■Ngày nhận bài: 27/7/2021 ■Ngày sửa bài: 13/8/2021 ■Ngày chấp nhận đăng: 25/8/2021

Study the effect of obstacles on ground acceleration caused by small explosions, near structures

Nghiên cứu ảnh hưởng của chướng ngại vật đối gia tốc nền đất do các vụ nổ nhỏ, gần công trình gây ra

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ABSTRACT:
In this paper, the author used experimental field methods to determine the ground acceleration when there is an explosion caused and when there is an obstacle preventing the propagation of surface waves. The research results of the article contribute to supplementing the solution to strengthen the structure of the building before small-scale explosions near the construction site.
Keywords: acceleration, *explosion*, *structure*.

TÓM TẮT:
Bài báo tác giả đã sử dụng phương pháp nghiên cứu thực nghiệm hiện trường để xác định gia tốc nền đất khi có vụ nổ gây ra và khi có chướng ngại vật ngăn cản sự lan truyền của sóng bề mặt. Kết quả nghiên cứu của bài báo góp phần bổ sung thêm giải pháp gia cường kết cấu công trình trước các vụ nổ quy mô nhỏ, phạm vi nổ gần công trình.
Từ khóa: gia tốc, nổ, kết cấu.

1. INTRODUCTION

Currently, in some remote islands, near-shore islands and coastal areas, the need to build new works on the island for purpose of national defense and security and socio-economic development is ever-increasing, particularly the use of explosive energy during the construction process is often difficult due to the proximity to the area where the works are currently exploited and used. Therefore a solution protecting the works before the explosion is a flexible retaining wall as it is easy to build the flexible retaining wall and it is highly economically and suitable for the work construction method.

2. FOREWORDS AND TEST PLACE AND CONTENTS

2.1. Forewords

Using field experiments, determining the ground acceleration value in front of and behind the retaining wall, and ground acceleration value in corresponding locations without the retaining wall as the explosion is situated in front of the retaining wall in cases of the explosives on the ground and under the ground.

2.2. Test place and model

Test place: Explosion test site, Thach Hoa Commune, Thach That District, Hanoi City.

For the amount of explosives (C = 200 g) placed on the ground and the amount (C = 200 g) placed under the ground at 200 mm, the dimension of the retaining wall: Length L = 2m; Width R = 1m; Depth H = 1m.

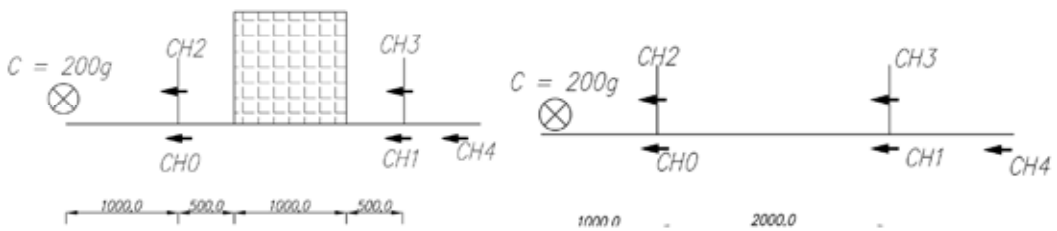

Figure 1. Test diagram for explosives on the ground

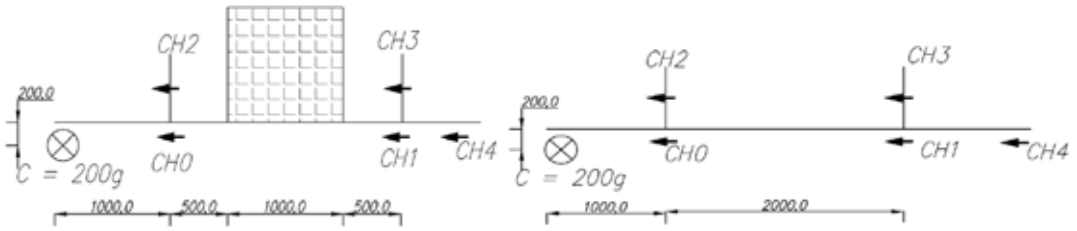

Figure 2. Test diagram for explosives under the ground

2.3. Test instruments

Figure 3. Test instruments

2.4. Test steps

Step 1: Set up 02 meters for ground acceleration values (CH0 and CH1) (refer to Figures 1,2).

Step 2: Determine the distance from the explosives to the meters, to the retaining wall.

Step 3: Check the operating conditions of the instrument before measurement, the safety conditions when testing the explosion.

Step 4: Conduct explosion, check the signal receiver on the computer.

2.5. Test results for the explosives on the ground

2.5.1. Using the flexible retaining wall

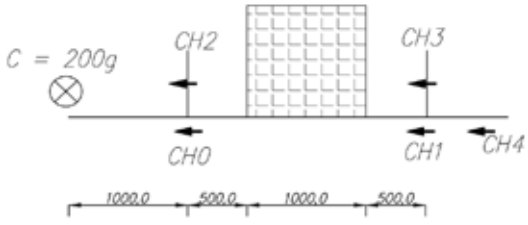

Figure 4. Test layout

2.5.1.1. Test 1

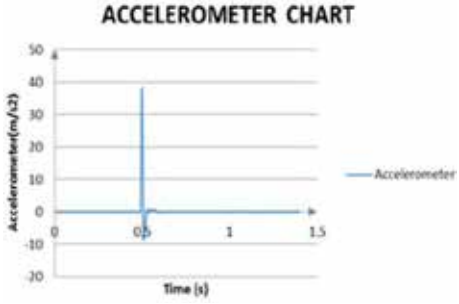

Figure 5. Chart of acceleration meter CH0

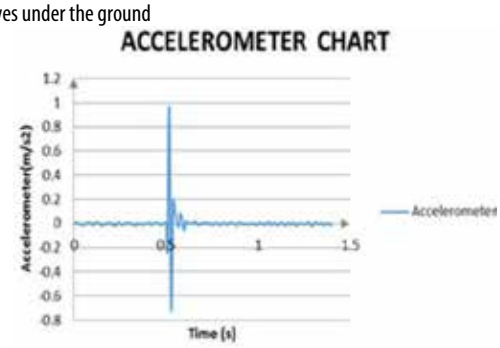

Figure 6. Chart of acceleration meter CH1

2.5.1.2. Test 2

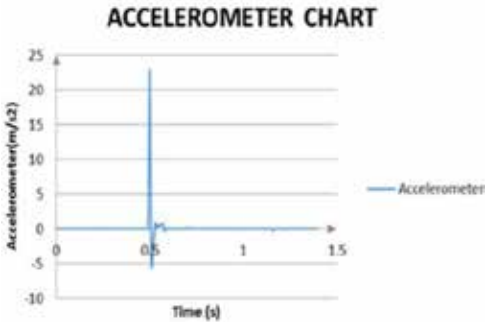

Figure 7. Chart of acceleration meter CH0

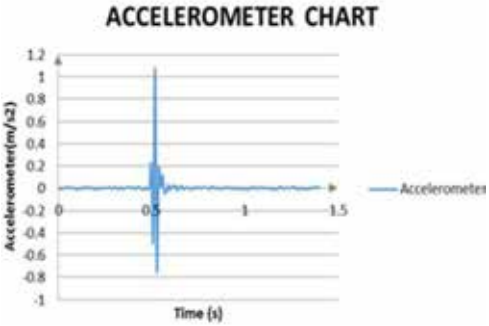

Figure 8. Chart of acceleration meter CH1

2.5.1.3. Test 3

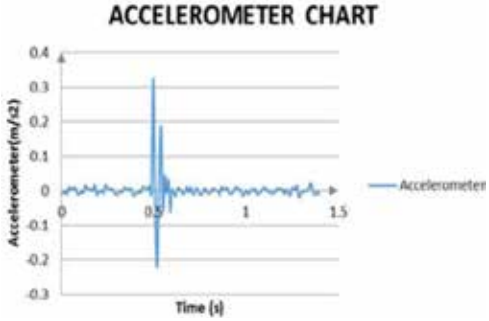

Figure 9. Chart of acceleration meter CH0

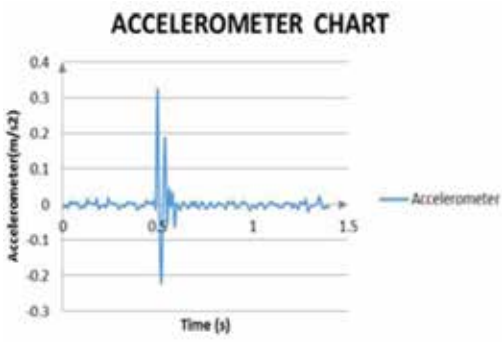

Figure 10. Chart of acceleration meter CH1

2.5.2. No using the flexible retaining wall

2.5.2.1. Test 1

Figure 11. Test layout

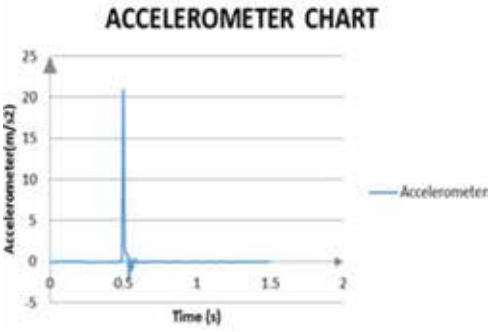

Figure 12. Chart of acceleration meter CH0

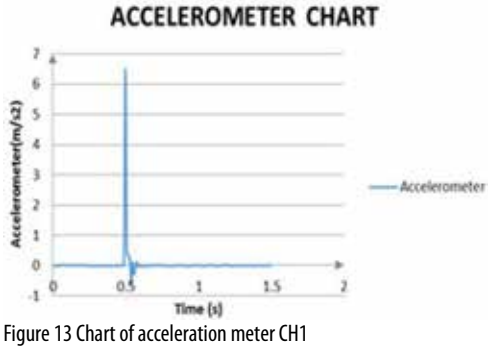

Figure 13 Chart of acceleration meter CH1

2.5.2.2. Test 2

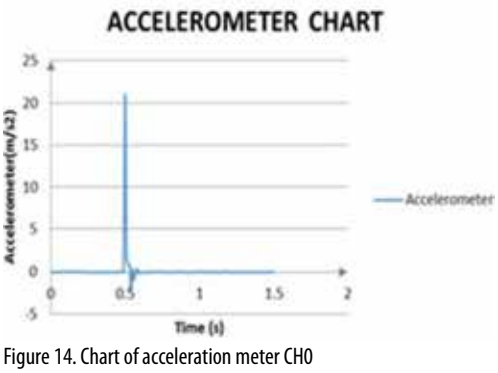

Figure 14. Chart of acceleration meter CH0

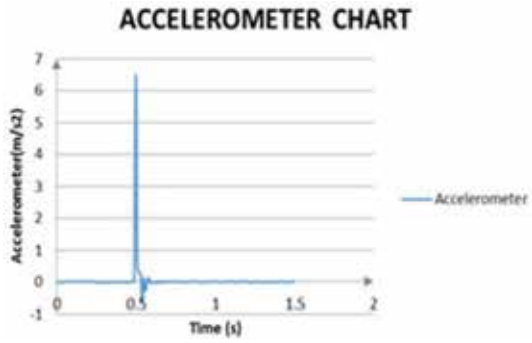

Figure 15. Chart of acceleration meter CH1

2.6. For the explosives under the ground

2.6.1. Using the flexible retaining wall

2.6.1.1. Test 1

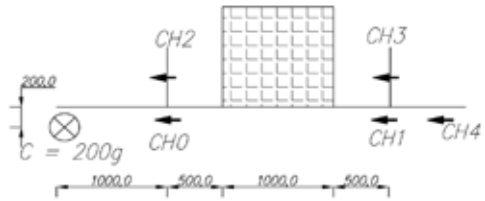

Figure 16. Test layout

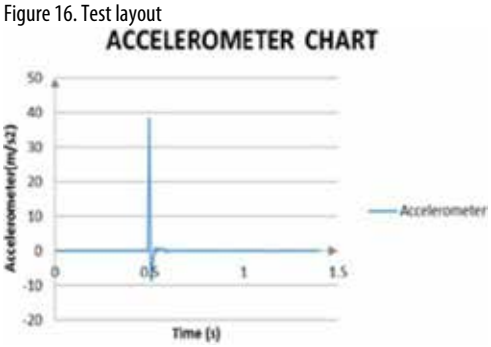

Figure 17. Chart of acceleration meter CH0

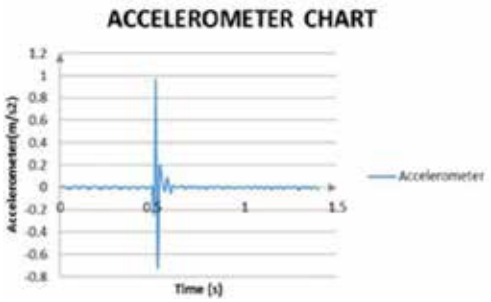

Figure 18. Chart of acceleration meter CH1

2.6.1.2. Test 2

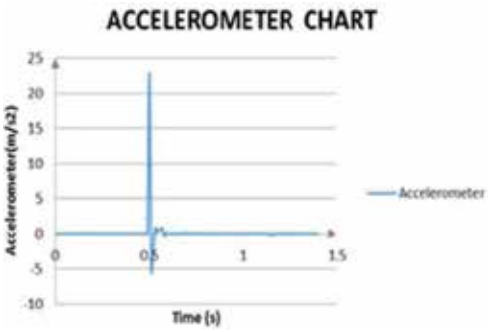

Figure 19. Chart of acceleration meter CH0

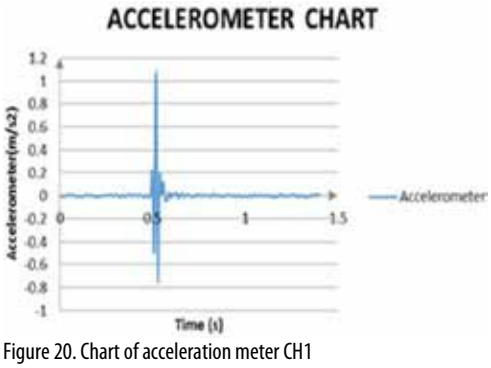

Figure 20. Chart of acceleration meter CH1

2.6.1.3. Test 3

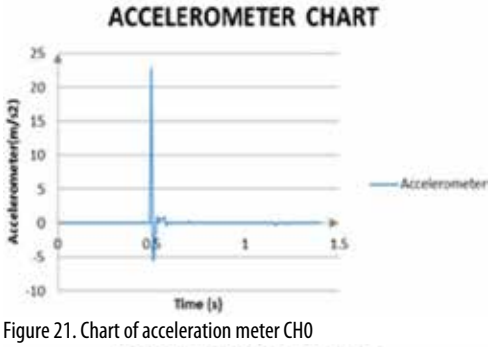

Figure 21. Chart of acceleration meter CH0

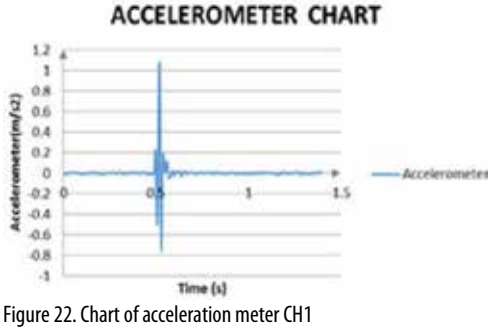

Figure 22. Chart of acceleration meter CH1

2.6.2. No using the flexible retaining wall

2.6.2.1. Test 1

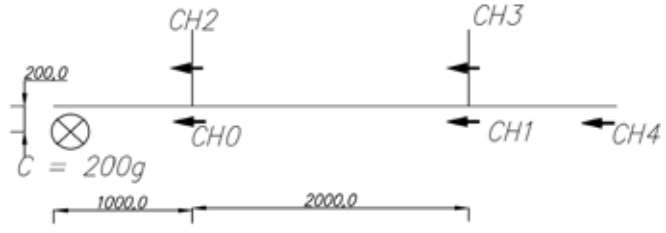

Figure 23. Test layout

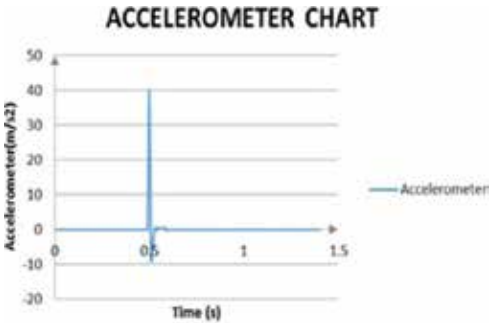

Figure 24. Chart of acceleration meter CH0

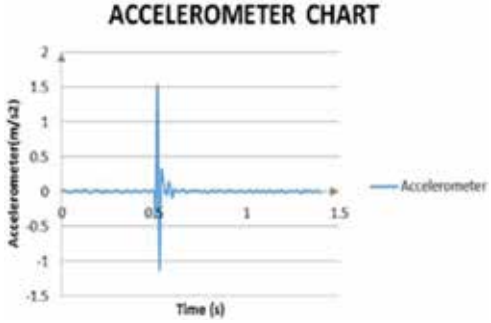

Figure 25 Chart of acceleration meter CH1

2.6.2.2. Test 2

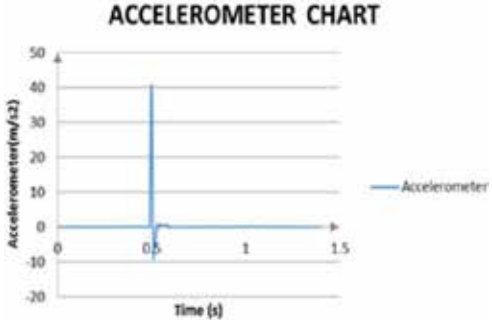

Figure 26. Chart of acceleration meter CH0

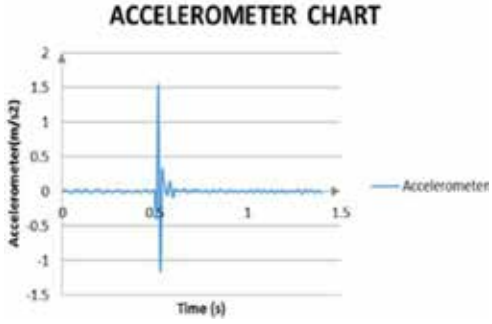

Figure 27. Chart of acceleration meter CH1

2.7. Summary of results

2.7.1. For the explosives on the ground

2.7.1.1 Using the flexible retaining wall

Table 1. Acceleration measurements

No.	Test	Acceleration value (m/s²)		Subtraction of acceleration measurements (m/s²)	Percent %
		Meter CH0	Meter CH1		
(1)	(2)	(3)	(4)	(5)	(6)
01	1st	20.15	1.50	18.65	92.55
02	2nd	20.00	2.00	18.00	90,00
03	3rd	20.15	1.75	18.40	91,31
Average		**20.10**	**1.75**	**18.35**	**91.29**

2.7.1.2 No using the flexible retaining wall

Table 2. Acceleration measurements

No.	Test	Acceleration value (m/s²)		Subtraction of acceleration measurements (m/s²)	Percent %
		Meter CH0	Meter CH1		
(1)	(2)	(3)	(4)	(5)	(6)
01	1st	20.15	6.60	13.55	67.24
02	2nd	20.25	6.70	13.55	66.91
Average		**20.20**	**6.65**	**13.55**	**67.08**

Remarks: For the explosives on the ground

With the flexible retaining wall, ground acceleration behind the retaining wall reduces. Therefore, the ground acceleration on the existing works will reduce, stabilizing the works, reducing impact, avoiding cracks of structures before explosions. Specific results are shown in Tables 1 and 2 above. Therefore, the use of the retaining wall to protect the works due to the impact of the explosives on the ground is highly feasible and the cost of construction is low.

2.7.2. For the explosives under the ground

2.7.2.1 Using the flexible retaining wall

Table 3. Acceleration measurements

No.	Test	Acceleration value (m/s²)		Subtraction of acceleration measurements (m/s²)	Percent %
		Meter CH0	Meter CH1		
(1)	(2)	(3)	(4)	(5)	(6)
01	1st	39.50	0.85	38.65	97.85
02	2nd	40.00	1.05	38.95	97.37
03	3rd	40.50	0.95	39.55	97.65
Average		**40,00**	**2.85**	**39.05**	**97.62**

Table 4. Acceleration measurements

No.	Test	Acceleration value (m/s²)		Subtraction of acceleration measurements (m/s²)	Percent %
		Meter CH0	Meter CH1		
(1)	(2)	(3)	(4)	(5)	(6)
01	1st	40.05	1.50	38.55	96,25
02	2nd	40.10	1.51	38.59	96,23
Average		**40.075**	**1.505**	**38.57**	**96.24**

Remarks: For the explosives under the ground

With the flexible retaining wall, ground acceleration behind the retaining wall reduces. Specific results are shown in Tables 3 and 4 above. the use of the retaining wall to protect the works due to the impact of the explosives on the ground is effective.

2.8. Conclusion

The test method shows that the acceleration value behind the retaining wall significantly reduce as compared to those without the retaining wall. In conclusion, the use of the retaining wall to protect the works due to the impact of the explosives is highly economically and feasible in the limited site plan.

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