



RIPS 2017

RUSSIA INTERNATIONAL PERFORATING SIMPOSIUM

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**PERFORATING SYSTEM SHAPED
CHARGE TESTING TECHNIQUES:
SS-05 VS. API RP 19B SEC.1**

RIPS-17-21

BVT JSC

Iakuba A.



Nihil est ab omni parte beatum.

There's nothing good in all
relationship.

Quintus Horatius Flaccus

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2. API RP 19B Sec.1

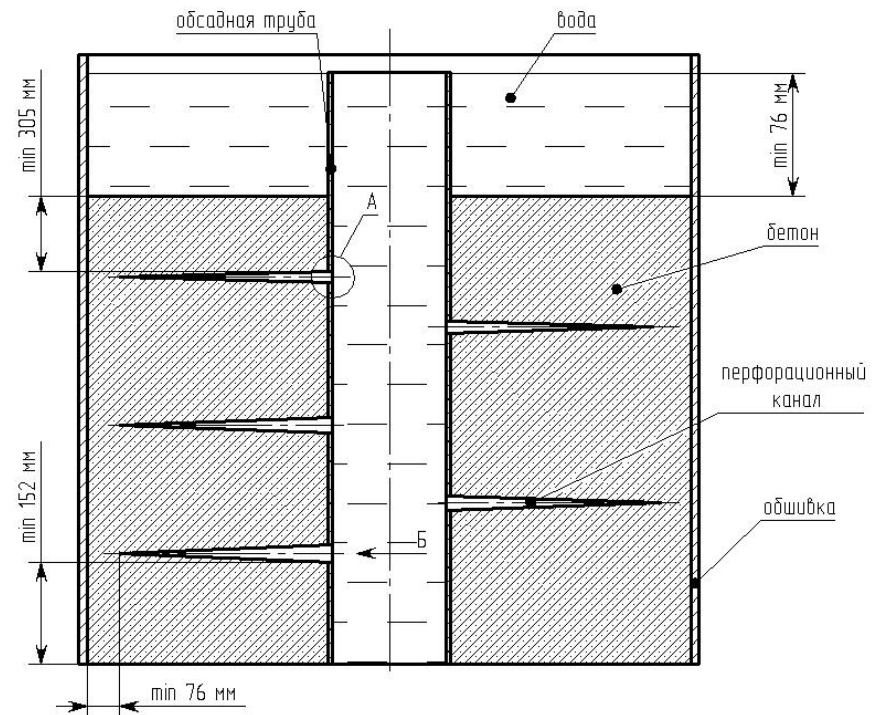
This recommended practice describes standard procedures for perforating equipment efficiency evaluation in such a way that this work presentation in the industry can be done under standard practice. This document replaces all editions of API RP 43 issued before.

Section 1 of the recommended practice provides the means for evaluation of perforating systems (multiple shot), performance data at an environmental temperature and atmospheric pressure testing conditions.

Accepted in 2006

Updated in 2014

Current status – active.



2. API RP 19B Sec. 1

Advantages:

- shooting perforator assembly;
- «Big» target configuration is close to the well design;
- the diameter of the holes on the target column reflects the diameter of the holes in the well string.

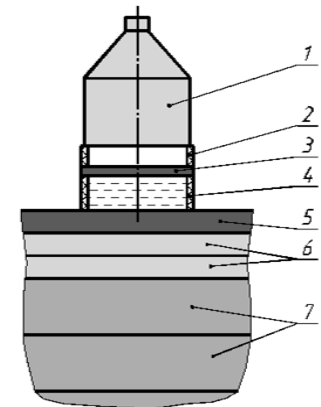
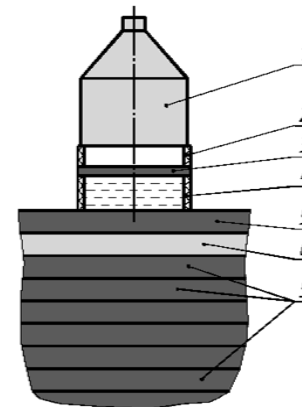
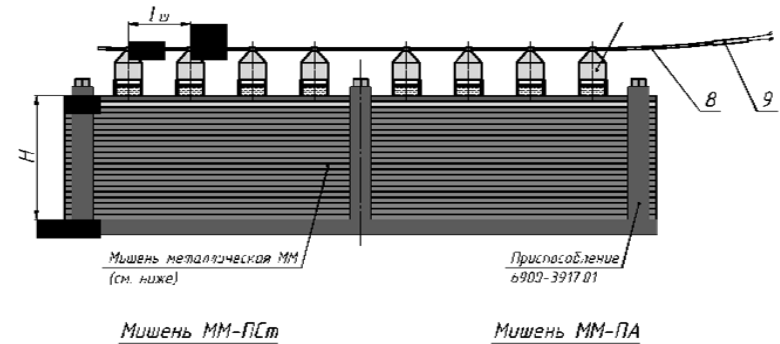
Disadvantages:

- penetrating depth measuring: bricks-markers reflect incompletely the concrete strength within «Big» target;
- strength changes with the target aging;
- conditions of material (sand, cement, water) affect significantly on the results of penetrating – it is forecasted not enough...



3. SS-05

- Methodological recommendations for down-hole blasting-perforation equipment (CC-05) shaped charge acceptance testing (hereinafter – “Methodological recommendations”) are intended for use during shaped charges (hereinafter – “SC” or “charges”) acceptance testing within perforating system (before testing on the well holes) and in the process of application under industrial conditions in the Russian Federation for providing the specified requirements of the industrial safety.
- The testing key task is determination of SC work safety and stability.
- Effective 2008.



- Current status – facultative during acceptance testing preforming (RGTN order No. 369 dated 17.09.2017)

3. SS-05

Test objects (charges) typing

Type 1 – charged with powder composite liners;

Group A₁ – charges of powder liners with straight linear generatric form made of cuprum or cuprum-lead composition with high density component (e.g., tungsten);

Group A₂ – charges of powder liners with curve linear generatric form made of cuprum or cuprum-lead composition with high density component (e.g., tungsten);

Group B – charges with powder liner made of cuprum or cuprum-lead composition not containing the high density components.

Type 2 - charged with solid-drawn metal liner.

Group C – charges with solid-drawn tapered liner including shaped form;

Group D – charges with solid-drawn semi-spherical liner.

Type of target used is determined by the type of charges tested:

- ***MM-PSt target*** (steel target) – for type 1 charges (groups A₁, A₂ and B);
- ***MM-PA target*** (aluminium target) – for type 2 charges (groups C, D).

3. SS-05

Advantages:

- **Materials parameters of the target are measured easily and with high-accuracy and not subjected to drift in time;**
- **Economic feasibility;**
- **Environmental friendliness.**

Disadvantages:

- **Target configuration does not match with the well hole design; charges fire-off without the perforator.**

4. Comparison and analysis

	API RP 19B	SS-05
1. Technical aspects		
The scheme proximity to real well hole	+	-
Perforator's case and casing column effect assessment	+	-
Time effect on the testing result (target strength parameters variation in time)	-	+
Influence of parameter inhomogeneity within the batches of materials	-	+
Target material parameters direct measuring	-	+
2. Economic aspects		
Testing cost	-	+
3. Environmental aspects		
Target disposition after the shoot-off	-	+

5. Findings and recommendations

- On the base of assessments mentioned, it can be seen that each testing system has its advantages and disadvantages.
- As for today, there is no alternatives to API RP 19B Sec.1 for assembled perforating systems testing.
- Both systems combining application allows to obtain true information on the work of shaped charge in particular, both for bursting and its work stability (bursting parameters dispersion), and on the work of the system as a whole.
- For tests of charges during production, it is preferable to shoot on metal targets with simultaneous shooting of concrete targets QC. Prior to the collection of statistical data in equal quantities, after obtaining sufficient volume - a decrease in the amount of QC. This procedure allows obtaining statistically confirmed data on the penetration ratios for each type of charge.

SS-05 vs. API RP 19B Sec.1?

Definitely No!

SS-05 together with API RP 19B Sec.1!

Definitely Yes!



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Thank you!
Questions ?

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Perforating system shaped charge testing techniques: SS-05 vs API RP
19B Sec.1