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Definitive Analysis in Seismicity Analysis (Case Study - Behbahan City)

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Abstract. Tectonic phenomena, the origin of most earthquakes, and as you know, the fault is a major factor in this phenomenon, therefore, information in this respect is vital. The study determined the seismicity of the area, where the structure will be built there, according to the importance of structure in a certain area is selected, to evaluate the potential of the faults. In this study, analysis of seismicity of the City Behbahan, checked, has a range of 100 km, as confirmed using empirical relationships.

Keywords: Confirmed, magnitude, intensity, Merkali, Behbahan

1. INTRODUCTION

Analytical method (absolute) is one of the methods of seismic studies in an area, which is used to assess the structures that failure leads to tragic consequences. This method provides a clear framework to evaluate the worst case of the vibrations of the earth. But this method, do not give information about the probability of an earthquake of reference, its occurrence position, the vibration is expected during the specified time, and the effect of uncertainties in various steps required to calculate the resulting characteristics of the land.

11 active faults, with strike-slip components, with a northwest - southeast trend, they have shaken up the job, and the movement of each, can cause devastating earthquake in Behbahan, have been identified, within 100 km of the city of Behbahan, and the parameters of the Earth, based on the possible movement of the fault, and the possible movement of half the length of the fault is calculated in Behbahan city. First, strength of each earthquake faults is calculated using the relationship of the length and magnitude of the earthquake fault. Of the fault, the fault line Aghajari is the seismic source, which has the potential of creating an earthquake, a large shear, Richter equal to 7.48 degrees.

2. CALCULATE THE CREATION OF EARTHQUAKE FAULTS

Because, analytical methods used for estimating ground motion parameters in this study. In this way, the maximum possible acceleration (MCL) is calculated. Therefore, it is necessary to maximum earthquake potential of the fault can be calculated. There are different methods to calculate the birth of seismic faults. One way is that the history of previous earthquakes that have occurred in the vicinity of the fault, are used to this method, is not a proper way, because of the failure to determine the magnitude and location of earthquakes historical error. While the largest possible earthquake (MCL), may have happened in that place until the zoning of the area [1].

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Analytical method is no longer appropriate method. In this method, first, an active fault zone in the radius of the site should be identified. After the diagnosis, since the power-generating earthquake faults related to the broken and dislocated long, so there is a direct correlation between the seismic induction and direct the length of Quaternary faults. Estimate the length of faulting, earthquakes in the future should be based on tectonic and seismic properties morphotectonic any faults. The percentage of the direct fault can be selected. Finally, during a major earthquake fault, presented in Table 1, a large earthquake (earthquake potential) of the fault according to the length and half the length of the fault rupture that occurs is calculated using empirical relationships. Extreme magnitude of the fault, which is evaluated in the study area, would be a very good show for the seismicity of the region, and among the largest earthquake in this series, reveals the maximum potential earthquake in the region [2]. Eleven faults have been identified, with names and calculated the magnitude of each of these different relationships is presented in Table 2.

By comparing the magnitude and intensity of earthquakes to the faults, it is clear that the maximum expected earthquake (MCE), has a large Ms = 7.8 and intensity I0 = 10.35, and the maximum possible earthquake (MPE) with magnitude Ms = 7.48 and intensity I0 = 9.87, is to Aghajari fault. Therefore it can be concluded that the maximum potential earthquake fault zone appears in Aghajari.

Table 1. Empirical fault length and magnitude of the earthquake.

NO.	SOURCE	CODE	RELATIONSHIP	VALIDITY (M_S) LIMIT	REMARKS
1	TOCHER (1958)	M (T)	$M = \log L + 5.7$	5 < M < 8	L : Km
2	PRESS (1967)	M (P)	$M = 1.06\log L + 5.75$	M 6≥	L : Km
3	HOUSNER (1967)	M (H)	$M = 1.5\log L + 5.34$	6.5 ≥ M	L : Km
4	SLEMMONS (1977)	M (SI)	$M = 1.11\log L + 5.15$	5 < M < 8	L : Km
5	MOHAJER – ASHJAI and NOWROOZI (1978)	M (MA-N)	$M = \log L + 5.4$		L : Km
6	BOLT (1978)	M (B)	$M = 0.76\log L + 6.03$		L : Km
7	SLEMMONS (1982)	M (S2)	$M = 1.182\log L + 1.606$		L: meters; Worldwide Faults
8	SLEMMONS (1982)	M (S3)	$M = 1.142\log L + 2.021$		L: meters; Reverse Faults
9	BONILLA, MARK and LIENKAEMPER (1984)	M (BML)	$M = 0.708\log L + 6.04$		L : Km
10	SLEMMONS (1966)	M (S4)	$M = 0.41\log L.D + 3.68$		L , D : centimeters
11	KING and KNOPOFF (1968)	M (KK)	$M = 0.53\log L.D^2 + 1.4$		L , D : centimeters
12	SLEMMONS (1982)	M (S5)	$M = 1.297\log D + 6.750$		D : meters; Worldwide Faults
13	SLEMMONS (1982)	M (S6)	$M = 1.306\log D + 6.793$		D : meters; Reverse Faults

Table 2. Estimated size, based on the probability of failure during the 50 and 100 percent of known faults, within a radius of 100 km Behbahan.

NO	Name of fault	50% of fault length	100% of fault length	maximum magnitude ranging of earthquakes Ms Is											
				1) M (T)		2) M (P)		3) M (H)		4) M (SI)		5) M (MA-N)		6) M (B)	
				MPE	MCE	MPE	MCE	MPE	MCE	MPE	MCE	MPE	MCE	MPE	MCE
1	Aghajari	70	140	7.55	7.85	7.71	8.03	11.8	8.56	7.20	7.53	7.25	7.55	7.43	7.66
2	Ramhormuz	50	100	7.40	7.70	7.55	7.87	89	8.34	7.04	7.37	7.10	7.40	7.7	7.55
3	Ragesefid	45	90	7.35	7.65	7.50	7.82	8.82	8.27	6.99	7.32	7.05	7.35	7.29	7.52
4	Behbahan	40	80	7.30	7.60	7.45	7.77	7.74	8.19	6.93	7.26	7.00	7.30	7.25	7.48
5	Mishan	35	70	7.24	7.54	7.39	7.71	7.66	8.11	6.86	7.15	6.94	7.24	7.20	7.43
6	Great Arjan	30	60	7.18	7.48	7.32	7.64	7.56	8.01	6.79	7.12	7.88	7.18	7.15	7.38
7	Do Gonbadan	5.27	55	7.14	7.44	7.28	7.60	7.50	7.95	65	7.08	7.84	7.14	7.12	7.35
8	Anne	5.27	55	7.14	7.44	7.28	7.60	7.50	7.95	6.75	7.08	7.84	7.14	7.12	7.35
9	Basht	25	50	7.10	7.40	7.23	7.55	7.44	7.89	6.70	7.03	7.80	7.10	7.09	7.32
10	North Dehdasht	5.22	45	7.05	7.35	7.18	7.50	7.37	7.82	6.65	6.98	7.75	7.05	7.06	7.29
11	Small Arjan	4	8	6.30	6.60	6.39	6.71	6.24	6.69	5.82	6.15	7.00	6.30	6.49	6.72

Table 3. Estimates based on the magnitude of a possible 50 and 100% of the rupture along the fault known within the range of radius 100 km Behbahan (continued table 2).

NO	**maximum magnitude limits the earthquake, Ms**															
	7) M (S2)		**8) M (S3)**		**9) M (BML)**		**10) M (S4)**		**11 M (KK)**		**12 M (S5)**		**13 M (S6)**		**M (AVE.)**	
	MPE	**MCE**	**MPE**	**MCE**	**MPE**	**MCE**	**MPE**	**MCE**	**MPE**	**MCE**	**MPE**	**MCE**	**MPE**	**MCE**	**MPE**	**MCE**
1	7.33	7.69	7.55	7.90	7.35	7.56	7.48	7.71	7.61	8.04	7.31	65.7	7.36	7.70	7.48	7.80
2	7.16	7.52	7.39	7.73	7.24	7.46	7.37	7.60	7.40	7.83	7.15	7.48	7.19	7.53	7.32	7.64
3	7.11	7.46	7.33	7.68	7.21	7.42	7.34	7.57	7.33	7.77	7.10	7.43	7.14	7.48	7.27	7.59
4	7.05	7.40	7.28	7.62	7.17	7.39	7.29	7.53	7.26	7.69	7.04	7.38	7.09	7.42	7.22	7.54
5	6.98	7.33	7.21	7.55	7.13	7.35	7.25	7.48	7.17	7.61	6.97	7.31	7.02	7.36	7.16	7.48
6	6.90	7.25	7.13	7.48	7.09	7.30	7.20	7.43	7.08	7.51	6.90	7.24	6.95	7.28	7.09	7.41
7	6.85	7.21	7.09	7.44	7.06	7.27	7.17	7.40	7.02	7.46	6.86	7.19	6.90	7.24	7.05	7.37
8	6.85	7.21	7.09	7.44	7.06	7.27	7.17	7.40	7.02	7.46	6.86	7.19	6.90	7.24	7.05	7.37
9	6.80	7.16	7.04	7.39	7.03	7.24	7.14	7.37	6.96	7.40	6.81	7.15	6.86	7.19	7.00	7.32
10	**6.65**	**7.11**	**6.99**	**7.34**	**7.00**	**7.21**	**7.11**	**7.34**	**6.90**	**7.33**	**6.66**	**7.10**	**6.80**	**7.14**	6.95	7.27
11	**5.86**	**6.22**	**6.13**	**6.48**	**6.47**	**6.68**	**6.53**	**6.66**	**5.81**	**6.24**	**5.92**	**6.25**	**5.96**	**6.29**	6.15	7.47

3. Calculate the seismic intensity of mineralization of faults

The relationship between the maximum intensity of earthquakes, macroseismic at the center of (in Merkali Scale) and magnitude, calculated from the experimental following orders [3].

1. Experimental order Amberses and Melville (1982),

2. Experimental order Mohajer Ashjaei & Noroozi (1978),

The maximum intensity of earthquakes caused by any fault of Behbahan has been calculated, according to the terms in the table (3), in the table (4). By comparing the severity of earthquakes in the area (M) Is characterized by maximum intensity of earthquakes in the city Behbahan (MCE) and (MPE) is due to the fault of Arjan, respectively, Is = 9.59 and Is = 9:12 Arjan fault that Behbahan, there, Create the most powerful earthquake in the earthquake Behbahan.

Table 4. Correlations to calculate the severity of an earthquake in the area.

NO.	SOURCE	RELATIONSHIP	VALID DISTANCE RANGE	INTEN. SCALE	REMARKS
1	SHEBALIN (1968)	$I(\Delta) = I_0 - 3.6Log(R/H)$		MSK	
2	CORNEL and MERZ (1974)	$I(\Delta) = I_0 + 3.72 - 2.99Log\Delta$	$\Delta \geq 17.5Km$	MM	
3	HOWELL and SCHULTZ (1974)	$I(\Delta) = I_0 + 3.278 - 0.0029 - 2.277Log\Delta$	$\Delta \geq 25.5Km$	MM	
4	GUPTA and NUTTLI (1976)	$I(\Delta) = I_0 + 3.70 - 0.0011\Delta - 270Log\Delta$	$\Delta \geq 23.0Km$	MM	
5	GUPTA (1976)	$I(\Delta) = I_0 + 2.35 - 0.00316\Delta - 1.79Log\Delta$	$\Delta \geq 18.8Km$	MM	
6	CHANDRA , Mc. WHORTER and NOWROOZI (1979)	$I(\Delta) = I_0 + 4.824 - 0.00548\Delta - 3.708 Log(\Delta + 20)$	$\Delta < 160Km$	MM	In the direction of the isoseismal elongation
		$I(\Delta) = I_0 + 8.729 + 0.01158\Delta - 6709 Log(\Delta + 20)$	$\Delta < 110Km$	MM	Normal in relation to the isoseimal elongation
		$I(\Delta) = I_0 + 6.453 - 0.00121\Delta - 4.960 Log(\Delta + 20)$	$\Delta < 120Km$	MM	Average attenuation
7	GANSE (1980)	$LnI(\Delta) = Ln I_0 + 0.10 - 0.00196\Delta - 0.076Ln\Delta$		MM	
		$LnI(\Delta) = Ln(1.5M - 1.5) + 0.0477 - 0.0022\Delta - 0.055Ln\Delta$		**MM**	

Table 5. Evaluate the severity of earthquakes at the center of the city Behbahan, based on the possible movement of 50 and 100 percent of known length of the fault rupture on land, in an area with the radius of 100 km.

NO	Direct distance fault to the north Behbahan	Focal length	intensity of the earthquake at the epicenter of the earthquake I0						(Maximum earthquake intensity to the site Behbahan, Is (MM							
			I_0 (MA-N)		I_0 (A-M)		I_0 (AVE)		SHEB		C & M		H & S		G & N	
			MPE	MCE	MPE	MCE	MPE	MCE	MPE	MCE	MPE	MCE	MPE	MCE	MPE	MCE
1	35	36.4	9.92	10.46	9.81	10.23	9.87	10.35	7.85	8.33	8.97	9.45	9.53	10.01	9.36	9.84
2	50	51.0	9.64	10.19	9.61	10.02	9.63	10.11	7.08	7.56	8.27	8.75	8.89	9.37	8.69	9.17
3	55	55.9	9.56	10.10	9.54	9.96	9.55	10.03	6.86	7.34	8.07	8.55	8.71	9.19	8.49	8.97
4	5	11.2	9.47	10.02	9.48	9.89	9.48	9.96	9.31	9.79	-	-	-	-	-	-
5	80	80.6	9.37	9.92	9.40	9.81	9.39	9.87	6.13	6.61	7.42	7.90	8.10	8.58	7.86	8.34
6	3	10.4	9.25	9.80	9.31	9.72	9.28	9.76	9.21	9.69	-	-	-	-	-	-
7	50	51.0	9.19	9.73	9.26	9.67	9.23	9.70	6.68	7.15	7.87	8.34	8.49	8.96	8.29	8.76
8	40	41.2	9.19	9.73	9.26	9.67	9.23	9.70	7.02	7.49	8.16	8.63	8.74	9.21	8.56	9.03
9	85	85.6	9.10	9.64	9.19	9.61	9.15	9.63	5.79	6.27	7.10	7.58	7.79	8.27	7.55	8.03
10	35	36.4	9.02	9.56	9.13	9.54	9.08	9.55	7.06	7.53	8.18	8.65	8.74	9.21	8.57	9.04
11	4	10.8	7.66	8.20	8.09	8.50	7.88	8.35	7.76	8.23	-	-	-	-	-	-

Table 6. Evaluate the severity of earthquakes at the center of the city Behbahan, based on the probability of failure of 50 and 100 percent of the known faults on the ground, in an area with the radius of 100 km Behbahan (continued table 5).

NO	I_S (MM)													
	GUPT.		CWN -1		CWN -2		CWN -3		GANS-1		GANS-2		AVE	
	MPE	MCE	MPE	MCE	MPE	MCE	MPE	MCE	MPE	MCE	MPE	MCE	MPE	MCE
1	9.35	9.83	-	-	7.33	7.81	-	-	7.77	8.15	7.76	8.15	8.49	8.95
2	8.78	9.26	7.34	7.82	-	-	-	-	7.17	7.52	7.18	7.55	7.93	8.38
3	8.61	9.09	-	-	6.34	6.82	-	-	6.99	7.34	7.01	7.37	7.64	8.08
4	-	-	9.09	9.57	-	-	-	-	9.18	9.65	8.86	9.31	9.11	9.58
5	8.08	8.56	6.36	6.84	-	-	-	-	6.36	6.68	6.39	6.72	7.09	7.53
6	-	-	-	-	8.91	9.39	-	-	9.38	9.86	8.96	9.43	9.12	9.59
7	8.38	8.85	6.94	7.41	-	-	-	-	6.87	7.22	6.88	7.24	7.55	7.99
8	8.59	9.06	-	-	-	-	6.81	7.28	7.13	7.49	7.12	7.49	7.77	8.21
9	7.78	8.26	-	-	-	-	5.48	5.96	6.11	6.43	6.13	6.46	6.72	7.16
10	8.56	9.03	-	-	6.54	7.01	-	-	7.15	7.52	7.13	7.51	7.74	8.19
11	-	-	-	-	7.40	7.87	-	-	7.78	8.24	7.44	7.90	7.60	8.06

4. CONCLUSION

It will be determined on the basis of available data and analysis of faults, the devastating earthquakes in the range of Behbahan, not unexpected, and investigated the area, had a history of seismicity. The magnitude and intensity of earthquakes during future earthquakes, the only criterion for our judgment, now, is the length of a straight section of the fault known as the greatest feature of experience earthquakes, in the context of the site. The natural hazards that threaten the city Behbahan range to include:

1. covered the deep faults and destructive earthquakes,

2. Faults movement on Earth,

3. Long-term earthquakes troops and

4- Establishment of ground, because of slow establishment of anticlines.

- The seismic survey area range Behbahan, indicated that covered the deep faults could cause earthquakes of Arjan magnitude Ms = 6.8, near Behbahan, calculations were based on published studies and articles by The author, Behbahan city when the earthquake is likely to experience a horizontal acceleration of gravity equal to 0.365 g. As a result, the minimum acceleration for the design of important structures in the city Behbahan is recommended to 0.35 g
- Although, so far there is no record of fault movement on the ground, in the range studied, but in this study, the movement of these faults is also considered. Surveys and geological studies of Behbahan variety show, the closest known faults on land located within 5 km of the North Behbahan, and
- If movement is possible, half the length of this fault could cause a major earthquake on the Richter scale 7:22, in Behbahan city.
- Long-term earthquake waves will only shake the risk to long-term. Experience has shown that more Zagros earthquake waves had a low to medium magnitude.
- 4- Establishment of the earth is a very slow and weak movement which can be seen in the Zagros anticlines and this establishment may be seen, in the anticline close to the Maroon dam.Tables study showed that among the known faults on the ground, Behbahan fault can cause the greatest danger in Behbahan city with a seismic job, A magnitude Ms = 7.22 and 5 kilometers to the north Behbahan

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