



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

CALL FOR  
PICKUP

443 on

LAS VEGAS OFFICE

301 E. Stewart Ave., Rm. 203  
Las Vegas, NV 89101

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CC  
gkpl  
R. Bell  
P. ...  
D. ...  
W. ...  
C. ...

TO: Bill Belke  
FROM: PHILIP JUSTUS  
Sr. On-Site Licensing Representatives' Office, Las Vegas, NV  
DATE: 9/29/93

TOTAL NUMBER OF PAGES: 11 INCLUDING COVER SHEET

- Attached are 3 refs that YMPO is using to spt. seismic design basis for EST. This subject will be discussed at TE on Oct 5th, as we discussed.
- These can go into PDR.

*2*



TRW Environmental Safety Systems Inc.

101 Convention Center Drive, Suite 540  
Las Vegas, NV 89109  
702.794 1800

WBS: 1.2.1  
QA: N/A

APR 6 11:30 AM '93

Contract No: DE-AC01-91RW00134  
LV.MG.RMS.4/93-055

April 1, 1993

William B. Simecka, Director  
Engineering and Development Division  
U. S. Department of Energy  
Yucca Mountain Site Characterization Project Office  
P. O. Box 98608  
Las Vegas, NV 89193-8606

ATTENTION: EDOAR H. PETRIE

ESF SEISMIC DESIGN BASIS DECISION PAPER

The M&O has recommended using a peak ground acceleration (PGA) of 0.75g as part of a preclosure seismic load design basis for permanent systems, structures, and components (SSC) of the ESF which would eventually become part of the proposed Repository system (letter LV.SC.RCQ.8/92-070 from L. D. Foust to W. B. Simecka, dated August 13, 1992). The letter further stipulates that the seismic hazard analysis for the site, from which the final Repository seismic design basis will be derived, will not be available until mid-1996 at earliest.

The Reference Information Base (RIB) Version 4, Revision 0, Item 2.1.1, stipulates that the seismic design basis underground should be half of the surface value. Based on a proposed surface value of 0.75g, half of the value would be 0.375g for the underground.

Based on the recommendation of the M&O and the RIB the following parameters are recommended for insertion into the ESFDR:

*Simecka*  
*Petrie*  
*Reynolds*  
*Ward*  
*Shadley*  
*Jones*  
*Thompson*  
*Waters*  
*Verna*

*Alinski / Voegelé - sec*  
*Stucker - 2000 / Harmonia - sec*  
*Chert*  
*Williamson / Wallace - 2000*  
*Sullivan / Quittnecht - TSS*

4-5-93

TRW Inc.

*where does 0.75g come from?*  
*suggested 0.3g*  
*surface contact motion*  
*ESF Perf. Eval. \**  
*1 2/3 of 0.3g*  
*surface contact motion values apply at all depths.*

1-339867  
*6*

LV.MG.RMS.4/93-055

April 1, 1993

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- ESF surface facilities classified as "permanent" which will be included in the Repository System shall use 0.75g PGA (TBV value) for a seismic design basis.
- ESF subsurface facilities classified as "permanent" which will be included in the Repository System shall use 0.4g PGA (TBV value) for a seismic design basis.\* ?

The following basis of understanding shall apply to the recommendation for ESFDR surface and subsurface seismic design basis:

- The interface between ESF surface and subsurface facilities shall be the ramp portals. The permanent portal components which may experience surface seismic ground effects shall conform to the 0.75g PGA criteria. All freestanding permanent surface facilities shall also conform to the 0.75g PGA criteria.
- The boundary interface between surface and subsurface within the portal shall be at the end of the ARMCO liner. All permanent construction in the starter tunnel and ramp areas after the liner shall conform to the 0.4g PGA criteria.
- All temporary surface facilities shall not be required to conform with the permanent structure seismic design basis criteria. Temporary facilities shall conform with local Uniform Building Code (UBC) criteria. The current UBC seismic criteria for the Yucca Mountain zone is 0.2g horizontal. The classification is on the boundary with the next higher zone which is 0.3g horizontal. The M&O recommends using the higher value to achieve conservatism in design for temporary structures.   
? what version of UBC 1985, 1988, 1991?
  
0.3g
  
0.2g
- All temporary subsurface facilities shall also be required to conform with the UBC standard of 0.3g horizontal. The RIB YMP document YMP/93-02 provides for a seismic basis of 0.3g for subsurface which coincidentally equals the UBC standard being recommended for the temporary surface facilities.

\* 0.4g PGA is rounded up from 0.375g

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April 1, 1993

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- ESF structures deemed to be permanent on the Q-List may be designed as temporary structures on the condition that if the Yucca Mountain site is selected to become the Repository, the temporary structures will be placed and designed to conform with the final Repository seismic basis of design. The final basis will result from the seismic hazard analysis which is an ongoing effort of site characterization. The final seismic basis of design will replace the TBV design basis of 0.75g (surface) and 0.4g (subsurface).
- Construction of temporary subsurface facilities to the 0.4g basis will not preclude the future construction of permanent facilities to a 0.75g or higher seismic design standard if necessary.

*Does ESF ramp design consider the seismic loading? →*  
*How to verify the design is safe,*  
*How to upgrade the design to the safety standard*

- There are four (4) permanent structures currently on the Q-List. They are: 1) underground openings consisting of shafts, ramps, and drifts; 2) seals; 3) liners; and 4) ground support. Underground openings are permanent items that are reinforced ground support such as rockbolts and by liners where necessary. Ground control is a program of maintaining stable underground openings by means of ground support for the life of the structure. Ground support will be temporary for the ESF and may be replaced at a future point in time should the ESF be incorporated into the Repository. Liners likewise can be temporary and may be replaced a necessary in the future. Note that liners will only be placed in the portal areas and in areas of bad rock underground. Liners will be minimized within safety constraints to allow the maximum amount of underground scientific investigation. Seals are inherently permanent and interface to the surface and, therefore, shall be designed to the proposed 0.75g PGA basis.

The following matrix illustrates the proposed seismic basis for the ESFDR:

	<u>ESF Design Basis</u>	<u>Repository Design Basis</u>
Subsurface	0.3g	0.4g (TBV)
Surface	UBC (0.3g)	0.75g (TBV)

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April 1, 1993

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It is the intent of the M&O to adopt the proposed Repository Design Basis values into the ESFDR and to use the 0.3g values for all temporary surface and subsurface ESF facilities.

If you have any questions regarding this matter, please contact Jack Nesbitt at 794-7152 or myself at 794-1869.

Sincerely,



Robert M. Sandifer, Manager  
MGDS Development  
Management and Operating Contractor

cc:

L. D. Foust, M&O, Las Vegas, NV  
C. J. Nesbitt, M&O, Las Vegas, NV  
J. M. Replogle, YMPO, Las Vegas, NV

CJN:cm 



TRW Environmental  
Safety Systems Inc.

151 Convention Center Drive, Suite 5-10  
Las Vegas, NV 89108  
702 795 1800

WBS: 1.2.1

QA: N/A

*Copy from Gary Teraoka (5-4-93)*

Contract #: DE-AC01-91RW00134  
LV.SIGMT.4/93-500

April 29, 1993

Mr. Edgar H. Petric, Acting Deputy Director  
Engineering & Development Division  
U.S. Department of Energy  
Yucca Mountain Site Characterization Project Office  
P.O. Box 98608  
Las Vegas, NV 89193-8606

Dear Mr. Petric:

Subject: ESF Seismic Design Basis

References:

- 1) Letter, Sandifer to Simecka, "ESF Seismic Design Basis Decision Paper - Correction Letter to LV.MG.RMS.9/93-055, Same Subject, Dated April 1, 1993", LV.MG.RMS.4/93-065, Dated April 12, 1993
- 2) Letter, Sandifer to Simecka, "ESF Seismic Design Basis Decision Paper", LV.MG.RMS.4/93-055, Dated April 1, 1993
- 3) Letter, Foust to Gertz, "Interim Seismic Design Basis for the ESF", LV.SC.RCQ.8/92-070, Dated August 13, 1992

The ESF Seismic Design Basis that will be used by the M&O for ESF design is enclosed. This design basis is the culmination of the documented information contained in the three references and various meetings amongst the M&O and the DOE. The ESFDR will be updated to include these values by June 1, 1993.

If you have any questions regarding this matter, please contact Gary Teraoka at 794-7416 or Jack Nesbitt at 794-7152.

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April 29, 1993  
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Sincerely,



Robert M. Sandifer, Manager  
MGDS Development  
Management and Operating Contractor

Enclosure  
(1) ESF Seismic Design Basis

cc:

- R.L. Ackaret, M&O/TRW, Las Vegas, NV
- L.G. Engwall, M&O/Fluor, Las Vegas, NV
- L.D. Foust, M&O/TRW, Las Vegas, NV
- T.C. Geer, M&O/Duke, Las Vegas, NV TG
- C.P. Gertz, DOE, Las Vegas, NV
- C.J. Houston, M&O/TRW, Las Vegas, NV
- P.W. McKie, M&O/MK, Las Vegas, NV
- C.J. Nesbitt, M&O/TRW, Las Vegas, NV
- R. Nolting, M&O, MK, Las Vegas, NV
- P.A. Pimentel, M&O/FD, Las Vegas, NV
- R.C. Quitmeyer, M&O/WCFS, Las Vegas, NV
- J.M. Replogle, DOE, Las Vegas, NV
- M.S. Rindskopf, M&O/TRW, Las Vegas, NV
- W.B. Simecka, DOE, Las Vegas, NV
- C.T. Statton, M&O/WCFS, Las Vegas, NV
- B.J. Verna, DOE, Las Vegas, NV

GMT/RMS:dif

## ESF SEISMIC DESIGN BASIS

### DEFINITION OF SURFACE AND SUBSURFACE

The delineation between surface and subsurface construction is the mountain side of the portal (or collar) interface. Subsurface construction is comprised of those areas where the excavation penetrates this interface and extends into the mountain; surface construction is comprised of those areas not penetrating this interface.

### ESF SEISMIC DESIGN BASIS

	SURFACE	**SUBSURFACE
ESF (Temporary)	UBC (Zone 4) ↗	0.3g
ESF (Permanent)	*	*
Repository	0.75g [TBV]	0.4g [TBV]

*0.4g (?)*

- \* ESF permanent items will be designed to the corresponding surface or subsurface Repository value. In some cases, ESF permanent items will be designed to a lesser criteria if the item can be upgraded (modified and/or supplemented) or replaced. In these cases the design basis will be the value for ESF temporary items.
- \*\* The surface seismic design basis will be applied to the subsurface items which are less than [TBD] ft. below the surface.

All ESF items which are intended to be incorporated into the potential repository are considered permanent. Permanent ESF items will be designed, constructed and maintained consistent with the quality controls and record keeping requirements expected for permanent items that are part of a potential repository.



TRW Environmental  
Safety Systems Inc.

101 Convention Center Drive, Suite P-110  
Las Vegas, NV 89109  
702.784.1800

WBS: 1.2.3.1  
QA: QA

August 13, 1992

Contract #: DE-AC01-91RW00134  
LV.SC.RCQ.8/92-070

Carl P. Gertz, Project Manager  
U. S. Department of Energy  
Yucca Mountain Site Characterization Project Office  
P. O. Box 98608  
Las Vegas, NV 89193-8608

Attention: W. B. Simecka

Subject: Interim Seismic Design Basis for the ESF

This letter provides a recommendation with respect to the Seismic Design Basis Loads which should be used by the Exploratory Studies Facility (ESF) designers for those items identified as being "ESF permanent systems, structures and components". These loads are presently listed as TBD in the ESFDR.

Previous attempts to develop a seismic design basis for the ESF included an analysis documented as "Exploratory Shaft Seismic Design Basis Working Group Report" (SAND88-1203). This report provided a seismic design basis assuming that the ESF was rated equivalent to an "essential" facility as defined in DOE 6430.1. This was done for conservatism; available analyses identified no surface or shaft structures, systems, or components that were important to public radiological safety. Changes in the ESF configuration, and advances in understanding of the seismic hazard at Yucca Mountain, have motivated a Technical Assessment (QMP-02-08) of the Working Group Report, which is now in progress.

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Based on a magnitude 6-1/2 earthquake occurring on the Bare Mountain fault, the Working Group recommended a seismic design basis of 0.3 g peak horizontal acceleration. Because the Working Group realized that there were uncertainties in the assessment of seismic hazards and local site effects, they included some conservatism in their recommendations. They advised that no credit be taken for attenuation of ground motion with depth, and that the ESF design (using an 0.3 g basis) also be evaluated for ground motions 1.67 times the design basis (0.5 g) to ensure adequate performance.

It is also noted that the conceptual design of the potential repository, as described in the Site Characterization Plan, used a seismic design basis of 0.4 g. It is expected that the seismic design basis, to be determined in 1996 from results of site characterization activities, will be higher than this value.

The ESFDR requires that the ESP permanent structures systems and components be designed and constructed with the same criteria, standards and quality assurance as required for a repository, to the extent known at the time of ESP design.

At the present time, updated standards have not been formulated. Investigations in support of a seismic hazard analysis for the site will not be complete until late 1995, with a status report to be issued in mid-1996. Final determination of repository structures, systems, and components important to public safety and waste isolation is not scheduled for completion until 1995. Thus, as anticipated in the ESFDR, the seismic design basis for the repository is not available for use in the ESF design.

Recognizing the current need to choose a seismic design basis for permanent components, systems, and structures of the ESP, a conservative basis of 0.75 g (peak horizontal and vertical acceleration) is recommended. This value is conservative, not only with respect to past estimates of a seismic design basis, but also with respect to our current knowledge concerning the potential activity of faults closer to the site than the Bare

TRW

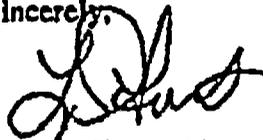
August 13, 1992  
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Mountain fault (e.g., Paint Brush Canyon fault). For comparison purposes, it is noted that the value of 0.75 g is the median ground acceleration expected from a magnitude 7.7 earthquake at a distance of about 2 kilometers. Earthquakes of this size are not expected to occur in the immediate vicinity of the site.

The interim design basis of 0.75 g is expected to exceed significantly the final design basis for the repository that will be derived from the upcoming seismic hazard analyses. This interim design value was intentionally selected to do so. Temporary facilities and structures will be designed according to seismic criteria contained in the Uniform Building Code (UBC). Costs for design and construction of the ESF portal (starter tunnel and highwall) will not be significantly affected by selection of a conservative basis. When seismic hazard analyses are completed, and if the site is found suitable, portions of the ESF incorporated into the repository will be re-evaluated to assure compliance with the final repository seismic design basis.

Any questions should be directed to Richard Quittmeyer at (702) 794-1864.

Sincerely,



L. Dale Foust, Manager, Nevada Site  
Technical Project Officer  
Management and Operating Contractor

cc:

J. R. Dyer, DOE/YMPO, Las Vegas, NV  
E. H. Petric, DOE/YMPO, Las Vegas, NV  
J. R. Beyer, M&O/Duke, Las Vegas, NV  
L. G. Engwall, M&O/Fluor, Las Vegas, NV  
C. J. Goewert, M&O/Fluor, Las Vegas, NV  
P. W. McKie, M&O/MK, Las Vegas, NV  
P. A. Pimentel, M&O/Fluor, Las Vegas, NV  
R. C. Quittmeyer, M&O/WCFS, Las Vegas, NV  
C. T. Statton, M&O/WCFS, Las Vegas, NV

RCQ/CTS/kcb  
RCQ