MORTAR PENETROMETER PRD800

User Manual

CONTENT

I. **Generality**

Penetration method is a new field detection method according to the relationship between the nail penetration depth in the mortar and mortar compression strength. Put a nail into the mortar by using the compression work spring loading. Test the nail penetration depth and convert the mortar compressive strength according to the strength-measuring curve. Penetration method has features of easy operation, high accuracy and low testing cost. It is suitable for the standard of ASTM C803.

II. **Introductions**

PRD800 Penetration resistance detector is a new product applying to the strength detection of masonry mortar. It adopts to the lever force method having light weight, easy operation and high accuracy features reduced the labor intensity of the testers, improved the detecting efficiency. It is the substitute product of the rebound method and in-situ method and its performance has reached the international leading level.
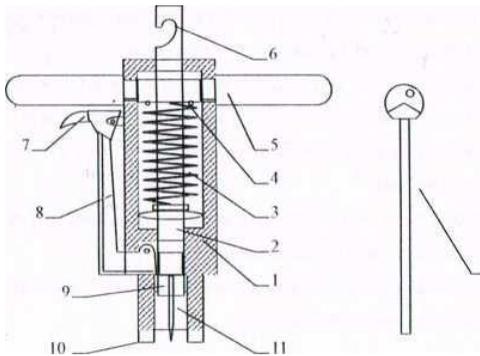
PRD800 Penetration resistance detector packing list is as following:
1. Penetrator
2. The depth tester
3. Force rod
4. Nail gauge
5. Nails
6. Rubber suction bulb
7. Nail tightening wrench
8. Manual
9. Carry case

• Penetration resistance detector (Fig. 1-1): It adopts to the penetration method relying on the special device springs providing

required energy. The spring has the same amount of compression, so the same energy is released each time. This ensures the accuracy and reliability of the test.

The depth tester (Fig 1-2): It is used to test the hole depth.

(fig.1-1) PRD800 Penetration resistance detector

1. Penetrator	5. Handle	9. Nail seat
2. Force rod	6. Strength slot	10. Cross-pein
3. Work spring	7. Trigger	11. Nail
4. Adjust nut	8. Hook.	12. Assistor
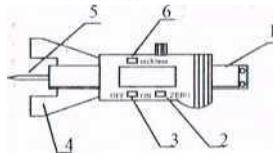
(Fig 1-2) The depth tester

1. Scale	3. Power switch	pein
2. Zero button	4. Cross-	5. Probe
		6. Switcher

■**Special nail:** It is made of special steel and it is an essential tool for the detection of the penetrator. After the nail put into the nail seat, the compression spring release the energy sending the steel nail into mortar.

The special nail with extreme hardness could ensure repeated use without affecting the detection accuracy.

■**Nail gauge:** It is used for checking the quality of the nail.

Put the nail gauge to the horizontal position and press the end of the nail against one side of the nail gauge. Follow the direction of the gauge groove to put the nail down. If the nail pass the nail gauge, the nail could not be used.

■**Nail seat tighten wrench:** Use to tighten the nail seat nut to fix the nail.

■**Assistor:** It is an auxiliary tool for working with the host.

According to leverage principle, adopting eccentric wheel form design and production, it can easily and fast add force to the host.

■**Rubber suction bulb:** It is used to blow up the dust and sand that may be stored in the hole to prevent the detection error.

■**Grinding wheel:** Used for grinding the surface of the mortar to eliminate the error that may occur when measuring hole depth.

III. **Specification**
1. Penetration resistance: 800±8
2. Power stroke: 20±0.1mm
3. Digital test ruler rang: 20±0.01mm
4. Nail length: 40mm
5. Nail diameter: 3.5mm
6. Gauge groove: 39.5mm

IV. **Operation**

1. Grinding the masonry brick gaps surface with grinding wheel
2. Put the nail into the hole of injection rod (2) nail seat (9). The tip of the nail is outward. Screw the nail seat nut with

a screw tightening wrench to fix the nail

3. One hand hold the penetrator (1) and the other hand set the long groove part of the assistor (12) in the end of the Strength slot (6). Match the horizontal pin of assistor (12) with the Strength slot (6) and hold the end of the assistor (12) forcing inside slowly. When the trigger (7) jump, it means the hook (7) was hiked up. (360°Alternating force could extend the working life of the tester.) Remove the assistor (12), and start testing.

4. In the testing, press the cross-pein against the polished masonry brick gaps surface and hold the penetrator firmly avoiding recoil force and press the trigger. The penetrator freely releases energy and finish one test. After testing, use the rubber suction bulb clear the test hole.

5. Use the depth tester test the depth of the hole. And use this value to check the Schedule A: The mortar compressive strength penetration test table and Schedule B: Conversion table of compressive strength of mortar (Mpa).

V. **Test point arrangement**

1. In the compressive strength of masonry mortar test, it should use a masonry components or structures which the square meter is not more than 25 m^2

2. In batch sampling, should be choose the masonry mortar built on the same floor, the same variety and the same strength grade, in meanwhile, no more than 250 m^3 masonry for a batch. The sampling quantity shall not be less than 30% of the masonry component.

3. And it should not be less than 6 components. The basic masonry can be according to a floor plan.

4. The tested mortar joint should be satiation. The thickness should not be less than 7mm.It should avoid vertical seam position, the edge of the hole of the door and the

edge of embedded part.
5. The horizontal seam depth of the porous brick masonry and hollow wall masonry should be no greater than 30mm.
6. In the test range, finish coat, plaster layer, seaming mortar, floating slurry and surface damage layer should be eliminated. And the mortar shall be exposed and polished for testing
7. Each component shall be tested at 16 points. The measuring points should be evenly distributed on the horizontal mortar joint of the components. The horizontal spacing of adjacent measurement points should not be less than 240mm, and each mortar joint measurement point should not be more than 2 points.

VI. Notices

(1). In the force state, injection side prohibit against yourself or others.
(2) .In case of damage to the nail seat, do not force catapult before set the nail on the penetrator.

Schedule A

The mortar compressive strength penetration test table

NO.	Unevenness d^0_i (mm)	depth gauge value d^1_i (mm)	penetration depth d_i (mm)	NO.	Unevenness d^0_i (mm)	depth gauge value d^1_i (mm)	penetration depth d_i (mm)
1				9			
2				10			
3				11			
4				12			
5				13			
6				14			
7				15			
8				16			
Notice							

Average penetration depth: $m_{dj} = \dfrac{1}{10}\sum\limits_{i=1}^{10} d_i$

The compressive strength conversion value of mortar : $f^c_{2,j} =$

Schedule B

Conversion table of compressive strength of mortar （Mpa）

Penetration depth d_i (mm)	The compressive strength conversion value of mortar $f^c_{2,j}$ (Mpa)		Penetration depth d_i (mm)	The compressive strength conversion value of mortar $f^c_{2,j}$ (Mpa)	
	Cement mix mortar	Cement mortar		Cement mix mortar	Cement mortar
2.90	15.6	—	5.40	4.0	4.6
3.00	14.5	—	5.50	3.9	4.5
3.10	13.5	15.5	5.60	3.7	4.3
3.20	12.6	14.5	5.70	3.6	4.1
3.30	11.8	13.5	5.80	3.4	4.0
3.40	11.1	12.5	5.90	3.3	3.8
3.50	10.4	11.9	6.00	3.2	3.7
3.60	9.8	11.2	6.10	3.1	3.6
3.70	9.2	10.5	6.20	3.0	3.4
3.80	8.7	10.0	6.30	2.9	3.3
3.90	8.2	9.4	6.40	2.8	3.2
4.00	7.8	8.9	6.50	2.7	3.1
4.10	7.3	8.4	6.60	2.6	3.0
4.20	7.0	8.0	6.70	2.5	2.9
4.30	6.6	7.6	6.80	2.4	2.8
4.40	6.3	7.2	6.90	2.4	2.7
4.50	6.0	6.9	7.00	2.3	2.6
4.60	5.7	6.6	7.10	2.2	2.6
4.70	5.5	6.3	7.20	2.2	2.5
4.80	5.2	6.0	7.30	2.1	2.4
4.90	5.0	5.7	7.40	2.0	2.3
5.00	4.8	5.5	7.50	2.0	2.3

5.10	4.6	5.3	7.60	1.9	2.2
5.20	4.4	5.0	7.70	1.9	2.1
5.30	4.2	4.8	7.80	1.8	2.1

Continued table （1）

Penetration depth d_i (mm)	The compressive strength conversion value of mortar $f^c_{2,j}$ (Mpa)		Penetration depth d_i (mm)	The compressive strength conversion value of mortar $f^c_{2,j}$ (Mpa)	
	Cement mix mortar	Cement mortar		Cement mix mortar	Cement mortar
7.90	1.8	2.0	10.50	1.0	1.1
8.00	1.7	2.0	10.60	0.9	1.1
8.10	1.7	1.9	10.70	0.9	1.1
8.20	1.6	1.9	10.80	0.9	1.0
8.30	1.6	1.8	10.90	0.9	1.0
8.40	1.5	1.8	11.00	0.9	1.0
8.50	1.5	1.7	11.10	0.8	1.0
8.60	1.5	1.7	11.20	0.8	1.0
8.70	1.4	1.6	11.30	0.8	0.9
8.80	1.4	1.6	11.40	0.8	0.9
8.90	1.4	1.6	11.50	0.8	0.9
9.00	1.3	1.5	11.60	0.8	0.9
9.10	1.3	1.5	11.70	0.8	0.9
9.20	1.3	1.5	11.80	0.7	0.9
9.30	1.2	1.4	11.90	0.7	0.8
9.40	1.2	1.4	12.00	0.7	0.8
9.50	1.2	1.4	12.10	0.7	0.8
9.60	1.2	1.3	12.20	0.7	0.8
9.70	1.1	1.3	12.30	0.7	0.8
9.80	1.1	1.3	12.40	0.7	0.8

9.90	1.1	1.2	12.50	0.7	0.8
10.00	1.1	1.2	12.60	0.6	0.7
10.10	1.0	1.2	12.70	0.6	0.7
10.20	1.0	1.2	12.80	0.6	0.7
10.30	1.0	1.1	12.90	0.6	0.7
10.40	1.0	1.1	13.00	0.6	0.7

Continued table （2）

Penetration depth d_i (mm)	The compressive strength conversion value of mortar $f^c_{2,j}$ (Mpa)		Penetration depth d_i (mm)	The compressive strength conversion value of mortar $f^c_{2,j}$ (Mpa)	
	Cement mix mortar	Cement mortar		Cement mix mortar	Cement mortar
13.10	0.6	0.7	15.50	0.4	0.5
13.20	0.6	0.7	15.60	0.4	0.5
13.30	0.6	0.7	15.70	0.4	0.5
13.40	0.6	0.6	15.80	0.4	0.5
13.50	0.6	0.6	15.90	0.4	0.4
13.60	0.5	0.6	16.00	0.4	0.4
13.70	0.5	0.6	16.10	0.4	0.4
13.80	0.5	0.6	16.20	0.4	0.4
13.90	0.5	0.6	16.30	0.4	0.4
14.00	0.5	0.6	16.40	0.4	0.4
14.10	0.5	0.6	16.50	0.4	0.4
14.20	0.5	0.6	16.60	0.4	0.4
14.30	0.5	0.6	16.70	—	0.4
14.40	0.5	0.5	16.80	—	0.4
14.50	0.5	0.5	16.90	—	0.4
14.60	0.5	0.5	17.00	—	0.4
14.70	0.5	0.5	17.10	—	0.4

14.80	0.5	0.5	17.20	—	0.4
14.90	0.4	0.5	17.30	—	0.4
15.00	0.4	0.5	17.40	—	0.4
15.10	0.4	0.5	17.50	—	0.4
15.20	0.4	0.5	17.60	—	0.4
15.30	0.4	0.5	17.70	—	0.4
15.40	0.4	0.5	—	—	—

Notes: The data in the table must not be extrapolated when applied. There is no data in the table, which can be obtained by interpolation, to the accuracy of 0,1 Mpa

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