr. John A. Blume
45 Second Street
San Francisco 5, California

Members
Mr. John S. Bolles
215 Liedesdorff
San Francisco 8, Cal.

Prof. Perry Byerly
University of California
Berkeley, Cal.

Prof. Harmer E. Davis
University of California
Berkeley, Cal.

Mr. Harold M. Engle
110 Sutter Street
San Francisco 4, Cal.

Mr. Robt. E. Glover
Design & Construction Br.
U. S. Bureau of Reclamation
Denver, Colorado

Prof. George W. Housner
Dept. of Civil Engineering
California Inst. of Technology
Pasadena, Cal.

Mr. Thomas F. Thompson
South Pacific Division
U. S. Army Engineers
130 Sutter Street
San Francisco 8, Cal.

Mr. John C. Little
251 Kearny Street
San Francisco 8, Cal.

Prof. Alfred L. Miller
Dept. of Civil Engineering
201 More Hall
University of Washington
Seattle 5, Washington

Prof. R. R. Martel
California Inst. of Technology
Pasadena, Cal.

Mr. Gilbert E. Morris
Superintendent of Buildings
Dept. of Buildings & Safety
City of Los Angeles
200 City Hall
Los Angeles 12, Cal.

Mr. Samuel E. Morris
General Mgr. & Chief Engineer
Dept. of Water & Power
City of Los Angeles
207 South Broadway
Los Angeles, Cal.

Mr. Henry C. Powers
608 Sharon Building
San Francisco 5, Cal.

Mr. Charles M. Herd
Principal Structural Engineer
California Division of Architecture
Sacramento, Cal.

Prof. Frank Neumann
Dept. of Geology
University of Washington
Seattle, Washington
Mr. William K. Cloud, Chief
Seismological Field Survey
U. S. Coast and Geodetic Survey
Old Mint Building
Fifth and Mission Streets
San Francisco 3, California

Dear Mr. Cloud:

The following statements refer to the questions raised in your letter of February 16, 1954, to the Members of the Advisory Committee on Engineering Seismology.

Question (a) on vibrations due to pile driving

Some measurements of the intensity and extent of vibrations due to driving piles would add useful knowledge to our fund of engineering information. However, I would regard such data as being less valuable than information on earthquake motion, and if funds and personnel are inadequate to do both I would prefer that the work on collection and processing of earthquake data be carried on.

Question (b) on accuracy of the strong-motion instruments now used

The strong-motion instruments now used do not give a complete record of the motion. A complete description would require that we measure three displacements and three rotations. This discrepancy was pointed out by Professor Martel at one of the Advisory Committee meetings. Our present instruments record only the three displacements. Measurements of linear accelerations along three mutually orthogonal axes and rotatory accelerations about these three axes could be considered a complete set. To confirm the adequacy of the present equipment we need more tests of the type described in the California Institute of Technology report on "Response of a Structure to an Explosive-generated Ground Shock," by D. E. Hudson, J. L. Alford, and G. W. Housner, dated September 1952. A study of this report will show that they obtained very good agreement between accelerations measured electrically and by a U. S. Coast and Geodetic Survey accelerometer. This would indicate that, insofar as the measurements of linear accelerations are concerned, the present type of instrument does a good job. It may also be noted that they were
able to obtain good correlations between measured and computed building response patterns. Although there are some differences between the observed and computed patterns, the correlation also indicates that the present type of instrument is doing a good job. I would conclude that, while I think we should measure some rotations, the data presently available do not lend much support to Mr. Derrick's doubts about the accuracy of our present strong-motion instruments. Aside from the failure to measure the rotations, I see no theoretical reason to doubt their accuracy.

**Question (c) about the preferable type of strong-motion records**

The answer to this question hinges largely on the way the user intends to apply the data. If the user wishes to study the response of a structure, such as a building or bridge, to the ground motion by using a torsion pendulum, then the displacement record will serve very well. I see no way to apply velocity records directly. They could, of course, be integrated to give displacements and then used with the torsion pendulum as suggested above. The acceleration records can be used directly with a pendulum of the Biot type, or they can be integrated twice and used with a torsion pendulum of the displacement type (see Transactions of the A.S.C.E., Vol. 108, 1943, page 365, and the writer's discussion, page 405, which gives a correlation between the results obtained from torsion pendulums operating from the accelerations and from the displacements). The acceleration record has an intrinsic value which is not shared with the records of other types. This is because it permits a direct comparison of the measured accelerations with the intensities specified in building codes. The acceleration record remains my first choice among the types which might be used. It is the most useful and versatile of the records which might be obtained.

It might be worthwhile to locate one of the new accelerographs in Alaska. This is an active earthquake area and, so far as the writer is aware, has no equipment installed now for recording strong motions. An accelerograph in this area could therefore supply data much needed for engineering purposes. The Bureau of Reclamation now operates in this area, and if housing proved to be a problem it might be possible to find room for the accelerograph in one of the Bureau buildings under the cooperative agreement now in force. If such a use of this instrument should seem desirable, then I suggest that you write directly to the Chief Engineer of the Bureau, stating the requirements for installation and operation of the instrument in this area so that he may have the information required to determine whether these requirements can be met.

Sincerely yours

REG: Glover

(Signed)

Robert E. Glover
Dr. D. S. Carder  
Chief, Branch of Seismology  
c/o Supervisor, Northwestern District  
United States Coast and Geodetic Survey  
725 Federal Office Building  
Seattle 4, Washington

Dear Dr. Carder:

In reference to your letter dated November 6 regarding your arrival in Denver on November 16 to install the former Pierce Ferry seismograph at the University of Colorado, a representative of the Chief Engineer's office will meet you at the Denver Union Depot. You will then be brought to the Denver Federal Center for the requested conference with Mr. Glover during the morning of November 15, after which you will be taken to Boulder to proceed with the seismograph station installation.

All components of the former Pierce Ferry seismograph station stored in the Bureau's Denver Federal Center warehouse are being transported to the University of Colorado geology building on November 12.

Sincerely yours,

W. E. Blomgren  
Acting Chief Engineer  
L. N. McClellan  
Chief Engineer

Blind to: R.E.Glover
JTRichardson:lmh-s
Mr. William K. Cloud, Chief
Seismological Field Survey
U. S. Coast and Geodetic Survey
Old Mint Building, Fifth and Mission Streets
San Francisco 3, California

Dear Mr. Cloud:

The new locations suggested for the 10-second period
displacement meters, as described in your letter of September 11,
seem very satisfactory.

It is my understanding that at least one of these
instruments will be left in the San Francisco area. I would
rate this area as the most important of those mentioned for
operation of instruments of this type.

Sincerely yours

[Signature]

Robert E. Glover

REGlover:cah-s
SEP 22 1953

Dr. George W. Housner
California Institute of Technology
Pasadena, California

Dear Dr. Housner:

Please accept my thanks for the copy of your interesting paper on "A Dislocation Theory of Earthquakes" which was recently sent to me.

It is of interest that your analysis indicates that horizontal accelerations due to earthquakes have an upper limit of intensity which, in the California area, can be placed at about one-third gravity. The Japanese seismologist Imamura expresses a similar idea in his text on "Theoretical and Applied Seismology," published by the Maruzen Company, Tokyo, 1937. For the Japanese area he sets the upper limit at 600 centimeters per second, per second (see page 196). It is, of course, quite conceivable that different areas would vary somewhat in their characteristics.

During one of the meetings of the Advisory Committee, Professor Martel commented on our lack of information about the rotatory components of ground motion during an earthquake. If your approach could be extended to supply some reasonable relationships between the linear and rotatory components, it would fill in a part of the earthquake picture which is now quite blank.

Sincerely yours

(Sgd)
Robert E. Glover
April 16, 1953

The Director
Coast and Geodetic Survey
Washington 25, D. C.

Dear Sir:

Comment on Mr. Neumann's report on "Some New Aspects of Destructive Earthquake Motion" is requested in the Acting Director's letter of April 8, 1953.

The writer has already commented on this draft in a letter to Mr. Neumann under date of April 4, 1952, and we have also had some interesting discussions of the problem of the interpretation and use of earthquake records whenever it has been possible for us to get together. I feel sure, therefore, that Mr. Neumann is aware of my views on this subject. We appear to hold considerable differences of opinion. Mr. Neumann is strongly disposed toward the analysis of a record in terms of simple harmonic components while the writer holds to the belief that this type of analysis will lead to trouble in application. The writer would prefer to follow the procedure of obtaining resonance patterns by operation of a torsion pendulum, or similar device, based upon displacement data such as those which have been developed by the Coast and Geodetic Survey through integration of accelerograph records. It seems too early yet to make a final decision as to which of these routes is preferable.

In regard to the text of Mr. Neumann's report, the writer would find it helpful if it were indicated on pages 41 and 42 whether logarithms to the base 10 or to base e are intended. Should there not be a minus sign in the last formula of page 42? The writer has also been in doubt in some cases as to whether accelerations inferred from a harmonic analysis, or as read from the original accelerograph record, or as read from a resonance spectrum obtained by means of a torsion pendulum were intended. On Figure 1, it would also be helpful if it could be explained as to how the means of maximum accelerations were obtained. The writer would also find it of interest if the absolute maximum accelerations as read from the accelerograph record were plotted on this chart.
It would be helpful as a basis for investigations of resonances produced by earthquake motion if a bulletin giving the original accelerograph data, and the integrations made from them, could be made available. At the April 1, 1950, meeting of the Advisory Committee on Engineering Seismology, the writer introduced a resolution concerning such a bulletin. The recommendation was approved but I am not aware that this bulletin was ever published.

Sincerely yours

(Signed)

Robert E. Glover
April 8, 1953

Dr. Robert E. Glover
1936 S. Lincoln Street
Denver, Colorado

Dear Dr. Glover:

Mr. Frank Neumann of this office sent you a lithographed work sometime ago on "SOME NEW ASPECTS OF DESTRUCTIVE EARTHQUAKE MOTION." This is a report of personal work by Mr. Neumann which the Bureau supported because of its novelty and probable value. We had hoped that it would receive the attention of competent reviewers, including yourself. We are interested in the development of concepts that might improve our capacity to conduct fruitful earthquake surveys and investigations.

In determining our own attitude toward further work in this field, it would be of great value to have your critical opinion of Mr. Neumann's work. Specifically, we would like to know if you believe that the relationships found in the work in question are based upon adequate data and correctly drawn. How, in detail, would you suggest that further work in this investigation be planned and carried out?

Your helpful comment would be highly valued.

Yours sincerely,

(Signed) Robert W. Knox

Rear Admiral, USC&GS
Acting Director
April 8, 1953

Dr. Robert E. Glover
1936 S. Lincoln Street
Denver, Colorado

Dear Dr. Glover:

Mr. Frank Neumann of this office sent you a lithographed work sometime ago on "SOME NEW ASPECTS OF DESTRUCTIVE EARTHQUAKE MOTION." This is a report of personal work by Mr. Neumann which the Bureau supported because of its novelty and probable value. We had hoped that it would receive the attention of competent reviewers, including yourself. We are interested in the development of concepts that might improve our capacity to conduct fruitful earthquake surveys and investigations.

In determining our own attitude toward further work in this field, it would be of great value to have your critical opinion of Mr. Neumann's work. Specifically, we would like to know if you believe that the relationships found in the work in question are based upon adequate data and correctly drawn. How, in detail, would you suggest that further work in this investigation be planned and carried out?

Your helpful comment would be highly valued.

Yours sincerely,

Robert W. Hill
Rear Admiral, USCGS
Acting Director
Mr. William K. Cloud
Chief, Seismological Field Survey
U. S. Coast and Geodetic Survey
Old Mint Building
Fifth and Mission Streets
San Francisco 3, California

Dear Mr. Cloud:

Some comments, relating to the intensity scales mentioned in your letter of March 4, 1953, are contained in my letter of May 9, 1951, to Mr. Ulrich. My preference, and it is a strong one, is to eliminate all inferred values and to retain only those values which are based upon eye witness accounts of what did happen. In other words, with reference to Modified Mercalli intensities to be reported for any earthquake, I would rely solely upon the statements of eye witnesses to what did occur in the quake to fix these intensity values. I would also resist altering the Modified Mercalli description until it is clearly demonstrated that such a change is necessary.

Intensity values collected and published in this way can become the basis for a seismic intensity map which shows what intensities have occurred at any given spot in the past. So long as such a map is based solely upon eye witness evidence, it can be defended against all efforts to discredit it. A map, on the other hand, which purports to show what someone thinks might occur in the future can not be so easily defended. These statements will hold even though the two maps may be very similar and are used for the same purposes.

A series of seismic intensity maps, based upon the Bureau epicenter maps for the western states, is in preparation here and is nearing completion. When our work on these maps is completed, as far as the records permit, it is planned to forward copies to your office and to Mr. Ray Clough for comment.

Sincerely yours

(Signed)

Robert E. Glover

REGlover:mjr-s
Note:
The Mr. Clough mentioned in the letter is Mr. Roy W. Clough, Secretary of the Earthquake Engineering Research Institute (California). At the meeting of the Advisory Committee for Engineering Seismology (U.S. COGS), on Feb 23, 1957, a resolution was adopted that no seismic probability map be referred to the Earthquake Engineering Research Institute for possible revision and sponsoring. This action was taken because the U.S. Coast and Geodetic Survey map had to be withdrawn as a result of criticism. (This map represented an opinion of what might happen, and events could not be successfully defended when its validity was attacked.)
Our map will represent what did happen in the past and cannot be defenses.

R.C. C.
Mr. Robert E. Glover  
U. S. Bureau of Reclamation  
Branch of Design & Construction  
Denver, Colorado

Dear Mr. Glover:

Enclosed herewith is a copy of a letter, File No. 40-fnc, dated 4 March 1953, from the Director in regard to use of the Modified MercalliIntensity Scale in preparation of isoseismal maps. With opinion both strong and widely varied on the subject, it seems desirable to secure written comment from as many sources as possible.

Would you please cooperate by studying the problem and submitting comments by 15 April 1953? Even if you have no definite opinion on the subject an answer would be appreciated as it will help determine to what extent various groups such as Engineers, Geologists, and Seismologists are interested in the problem.

Respectfully yours,

William K. Cloud  
Chief  
Seismological Field Survey
March 4, 1953

To: Chief, Seismological Field Survey
   U. S. Coast & Geodetic Survey
   214 Old Mint Building
   San Francisco 3, California

Subject: Use of Intensity Scale

This office has become aware of criticism of some recent isoseismal maps, due probably to too high rating of ground effects which apparently have tended to be inconsistent with ratings based on observed building effects. Please consider carefully whether your appraisals of ground effects cannot be generally lowered to eliminate the trouble. It would be desirable to base isoseismal maps solely on building effects until it is felt that the proper interpretation can be made of ground effects. An additional caution that seems indicated is to avoid appraising intensity by the ordinary criteria where building failures are traceable to slumping of the ground or other foundation failures rather than to vibration. Please discuss this problem with Dr. Byerly, Dr. Richter and others, for opinions and possible help. Some revision of the M.M. Scale may be desirable if the situation is correctly appraised in the foregoing comments.

/s/ ROBERT W. KNOX
Acting Director
Mr. William K. Cloud
Chief, Seismological Field Survey
U. S. Coast and Geodetic Survey
Old Mint Building
Fifth and Mission Streets
San Francisco 3, California
PLACE: Old Mint Building, San Francisco, Calif.

DATE: March 7, 1953

TIME: 3:20 P.M.

Vice Chairman George W. Housner, Presiding.

(1) **Roll Call:** The following were present:

Blume  
Byerly  
Engle  
Housner  
Little  
Powers  
Willett

Mr. Cloud, Representative of the U. S. Coast & Geodetic Survey, Seismological Division, was also present.

(2) **Secretary's Report:** Mr. Blume reported on the disposition of the correspondence (and replies to same) resulting from the meeting of February 23, 1952.

(3) **Committee Report:** The Special Subcommittee on Instruments consisting of George W. Housner, Chairman, R. R. Martel, and H. Benioff submitted their written report which was accepted by all present. A copy of this report is attached. It was moved, seconded, and unanimously voted that the information contained in this report be sent to the Director of the U. S. Coast & Geodetic Survey.

(4) In view of the recent Kern County earthquakes, it was moved, seconded, and passed that the Committee recommend installation of a permanent accelerograph in a suitable location in the City of Bakersfield, California, rather than at Visalia, California, as was recommended at a previous meeting.

(5) Upon learning that two sets of Carder displacement meters would be available, it was moved, seconded and passed that the Committee recommend one set of such meters be installed in the City of Bakersfield, California, and the other set be installed in the City of Seattle, Washington.

(6) **Adjournment:** The meeting adjourned at 3:40 P.M.

John A. Blume  
Secretary
The Director,
U. S. Coast and Geodetic Survey,
Washington 25, D.C.

Dear Sir:

At a meeting of the Advisory Committee on Engineering Seismology held March 7, 1953, the following recommendations were passed regarding the work of the U. S. Coast and Geodetic Survey in seismological instrumentation:

1. A report was received and accepted from the Special Committee on Instruments which has been studying the matter of low cost instrumentation during the past year. This report, which is shown in its entirety on the attached page, has been adopted as the recommendation of the Advisory Committee and is sent to you for your information and guidance.

2. In view of the recent Kern County earthquakes, the Advisory Committee recommends that a permanent accelerograph be installed in a suitable location in the City of Bakersfield, California, rather than at Visalia, California as was previously recommended.

3. The Advisory Committee recommends that the two sets of Carder displacement meters, which will be available shortly, be installed as follows:

One set in Bakersfield, California
One set in Seattle, Washington

Very truly yours,

/s/ John A. Blume,
Secretary
A subcommittee, composed of R. R. Martel, H. Benioff, and G. Housner, was appointed to consider a special type of seismograph. The instrument was conceived as a low-cost seismometer, one whose cost is sufficiently low to permit large numbers to be used and thus obtain a better coverage than is now available with the standard U.S.C.G.S. seismometers. In its simplest form, the instrument is a one degree of freedom system, being an oscillator whose natural period of vibration is approximately 1/2 second and which has approximately 0.05 of critical damping. Only the maximum displacement of the oscillator would be recorded. The instrument is thus equivalent to a simple one degree of freedom structure of 1/2 second period and 0.05 critical damping whose maximum displacement is recorded during the shock. A more elaborate form of the instrument would have a number of oscillators of different periods of vibration. The information given by the instrument is thus one or more points on the 0.05 damped spectrum curve of the ground acceleration and the instrument does not record ground acceleration or displacement.

The consensus of the Subcommittee is as follows: When used in connection with the standard accelerometer the instrument would give valuable supplementary information, particularly in the multiple oscillator form. For example, in the Los Angeles area there are a number of standard accelerometers which give a complete accelerogram of the ground motion. If, in addition, a dozen or so of the proposed instruments were scattered in the area they would give information on the variation of ground motion intensity over the area, effect of soft soil, etc. It is thought, however, that the information furnished by the instruments would be of much less value if they were used without a standard instrument furnishing at least one complete accelerogram of the shock. In other words, the Subcommittee is of the opinion that the minimum requirement for engineering purposes is one complete strong-motion record of each strong shock until such a time as a sufficiently large number of strong-motion accelerograms have been recorded to give statistically reliable data on the characteristics of strong-motion shocks.

It is suggested by the Subcommittee that the U.S.C.G.S. explore the cost of such instruments and perhaps construct several, and place them in either the Los Angeles or San Francisco area for observation of performance under field conditions.

/s/ G. W. Housner
For the Subcommittee on Instruments
Dr. G. W. Housner  
California Institute of Technology  
Pasadena, California

Dear Dr. Housner:

Please accept my thanks for the copy of the report on  
"Response of a Structure to an Explosive-Generated Ground Shock"  
by D. E. Hudson, J. L. Alford, and G. W. Housner which was  
recently sent to me.

This report makes an important and convincing contribu- 
tion to the literature on the effects of earthquake motions on  
structures. It is especially significant that resonance effects  
were found which imposed forces on the structure nearly one and  
one-half times as great as would have been produced by the ground  
acceleration acting directly on the mass of the structure.

In Heading 1 under the paragraph on "Relation to Building  
Design" it is observed that the ability of structures to resist  
earthquakes having intensities which were, in all probability,  
greater than the intensity allowances made in their design, may be  
due to the dissipation of vibrational energy by yielding or crack- 
ing. The Bureau of Reclamation studies reported by Edwin Rose in  
the memorandum on "Inelastic Structural Action in Earthquake-  
Resistant Design" throws light on this question. A copy of this  
memorandum is enclosed. These studies were made with the aid of  
a torsion pendulum of special design which permitted the effect of  
yielding of the steel in a structure, like one of doubly reinforced  
concrete construction, to be evaluated. An example of the effec-
tiveness of yielding for dissipation of vibrational energy is  
provided by the case of a structure having a natural frequency of  
two cycles per second subjected to the East-West component of the  
Helena, Montana earthquake of October 31, 1935. With the steel  
designed to resist a lateral force of 9.7 percent of the weight of  
the structure at the elastic limit and no damping, stresses reach- 
ing the elastic limit were found to occur four times. However, the  
permanent deformation strain resulting from the overstress was  
found to be only 2.7 times the elastic strain at the elastic limit.  
This amount of permanent set might only be made evident through
the occurrence of a small amount of cracking. Such a structure might then have ridden out the Helena quake with only minor damage even though the ground accelerations produced by this quake were about 1/4 percent of gravity.

In Heading 2, it is stated that "It is well known that all structures designed to resist 10% g are not equally strong but that some of them are very much stronger than others." In reinforced concrete structures one cause for such discrepancies may be easy to find. A common code provision permits the stresses in the steel to be increased one-third under earthquake loadings. Suppose, to fix ideas, we assume that the structure is being designed to resist a lateral force of 0.10 gravity and that the design stress is one-half the elastic limit of the steel. Since no damage will be sustained by the structure until yielding of the steel occurs, have we not designed such structures to withstand 0.30 gravity loading instead of 0.1 gravity loading?

Sincerely yours

(Signed)

Robert E. Glover

Enclosure

REGlover:ksy-8
January 26, 1953

Mr. Robert E. Glover
1936 S. Lincoln Street
Denver, Colorado

Dear Mr. Glover:

I do not know whether you ever received an official notification of your appointment as Collaborator with the Coast & Geodetic Survey. We originally intended that the members of the Advisory Committee on Engineering Seismology would have the official status of Collaborator but recently the Department of Commerce has advised that this is undesirable for certain administrative reasons.

We are sending you accordingly the enclosed Notice of Termination. I would like you to know that this is entirely perfunctory and that it has no bearing upon your service on our Advisory Committee. We have benefited much by having your advice and wish to express our thanks and gratification for your generosity in serving as a member.

Yours very cordially,

[Signature]

Elliott B. Roberts
Captain, USCGS

Enclosure
DEPARTMENT OF COMMERCE  
U.S. COAST AND GEODETIC SURVEY

NOTIFICATION OF PERSONNEL ACTION

<table>
<thead>
<tr>
<th>1. NAME (MR.—MISS—MRS.—ONE GIVEN NAME, INITIAL(S), AND SURNAME)</th>
<th>2. DATE OF BIRTH</th>
<th>3. JOURNAL OR ACTION NO.</th>
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<td>Mr. Robert E. Glover</td>
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<td>1-15-53</td>
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This is to notify you of the following action affecting your employment:

5. NATURE OF ACTION (USE STANDARD TERMINOLOGY)  
6. EFFECTIVE DATE  
7. CIVIL SERVICE OR OTHER LEGAL AUTHORITY

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<td>Collaborator in Seismology</td>
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8. POSITION TITLE
9. SERVICE, SERIES, GRADE, SALARY
10. ORGANIZATIONAL DESIGNATIONS
11. HEADQUARTERS
12. FIELD OR DEPT'L
13. FIELD
14. POSITION CLASSIFICATION ACTION
15. VETERAN'S PREFERENCE
16. NEW  VICE  I.A.  REAL
17. APPROPRIATION
18. SUBJECT TO C.S. RETIREMENT ACT (YES-NO)
19. DATE OF APPOINTMENT AFFIDAVITS (ACCESSIONS ONLY)
20. LEGAL RESIDENCE
   CLAIMED  PROVED
   STATE: Colorado

21. REMARKS: This action is subject to all applicable laws, rules, and regulations and may be subject to investigation and approval by the United States Civil Service Commission. The action may be corrected or canceled if not in accordance with all requirements.

Department of Commerce memorandum of March 20, 1952 from Acting Director of Personnel discontinuing formalizing appointment actions for members on Advisory Committee on Engineering Seismology and terminating those appointments which have already been made.

/S/ Joseph M. Hart
Personnel Officer 18-men
22. SIGNATURE OR OTHER AUTHENTICATION

EMPLOYEE'S COPY

2 G. P. O. 1951-935278
ADVISORY COMMITTEE ON ENGINEERING SEISMOLOGY

10 December 1952

TO: Members of the Advisory Committee on Engineering Seismology

Gentlemen:

For your files, there is enclosed herewith a copy of a letter from the Director, U. S. Coast and Geodetic Survey, announcing the selection of Mr. Thomas F. Thompson to represent the U. S. Army Engineers on the Advisory Committee. Mr. Thompson replaces Mr. B. F. Jakobsen,

Sincerely yours,

John A. Blume
Secretary
Professor Lydik S. Jacobsen, Chairman
Advisory Committee on Engineering Seismology
Department of Mechanical Engineering
Stanford University
Stanford, California

Dear Professor Jacobsen:

Mr. Thomas F. Thompson, geologist for the South Pacific Division, Corps of Engineers, U. S. Army, has been selected to serve on our Advisory Committee on Engineering Seismology in lieu of Mr. B. F. Jakobsen who has retired from active duty.

Mr. Thompson is highly recommended by the Corps of Engineers, and is a Fellow of Geological Society of America and the American Association for the Advancement of Science. His professional career for over twenty years has been devoted to geological studies concerned with design and construction of large engineering projects.

Will you kindly make the necessary changes and notifications to effect this change.

Very truly yours,

/s/ R.F.A. Studds
Rear Admiral, USCG
Director
Dr. G. W. Housner
California Institute
Of Technology
Pasadena, California

Dear Dr. Housner:

Please accept my thanks for the copy of your interesting report on "Intensity of Ground Motion During Strong Earthquakes" which was recently sent to me. It is very helpful to have a list of maximum accelerations as read from the accelerograms as given in your Table III.

You may find it of interest to compare the correlation curve described by Cornwell with your Figures 13 and 15. The intensities shown on the graph attached to Cornwell's memo are maximum intensities for the quake. This memo is included in the Bureau of Reclamation data on earthquake-resistant design. I believe you have a copy of this.

The two enclosed papers may be of interest to you. The one on "Earthquake Stresses in Frame Structures" contains some resonance factors obtained by use of our torsion pendulum apparatus for the Helena quake. The quantities in Table 2 would probably compare approximately with your data for 0.02 critical damping. These results check closely with Biots' data. The paper on "Application of an Analog Computer to the Hydraulic Problems of the Sacramento-San Joaquin Delta in California" may be of interest to you because of the use of a square law resistor to represent hydraulic friction in an analog.

Sincerely yours

Robert E. Glover

Enclosures
Mr. Robert E. Glover
Bureau of Reclamation
Denver Federal Center
Building 56
Denver, Colorado

Dear Mr. Glover:

Dr. Housner forwarded your material on seismic intensity maps to me early this summer. My reply to you has been delayed both by my being out of the State all summer and by the death of Frank Ulrich whom we expected to carry on with this work.

At a special meeting of the Earthquake Engineering Research Institute held on October 15, 1952, however, a committee was appointed to investigate the advisability of having the Institute sponsor a seismic probability map, since the USC&GS has withdrawn their sponsorship. This committee, headed by Mr. H. C. Powers, 608 Sharon Building, San Francisco, will be very interested in your work on seismic intensities, and I have forwarded your material to them. You may carry on any future correspondence with Mr. Powers directly, or you may contact him through me if you wish.

Sincerely yours,

Ray W. Clough
Secretary
Mr. William K. Cloud, Acting Chief
Seismological Field Survey
U. S. Coast and Geodetic Survey
Old Mint Building
Fifth and Mission Streets
San Francisco 3, California

Dear Mr. Cloud:

After giving some thought to the questions raised in your letter of August 13, it seems to me that the course most likely to lead to useful results would be to incorporate the Carder displacement meters with accelerographs.

These instruments should assist in the interpretation of the accelerograph record by providing needed data on displacements and velocities which have been missing heretofore. Installation of two sets in a building would not produce useful data unless additional data on the mode patterns, damping rates, mode frequencies, and the like were available. For such an investigation a quick-starting oscillograph installation would have advantages.

The suggested Arvin location seems a good choice in view of the recent earthquake activity in that area. An installation in San Francisco would be logical because of the importance of this area. I am sure that I would be happy with any final choice of location you might make.

Sincerely yours

(Signed)

Robert E. Glover

Bureau of Reclamation
Building 56
Denver Federal Center
Denver, Colorado
August 25, 1952
To Members of the Advisory Committee on Engineering Seismology

Mr. Robert E. Glover
Head, Technical Section
Branch of Design and Construction
Denver Federal Center
Denver, Colorado

Dear Mr. Glover:

The San Francisco office will soon have available 2 sets of Carder displacement meters for installation at permanent strong motion stations. These instruments are horizontal compound pendulums with free periods of about 2.5 seconds and static magnification of 1. Being small, a set of 2 can be incorporated with an accelerograph and made to record on the same roll of photographic paper. Suggestions on location for the 2 sets would be appreciated.

You have already recommended locations for 4 sets of Carder meters at El Centro, Long Beach, Hollister, and San Jose. Those sets are being installed as fast as possible. In fact the set at Hollister was installed in time to record the 21 July earthquake. For the 2 additional sets of Carders, installation in a building having an accelerograph in the basement and on the top floor might have some merit.

In view of the 21 July earthquake, consideration might also be given to relocation of the accelerograph now scheduled for permanent installation in the Visalia, California area, perhaps at Arvin, Calif. or some other place nearer the south end of the valley. The nearest strong motion station where a record was obtained from the earthquake was at Taft, California.

With Mr. Ulrich gone, your advice and recommendation are more than ever needed.

Sincerely yours,

WILLIAM K. CLOUD, Acting Chief
Seismological Field Survey
JUL 16 1952

Dr. J. L. Alford
California Institute of Technology
Pasadena, California

Dear Dr. Alford:

Your kindness in sending me a copy of the interesting report on "Spectrum Analysis of Strong Motion Earthquakes" by J. L. Alford, G. W. Housner, and R. R. Mardel is much appreciated.

The comments regarding the important effect of small amounts of damping in controlling resonance in structures subjected to earthquake motions are of particular interest.

A copy of my A.C.I. paper on "Earthquake Stresses in Frame Structures" is forwarded herewith. The Bureau of Reclamation Earthquake Analyzer described therein is equipped with electromagnetic damping. It works well but has never been used to produce resonance spectra with various amounts of damping.

Sincerely yours

(SIGNED)

Robert E. Glover

Enclosure

#EGlover:bpm-s
June 9, 1952

Mr. Robert E. Glover
Bureau of Reclamation
Denver Federal Center
Building 56
Denver, Colorado

Dear Mr. Glover:

In answer to your letter of 27 May 1952, I am sure the E.E.R.I. is interested in seismic intensity maps. I think the members most qualified to comment on them are Professor Byerly and Mr. Ulrich. I am referring your letter to Professor Ray Clough of the University of California at Berkeley (E.E.R.I. Secretary) who will speak to Byerly and Ulrich and will let you know what they say.

Sincerely yours,

G. W. Housner

GWH: mef
CC: R. Clough
June 9, 1952

Mr. Robert Glover
Bureau of Reclamation
Denver Federal Center
Denver, Colorado

Dear Mr. Glover:

Replying to your letter of May 28, I take pleasure in furnishing herewith a copy of the draft of the proposed paper for the Proceedings of the American Society of Civil Engineers. There are a number of graphs among the illustrations showing the relationship between intensity and epicentral distance. Please let me know in case I can be of further service. Remember also that this is a personal and not an official report.

I sincerely wish you could find a way to attend the Los Angeles symposium on June 26-27. I am anticipating a certain amount of discussion which should be profitable to all of us interested in the engineering-seismology problem.

Sincerely yours,

[Signature]

Frank Neumann
Chief, Seismology Branch.
June 3, 1952

Mr. Robert E. Glover
Bureau of Reclamation
Denver Federal Center
Denver, Colorado

Dear Mr. Glover:

Thank you very much for the copy of your letter to Mr. Blume suggesting a program of action for the engineers to pursue, and for the epicenter maps. Both are of real interest, especially your thoughts regarding a research program which I hope to study in detail as soon as time permits.

Incidentally, my pay check was sent to St. Louis instead of Denver. Am sorry to have put you to so much trouble looking for it.

Sincerely yours,

[Signature]

Frank Neumann
Chief, Seismology Branch.
Mr. Frank Neumann  
Chief, Seismological Branch  
Coast and Geodetic Survey  
Department of Commerce  
Washington 25, D. C.

Dear Mr. Neumann:

In the draft of your proposed paper, there is a graph, which, if I remember correctly, shows how the Modified Mercalli intensity falls off with distance from the epicenter of a quake.

Since our Acting Chief Engineer, Mr. Blomgren, has recently consented to our doing some additional work to convert the Bureau of Reclamation epicenter maps to seismic intensity maps, a copy of this graph would be useful to us.

If it would not conflict with your original purposes it would be much appreciated if you could let me have a copy of this chart.

Sincerely yours

(Signed)

Robert E. Glover
Bureau of Reclamation
Denver Federal Center
Building 56
Denver, Colorado
May 27, 1952

Dr. George W. Housner
California Institute of Technology
Pasadena 4, California

Dear Dr. Housner:

In my letter of April 25, 1952, I described a procedure which could be used to convert the Bureau of Reclamation epicenter maps into earthquake intensity maps. Since that letter was written, our Acting Chief Engineer, Mr. Blomgren, has granted us permission to do some more work on these maps.

Since the Advisory Committee at their last meeting referred The Coast and Geodetic Survey Seismic Probability Map to the Institute for possible revision and sponsoring, it may be that some mutual benefit can be derived from this work. In particular, if the Bureau constructs the isoseismal maps, giving intensities to the modified Mercalli scale, and sends copies of these maps to the Institute, would it be possible to obtain in return the comment of some of the Institute members who have made a special study of earthquake occurrences?

Sincerely yours

(Signed)

Robert E. Glover
MAY 28 1952

Mr. Frank Neumann
Chief, Seismology Branch
United States Coast and Geodetic Survey
Department of Commerce
Washington 25, D. C.

Dear Mr. Neumann:

When you were here on May 12, we discussed the need for a program of things to be done to facilitate the preparation of better codes for earthquake-resistant construction, and I promised to send a copy of a letter which I had previously sent to Mr. Blume on this subject. A copy of the letter is enclosed.

A copy of the Bureau of Reclamation epicenter location maps is also enclosed for your files.

Sincerely yours

[Signature]

Robert E. Glover

Enclosures

/REGlover:mid-s
May 12, 1952

Mr. R. E. Glover  
Bureau of Reclamation  
Denver Federal Center  
Denver, Colorado  

Dear Mr. Glover:

Thanks for sending us the epicenter maps.

You ask what we are now doing on earthquake research. At present we are using the analog computer to investigate the response of multi-degree-of-freedom systems, with varying amounts of damping, to the recorded ground motion of some of the strongest earthquakes.

I am sorry that we have exhausted our supply of ONR reports about which you inquired. However, the essential data is being published in a paper in the Bulletin of the Seismological Society and it should appear in one of the coming numbers.

You asked about finding mode shapes and frequencies of complex structures. It seems to me that the only logical way of doing this is by using techniques similar to Stodola's method or Holzer's method (see Den Hartog, Mechanical Vibrations). Aeronautical engineers have done a lot with this in connection with flutter analysis. It is laborious but I don't see any way around it.

With best regards,

[Signature]

George W. Housner

GWH; mef
Dr. George W. Housner
California Institute of Technology
Pasadena 4, California

Dear Dr. Housner:

It would be appreciated if you would bring me up to date on the results of studies being made on the California Institute of Technology electric analog computer which have a bearing on the problem of structure response to earthquake motions.

I understand, from some recent correspondence with Mr. Frank Neumann, that you have completed some resonance spectrum studies for a number of recorded quakes. If there is a report on this work I would be much interested to learn how to obtain it.

It would also be of interest if you could tell me whether you have worked out the problem of finding the mode patterns and frequencies for a complex structure such as a tall building. I would also like to know what program of earthquake investigations may be planned for this machine in the future.

The minutes of the Advisory Committee meeting of February 23, 1952, indicate that the Coast and Geodetic Survey seismic probability map was referred to the Earthquake Engineering Research Institute for possible revision and sponsoring. Prints of the Bureau of Reclamation epicenter maps are therefore being forwarded in the hope that you may find them of help in this new task. It has occurred to me that, starting with such maps, isoseismal lines for the plotted quakes could first be drawn and then envelope isoseismals could be plotted which would represent the greatest earthquake intensities which had occurred at any spot during the period of record. Having these envelope isoseismals in terms of the modified Mercalli scale, it would then be possible to interpolate isoseismals in terms of percent gravity acceleration by use of relations such as are described in Cornwell's memorandum. A copy of this memorandum is included in the compilation of "Bureau of Reclamation Data on Earthquake Resistant Design" sent to you some time ago.

Sincerely yours

Robert E. Glover

Enclosures

REGlover:bsb-s

X-0-8925 to 3942 inclusive
April 24, 1952

Dr. Merit P. White, Chairman
Structural Dynamics Committee
Civil Engineering Department
University of Massachusetts
Amherst, Massachusetts

Dear Dr. White:

Your inquiry of April 14, 1952, finds me with no work presently in progress which could be used as the basis of a paper which I could present at the American Geophysical Union technical session planned for the American Society of Civil Engineers' Centennial Meeting on September 12, 1952, at Chicago.

Present indications are, therefore, that I will be unable to participate in the Chicago meeting.

Sincerely yours

(Sgd)

Robert E. Glover

REGlover:mkf-s
April 14, 1952

TO: Members of the Structural Dynamics Committee

Gentlemen:

The American Geophysical Union is planning to present a Technical Session on Friday afternoon, September 12, 1952, as part of the A.S.C.E. Centennial meeting in Chicago. The subject is "Seismology as it Applies to the Design of Engineering Structures." We have been asked whether or not a member of the Structural Dynamics Committee will be able to present a paper at this session.

Will each of you consider this matter and if you will be able and willing to take part in this session please let me know.

Sincerely,

[Signature]

Merit P. White, Chairman
Structural Dynamics Committee
Denver, Colorado

Telegram

C. M. Duke  
University of California  
Los Angeles, California

Opportunity for participation in the Symposium on Earthquake and Blast Effects on Structures as offered in your telegram of April 7 much appreciated. I regret therefore that I will be unable to attend the meeting on June 27.

Robert E. Glover

REGlover:ngm-s
April 4, 1952

Mr. Robert E. Glover
U.S. Bureau of Reclamation
Denver, Colorado

Dear Mr. Glover:

I am pleased to inform you that the U.S. Department of Commerce has granted the request of this Bureau to exempt members of the Advisory Committee on Engineering Seismology from the routine appointment procedure of regular employees, including fingerprinting, personal history, and the loyalty check. It is therefore possible for you to continue as a member of the Advisory Committee without an appointment as Collaborator and you may, therefore, disregard our previous request for your personal data. Those members who wish nevertheless to fill out the necessary papers will be gladly continued as Collaborators.

The annoyance caused you by this situation is sincerely regretted. I hope most earnestly that you will be so generous as to continue serving on the Committee. Your advice is valued very highly.

Yours very truly,

R.F.A. Studds,
Rear Admiral, USC&GS
Director
APR 4 - 1952

Mr. Frank Neumann  
Chief Seismological Branch  
Coast and Geodetic Survey  
Department of Commerce  
Washington 25, D. C.

Dear Mr. Neumann:

The following comments refer to the draft of your proposed paper on "Some New Aspects of Destructive Earthquake Motion."

This paper would be much easier for me to read if the process of finding a "ground period" were described at the beginning of the paper and a terminology was adopted which would everywhere clearly distinguish between a "ground period" and an oscillator period. For example a "spectrum" can be obtained either way but the two spectra will be much different.

On page 9 values of "Maximum Acceleration Disregarding Period" are given, but in the table itself the quantity is called the "Average Maximum Acceleration." It is not explained how these two maxima are related nor does it seem to be clear why these values should differ from the maximum values given in the table of page 43. Are these accelerations read directly from the accelerograph charts or are they inferred values from readings of supposed simple harmonic constituents?

The writers strong aversion to attempts to express earthquake motions in terms of simple harmonic constituents and the reasons for this feeling have been previously expressed in my letter of May 9, 1951, to Mr. Ulrich and the letter of August 13, 1951, to you so that no more need be said on that point here. It may be noted, however, that the difficulty of Item 12 of page 49 could be readily overcome by arrangements to impose the actual ground acceleration, as recorded by an accelerograph, on the shaking table.

Sincerely yours

(rgd)

Robert E. Glover
ADVISORY COMMITTEE ON ENGINEERING SEISMOLOGY

10 March 1952

TO: Members of the Advisory Committee on Engineering Seismology

Gentlemen:

The minutes of the EERI meeting will be forwarded to you in the near future. They will be mailed to you by the new Secretary, Ray W. Olough.

JOHN A. BLUME
Place: 214 Old Mint Building, San Francisco, Calif.
Date: February 23, 1952
Time: 2:45 p.m.

Chairman Lydik S. Jacobsen, presiding.

1. Roll Call - The following were present: Blume, Byerly, Housner, Jacobsen, Little, Miller, Powers, Willett, Ulrich (representative of the Department of Commerce); Absent: Rolles, Davis, Engle, Glover, Jakobsen, Martel, Morris, G.E., Morris, S.B., Perkins.

2. Chairman's Report - Chairman Jacobsen reported that the only business he had done during the past year was to write a letter to the Secretary of Commerce relative to the personnel of the Seismological Field Survey.

3. Secretary's Report - Mr. Blume stated that he had nothing to report that wouldn't be covered under subsequent items on the agenda.

4. Treasurer's Report - The Treasurer reported that the balance in the bank as of the last meeting of $434.23 had been transferred to the Earthquake Engineering Research Institute as requested by the Advisory Committee at their last meeting. The account is now closed, with no balance.

5. Committee Reports - There being no active committees, there were no reports.

6. Report of Coast and Geodetic Survey Activities - A written report (attached) was given to each member. The Advisory Committee approved the recommendation for the installation, when available, of two Carder displacement meters at Hollister, Long Beach, El Centro, and San Jose (basement). The Advisory Committee also approved the recommendation for the installation of an accelerograph on the southeastern side of the Central Valley in the vicinity of Visalia or Porterville.

The Seismic Probability Map was discussed to considerable extent. Some at first thought that the action of the Coast Survey of removing the zoned map was in the right direction, others members thought the new map was useless as far as helping the engineer, owner, or building officials determine seismicity for any particular location. After considerable discussion a resolution was adopted that the Seismic Probability Map be referred to the Earthquake Engineering Research Institute for possible revision and sponsoring. The discussion also brought out a request for a careful check and revision of the dots with perhaps some notation regarding dates. Professor Miller was particularly interested in the dot for the Puget Sound region for the earthquake of April 1949. It was suggested that the new map of the Coast and Geodetic Survey be accompanied by a list of dates of earthquakes on the map with the intensities. It was pointed out that the dots on the map gave no indication as to the areal extent of damage of any earthquake. Professor Miller particularly mentioned the Pacific Northwest earthquake which did considerable damage as far as Longview, Washington, and yet is marked by a small dot on Puget Sound. This was considered very misleading.

The program for measuring horizontal earth movement along faults was discussed by Professor Byerly and Mr. Ulrich. A resolution was adopted that the proposed future program of the Coast and Geodetic Survey relative to measuring motion across faults be approved and endorsed.
Personnel — Resolution was adopted that a stronger letter be written to the Secretary of Commerce, to include a statement that personnel and instruments should not be cut or curtailed for special projects. This resolution was adopted in view of the fact that no action was taken on the letter written last year by the Advisory Committee to the Secretary of Commerce.

7. Future Program and Policy of ACES — The feeling of the Advisory Committee was that the Committee should continue as an Advisory Committee. Many members expressed an unwillingness to fill out employment and other forms to function as collaborators with the U. S. Coast and Geodetic Survey. It was left to individual members to either fill out the forms or resign as collaborators, but in any case to continue as a member of the Advisory Committee.

8. Other Business — Mr. Neumann's letter, which had been referred by the Earthquake Engineering Research Institute to the Advisory Committee, was read. After considerable discussion a resolution was adopted that a sub-committee on instruments study the letter and the entire subject, for recommendation to the Advisory Committee. This study and recommendation can be made by mail. The members of this instrument committee to consist of Housner, Benioff, and Martel. The Advisory Committee favors a widespread earthquake coverage by low-cost instruments of less precision than the accelerograph but with the retention of the present sprinkling of accelerographs.

9. The present officers were re-elected for 1952: Chairman, Lydik S. Jacobsen; Vice-Chairman, George W. Housner; Secretary, John A. Blume; Treasurer, Franklin P. Ulrich.

10. Adjournment — The meeting adjourned at 4:05 p.m.

John A. Blume, Secretary
U. S. Coast and Geodetic Survey
Seismological Field Survey

REPORT OF U. S. COAST AND GEODETIC SURVEY ACTIVITIES FOR 1951

1. General

Continued information office on seismology and operation of three tilt meters. Other work in more detail, as listed below.

2. Questionnaire Program

Continued the collection of information on felt earthquakes in the United States and its possessions. In the 11 Western States, 148 earthquakes were reported felt and 1242 reports were received; field investigations were made for 8 earthquakes and intensive questionnaire coverages were made for 15 shocks. The annual publication "U. S. Earthquakes 1949" was published and the manuscript for "U. S. Earthquakes 1950" has been prepared. The "Quarterly Abstracts of Earthquake Reports" and the "Quarterly Engineering Seismology Bulletin" were continued on a current basis.

3. Strong Motion Program

Instruments:

New instruments built and assembled - 1 6-inch accelerograph.

Total strong-motion instruments as of 31 December 1951 ....... 79
Acceleroographs ................................ 59
Displacement Meters .......................... 6
Weed Strong Motion Seismographs ......... 11
Housner Accelerograph ...................... 2
Mechanical Vibration Recorder ........... 1

Instruments not in operation as of December 31, 1951:

(1) Eight components Carder displacement meters. Period 2 to 2-1/2 seconds; magnification 1. (To be used on Special Project in spring of 1952.) Will be available for permanent installation later. Recommend that 2 components be installed at Hollister, Santa Barbara, Long Beach, and El Centro.

(2) One small 6-inch accelerograph. To be retained at San Francisco for test purposes. (Temporarily at UCLA) Four 12-inch accelerographs. Three to be used on Special Project in spring of 1952. Will be reinstalled in California later, releasing 3 6-inch accelerographs; the fourth to be retained at Washington, D.C.

These 3 6-inch accelerographs plus 2 more being built will be available for installation as follows:

2 at Cachuma Dam (A Bureau of Reclamation Project near Santa Barbara) (cont. on page 2)
1 at Tacoma (Previously approved by the AGS
1 at Portland)

1 recommended for installation at east side of South Central Valley. Probably Porterville or Visalia.

Records for 1951:

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerograph Records</td>
<td>38</td>
</tr>
<tr>
<td>Displacement Meter</td>
<td>8</td>
</tr>
<tr>
<td>Weed Seismograph</td>
<td>2</td>
</tr>
<tr>
<td>Housner Accelerograph</td>
<td>0</td>
</tr>
<tr>
<td>Mechanical Vibration Recorder</td>
<td>0</td>
</tr>
</tbody>
</table>

Total number of records, 48; from 17 shocks.

4. Vibration

Made a series of tests on Baldwin Hills Reservoir in February 1951. Only a limited amount of work done on preparation of reports.

5. Seismic Probability Map

"The Seismic Probability Map of the United States, ExC-76, issued by the U. S. Coast and Geodetic Survey in 1951, has been withdrawn from circulation because it was found to be subject to misinterpretation and too general to satisfy the requirements of many users. In place of the Seismic Probability Map the Bureau offers a map showing the distribution of important earthquakes which can be used as a guide in evaluating earthquake risk." (Quoted from Statement prepared in Washington Office, USGS)

6. Program for Measuring Horizontal Earth Movement (See attached sheets)

7. Personnel and Special Projects

One man was transferred to Washington in February 1951 for special instrument work and resigned in June. One man on special classified project to July 1. Three men, two trucks, and all available spare instruments from San Francisco; one man and one truck from Boulder City; and four men with two trucks from Washington on special project from September into December. All available personnel from San Francisco on this project during the last half of the year. Instruments now (February 1, 1952) being overhauled for Special Project in spring of 1952.

February 15, 1952
To:  kr. Franklin P. Ulrich  
Chief, Seismological Field Survey  
U. S. Coast and Geodetic Survey  
Fifth and Mission Streets  
San Francisco 3, California  

Subject:  Horizontal earth movement  

17 January 1952  

In reply to your letter of 10 January 1952, additional copies of the reprint "Horizontal Earth Movement in California" are being forwarded to you under separate post.  

The surveys which have been made since 1949 for the purpose of detecting horizontal displacement have not shown any movement of sufficient magnitude to be considered significant. Comparisons with earlier surveys give further confirmation of the creeping movement of the southwestern side of the fault relative to the northeastern side. I am enclosing a copy of a memorandum originating in the Division of Geodesy outlining the program of re-triangulation for the next several years. The first program under 1952 has been completed and a party is re-surveying the San Fernando to Bakersfield project at the present time. This program will be followed in future years to the extent possible.  

Enclosure  

/s/ ROBERT W. KNOX  
Acting Director
The Chief, Division of Geodesy

The Chief, Section of Triangulation

Triangulation for earthquake investigations

I have prepared a tentative program for surveys in California to be used for earthquake investigations. The program is for 10 years and could be repeated every 10 years thereafter.

The program as outlined will serve as a basis for discussion with seismologists, geologists, and engineers. I have endeavored to arrange the projects in the order which will give the best spacing with reference to earlier surveys.

This program is for the horizontal control. Some of the projects involve traverse for which leveling would be required. It is my opinion that additional lines of leveling should be rerun periodically as a coordinated part of the total program.

<table>
<thead>
<tr>
<th>Year</th>
<th>Projects</th>
<th>Previous Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952</td>
<td>Across Hayward Fault east to Mt. Loma San Fernando to Bakersfield</td>
<td>New 1932</td>
</tr>
<tr>
<td>1953</td>
<td>Newport Beach to Bear Lake</td>
<td>1929,1934</td>
</tr>
<tr>
<td>1954</td>
<td>El Centro Area</td>
<td>1935,1941</td>
</tr>
<tr>
<td>1955</td>
<td>Primary Scheme - Southern California</td>
<td>1910,1924</td>
</tr>
<tr>
<td>1956</td>
<td>Owens Valley</td>
<td>1935</td>
</tr>
<tr>
<td>1957</td>
<td>Coastal Scheme - 1st order Olema Crystal Springs</td>
<td>1830,1923,1946-1948 1907,1948 1907,1948</td>
</tr>
<tr>
<td>1961</td>
<td>Monterey Bay San Luis Obispo northeastward</td>
<td>1930,1951 1932,1951</td>
</tr>
</tbody>
</table>

O. A. Whitten
Dear Sir:

There is enclosed herewith a copy of a statement received in this office today. This statement will no doubt be of considerable interest to engineers and others interested in building codes.

Respectfully yours,

Franklin P. Ulrich  
Chief  
Seismological Field Survey
Mr. John A. Blume, Secretary
Advisory Committee for Engineering Seismology
45 Second Street
San Francisco 5, California

Dear Mr. Blume:

When I was in San Francisco on April 1, we had an opportunity to discuss briefly the relations between the Advisory Committee and the A.S.C.E. Joint Committee of which we are both members. As you recall, I was present during a part of the Earthquake Engineering Research Institute session, although I was unable to take any active part due to present restrictions. From what was said there, it appeared to me that in spite of strenuous efforts by several members of this body, sufficient financial backing had not been obtained to permit the Institute to assume its intended role of providing a clearing-house for earthquake engineering information and research funds. If this situation does not improve in the near future it will be necessary to find some other way to accomplish these purposes, and such changes will have a bearing on the relations mentioned above.

If it should thus become necessary to change the present line of attack on the earthquake problem, then I would suggest the following procedure.

An act of Congress entitled "An act to define the functions and duties of the Coast and Geodetic Survey and for other purposes," which is Public Law 373, 80th Congress, Chapter 504, 1st Session, approved August 6, 1947, confers special powers on the Coast and Geodetic Survey. Among these are and I quote from a printed copy:

"***The Director of the Coast and Geodetic Survey*** is authorized to conduct the following activities***to conduct investigations and research in***seismology***to enter into cooperative agreements with and to receive and expend funds made available by any state or subdivision thereof or any public or private organization or individual for surveys or investigations authorized herein***and for preparation and publication of the results thereof***to contract with qualified organizations***when in the public interests***to accept and utilize gifts or bequests of
money and other real or personal property for the purpose of aiding or facilitating the work of the Coast and Geodetic Survey and such gifts and bequests and the income therefrom shall be exempt from Federal taxes. There are hereby authorized to be appropriated such funds as may be necessary.

As you will note these powers would provide a solution of the legal difficulties of handling funds. If the Coast and Geodetic Survey could be persuaded to act under these powers, then the Advisory Committee would have the backing of a stable organization, which is conceded by all to be a matter of the greatest importance. It also seems possible to so conduct operations that involvement of the present seismological organization of the Coast and Geodetic Survey in engineering activities could be avoided. In fact, the provision by them of a part time secretary to handle correspondence should be about the extent of their participation. To accomplish this I suggest the following procedure:

The Advisory Committee would first make up a carefully considered compilation of problems which in their judgment must be solved before fully satisfactory codes can be written. This compilation would next be broken down into a numbered list of projects. This list could then be sent to various universities and other research organizations with a request that they indicate which of the projects they are equipped to handle and how much the cost would be. With this information available interested organizations could be provided with definite proposals to consider. It is understood that the Institute members already know of such organizations. Much of the work could in fact be handled by individuals. Whenever an individual or group was found willing to support or undertake a project, the secretary would act to bring the sponsor and research organization together so that they could arrange details to their mutual satisfaction. The Advisory Committee and the Coast and Geodetic Survey would encourage publication of the results of such efforts since, from the Advisory Committee's standpoint, the wider publicity given to such findings the better. Publication would also insure that proper credit was given where due. Any questions of an engineering nature could be referred back to the Advisory Committee to be handled at meetings or by correspondence if necessary.
With such a working arrangement the A.S.C.E. Joint Committee could serve to bring the Advisory Committee's problems before the members of that organization so that their technical skills could be brought to bear on the program.

Sincerely yours,

/\n
Robert E. Glover
Memorandum

To: R. E. Clover

From: Chief, Legal Division

Subject: Appointment on Advisory Committee on Engineering Seismology—U. S. Coast and Geodetic Survey.

1. It appears that appointment of a Federal employee by another Federal agency, said appointment to be without compensation, is not prohibited. Thus it was held by the Comptroller General in 16 Comp. Gen. 55 that there was no legal objection to the appointment by the Department of Agriculture of an individual employed by the Department of State where the appointee would serve as a collaborator without additional compensation. See, also, 27 Comp. Gen. 151. Under such circumstances, neither the statutory prohibition against one individual holding two offices or the prohibition against the Government accepting voluntary services is violated.

2. Further, the payment by one agency of travel expenses only for an employee of another agency has been authorized. (See opinion of the Comptroller General reported in 15 Comp. Gen. 328.)

3. It is therefore my conclusion that you may properly execute the two forms sent to you by the Department of Commerce.
Chief, Legal Division
R. E. Glover

Advisory Committee Activities

References

1. Reference is made to the letters of June 29 and August 18, 1943, to Chief, Legal Division, Denver, from Chief Counsel on "Participation in the work of the Advisory Committee on Engineering Seismology by an Employee of the Bureau of Reclamation."

Earthquake Engineering Research Institute

2. It will be recalled that these letters were concerned with the questions arising because of a proposal that the advisory Committee organize the above Institute as a nonprofit corporation under the laws of the State of California. In the letter of August 18, 1943, it was decided that I might attend such meetings as a member of the committee with expenses for attendance to be paid by the Bureau. However, in view of the expressions in Paragraphs 3 and 4 of the letter of June 29, 1943, I have confined my attention to technical matters and taken no part in the organizational activities. In Paragraph 5 of the letter of June 29, 1943, it is suggested that it would be desirable to examine the charter and bylaws (of the Institute) with reference to their effect on my work with the committee.

Present Status

3. The present status is that the Institute has been incorporated. The writer holds an appointment as Collaborator in Seismology (without compensation) to the Coast and Geodetic Survey. The Director of the Coast and Geodetic Survey has confirmed the status of the Collaborators in Seismology, extended them franking privileges and stated that so far as his office is concerned the organization of the Institute will not affect the status of the Advisory Committee as previously constituted. Thus the Institute and the Advisory Committee are separate entities although composed of much the same membership. On request, and after being assured by Mr. Brown that there would be no impropriety in so doing, I accepted membership in the Institute. I have, however, taken no part in their affairs other than to pay the membership dues. The Institute is at present unable to function because of a lack of financial support. This is a condition which seems likely to continue.
Comments

4. The Institute was organized to provide a clearing-house for seismological information of an engineering nature and to provide a legal status for handling funds. These purposes are laudable enough and in fact there is a strong consensus among the California members that some such organization is essential if the problems of earthquake resistant structures are to be solved. They are probably right. When I was in Washington about a year ago, however, I followed up a clue provided by a chance remark made at one of the meetings and found that the Coast and Geodetic Survey had been granted special authority by the Congress to perform essentially the function for which the Institute was being organized. This act is Public Law 373, 80th Congress, Chapter 504, 1st session, approved August 6, 1947. The copy included in the accompanying compilation was given to me by Commander Roberts of the Coast and Geodetic Survey. For this reason the organization of the Institute seems unnecessary. It had seemed unwise to me from the beginning. I was not present at the first meetings of the committee when the reasons for attempting its organization were given, and I have not been able to get a satisfactory explanation since. It seems to stem from a disinclination of a seismological organization to enter the engineering field. Even this argument is weak because, with the Advisory Committee to fall back on, they would not have to. Although the Advisory Committee has been able to make progress along technical lines, as the recent excellent records obtained from the Olympia, Washington quake will witness, the Institute organizational questions have taken a good deal of time. Perhaps the worst aspect of the attention to these affairs is that it perpetuates a situation which leaves the committee without a functioning organization to carry out their program. Having just returned from an Advisory Committee meeting in which a meeting of the Institute was convened without the advisory committee business having been completed, I am in the mood to write to the Secretary of the Advisory Committee to suggest that we solve these problems by advising the Coast and Geodetic Survey of the necessity for them to act under the authority granted them.

Letter of Endorsement

5. It has been requested that members of the committee furnish a letter of endorsement for the Institute to be used in
a Brochure which it is proposed to issue soon. I do not feel that it is proper to do this and have ignored the request. I have, by letters of September 16, 1943, to Lydik S. Jacobsen, Chairman of the Committee, and to John A. Blume, Secretary, and verbally made my position known to the committee membership. I believe my position is understood by them, and I understand some other members in the employ of the Government have also declined.

Review

6. The Articles of Incorporation of the Institute are supplied herewith to permit the review suggested by the Chief Counsel. It would be helpful also if you could give me your comments on the propriety of the solution suggested at the end of Paragraph 4 above since something should be done soon to end the dissipation of effort which results from the present situation.

Enclosure
Mr. Robert E. Glover  
U. S. Bureau of Reclamation  
Denver Federal Center  
Denver, Colorado  

Dear Mr. Glover:

Relative to your appointment on the Advisory Committee on Engineering Seismology and the possibility of future payment of travel expenses at the meetings, the following is quoted from a letter from our Washington Office:

"When an employee of another Bureau or agency of the Federal Government is appointed as Collaborator by this Bureau it is necessary that he complete and forward to this Office the following forms:

Oath of Office, Form No. 61  
Non-strike Affidavit

These forms are required before we have authority to issue travel orders or make any payment of per diem. It is requested that your office or the Seismological Field Survey secure these forms in the case of Mr. Robert E. Glover and Mr. B. F. Jakobsen."

Accordingly, there are enclosed herewith Oath of Office and the Non-strike Affidavit forms. Will you please fill out these forms and return them to this office?

/s/ FRANKLIN P. ULRICH, Chief  
Seismological Field Survey

Enclosures

Cc: Supervisor, Western District
Dr. Lydik B. Jacobsen,  
Chairman, Advisory Committee  
on Engineering Seismology,  
Mechanical Engineering Department,  
Stanford University,  
Stanford, California.

Dear Dr. Jacobsen:

In order to make the results of Bureau of Reclamation developments auditable to the Advisory Committee on Engineering Seismology I have had the following data bearing on earthquake resistant design assembled for your use:


2. Earthquake Studies for Pit River Bridge, by J. L. Savage, from Civil Engineering for August 1939.


4. Theory of the Action of a Beam or Frame Subjected to an Earthquake, by R. E. Glover, Technical Memorandum No. 503, April 26, 1940.

5. Earthquake Stresses in Frame Structures, by R. E. Glover, Journal of the American Concrete Institute for April 1942.

6. Spectrum Curve determined by Earthquake Analyzer for 8-3 Trace, El Centro Accelerograph Record, Imperial Valley Earthquake, May 18, 1940, by C. C. Rose, Informal Memorandum June 17, 1942. (To this are also attached four spectra for the Helena, Montana, quake of October 31, 1935.)

7. The Bureau Earthquake Analyzer, a brief description to which are attached photos of the old and new pendulum devices and three curves showing correlation between computed and pendulum data.


10. **A Summary of Seismological Investigations Made in the Lake Mead Area, with comments on Data Obtained at the Shasta and Grand Coulee Dams**, by J. T. Richardson. **Technical Memorandum No. 634, April 1, 1947.**

11. **Addendum to the Memorandum of April 1, 1947.**

These data will be brought to San Francisco by Mr. Glover at the time of the forthcoming meeting on February 10 and 11.

Sincerely yours,

Walker R. Young

Walker R. Young,
Chief Engineer.

EC-R.E.Glover
Record copy