GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, P.O. BOX 460, PLEASANTON, CALIFORNIA 94566

NUCLEAR ENERGY
ENGINEERING
DIVISION

March 31, 1980

Mr. Darrell G. Eisenhut, Acting Director
Division of Operating Reactors
Office of Nuclear Reactor Regulations
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Eisenhut:

SUBJECT: Dip Angle for General Electric Test Reactor (GETR) Site Shears

The measurements taken to determine the angle of dip in the trenches at the GETR site were reviewed by Earth Sciences Associates. The results, which are attached, show that the dip angle was 45 degrees or less on all shears observed at the GETR site. We recommend that if surface offset is to be considered in the structural analyses that dip angles ranging between 10 degrees to 30 degrees be used.

Very truly yours,

R. W. Darmitzel

R. W. Darmitzel, Manager
Irradiation Processing Operation
Nuclear Engineering Division

OFFICIAL SEAL
VIRGINIA C. CACOUBOO
NOTARY PUBLIC - CALIFORNIA
ALAMEDA COUNTY
My comm. expires MAR 8, 1981

/11

attachments

8004020185

AFFIRMATION

The General Electric Company hereby submits the attached letter, subject "Dip Angle for General Electric Test Reactor (GETR) Site Shears".

To the best of my knowledge and belief, the information contained therein is accurate.

R. W. Darmitzel, Manager
Irradiation Processing Operation

Submitted and sworn before me this 31st day of March 1980.

Virginia C Casqueiro, Notary Public in and for the County of Alameda, State of California.

March 27, 1980
1886

MEMORANDUM

To: Dwight L. Gilliland,
Manager, Reactor Irradiation
General Electric Company

From: Richard C. Harding,
Earth Sciences Associates

Subject: Recommended Design Values for Dip Angle of Potential Surface Offsets at the GETR Site

This memorandum is in response to questions regarding the angle of dip of shear surfaces which would result from postulated thrust faulting at the GETR site. Because regional tectonic stresses that govern the style and rate of displacement on faults in central California have remained relatively constant over at least the last few million years, it is reasonable to assume that future offsets within a fault zone will have a similar orientation to offsets that have occurred in the recent geologic past.

Existing shears at the GETR site, upon which repeated movements have occurred, consistently exhibit low dip angles. Table 1, attached, is a list of attitudes measured on shear planes in the trenches. All of the shears exposed have dip angles (largest acute angle between the plane of shear and a horizontal plane) of 45^{o} or less. Of the measurements taken, 70 percent of the dips are 30^{o} or less. The two main shears closest to the GETR (B-1/B-3 and B-2) have dips ranging from 0 to 25^{o}.

From fault mechanics theory, it is known that shears develop at angles less than 45^{o} (most commonly 30^{o}) with the greatest principal stress axis. Low angle thrust faults, such as the postulated Verona fault, develop when the greatest principal stress axis is horizontal, as occurs in regions of the earth's crust that are under compression. Although the principal stress axes can have any orientation within the earth's crust, the low angle thrust shears at the GETR site indicate that in the recent geologic past the greatest principal stress axis within near surface materials at the site has been horizontal. There is no reason to expect that this stress orientation has changed since the last offset occurred or will change in the near future.

Thus, it can be assumed that postulated future offsets at the GETR site will

occur on low angle shears with dips less than 45^{o}. Although it is highly unlikely, based on the geologic record and on probability analyses, that future offsets will occur in the GETR foundation soils, if surface offsets are considered in structural analyses, I would recommend that dip angles in the range of 10^{o} to 30^{o} be used.

RCH:jw

Table 1

Trench/ Boring	Station No.(1)	Shear Plane Strike	Shear Plane Dip	Striations/Grooves Trend	Striations/Grooves Plunge (2)	Complement of Pitch Angle (3)	Avg. Value of Complement of Pitch Angle
B-1	0+40	N32°W	9°N	(none observed in field)		—	—
B-2	0+56	N35°W	25°NE	N42°E	24°	+12°	+12°
B-3	0+10	N60°W	20°NE	N38°E	20°	-8°	-24°
	0+27	N65°W	15°NE	N55°E	13°	-39°	
H	0+91(E)	N85°W	30°N	N30°E	25°(28°)	-22°	-24°
	0+76(W)	EW	35°N	N35°E	35°(30°)	-39°	
	0+85(W)	EW	25°N	N35°E	25°(21°)	-42°	
	0+94(W)	N55°W	15°N	N35°E	10°(15°)	0°	
	0+86(W)	N70°W	30°N	N40°E	25°(28°)	-18°	
T-1	125-152	N51°W(avg)	14°N(avg)	N15°E(avg)	(12°avg)	+23°	+23°
T-2	112(I)	N55°W	22°N	N37°E	22°	-2°	+1°
	120(I)	N85°W	25°N	N32°E	25°(22°)	-25°	
	120(I)	N25°W	15°N	N60°E	21°(15°)	+5°	
	26(II)	N75°W	35°N	N50°E	(30°)	-30°	
	26(II)	N15°W	42°NE	N20°E	(27°)	47°	
	26(II)	N15°W	30°N	N20°E	(27°)	51°	
	20(II)	N10°W	35°N	N4°E	(10°)	73°	
	22(III)	N75°W	33°NE	N45°E	(29°)	-26°	
	28(III)	N60°W	30°NE	N55°E	(27°)	-22°	
	28(III)	N80°W	45°NE	N55°E	(35°)	-35°	

Notes:
(1) Roman numerals and E(east), W(west) in parentheses are keyed to walls logged in Trenches T-2 and H.
(2) Values of plunge in parentheses were calculated from shear plane attitude and trend of striations/grooves.
(3) + values indicate that the strike-slip component of slip is right-lateral.
- values indicate that the strike-slip component of slip is left-lateral.