

Descriptions of experiments

Test model

The IWHR centrifuge provides a maximum centrifugal acceleration of 300g with a maximum rotation radius of 5.03m and payload of 150t. A 1280mm long, 720mm wide, and 950mm high aluminum alloy container, with an observation window made of organic glass on one side, is placed in the centrifuge basket, the dimensions of which are 1500×1000×1500mm³. An air-backed steel plate anchored by the concrete sand is used to study the dynamic responses of the structure, in the left side of the container, which is out of the scope of this paper. The height of the water in the container is 600mm and the relative positions of explosives, pressure sensor, and the camera are schematically given in Figure 1, where D is the depth of explosives; L denotes the distance from the explosion to the steel plate; and R represents the distance from the explosive to the pressure sensor.

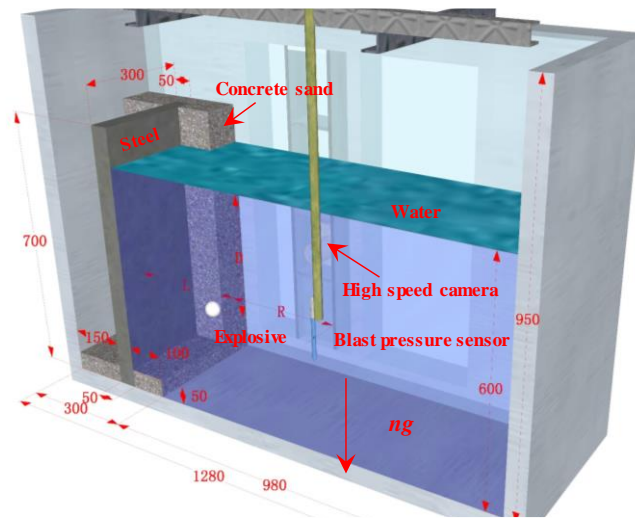


Figure 1 Test model

Test procedure

Table 1 shows 19 effective UNDEX tests in centrifuge, which are organized as combinations of varying accelerations and position of detonators, namely, different π_3 and π_4 . It should be noted that UE-18 and UE-19 are mainly adopted to investigate the structure response, which would be discussed in another paper.

Table 1 Experiment scheme

No.	n (g)	W_0 (g)	W (g)	D (cm)	L (cm)	R (cm)	Filmed
UE-01	20	1.020	1.612	30	30	35	√
UE-02	30	1.021	1.613	30	30	35	√
UE-03	40	1.025	1.620	30	30	35	√
UE-04	40	1.023	1.616	30	30	35	√
UE-05	50	1.038	1.640	30	30	35	√
UE-06	40	1.015	1.604	30	20	30	
UE-07	40	1.040	1.643	20	20	30	
UE-08	20	1.016	1.605	20	20	30	
UE-09	40	1.024	1.618	30	25	25	
UE-10	40	1.010	1.596	30	15	17.5	
UE-11	40	1.025	1.620	30	5	15	
UE-12	20	0.150	0.261	37.5	30	35.79	√
UE-13	30	0.050	0.087	25	30	35.36	√
UE-14	1	0.050	0.087	30	30	35	√

UE-15	20	0.050	0.087	30	30	35	√
UE-16	40	0.050	0.087	30	30	35	√
UE-17	40	0.150	0.261	30	30	35	√
UE-18	40	0.150	0.261	30	4.6	17.9	
UE-19	1	0.050	0.087	30	3.7	18.8	

Note: W_0 is RDX equivalent of explosives, while W stands for TNT equivalent.

Position of gauges

Figure 2 shows the layout of 20 strain gauges and 3 accelerometers that are installed on the downstream side of the steel plate to measure deformation and vibration of the plate.

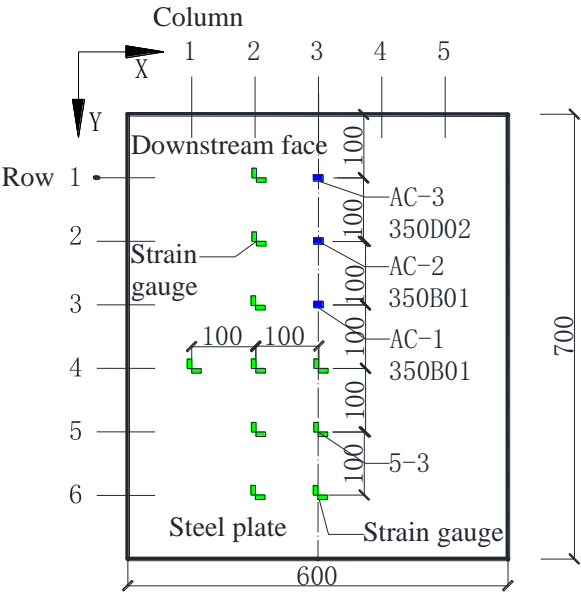


Figure 2 Layout of strain gauges and accelerometers on downstream side of the plate. NOTE: The strain gauge location is named as (row number) - (column number)

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- 1 Hu J, Chen Z Y, Zhang X D, et al. Underwater explosion in centrifuge Part I: validation and calibration of scaling laws. Sci China Tech Sci. doi: 10.1007/s11431-017-9083-0
- 2 Long Y, Zhou H Y, Liang X Q, et al. Underwater explosion in centrifuge Part II: dynamic responses of defensive steel plate. Sci China Tech Sci. doi: 10.1007/s11431-017-9107-2.