

API DATASHEETS  
IN PRODUCTION

1-3/8" RTG  
1-9/16" RTG  
1-11/16" CAPSULE  
2" RTG  
2-1/8" CAPSULE  
2-1/2" RTG  
2-3/4" EXPENDABLE  
3-1/8" EXPENDABLE  
3-1/8" PORT PLUG  
3-1/8" EEG  
3-3/8" EXPENDABLE  
4" PORT PLUG  
4" EEG  
4" EXPENDABLE  
4-1/2" EXPENDABLE  
4-5/8" EXPENDABLE  
5" EXPENDABLE  
7" EXPENDABLE

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 1.8 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 1-3/8" RTG, 4 SPF 0° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 1-3/8" 1.8 Gm HMX DP RTG Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. RTG-1302-400 Date of Manufacture 11/07/2000 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Expendable (HC, E) Recommended Minimum ID for Running 1.59 inches  
 Phasing Tested 0° degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Preliminary Data - Unofficial Test. Uses 40-HMX-Ribbon detonating cord. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 06/01/2001  
 Target Data 48" OD, Briquet Compressive Strength 6,440 psi, Age of Target 205 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	
Clearance, in.	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
Casing Hole Diameter, Short Axis, in.	0.18	0.17	0.17	0.16	0.16	0.16	0.14					
Casing Hole Diameter, Long Axis, in.	0.18	0.18	0.17	0.17	0.16	0.18	0.16					
Average Casing Hole Diameter, in.	0.18	0.18	0.17	0.17	0.16	0.17	0.15					
Total Depth, in.	5.20	4.90	4.70	4.40	4.10	4.80	4.90					
Burr Height, in.	0.06	0.08	0.04	0.02	0.06	0.08	0.10					
Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.												XXXXXXX
Casing Hole Diameter, Short Axis, in.												0.16
Casing Hole Diameter, Long Axis, in.												0.17
Average Casing Hole Diameter, in.												0.17
Total Depth, in.												4.70
Burr Height, in.												0.06

Remarks \_\_\_\_\_

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity _____ %	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
	Faceplate Hole Diameter, Short Axis, in.							
	Faceplate Hole Diameter, Long Axis, in.							
Date of Beria Test _____	Average Faceplate Hole Diameter, in.							
	Total Depth, in.							

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED \_\_\_\_\_  
 PRELIMINARY (Company Officer) (Title) (Date) (Company) (Address)

1-3/8" RTG @ 4 SPF 0° with CHARGE 1-3/8" 1.8 Gm HMX DP RTG P/N RTG-1302-400

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available To All (From Titan) Explosive Weight 3.2 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 1-9/16" RTG Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 1-9/16" 3.2 Gm RDX DP Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. RTG-1603-300 Date of Manufacture 5/18/93 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Expendable (HC, E), Thru Tubing Recommended Minimum ID for Running 1.78 inches  
 Phasing Tested 180 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 2-3/8" OD, Weight 4.6 lb/ft, L-80 API Grade, Date of Concrete Test 6/25/93  
 Target Data 24" OD, Briquet Compressive Strength 7310 psi, Age of Target 32 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Casing Hole Diameter, Short Axis, in.	0.21	0.21	0.21	0.20	0.22	0.22	0.22	0.22	0.21	0.21	0.20
Casing Hole Diameter, Long Axis, in.	0.22	0.22	0.21	0.21	0.23	0.23	0.23	0.23	0.22	0.23	0.22
Average Casing Hole Diameter, in.	0.22	0.22	0.21	0.21	0.23	0.23	0.23	0.23	0.22	0.22	0.22
Total Depth, in.	7.00	6.87	7.12	7.37	6.00	6.87	6.62	6.50	7.00	6.87	6.25
Burr Height, in.	0	0	0	0	0	0	0	0	0	0	0

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.25	0.25	0.25	0.25	0.25							XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.21	0.23	0.23	0.22	0.23							0.22
Casing Hole Diameter, Long Axis, in.	0.22	0.23	0.24	0.23	0.24							0.23
Average Casing Hole Diameter, in.	0.22	0.23	0.24	0.23	0.24							0.23
Total Depth, in.	7.00	6.38	5.90	6.25	5.87							6.62
Burr Height, in.	0	0	0	0	0							0

Remarks \_\_\_\_\_

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Berea Bulk Porosity _____ %	Faceplate Hole Diameter, Short Axis, in. _____							
Date of Beria Test _____	Faceplate Hole Diameter, Long Axis, in. _____							
	Average Faceplate Hole Diameter, in. _____							
	Total Depth, in. _____							

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

____ CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<input checked="" type="checkbox"/> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
____ PRELIMINARY					

1-9/16" RTG @ 4 SPF 180° WITH CHARGE 1-9/16" 3.2 Gm RDX DP P/N RTG-1603-300

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 3.2 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 1-9/16" RTG GUN, 6 SPF 60° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 1-9/16" 3.2 Gm HMX DP Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. RTG-1603-400 Date of Manufacture 09/12/2006 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E), Thru Tubing Recommended Minimum ID for Running 1.78 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 2-3/8" OD, Weight 4.6 lb/ft, L-80 API Grade, Date of Concrete Test 09/27/2006  
 Target Data 30" OD, Briquet Compressive Strength 6,630 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.09	0.31	0.43	0.31	0.09	0.00	0.09	0.31	0.43	0.31	0.09
Casing Hole Diameter, Short Axis, in. ---	0.28	0.26	0.20	0.22	0.20	0.23	0.28	0.25	0.24	0.21	0.18	0.23
Casing Hole Diameter, Long Axis, in. ---	0.29	0.26	0.24	0.23	0.22	0.24	0.28	0.28	0.25	0.22	0.22	0.24
Average Casing Hole Diameter, in. -----	0.29	0.26	0.22	0.23	0.21	0.24	0.28	0.27	0.25	0.22	0.20	0.24
Total Depth, in. -----	6.19	7.19	7.19	5.69	6.57	6.44	5.44	8.69	6.07	6.19	5.44	5.94
Burr Height, in. -----	0.05	0.03	0.04	0.01	0.03	0.02	0.05	0.03	0.02	0.05	0.04	0.04

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.09	0.31	0.43	0.31	0.09							XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.23	0.25	0.22	0.22	0.20	0.23							0.23
Casing Hole Diameter, Long Axis, in. ---	0.23	0.25	0.23	0.22	0.20	0.23							0.24
Average Casing Hole Diameter, in. -----	0.23	0.25	0.23	0.22	0.20	0.23							0.24
Total Depth, in. -----	7.07	7.19	5.69	6.69	5.82	7.82							6.52
Burr Height, in. -----	0.05	0.06	0.05	0.04	0.02	0.02							0.04

Remarks Tested with 40 HMX flat detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 6.91

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED \_\_\_\_\_  
 PRELIMINARY \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)

1-9/16" RTG @ 6 SPF 60° with CHARGE 1-9/16" 3.2 Gm HMX DP P/N RTG-1603-400

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 3.2 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 1-9/16" RTG, 4 SPF 0° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 1-9/16" 3.2 Gm HMX SDP RTG Prospector® Maximum Pressure Rating 19,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. RTG-1603-420T Date of Manufacture 04/26/2000 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Expendable (HC, E) Recommended Minimum ID for Running 1.78 inches  
 Phasing Tested 0° degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Preliminary Data. Uses 40-HMX-Ribbon detonating cord. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 05/11/2000  
 Target Data 48" OD, Briquet Compressive Strength 5150 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Casing Hole Diameter, Short Axis, in.	0.18	0.20	0.20	0.21	0.20	0.18	0.19	0.19	0.19	0.19	0.20
Casing Hole Diameter, Long Axis, in.	0.19	0.20	0.21	0.22	0.20	0.20	0.21	0.22	0.20	0.19	0.21
Average Casing Hole Diameter, in.	0.19	0.20	0.21	0.22	0.20	0.19	0.20	0.21	0.20	0.19	0.21
Total Depth, in.	10.75	10.38	11.25	10.00	12.25	10.50	10.13	12.44	10.88	11.00	12.00
Burr Height, in.	.03	.02	.04	.02	.03	.03	.02	.03	.03	.04	.02

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.00											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.18											0.19
Casing Hole Diameter, Long Axis, in.	0.19											0.20
Average Casing Hole Diameter, in.	0.19											0.20
Total Depth, in.	9.38											10.91
Burr Height, in.	.02											.03

Remarks \_\_\_\_\_

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity _____ %	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Faceplate Hole Diameter, Short Axis, in. _____								
Faceplate Hole Diameter, Long Axis, in. _____								
Average Faceplate Hole Diameter, in. _____								
Total Depth, in. _____								

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED \_\_\_\_\_  
 PRELIMINARY (Company Officer) (Title) (Date) (Company) (Address)

1-9/16" RTG @ 4 SPF 0° with CHARGE 1-9/16" 3.2 Gm HMX SDP RTG Prospector® P/N RTG-1603-420T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 3.2 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 1-9/16" RTG, 6 SPF 0° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 1-9/16" 3.2 Gm HMX BH RTG Prospector® Maximum Pressure Rating 19,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-1603-410 Date of Manufacture 11/08/2001 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Expendable (HC, E) Recommended Minimum ID for Running 1.78 inches  
 Phasing Tested 0° degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks PRELIMINARY DATA - UNOFFICIAL TEST. Uses 40-HMX-Ribbon detonating cord. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 01/18/2002  
 Target Data 36" OD, Briquet Compressive Strength 7,825 psi, Age of Target 683 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Casing Hole Diameter, Short Axis, in.	0.38	0.40	0.38	0.42	0.40	0.39	0.40	0.41	0.41	0.39	0.42
Casing Hole Diameter, Long Axis, in.	0.40	0.40	0.38	0.43	0.41	0.39	0.41	0.41	0.42	0.40	0.43
Average Casing Hole Diameter, in.	0.39	0.40	0.38	0.43	0.41	0.39	0.41	0.41	0.42	0.40	0.43
Total Depth, in.	3.05	3.05	3.25	2.85	3.45	3.55	3.55	3.45	3.25	3.25	2.95
Burr Height, in.	0.04	0.03	0.04	0.05	0.03	0.05	0.03	0.04	0.05	0.04	0.05

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.00											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.44											0.40
Casing Hole Diameter, Long Axis, in.	0.44											0.41
Average Casing Hole Diameter, in.	0.44											0.41
Total Depth, in.	3.05											3.23
Burr Height, in.	0.04											0.04

Remarks \_\_\_\_\_

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity _____ %	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Faceplate Hole Diameter, Short Axis, in. _____								
Faceplate Hole Diameter, Long Axis, in. _____								
Average Faceplate Hole Diameter, in. _____								
Total Depth, in. _____								

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED \_\_\_\_\_  
 PRELIMINARY (Company Officer) (Title) (Date) (Company) (Address)

1-9/16" RTG @ 6 SPF 0° with CHARGE 1-9/16" 3.2 Gm HMX BH RTG Prospector® P/N FLO-1603-410

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available To All (From Titan) Explosive Weight 8.0 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 1-11/16" Prospector®-CP CAPSULE, 6 SPF 0° Max. Temp, °F 365 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 1-11/16" 8 Gm HMX SDP Capsule Maximum Pressure Rating 15,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. CAP-1708-420T Date of Manufacture 03/23/2002 Shot Density Tested 6 Shots per foot  
 Gun Type Semi-Expendable Strip Recommended Minimum ID for Running 1.78 inches  
 Phasing Tested 0 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Small Steel Fragments Debris Weight 70 gm/charge, Debris 0.66 in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications. Was CAP-1608-420T.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 04/29/2002  
 Target Data 36" OD, Briquet Compressive Strength 7280 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Casing Hole Diameter, Short Axis, in.	0.25	0.22	0.23	0.21	0.21	0.20	0.22	0.21	0.24	0.21	0.23
Casing Hole Diameter, Long Axis, in.	0.25	0.23	0.25	0.23	0.23	0.28	0.26	0.21	0.26	0.25	0.25
Average Casing Hole Diameter, in.	0.25	0.23	0.24	0.22	0.22	0.24	0.24	0.21	0.25	0.23	0.24
Total Depth, in.	23.05	18.05	20.75	21.25	18.75	14.55	16.25	17.25	20.25	16.75	18.25
Burr Height, in.	0.03	0.02	0.04	0.03	0.03	0.04	0.03	0.02	0.04	0.04	0.03

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.00											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.25											0.22
Casing Hole Diameter, Long Axis, in.	0.25											0.25
Average Casing Hole Diameter, in.	0.25											0.24
Total Depth, in.	24.05											19.10
Burr Height, in.	0.03											0.03

Remarks Use with 80-HMX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 20.70 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity _____ %	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Date of Beria Test _____	Faceplate Hole Diameter, Short Axis, in. _____							
	Faceplate Hole Diameter, Long Axis, in. _____							
	Average Faceplate Hole Diameter, in. _____							
	Total Depth, in. _____							

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

____ CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<input checked="" type="checkbox"/> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
____ PRELIMINARY					

1-11/16" CAP @ 6 SPF 0° with CHARGE 1-11/16" 8 Gm HMX SDP Capsule P/N CAP-1708-420T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available To All (From Titan) Explosive Weight 8.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 1-11/16" Prospector®-CP CAPSULE, 6 SPF 0° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 1-11/16" 8 Gm RDX BH Capsule Maximum Pressure Rating 15,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. CAP-1708-310B Date of Manufacture 06/25/2007 Shot Density Tested 6 Shots per foot  
 Gun Type Semi-Expendable Strip Recommended Minimum ID for Running 1.78 inches  
 Phasing Tested 0 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Small Steel Fragments Debris Weight 70 gm/charge, Debris 0.66 in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications. Was CAP-1608-420T.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 07/25/2007  
 Target Data 24" OD, Briquet Compressive Strength 6215 psi, Age of Target 69 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Casing Hole Diameter, Short Axis, in.	0.60	0.60	0.57	0.57	0.55	0.60	0.58	0.61	0.58	0.56	0.54
Casing Hole Diameter, Long Axis, in.	0.61	0.62	0.58	0.59	0.55	0.60	0.59	0.63	0.60	0.60	0.59
Average Casing Hole Diameter, in.	0.61	0.61	0.58	0.58	0.55	0.60	0.59	0.62	0.59	0.58	0.57
Total Depth, in.	4.38	5.50	4.63	4.75	5.13	5.38	5.25	5.50	5.00	4.75	4.88
Burr Height, in.	0.06	0.07	0.05	0.06	0.05	0.06	0.07	0.05	0.06	0.05	0.06

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.00											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.53											0.58
Casing Hole Diameter, Long Axis, in.	0.55											0.59
Average Casing Hole Diameter, in.	0.54											0.59
Total Depth, in.	5.00											5.01
Burr Height, in.	0.07											.06

Remarks Use with 80-RDX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 5.23 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity _____ %	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Date of Beria Test _____	Faceplate Hole Diameter, Short Axis, in. _____							
	Faceplate Hole Diameter, Long Axis, in. _____							
	Average Faceplate Hole Diameter, in. _____							
	Total Depth, in. _____							

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

____ CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<input checked="" type="checkbox"/> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
____ PRELIMINARY					

1-11/16" CAP @ 6 SPF 0° with CHARGE 1-11/16" 8 Gm HMX BH Capsule P/N CAP-1708-310B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 6.5 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 2" RTG GUN, 4 SPF 60° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 2" 6.5 Gm RDX GH Outlaw® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. RTG-2106-331 Date of Manufacture 09/08/2004 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 2.25 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 2-7/8" OD, Weight 6.4 lb/ft, L-80 API Grade, Date of Concrete Test 11/10/2004  
 Target Data 48" OD, Briquet Compressive Strength 5,720 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.10	0.32	0.44	0.32	0.10	0.00	0.10	0.32	0.44	0.32	0.10
Casing Hole Diameter, Short Axis, in. ---	0.38	0.37	0.34	0.30	0.33	0.36	0.38	0.35	0.35	0.32	0.34	0.36
Casing Hole Diameter, Long Axis, in. ---	0.39	0.37	0.36	0.34	0.35	0.38	0.38	0.39	0.36	0.33	0.36	0.37
Average Casing Hole Diameter, in. -----	0.39	0.37	0.35	0.32	0.34	0.37	0.38	0.37	0.36	0.33	0.35	0.37
Total Depth, in. -----	12.97	14.72	10.97	12.22	10.60	10.97	13.22	11.47	10.72	11.35	12.22	12.97
Burr Height, in. -----	0.06	0.05	0.06	0.07	0.05	0.05	0.04	0.05	0.07	0.05	0.05	0.06

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.10	0.32	0.44	-----	-----	-----	-----	-----	-----	-----	-----	XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.38	0.36	0.35	0.31	-----	-----	-----	-----	-----	-----	-----	-----	0.35
Casing Hole Diameter, Long Axis, in. ---	0.38	0.37	0.38	0.34	-----	-----	-----	-----	-----	-----	-----	-----	0.37
Average Casing Hole Diameter, in. -----	0.38	0.37	0.37	0.33	-----	-----	-----	-----	-----	-----	-----	-----	0.36
Total Depth, in. -----	12.60	11.10	10.22	10.85	-----	-----	-----	-----	-----	-----	-----	-----	11.82
Burr Height, in. -----	0.04	0.05	0.06	0.04	-----	-----	-----	-----	-----	-----	-----	-----	0.05

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 12.12

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

2" RTG @ 4 SPF 60° with CHARGE 2" 6.5 Gm RDX GH Outlaw® P/N RTG-2106-331

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 6.5 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 2" RTG GUN, 4 SPF 60° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 2" 6.5 Gm HMX SDP Gunslinger® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. RTG-2106-421T Date of Manufacture 06/02/2004 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 2.25 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 2-7/8" OD, Weight 6.4 lb/ft, L-80 API Grade, Date of Concrete Test 08/05/2004  
 Target Data 72" OD, Briquet Compressive Strength 6965 psi, Age of Target 29 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.10	0.32	0.44	0.32	0.10	0.00	0.10	0.32	0.44	0.32	0.10
Casing Hole Diameter, Short Axis, in. ---	0.25	0.22	0.25	0.24	0.27	0.26	0.24	0.27	0.26	0.27	0.27	0.29
Casing Hole Diameter, Long Axis, in. ---	0.26	0.25	0.26	0.25	0.29	0.26	0.24	0.27	0.27	0.28	0.30	0.35
Average Casing Hole Diameter, in. -----	0.26	0.24	0.26	0.25	0.28	0.26	0.24	0.27	0.27	0.28	0.29	0.32
Total Depth, in. -----	27.85	Lost	25.22	24.85	21.47	22.60	29.85	29.85	26.97	16.72	23.72	24.47
Burr Height, in. -----	0.05	0.05	0.06	0.06	0.05	0.04	0.06	0.05	0.07	0.07	0.05	0.06

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.10	0.32	0.44	-----	-----	-----	-----	-----	-----	-----	-----	XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.25	0.27	0.28	0.28	-----	-----	-----	-----	-----	-----	-----	-----	0.26
Casing Hole Diameter, Long Axis, in. ---	0.27	0.29	0.29	0.29	-----	-----	-----	-----	-----	-----	-----	-----	0.28
Average Casing Hole Diameter, in. -----	0.26	0.28	0.29	0.29	-----	-----	-----	-----	-----	-----	-----	-----	0.27
Total Depth, in. -----	29.97	24.22	23.35	24.60	-----	-----	-----	-----	-----	-----	-----	-----	25.05
Burr Height, in. -----	0.04	0.05	0.06	0.05	-----	-----	-----	-----	-----	-----	-----	-----	0.05

Remarks Tested with 40-HMX-Flat detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 26.84

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

2" RTG @ 4 SPF 60° with CHARGE 2" 6.5 Gm HMX SDP Gunslinger® P/N RTG-2106-421T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 6.5 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 2" RTG, 4 SPF 0° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 2" 6.5 Gm RDX BH Maximum Pressure Rating 17,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-2106-310 Date of Manufacture 03/15/2000 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Expendable (HC, E) Recommended Minimum ID for Running 2.25 inches  
 Phasing Tested 0° degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. Uses 40-RDX-Ribbon detonating cord. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 05/11/2000  
 Target Data 48" OD, Briquet Compressive Strength 8,650 psi, Age of Target 158 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Casing Hole Diameter, Short Axis, in.	0.49	0.49	0.50	0.50	0.50	0.49	0.49	0.49	0.48	0.50	0.52
Casing Hole Diameter, Long Axis, in.	0.51	0.50	0.51	0.53	0.50	0.50	0.50	0.52	0.52	0.50	0.53
Average Casing Hole Diameter, in.	0.50	0.50	0.51	0.52	0.50	0.50	0.50	0.50	0.50	0.50	0.53
Total Depth, in.	5.25	4.25	4.25	3.88	3.75	3.75	4.00	3.50	4.13	4.38	3.88
Burr Height, in.	.04	.03	.04	.02	.03	.04	.03	.03	.04	.03	.02

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.00	0.00	0.00	0.00								XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.50	0.52	0.49	0.51								0.50
Casing Hole Diameter, Long Axis, in.	0.52	0.54	0.52	0.51								0.51
Average Casing Hole Diameter, in.	0.51	0.53	0.51	0.51								0.51
Total Depth, in.	4.13	4.50	4.00	4.38								4.14
Burr Height, in.	.03	.04	.03	.04								.03

Remarks Penetration normalized to 5000 psi by the method of SPE 27424 (approx. 3.8%/1000 psi) = 4.72 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party \_\_\_\_\_  
 I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

2" RTG @ 4 SPF 0° with CHARGE 2" 6.5 Gm RDX BH P/N FLO-2106-310

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available To All (From Titan) Explosive Weight 15.0 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 2-1/8" PROSPECTOR®-CP CAPSULE, 6 SPF 0° Max. Temp, °F 365 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 2-1/8" 15 Gm HMX SDP Capsule Maximum Pressure Rating 15,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. CAP-2115-420T Date of Manufacture 02/15/2002 Shot Density Tested 6 Shots per foot  
 Gun Type Semi-Expendable Strip Recommended Minimum ID for Running 2.25 inches  
 Phasing Tested 0 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode Selective, X Simultaneous  
 Debris Description Small Steel Fragments Debris Weight 136 gm/charge, Debris 1.22 in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17 lb/ft, L-80 API Grade, Date of Concrete Test 03/20/2002  
 Target Data 48" OD, Briquet Compressive Strength 7950 psi, Age of Target 29 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Casing Hole Diameter, Short Axis, in.	0.24	0.24	0.26	0.26	0.22	0.28	0.28	0.28	0.26	0.24	0.25
Casing Hole Diameter, Long Axis, in.	0.25	0.25	0.27	0.30	0.27	0.30	0.30	0.31	0.27	0.27	0.28
Average Casing Hole Diameter, in.	0.25	0.25	0.27	0.28	0.25	0.29	0.29	0.30	0.27	0.26	0.27
Total Depth, in.	23.30	36.43	28.30	32.55	26.30	31.80	35.55	36.80	22.30	33.80	31.80
Burr Height, in.	0.04	0.03	0.03	0.04	0.03	0.02	0.04	0.03	0.03	0.04	0.03

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.00	0.00	0.00	0.00	0.00							XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.24	0.25	0.24	0.25	0.24							0.25
Casing Hole Diameter, Long Axis, in.	0.27	0.27	0.28	0.28	0.27							0.28
Average Casing Hole Diameter, in.	0.26	0.26	0.26	0.27	0.26							0.27
Total Depth, in.	30.55	30.80	30.30	35.05	34.05							31.23
Burr Height, in.	0.03	0.04	0.03	0.04	0.03							0.03

Remarks Use with 80-HMX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 34.65 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
<u>        </u> %	Faceplate Hole Diameter, Short Axis, in. <u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>
	Faceplate Hole Diameter, Long Axis, in. <u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>
Date of Beria Test <u>        </u>	Average Faceplate Hole Diameter, in. <u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>
	Total Depth, in. <u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>	<u>        </u>

**CERTIFICATION**

Type of Certification: X Self          Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

<u>        </u> CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<u>X</u> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
<u>        </u> PRELIMINARY					

2-1/8" CAP @ 6 SPF 0° with CHARGE 2-1/8" 15 Gm HMX SDP Capsule P/N CAP-2115-420T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available To All (From Titan) Explosive Weight 15.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 2-1/8" PROSPECTOR®-CP CAPSULE, 6 SPF 0° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 2-1/8" 15 Gm RDX BH Capsule Maximum Pressure Rating 15,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. CAP-2115-310B Date of Manufacture 03/14/2007 Shot Density Tested 6 Shots per foot  
 Gun Type Semi-Expendable Strip Recommended Minimum ID for Running 2.25 inches  
 Phasing Tested 0 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode Selective, X Simultaneous  
 Debris Description Small Steel Fragments Debris Weight 136 gm/charge, Debris 1.22 in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17 lb/ft, L-80 API Grade, Date of Concrete Test 05/17/2007  
 Target Data 36" OD, Briquet Compressive Strength 6215 psi, Age of Target 63 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Casing Hole Diameter, Short Axis, in.	0.64	0.62	0.64	0.60	0.57	0.62	0.54	0.62	0.66	0.65	0.57
Casing Hole Diameter, Long Axis, in.	0.66	0.64	0.65	0.61	0.63	0.63	0.60	0.66	0.67	0.67	0.63
Average Casing Hole Diameter, in.	0.65	0.63	0.65	0.61	0.60	0.63	0.57	0.64	0.67	0.66	0.60
Total Depth, in.	6.43	6.68	6.05	5.80	6.13	6.05	5.30	5.55	6.30	6.55	6.55
Burr Height, in.	0.06	0.07	0.05	0.06	0.06	0.07	0.05	0.07	0.05	0.06	0.06

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.00											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.66											0.62
Casing Hole Diameter, Long Axis, in.	0.66											0.64
Average Casing Hole Diameter, in.	0.66											0.63
Total Depth, in.	6.80											6.18
Burr Height, in.	0.06											0.06

Remarks Use with 80-RDX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 6.45 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
<u>        </u> %	Faceplate Hole Diameter, Short Axis, in.							
	Faceplate Hole Diameter, Long Axis, in.							
Date of Beria Test	Average Faceplate Hole Diameter, in.							
	Total Depth, in.							

**CERTIFICATION**

Type of Certification:  Self  Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

   CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED (Company Officer) (Title) (Date) (Company) (Address)  
   PRELIMINARY

2-1/8" CAP @ 6 SPF 0° with CHARGE 2-1/8" 15 Gm RDX BH Capsule P/N CAP-2115-310B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 11 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 2-1/2" RTG GUN, 6 SPF 60° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 2-1/2" 11 Gm RDX DP Prospector® Maximum Pressure Rating 13,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. RTG-2511-301 Date of Manufacture 10/08/2002 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 2.71 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained in Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum ID ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 3-1/2" OD, Weight 9.2 lb/ft, L-80 API Grade, Date of Concrete Test 11/13/2002  
 Target Data 54" OD, Briquet Compressive Strength 5,610 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.11	0.35	0.49	0.35	0.11	0.00	0.11	0.35	0.49	0.35
Casing Hole Diameter, Short Axis, in.	0.37	0.38	0.38	0.40	0.42	0.40	0.41	0.40	0.39	0.40	0.42
Casing Hole Diameter, Long Axis, in.	0.41	0.40	0.39	0.42	0.43	0.43	0.41	0.42	0.42	0.41	0.43
Average Casing Hole Diameter, in.	0.39	0.39	0.39	0.41	0.43	0.42	0.41	0.41	0.41	0.41	0.43
Total Depth, in.	18.50	18.63	19.88	15.75	18.75	19.50	15.25	17.38	14.25	18.38	17.25
Burr Height, in.	0.04	0.05	0.03	0.04	0.05	0.04	0.04	0.03	0.05	0.06	0.04

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.11	0.00	0.11	0.35	0.49	0.35	0.11					XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.42	0.40	0.39	0.41	0.42	0.41	0.39					0.40
Casing Hole Diameter, Long Axis, in.	0.43	0.42	0.42	0.41	0.43	0.43	0.41					0.42
Average Casing Hole Diameter, in.	0.43	0.41	0.41	0.41	0.43	0.42	0.40					0.41
Total Depth, in.	19.50	15.38	16.25	20.13	17.63	14.88	19.63					17.61
Burr Height, in.	0.04	0.04	0.03	0.04	0.05	0.03	0.05					0.04

Remarks Tested with 40-RDX-Ribbon detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 17.99 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity _____ %	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Date of Beria Test _____	Faceplate Hole Diameter, Short Axis, in. _____							
	Faceplate Hole Diameter, Long Axis, in. _____							
	Average Faceplate Hole Diameter, in. _____							
	Total Depth, in. _____							

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will be substantially the same as the equipment which would be furnished to perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) (Title) (Date) (Company) (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

2-1/2" RTG @ 6 SPF 60° with CHARGE 2-1/2" 11 Gm RDX DP Prospector® P/N RTG-2511-301

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 11.0 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 2-1/2" RTG GUN, 6 SPF 60° Max. Temp, °F 400 1 hr          3 hr          24 hr          100 hr          200 hr  
 Charge Name 2-1/2" 11 Gm HMX SDP Gunslinger® Maximum Pressure Rating 13,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. RTG-2511-422T Date of Manufacture 07/03/2002 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 2.71 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained In Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 3-1/2" OD, Weight 9.2 lb/ft, L-80 API Grade, Date of Concrete Test 08/29/2002  
 Target Data 66" OD, Briquet Compressive Strength 6,800 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.11	0.35	0.49	0.35	0.11	0.00	0.11	0.35	0.49	0.35
Casing Hole Diameter, Short Axis, in.	0.27	0.33	0.32	0.31	0.32	0.27	0.28	0.29	0.33	0.32	0.33
Casing Hole Diameter, Long Axis, in.	0.29	0.33	0.34	0.32	0.33	0.29	0.28	0.29	0.33	0.34	0.35
Average Casing Hole Diameter, in.	0.28	0.33	0.33	0.32	0.33	0.28	0.28	0.29	0.33	0.33	0.34
Total Depth, in.	LOST	28.25	34.25	33.75	25.50	27.38	32.88	32.25	34.25	25.25	32.25
Burr Height, in.	0.04	0.05	0.04	0.05	0.04	0.04	0.03	0.02	0.04	0.05	0.03

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.11	0.00	0.11	0.35	0.49	0.35	0.11					XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.33	0.29	0.29	0.29	0.32	0.31	0.30					0.31
Casing Hole Diameter, Long Axis, in.	0.33	0.31	0.30	0.34	0.33	0.31	0.30					0.32
Average Casing Hole Diameter, in.	0.33	0.30	0.30	0.32	0.33	0.31	0.30					0.32
Total Depth, in.	31.25	20.88	29.75	34.25	33.25	31.75	31.63					30.52
Burr Height, in.	0.03	0.04	0.03	0.05	0.04	0.05	0.04					0.04

Remarks Tested with 40-HMX-Ribbon detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 32.52 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
<u>        </u> %	Faceplate Hole Diameter, Short Axis, in.							
	Faceplate Hole Diameter, Long Axis, in.							
Date of Beria Test	Average Faceplate Hole Diameter, in.							
	Total Depth, in.							

**CERTIFICATION**

Type of Certification: X Self          Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

         CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED (Company Officer) (Title) (Date) (Company) (Address)  
         PRELIMINARY

2-1/2" RTG @ 6 SPF 60° with CHARGE 2-1/2" 11 Gm HMX SDP Gunslinger® P/N RTG-2511-422T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 11.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 2-1/2" RTG, 4 SPF 0° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 2-1/2" 11 Gm RDX BH Maximum Pressure Rating 13,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-2511-310B Date of Manufacture 07/27/99 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 2.71 inches  
 Phasing Tested 0 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained in Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. Uses 40-RDX-Ribbon detonating cord. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 07/27/99  
 Target Data 48" OD, Briquet Compressive Strength 5,340 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Casing Hole Diameter, Short Axis, in.	0.54	0.57	0.54	0.59	0.61	0.58	0.58	0.57	0.57	0.59	0.56
Casing Hole Diameter, Long Axis, in.	0.57	0.60	0.56	0.61	0.65	0.63	0.60	0.60	0.60	0.63	0.62
Average Casing Hole Diameter, in.	0.56	0.59	0.55	0.60	0.63	0.61	0.59	0.59	0.58	0.61	0.59
Total Depth, in.	4.75	5.13	4.50	4.75	5.00	5.13	4.50	4.75	4.50	5.00	5.13
Burr Height, in.	.04	.05	.05	.04	.05	.03	.05	.05	.04	.06	.04

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.00											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.59											0.57
Casing Hole Diameter, Long Axis, in.	0.61											0.61
Average Casing Hole Diameter, in.	0.60											0.59
Total Depth, in.	5.00											4.85
Burr Height, in.	.04											.05

Remarks \_\_\_\_\_

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity _____ %	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
	Faceplate Hole Diameter, Short Axis, in. _____							
	Faceplate Hole Diameter, Long Axis, in. _____							
Date of Beria Test _____	Average Faceplate Hole Diameter, in. _____							
	Total Depth, in. _____							

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

____ CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<input checked="" type="checkbox"/> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
____ PRELIMINARY					

2-1/2" RTG @ 4 SPF 0° with CHARGE 2-1/2" 11 Gm RDX BH P/N FLO-2511-310B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 15.0 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 2-3/4" EXP, 6 SPF 60° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 2-3/4" 15 Gm HMX SDP Gunslinger® Maximum Pressure Rating 23,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-2715-422T Date of Manufacture 09/04/2002 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.00 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained in carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum ID ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 10/04/2002  
 Target Data 84" OD, Briquet Compressive Strength 5,080 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.24	0.86	1.25	0.86	0.24	0.00	0.24	0.86	1.25	0.86
Casing Hole Diameter, Short Axis, in.	0.41	0.40	0.35	0.26	0.31	0.33	0.40	0.40	0.35	0.26	0.34
Casing Hole Diameter, Long Axis, in.	0.42	0.42	0.36	0.28	0.32	0.35	0.42	0.41	0.37	0.26	0.35
Average Casing Hole Diameter, in.	0.42	0.41	0.36	0.27	0.32	0.34	0.41	0.41	0.36	0.26	0.35
Total Depth, in.	27.50	28.25	34.00	27.50	34.75	35.00	30.25	31.75	35.00	37.00	35.00
Burr Height, in.	0.04	0.05	0.05	0.06	0.04	0.06	0.04	0.05	0.05	0.07	0.05

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.24	0.00	0.24	0.86	1.25	0.86	0.24					XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.36	0.42	0.34	0.29	0.28	0.29	0.30					0.34
Casing Hole Diameter, Long Axis, in.	0.36	0.42	0.36	0.31	0.28	0.31	0.31					0.35
Average Casing Hole Diameter, in.	0.36	0.42	0.35	0.30	0.28	0.30	0.31					0.35
Total Depth, in.	34.00	36.25	36.50	31.50	28.00	34.00	36.38					32.92
Burr Height, in.	0.05	0.05	0.04	0.05	0.05	0.04	0.04					0.04

Remarks Tested with 80-HMX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 33.01 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity _____ %	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Date of Beria Test _____	Faceplate Hole Diameter, Short Axis, in. _____							
	Faceplate Hole Diameter, Long Axis, in. _____							
	Average Faceplate Hole Diameter, in. _____							
	Total Depth, in. _____							

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will be substantially the same as the equipment which would be furnished to perforate a well for any operator.

____ CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<u>X</u> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
____ PRELIMINARY					

2-3/4" EXP @ 6 SPF 60° with CHARGE 2-3/4" 15 Gm HMX SDP Gunslinger® P/N EXP-2715-422T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 15.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 2-3/4" EXP, 6 SPF 60° Max. Temp, °F 325 1 hr          3 hr          24 hr          100 hr          200 hr  
 Charge Name 2-3/4" 15g RDX BH EXP BountyHunter® Maximum Pressure Rating 23,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-2715-310B Date of Manufacture 05/22/2003 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.00 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained In Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 12/15/2003  
 Target Data 36" OD, Briquet Compressive Strength 10,640 psi, Age of Target 816 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.24	0.86	1.25	0.86	0.24	0.00	0.24	0.86	1.25	0.86
Casing Hole Diameter, Short Axis, in.	0.77	0.73	0.69	0.65	0.67	0.75	0.77	0.72	0.70	0.63	0.67
Casing Hole Diameter, Long Axis, in.	0.81	0.75	0.69	0.69	0.71	0.75	0.78	0.74	0.70	0.69	0.69
Average Casing Hole Diameter, in.	0.79	0.74	0.69	0.67	0.69	0.75	0.78	0.73	0.70	0.66	0.68
Total Depth, in.	5.15	4.75	5.65	4.25	4.35	4.65	4.95	4.95	4.35	3.95	4.25
Burr Height, in.	0.04	0.05	0.04	0.04	0.03	0.04	0.04	0.03	0.05	0.05	0.04

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.24	0.00	0.24	0.86	1.25	0.86	0.24					XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.73	0.77	0.74	0.67	0.67	0.67	0.72					0.71
Casing Hole Diameter, Long Axis, in.	0.75	0.79	0.76	0.69	0.67	0.71	0.74					0.73
Average Casing Hole Diameter, in.	0.74	0.78	0.75	0.68	0.67	0.69	0.73					0.72
Total Depth, in.	4.65	5.25	4.85	4.75	4.25	4.25	4.85					4.67
Burr Height, in.	0.04	0.05	0.04	0.05	0.04	0.04	0.03					0.04

Remarks Tested with 80-RDX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 5.70 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity          % Shot No.          No. 1          No. 2          No. 3          No. 4          No. 5          No. 6          Average           
 Date of Beria Test          Faceplate Hole Diameter, Short Axis, in.           
 Faceplate Hole Diameter, Long Axis, in.           
 Average Faceplate Hole Diameter, in.           
 Total Depth, in.         

**CERTIFICATION**

Type of Certification: X Self          Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

X CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
         RECERTIFIED (Company Officer) (Title) (Date) (Company) (Address)  
         PRELIMINARY

2-3/4" EXP @ 6 SPF 60° with CHARGE 2-3/4" 15 Gm RDX BH EXP BountyHunter® P/N FLO-2715-310B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 12 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" EXP H.D. Gun, 12 SPF 135°/45° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-1/8" 12 Gm HMX SDP GUNSLINGER® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3112-421T Date of Manufacture 03/21/2005 Shot Density Tested 12 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 135/45 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained in carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5" OD, Weight 15 lb/ft, L-80 API Grade, Date of Concrete Test 03/23/2005  
 Target Data 48" OD, Briquet Compressive Strength 9,960 psi, Age of Target 12 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12	
Clearance, in. -----	0.00	1.05	0.55	0.14	1.29	0.14	0.55	1.05					
Casing Hole Diameter, Short Axis, in. . . . .	0.36	0.24	0.33	0.40	0.22	0.38	0.31	0.22					
Casing Hole Diameter, Long Axis, in. . . . .	0.37	0.24	0.34	0.40	0.22	0.40	0.31	0.25					
Average Casing Hole Diameter, in. . . . .	0.37	0.24	0.34	0.40	0.22	0.39	0.31	0.24					
Total Depth, in. -----	21.30	22.80	19.68	16.55	19.93	18.30	18.05	21.93					
Burr Height, in. -----	0.05	0.08	0.07	0.03	0.09	0.08	0.05	0.05					
Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----													XXXXXXX
Casing Hole Diameter, Short Axis, in. . . . .													0.31
Casing Hole Diameter, Long Axis, in. . . . .													0.32
Average Casing Hole Diameter, in. . . . .													0.31
Total Depth, in. -----													19.82
Burr Height, in. -----													0.06

Remarks 80-HMX-XHV detonating cord. Shots #1 & #2 perforated thru target; actual penetration may be greater. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000 psi) = 23.61

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. ----- \_\_\_\_\_

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ V.P. Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED \_\_\_\_\_  
X PRELIMINARY \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)

3-1/8" EXP H.D. @ 12 SPF 135°/45° with CHARGE 3-1/8" 12 Gm HMX SDP GUNSLINGER® P/N EXP-3112-421T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 19.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" EEG GUN, 4 SPF 90° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 19 Gm RDX SDP Prospector® Maximum Pressure Rating 7,500 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3319-322T Date of Manufacture 03/04/2004 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Steel Carrier, Reusable (HC, R) Recommended Minimum ID for Running 3.58 inches  
 Phasing Tested 90 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. Must be shot under fluid. See Titan GunFacts™ sheet for system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 04/20/2004  
 Target Data 108" OD, Briquet Compressive Strength 6040 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.39	0.88	0.39	0.00	0.39	0.88	0.39	0.00	0.39	0.88	0.39
Casing Hole Diameter, Short Axis, in. ---	0.36	0.36	0.45	0.39	0.38	0.38	0.45	0.35	0.36	0.40	0.41	0.36
Casing Hole Diameter, Long Axis, in. ---	0.37	0.38	0.45	0.41	0.38	0.39	0.45	0.37	0.36	0.42	0.44	0.38
Average Casing Hole Diameter, in. -----	0.37	0.37	0.45	0.40	0.38	0.39	0.45	0.36	0.36	0.41	0.43	0.37
Total Depth, in. -----	44.50	41.00	36.25	36.50	45.25	41.25	40.25	41.63	34.25	39.75	39.25	35.00
Burr Height, in. -----	0.05	0.05	0.06	0.04	0.05	0.05	0.07	0.06	0.04	0.05	0.06	0.05

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.39	0.88	0.39	-----	-----	-----	-----	-----	-----	-----	-----	XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.37	0.40	0.42	0.40	-----	-----	-----	-----	-----	-----	-----	-----	0.39
Casing Hole Diameter, Long Axis, in. ---	0.39	0.41	0.43	0.40	-----	-----	-----	-----	-----	-----	-----	-----	0.40
Average Casing Hole Diameter, in. -----	0.38	0.41	0.43	0.40	-----	-----	-----	-----	-----	-----	-----	-----	0.40
Total Depth, in. -----	32.75	34.25	36.50	43.50	-----	-----	-----	-----	-----	-----	-----	-----	38.87
Burr Height, in. -----	0.05	0.05	0.07	0.06	-----	-----	-----	-----	-----	-----	-----	-----	0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 40.32

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-1/8" EEG @ 4 SPF 90° with CHARGE 3-3/8" 19 Gm RDX SDP Prospector® P/N EXP-3319-322T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 22.7 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" EXPENDABLE GUN, 6 SPF 60° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3 3/8" 22.7 Gm HMX DP Prospector® Maximum Pressure Rating 22,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3323-401T Date of Manufacture 4/28/99 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.58 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Also available in 4 SPF 90 degree phasing. Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 8/12/99  
 Target Data 72" OD, Briquet Compressive Strength 10,920 psi, Age of Target 32 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	
Clearance, in.	0.18	0.62	0.87	0.62	0.18	0.00						
Casing Hole Diameter, Short Axis, in.	0.42	0.41	0.41	0.44	0.46	0.40						
Casing Hole Diameter, Long Axis, in.	0.45	0.42	0.46	0.46	0.46	0.40						
Average Casing Hole Diameter, in.	0.44	0.42	0.44	0.45	0.46	0.40						
Total Depth, in.	24.25	28.25	22.75	21.25	24.00	20.75						
Burr Height, in.	0.06	0.05	0.06	0.07	0.05	0.08						
Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.												XXXXXXX
Casing Hole Diameter, Short Axis, in.												0.42
Casing Hole Diameter, Long Axis, in.												0.44
Average Casing Hole Diameter, in.												0.43
Total Depth, in.												23.54
Burr Height, in.												0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 29.01 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party \_\_\_\_\_

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED \_\_\_\_\_  
 PRELIMINARY (Company Officer) (Title) (Date) (Company) (Address)

3-1/8" EXP @ 6 SPF 60° with CHARGE 3-3/8" 22.7 Gm HMX DP Prospector® EXP-3323-401T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 22.7 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" EXPENDABLE GUN, 6 SPF 60° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3 3/8" 22.7 Gm HMX SDP Gunslinger® Maximum Pressure Rating 22,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3323-422T Date of Manufacture 02/28/2003 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.58 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Also available in 4 SPF 90 degree phasing. Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 04/02/2003  
 Target Data 90" OD, Briquet Compressive Strength 7,540 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.62	0.88	0.62	0.18	0.00	0.18	0.62	0.88	0.62	0.18	0.00
Casing Hole Diameter, Short Axis, in.	0.42	0.40	0.39	0.43	0.43	0.42	0.43	0.41	0.40	0.41	0.42
Casing Hole Diameter, Long Axis, in.	0.42	0.41	0.40	0.43	0.44	0.44	0.44	0.42	0.43	0.41	0.44
Average Casing Hole Diameter, in.	0.42	0.41	0.40	0.43	0.44	0.43	0.44	0.42	0.42	0.41	0.43
Total Depth, in.	33.75	36.50	30.75	35.75	35.38	31.75	37.75	31.25	38.50	40.00	33.25
Burr Height, in.	0.05	0.05	0.07	0.07	0.06	0.04	0.05	0.07	0.05	0.06	0.04

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.18	0.62	0.88	0.62	0.18							XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.41	0.39	0.43	0.41	0.38							0.41
Casing Hole Diameter, Long Axis, in.	0.41	0.39	0.43	0.41	0.41							0.42
Average Casing Hole Diameter, in.	0.41	0.39	0.43	0.41	0.40							0.42
Total Depth, in.	LOST	38.50	35.25	32.25	35.88							35.10
Burr Height, in.	0.06	0.05	0.06	0.05	0.05							0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 38.39 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) (Title) (Date) (Company) (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-1/8" EXP @ 6 SPF 60° with CHARGE 3-3/8" 22.7 Gm HMX SDP Gunslinger® EXP-3323-422T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 12.0 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" EXP H.D. GUN, 12 SPF 140°/20° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-1/8" 12 Gm HMX BH Maximum Pressure Rating 20,000 psi, Carrier Material H. T. Steel  
 Manufacturer Charge Part No. FLO-3112-410B Date of Manufacture 06/05/2001 Shot Density Tested 12 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.58 inches  
 Phasing Tested 140/20 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained In Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5" OD, Weight 15 lb/ft, L-80 API Grade, Date of Concrete Test 07/24/2001  
 Target Data 30" OD, Briquet Compressive Strength 6,850 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	1.09	0.44	0.25	1.23	0.03	0.89	0.66	0.11	1.28	0.11
Casing Hole Diameter, Short Axis, in.	0.58	0.60	0.62	0.60	0.53	0.56	0.56	0.54	0.57	0.52	0.54
Casing Hole Diameter, Long Axis, in.	0.62	0.60	0.66	0.60	0.57	0.60	0.62	0.56	0.65	0.60	0.62
Average Casing Hole Diameter, in.	0.60	0.60	0.64	0.60	0.55	0.58	0.60	0.55	0.61	0.56	0.58
Total Depth, in.	6.80	6.05	6.80	5.55	4.80	6.05	5.30	5.80	5.05	5.68	5.93
Burr Height, in.	0.05	0.06	0.07	0.05	0.08	0.06	0.07	0.08	0.05	0.09	0.09

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.66	0.89	0.03	1.23	0.25	0.44	1.09					XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.58	0.57	0.60	0.57	0.58	0.65	0.60					0.58
Casing Hole Diameter, Long Axis, in.	0.64	0.59	0.66	0.63	0.62	0.69	0.64					0.62
Average Casing Hole Diameter, in.	0.61	0.58	0.63	0.60	0.60	0.67	0.62					0.60
Total Depth, in.	5.55	5.55	5.43	5.78	6.55	5.18	5.30					5.73
Burr Height, in.	0.07	0.07	0.06	0.07	0.08	0.06	0.07					0.07

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 6.12 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity _____ %	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Date of Beria Test _____	Faceplate Hole Diameter, Short Axis, in. _____	_____	_____	_____	_____	_____	_____	_____
	Faceplate Hole Diameter, Long Axis, in. _____	_____	_____	_____	_____	_____	_____	_____
	Average Faceplate Hole Diameter, in. _____	_____	_____	_____	_____	_____	_____	_____
	Total Depth, in. _____	_____	_____	_____	_____	_____	_____	_____

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

____ CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<u>X</u> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
____ PRELIMINARY					

3-1/8" EXP H.D. @ 12 SPF 140°/20° with CHARGE 3-1/8" 12 Gm BH P/N FLO-3112-410B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 11.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" PORT PLUG GUN, 4 SPF 120° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-1/8" 11 Gm RDX DP Prospector® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. PPG-3111-301 Date of Manufacture 4/18/2001 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Reusable (HC, R) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 120 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Same as Part No. PPG-3111-300. Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 5/22/2001  
 Target Data 60" OD, Briquet Compressive Strength 6,120 psi, Age of Target 29 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.62	0.62	0.00	0.62	0.62	0.00	0.62	0.62	0.00	0.62
Casing Hole Diameter, Short Axis, in.	0.26	0.40	0.39	0.26	0.40	0.40	0.25	0.39	0.38	0.28	0.40
Casing Hole Diameter, Long Axis, in.	0.29	0.40	0.39	0.28	0.41	0.41	0.28	0.39	0.39	0.29	0.41
Average Casing Hole Diameter, in.	0.28	0.40	0.39	0.27	0.41	0.41	0.27	0.39	0.39	0.29	0.41
Total Depth, in.	19.25	15.63	18.25	14.25	14.25	17.00	18.50	15.75	16.75	18.00	16.75
Burr Height, in.	0.04	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.05	0.04	0.06

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.62											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.37											0.35
Casing Hole Diameter, Long Axis, in.	0.39											0.36
Average Casing Hole Diameter, in.	0.38											0.36
Total Depth, in.	17.50											16.82
Burr Height, in.	0.05											0.05

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 17.50 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY

3-1/8" PPG @ 4 SPF 120° with CHARGE 3-1/8" 11 Gm DP Prospector® P/N PPG-3111-301

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 11.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" PPG GUN, 4 SPF 120° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-1/8" 11 Gm RDX BH Prospector® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. PPG-3111-311 Date of Manufacture 07/02/2004 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Steel Carrier, Reusable (HC, R) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 120 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 08/04/2004  
 Target Data 48" OD, Briquet Compressive Strength 5780 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12	
Clearance, in. -----	0.25	0.52	0.52	0.25	0.52	0.52	0.25	0.52	0.52	0.25	0.52	0.52	
Casing Hole Diameter, Short Axis, in. . .	0.51	0.48	0.56	0.61	0.52	0.52	0.56	0.51	0.50	0.52	0.49	0.54	
Casing Hole Diameter, Long Axis, in. . .	0.55	0.52	0.58	0.63	0.56	0.54	0.59	0.53	0.52	0.56	0.51	0.54	
Average Casing Hole Diameter, in. . . .	0.53	0.50	0.57	0.62	0.54	0.53	0.58	0.52	0.51	0.54	0.50	0.54	
Total Depth, in. -----	21.00	15.88	14.75	16.38	18.00	14.63	17.50	12.63	14.00	15.88	11.75	16.13	
Burr Height, in. -----	0.05	0.05	0.07	0.06	0.05	0.06	0.04	0.07	0.05	0.05	0.07	0.05	
Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----													XXXXXXX
Casing Hole Diameter, Short Axis, in. . .													0.53
Casing Hole Diameter, Long Axis, in. . .													0.55
Average Casing Hole Diameter, in. . . .													0.54
Total Depth, in. -----													15.71
Burr Height, in. -----													0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 16.15

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-1/8" PPG @ 4 SPF 120° with CHARGE 3-1/8" 11 Gm RDX BH PROSPECTOR® P/N PPG-3111-311

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 11.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" PORT PLUG GUN, 4 SPF 120° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-1/8" 11 Gm RDX SDP Prospector® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. PPG-3111-321 Date of Manufacture 4/28/99 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Reusable (HC, R) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 120 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Same as PPG-3111-300. Also available in 90 degree phasing. Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 9/10/99  
 Target Data 60" OD, Briquet Compressive Strength 7,380 psi, Age of Target 31 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.62	0.62	0.00	0.62	0.62	0.00	0.62	0.62	0.00	0.62
Casing Hole Diameter, Short Axis, in.	0.33	0.24	0.22	0.33	0.25	0.23	0.33	0.22	0.23	0.31	0.24
Casing Hole Diameter, Long Axis, in.	0.34	0.25	0.23	0.34	0.25	0.25	0.33	0.24	0.23	0.31	0.24
Average Casing Hole Diameter, in.	0.34	0.25	0.23	0.34	0.25	0.24	0.33	0.23	0.23	0.31	0.24
Total Depth, in.	20.50	15.75	16.25	19.13	16.00	17.00	20.00	16.44	16.63	20.75	15.50
Burr Height, in.	0.04	0.06	0.03	0.05	0.05	0.03	0.04	0.05	0.07	0.06	0.07

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.62											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.22											0.26
Casing Hole Diameter, Long Axis, in.	0.22											0.27
Average Casing Hole Diameter, in.	0.22											0.27
Total Depth, in.	16.50											17.54
Burr Height, in.	0.05											0.05

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 19.08 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-1/8" PPG @ 4 SPF 120° with CHARGE 3-1/8" 11 Gm RDX SDP Prospector® P/N PPG-3111-321

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 12.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" PORT PLUG GUN, 4 SPF 120° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-1/8" 12 Gm RDX SDP Prospector® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. PPG-3112-321T Date of Manufacture 4/18/2001 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Reusable (HC, R) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 120 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Same as Part No. PPG-3112-320T. Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 5/22/2001  
 Target Data 60" OD, Briquet Compressive Strength 6,740 psi, Age of Target 29 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.62	0.62	0.00	0.62	0.62	0.00	0.62	0.62	0.00	0.62
Casing Hole Diameter, Short Axis, in.	0.32	0.34	0.33	0.32	0.30	0.36	0.37	0.27	0.35	0.36	0.23
Casing Hole Diameter, Long Axis, in.	0.33	0.35	0.35	0.37	0.31	0.39	0.40	0.28	0.36	0.37	0.27
Average Casing Hole Diameter, in.	0.33	0.35	0.34	0.35	0.31	0.38	0.39	0.28	0.36	0.37	0.25
Total Depth, in.	23.00	23.25	20.88	22.25	21.88	23.63	21.88	22.63	22.63	22.38	Lost
Burr Height, in.	0.04	0.04	0.05	0.03	0.04	0.05	0.04	0.05	0.05	0.03	0.06

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.62											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.32											0.33
Casing Hole Diameter, Long Axis, in.	0.34											0.34
Average Casing Hole Diameter, in.	0.33											0.34
Total Depth, in.	21.50											22.40
Burr Height, in.	0.05											0.05

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 23.82 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-1/8" PPG @ 4 SPF 120° with CHARGE 3-1/8" 12 Gm RDX SDP Prospector® P/N PPG-3112-321T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 11.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" PORT PLUG GUN, 4 SPF 120° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-1/8" 11 Gm RDX GH Outlaw® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. PPG-3111-331 Date of Manufacture 03/19/2003 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Reusable (HC, R) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 120 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 04/23/2003  
 Target Data 60" OD, Briquet Compressive Strength 8,595 psi, Age of Target 31 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.62	0.62	0.00	0.62	0.62	0.00	0.62	0.62	0.00	0.62
Casing Hole Diameter, Short Axis, in.	0.38	0.40	0.46	0.38	0.39	0.40	0.40	0.40	0.41	0.38	0.41
Casing Hole Diameter, Long Axis, in.	0.42	0.41	0.47	0.39	0.40	0.44	0.41	0.42	0.42	0.39	0.42
Average Casing Hole Diameter, in.	0.40	0.41	0.47	0.39	0.40	0.42	0.41	0.41	0.42	0.39	0.42
Total Depth, in.	15.75	20.00	17.25	18.75	21.75	16.25	21.00	19.00	20.25	19.00	18.50
Burr Height, in.	0.05	0.06	0.05	0.05	0.04	0.05	0.04	0.06	0.06	0.05	0.07

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.62											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.43											0.40
Casing Hole Diameter, Long Axis, in.	0.45											0.42
Average Casing Hole Diameter, in.	0.44											0.41
Total Depth, in.	22.25											19.15
Burr Height, in.	0.05											0.05

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000 psi) = 21.74 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED \_\_\_\_\_  
 PRELIMINARY (Company Officer) (Title) (Date) (Company) (Address)

3-1/8" PPG @ 4 SPF 120° with CHARGE 3-1/8" 11 Gm RDX GH Outlaw® P/N PPG-3111-331

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 15.0 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" EEG Gun, 6 SPF 60° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 2-3/4" 15 Gm HMX SDP Gunslinger® Maximum Pressure Rating 7,500 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-2715-422T Date of Manufacture 09/23/2004 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.58 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. Must be shot under fluid. See Titan GunFacts™ sheet for system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 11/09/2004  
 Target Data 96" OD, Briquet Compressive Strength 5,266 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.18	0.62	0.88	0.62	0.18	0.00	0.18	0.62	0.88	0.62	0.18
Casing Hole Diameter, Short Axis, in. ---	0.36	0.35	0.26	0.34	0.23	0.26	0.39	0.35	0.27	0.34	0.25	0.25
Casing Hole Diameter, Long Axis, in. ---	0.38	0.35	0.30	0.34	0.25	0.26	0.39	0.36	0.28	0.34	0.25	0.26
Average Casing Hole Diameter, in. -----	0.37	0.35	0.28	0.34	0.24	0.26	0.39	0.36	0.28	0.34	0.25	0.26
Total Depth, in. -----	31.50	42.38	24.75	22.00	28.00	31.75	35.38	37.75	35.75	31.88	36.25	32.63
Burr Height, in. -----	0.05	0.05	0.07	0.08	0.06	0.05	0.06	0.06	0.05	0.07	0.06	0.06

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.18	0.62	0.88	0.62	0.18							XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.38	0.34	0.26	0.34	0.23	0.26							0.30
Casing Hole Diameter, Long Axis, in. ---	0.38	0.34	0.26	0.35	0.25	0.27							0.31
Average Casing Hole Diameter, in. -----	0.38	0.34	0.26	0.35	0.24	0.27							0.31
Total Depth, in. -----	35.75	36.25	34.75	23.00	30.25	28.75							32.15
Burr Height, in. -----	0.06	0.04	0.05	0.05	0.07	0.06							0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000 psi) = 32.45

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. ----- \_\_\_\_\_

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-1/8" EEG @ 6 SPF 60° with CHARGE 2-3/4" 15 Gm HMX SDP Gunslinger® P/N EXP-2715-422T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 19.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" EEG GUN, 4 SPF 90° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 19 Gm RDX SDP Prospector® Maximum Pressure Rating 7,500 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3319-322T Date of Manufacture 03/04/2004 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.58 inches  
 Phasing Tested 90 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. Must be shot under fluid. See Titan GunFacts™ sheet for system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 04/20/2004  
 Target Data 108" OD, Briquet Compressive Strength 6040 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.39	0.88	0.39	0.00	0.39	0.88	0.39	0.00	0.39	0.88	0.39
Casing Hole Diameter, Short Axis, in. ---	0.36	0.36	0.45	0.39	0.38	0.38	0.45	0.35	0.36	0.40	0.41	0.36
Casing Hole Diameter, Long Axis, in. ---	0.37	0.38	0.45	0.41	0.38	0.39	0.45	0.37	0.36	0.42	0.44	0.38
Average Casing Hole Diameter, in. -----	0.37	0.37	0.45	0.40	0.38	0.39	0.45	0.36	0.36	0.41	0.43	0.37
Total Depth, in. -----	44.50	41.00	36.25	36.50	45.25	41.25	40.25	41.63	34.25	39.75	39.25	35.00
Burr Height, in. -----	0.05	0.05	0.06	0.04	0.05	0.05	0.07	0.06	0.04	0.05	0.06	0.05

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.39	0.88	0.39	-----	-----	-----	-----	-----	-----	-----	-----	XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.37	0.40	0.42	0.40	-----	-----	-----	-----	-----	-----	-----	-----	0.39
Casing Hole Diameter, Long Axis, in. ---	0.39	0.41	0.43	0.40	-----	-----	-----	-----	-----	-----	-----	-----	0.40
Average Casing Hole Diameter, in. -----	0.38	0.41	0.43	0.40	-----	-----	-----	-----	-----	-----	-----	-----	0.40
Total Depth, in. -----	32.75	34.25	36.50	43.50	-----	-----	-----	-----	-----	-----	-----	-----	38.87
Burr Height, in. -----	0.05	0.05	0.07	0.06	-----	-----	-----	-----	-----	-----	-----	-----	0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 40.32

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-1/8" EEG @ 4 SPF 90° with CHARGE 3-3/8" 19 Gm RDX SDP Prospector® P/N EXP-3319-322T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 19.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-1/8" EEG GUN, 4 SPF 60° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 19 Gm RDX GH Outlaw® Maximum Pressure Rating 7,500 psi, Carrier Material H. T. Steel  
 Manufacturer Charge Part No. EXP-3319-331 Date of Manufacture 07/12/2001 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.58 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained In Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 07/24/2001  
 Target Data 56" OD, Briquet Compressive Strength 6,710 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.18	0.62	0.88	0.62	0.18	0.00	0.18	0.62	0.88	0.62
Casing Hole Diameter, Short Axis, in.	0.59	0.60	0.45	0.39	0.40	0.57	0.56	0.54	0.39	0.34	0.40
Casing Hole Diameter, Long Axis, in.	0.61	0.61	0.46	0.40	0.40	0.58	0.58	0.54	0.41	0.40	0.44
Average Casing Hole Diameter, in.	0.60	0.61	0.46	0.40	0.40	0.58	0.57	0.54	0.40	0.37	0.42
Total Depth, in.	21.75	20.75	22.25	22.25	21.25	23.25	21.50	21.00	22.75	21.75	21.00
Burr Height, in.	0.05	0.07	0.07	0.06	0.04	0.05	0.05	0.07	0.06	0.08	0.07

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.18											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.54											0.48
Casing Hole Diameter, Long Axis, in.	0.56											0.50
Average Casing Hole Diameter, in.	0.55											0.49
Total Depth, in.	23.50											21.92
Burr Height, in.	0.06											0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 23.29 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED \_\_\_\_\_  
 PRELIMINARY (Company Officer) (Title) (Date) (Company) (Address)

3-1/8" EEG @ 4 SPF 60° with CHARGE 3-3/8" 19 Gm RDX GH Outlaw® P/N EXP-3319-331

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 19.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-3/8" Expendable, 6 SPF 60 Deg Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 19 Gm RDX DP EXP Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3319-302 Date of Manufacture 08/26/2006 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 09/27/2006  
 Target Data 66 OD, Briquet Compressive Strength 5410 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45	0.14
Casing Hole Diameter, Short Axis, in. ---	0.38	0.41	0.40	0.40	0.42	0.41	0.41	0.39	0.38	0.38	0.40	0.41
Casing Hole Diameter, Long Axis, in. ---	0.38	0.42	0.41	0.40	0.43	0.42	0.42	0.41	0.40	0.41	0.41	0.42
Average Casing Hole Diameter, in. -----	0.38	0.42	0.41	0.40	0.43	0.42	0.42	0.40	0.39	0.40	0.41	0.42
Total Depth, in. -----	20.25	23.00	21.63	21.88	20.00	24.25	21.25	21.63	21.13	20.13	22.75	21.75
Burr Height, in. -----	0.05	0.06	0.07	0.06	0.05	0.04	0.05	0.06	0.05	0.07	0.05	0.04

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45	0.14	XXXXX
Casing Hole Diameter, Short Axis, in. ---	0.42	0.42	0.38	0.39	0.39	0.43	0.42	0.40	0.36	0.37	0.41	0.42	0.40
Casing Hole Diameter, Long Axis, in. ---	0.43	0.42	0.39	0.40	0.42	0.43	0.43	0.40	0.37	0.40	0.43	0.45	0.41
Average Casing Hole Diameter, in. -----	0.43	0.42	0.39	0.40	0.41	0.43	0.43	0.40	0.37	0.39	0.42	0.44	0.41
Total Depth, in. -----	23.00	24.25	21.00	22.00	25.25	23.88	20.75	24.25	21.25	22.38	20.75	20.50	22.04
Burr Height, in. -----	0.05	0.07	0.06	0.06	0.05	0.06	0.04	0.07	0.05	0.07	0.05	0.05	0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 22.36

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-3/8" EXP @ 6 SPF 60° with CHARGE 3-3/8" 19 Gm RDX DP EXP P/N EXP-3319-302

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 22.7 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-3/8" Expendable, 6 SPF 60 Deg Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 22.7 Gm RDX DP EXP Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3323-302 Date of Manufacture 08/26/2006 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 09/27/2006  
 Target Data 60 OD, Briquet Compressive Strength 6490 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45	0.14
Casing Hole Diameter, Short Axis, in. ---	0.40	0.42	0.43	0.46	0.44	0.44	0.41	0.46	0.44	0.41	0.40	0.44
Casing Hole Diameter, Long Axis, in. ---	0.43	0.44	0.45	0.46	0.45	0.45	0.43	0.48	0.45	0.45	0.48	0.46
Average Casing Hole Diameter, in. -----	0.42	0.43	0.44	0.46	0.45	0.45	0.42	0.47	0.45	0.43	0.44	0.45
Total Depth, in. -----	21.25	19.25	19.75	21.88	19.13	21.50	21.75	20.50	24.25	19.25	22.00	21.38
Burr Height, in. -----	0.06	0.07	0.06	0.08	0.06	0.06	0.07	0.05	0.04	0.09	0.08	0.06

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45	0.14	XXXXX
Casing Hole Diameter, Short Axis, in. ---	0.42	0.45	0.43	0.45	0.39	0.45	0.46	0.42	0.45	0.43	0.46	0.42	0.43
Casing Hole Diameter, Long Axis, in. ---	0.43	0.46	0.43	0.45	0.46	0.46	0.48	0.44	0.47	0.45	0.47	0.44	0.45
Average Casing Hole Diameter, in. -----	0.43	0.46	0.43	0.45	0.43	0.46	0.47	0.43	0.46	0.44	0.47	0.43	0.44
Total Depth, in. -----	22.75	19.50	22.38	23.75	18.75	23.25	23.00	18.38	20.25	22.50	23.63	20.00	21.25
Burr Height, in. -----	0.08	0.04	0.05	0.06	0.07	0.06	0.05	0.06	0.05	0.06	0.06	0.05	0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 22.40

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-3/8" EXP @ 6 SPF 60° with CHARGE 3-3/8" 22.7 Gm RDX DP EXP P/N EXP-3323-302

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 22.7 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-3/8" EXP GUN, 6 SPF 60° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 22.7 Gm RDX GH Outlaw® Maximum Pressure Rating 20,000 psi, Carrier Material H. T. Steel  
 Manufacturer Charge Part No. EXP-3323-331 Date of Manufacture 05/29/2001 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained In Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 06/06/2001  
 Target Data 60" OD, Briquet Compressive Strength 6,660 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	
Clearance, in.	0.00	0.14	0.45	0.63	0.45	0.14						
Casing Hole Diameter, Short Axis, in.	0.55	0.54	0.52	0.49	0.54	0.52						
Casing Hole Diameter, Long Axis, in.	0.57	0.54	0.58	0.50	0.56	0.58						
Average Casing Hole Diameter, in.	0.56	0.54	0.55	0.50	0.55	0.56						
Total Depth, in.	20.38	20.75	21.25	20.50	19.50	21.25						
Burr Height, in.	0.06	0.05	0.07	0.06	0.05	0.04						
Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.												XXXXXXX
Casing Hole Diameter, Short Axis, in.												0.53
Casing Hole Diameter, Long Axis, in.												0.55
Average Casing Hole Diameter, in.												0.54
Total Depth, in.												20.61
Burr Height, in.												0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 21.85 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity	%	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Faceplate Hole Diameter, Short Axis, in.									
Faceplate Hole Diameter, Long Axis, in.									
Average Faceplate Hole Diameter, in.									
Total Depth, in.									

**CERTIFICATION**

Type of Certification:  Self  Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED  
 PRELIMINARY (Company Officer) (Title) (Date) (Company) (Address)

3-3/8" EXP @ 6 SPF 60° with CHARGE 3-3/8" 22.7 Gm RDX GH Outlaw® P/N EXP-3323-331

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 22.7 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 3 3/8" EXPENDABLE, 6 SPF 60° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3 3/8" 22.7 Gm HMX SDP Gunslinger® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3323-422T Date of Manufacture 4/04/2001 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 5/22/2001  
 Target Data 120" OD, Briquet Compressive Strength 6,880 psi, Age of Target 29 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45
Casing Hole Diameter, Short Axis, in.	0.38	0.41	0.40	0.41	0.46	0.43	0.39	0.44	0.45	0.44	0.43
Casing Hole Diameter, Long Axis, in.	0.41	0.41	0.40	0.41	0.46	0.43	0.39	0.46	0.45	0.44	0.44
Average Casing Hole Diameter, in.	0.40	0.41	0.40	0.41	0.46	0.43	0.39	0.45	0.45	0.44	0.44
Total Depth, in.	33.75	36.75	36.50	34.25	39.25	36.75	33.25	34.88	36.13	39.00	33.25
Burr Height, in.	0.04	0.05	0.06	0.07	0.05	0.04	0.03	0.05	0.06	0.07	0.04

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.14	0.00	0.14	0.45	0.63	0.45	0.14					XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.43	0.40	0.41	0.45	0.42	0.43	0.40					0.42
Casing Hole Diameter, Long Axis, in.	0.44	0.40	0.42	0.46	0.44	0.43	0.40					0.43
Average Casing Hole Diameter, in.	0.44	0.40	0.42	0.46	0.43	0.43	0.40					0.43
Total Depth, in.	37.75	37.38	42.25	41.88	36.75	38.75	37.75					37.02
Burr Height, in.	0.05	0.06	0.05	0.08	0.06	0.05	0.05					0.05

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 39.56 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-3/8" EXP @ 6 SPF 60° with CHARGE 3-3/8" 22.7 Gm HMX SDP Gunslinger® P/N EXP-3323-422T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 22.7 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 3-3/8" EXP GUN, 6 SPF 60° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 22.7 Gm HMX DP Prospector® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3323-461T Date of Manufacture 03/02/2004 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 4/20/2004  
 Target Data 108" OD, Briquet Compressive Strength 7670 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45	0.14
Casing Hole Diameter, Short Axis, in. ---	0.39	0.35	0.35	0.35	0.36	0.35	0.38	0.36	0.33	0.34	0.36	0.33
Casing Hole Diameter, Long Axis, in. ---	0.39	0.36	0.35	0.36	0.38	0.36	0.38	0.38	0.36	0.36	0.37	0.34
Average Casing Hole Diameter, in. -----	0.39	0.36	0.35	0.36	0.37	0.36	0.38	0.37	0.35	0.35	0.37	0.34
Total Depth, in. -----	36.75	41.00	36.75	36.38	30.88	36.00	39.25	43.75	32.75	28.25	38.13	27.00
Burr Height, in. -----	0.04	0.05	0.06	0.06	0.05	0.06	0.05	0.07	0.05	0.06	0.04	0.05

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.14	0.45	0.63	0.45	0.14							XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.39	0.36	0.34	0.34	0.36	0.35							0.36
Casing Hole Diameter, Long Axis, in. ---	0.39	0.36	0.35	0.35	0.37	0.35							0.36
Average Casing Hole Diameter, in. -----	0.39	0.36	0.35	0.35	0.37	0.35							0.36
Total Depth, in. -----	32.25	38.75	34.38	36.63	35.50	37.00							35.63
Burr Height, in. -----	0.06	0.05	0.06	0.06	0.07	0.05							0.06

Remarks Tested with 80-HMX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 39.15

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_  
 RECERTIFIED G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ PRELIMINARY (Company Officer) (Title) (Date) (Company) (Address)

3-3/8" EXP @ 6 SPF 60° with CHARGE 3-3/8" 22.7 Gm HMX DP Prospector® P/N EXP-3323-461T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 25 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-3/8" EXP GUN, 6 SPF 60° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 25 Gm RDX GH Outlaw® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3325-331 Date of Manufacture 05/18/2004 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 08/04/2004  
 Target Data 84" OD, Briquet Compressive Strength 5890 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45	0.14
Casing Hole Diameter, Short Axis, in. ---	0.54	0.58	0.57	0.58	0.55	0.52	0.52	0.58	0.55	0.57	0.57	0.53
Casing Hole Diameter, Long Axis, in. ---	0.55	0.59	0.60	0.59	0.56	0.54	0.54	0.59	0.57	0.59	0.59	0.55
Average Casing Hole Diameter, in. -----	0.55	0.59	0.59	0.59	0.56	0.53	0.53	0.59	0.56	0.58	0.58	0.54
Total Depth, in. -----	34.55	23.75	35.15	27.05	25.05	33.95	30.85	30.15	33.25	25.05	27.15	32.15
Burr Height, in. -----	0.06	0.05	0.07	0.06	0.05	0.05	0.06	0.04	0.07	0.08	0.05	0.05

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.14	0.45	0.63	-----	-----	-----	-----	-----	-----	-----	-----	XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.54	0.59	0.58	0.54	-----	-----	-----	-----	-----	-----	-----	-----	0.56
Casing Hole Diameter, Long Axis, in. ---	0.56	0.60	0.59	0.59	-----	-----	-----	-----	-----	-----	-----	-----	0.57
Average Casing Hole Diameter, in. -----	0.55	0.60	0.59	0.57	-----	-----	-----	-----	-----	-----	-----	-----	0.57
Total Depth, in. -----	34.25	32.05	24.05	31.25	-----	-----	-----	-----	-----	-----	-----	-----	29.81
Burr Height, in. -----	0.07	0.05	0.05	0.06	-----	-----	-----	-----	-----	-----	-----	-----	0.06

Remarks Tested with 80-RDX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 30.76

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-3/8" EXP @ 6 SPF 60° with CHARGE 3-3/8" 25 Gm RDX GH Outlaw® P/N EXP-3325-331

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 25 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 3-3/8" EXP GUN, 6 SPF 60° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 25 Gm HMX SDP Gunslinger® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3325-421T Date of Manufacture 04/14/2004 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. Note: Fits Titan Gun Kits Series 0365-1A00-066 (Wireline) and 0403-1A00-066 (TCP) only.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 5/25/2004  
 Target Data 120" OD, Briquet Compressive Strength 6405 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45	0.14	0.00
Casing Hole Diameter, Short Axis, in. ---	0.40	0.41	0.44	0.40	0.39	0.45	0.40	0.39	0.42	0.41	0.40	0.40
Casing Hole Diameter, Long Axis, in. ---	0.40	0.42	0.46	0.40	0.41	0.47	0.40	0.40	0.44	0.42	0.41	0.40
Average Casing Hole Diameter, in. -----	0.40	0.42	0.45	0.40	0.40	0.46	0.40	0.40	0.43	0.42	0.41	0.40
Total Depth, in. -----	46.25	49.25	52.25	46.25	43.50	46.35	41.50	48.00	42.50	49.00	52.25	47.25
Burr Height, in. -----	0.05	0.05	0.07	0.06	0.06	0.04	0.06	0.07	0.07	0.06	0.04	0.05

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45			XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.40	0.40	0.43	0.40	0.40	0.39	0.43	0.39	0.43	0.41			0.41
Casing Hole Diameter, Long Axis, in. ---	0.40	0.42	0.44	0.42	0.40	0.40	0.45	0.40	0.45	0.44			0.42
Average Casing Hole Diameter, in. -----	0.40	0.41	0.44	0.41	0.40	0.40	0.44	0.40	0.44	0.43			0.42
Total Depth, in. -----	44.13	52.75	53.75	45.63	45.63	50.75	39.25	42.35	53.75	49.50			47.36
Burr Height, in. -----	0.07	0.05	0.06	0.06	0.07	0.05	0.05	0.06	0.06	0.04			0.06

Remarks Shot #1 at 60° phase. Tested with 80-HMX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 49.77

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-3/8" EXP @ 6 SPF 60° with CHARGE 3-3/8" 25 Gm HMX SDP Gunslinger® P/N EXP-3325-421T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 12.0 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 3-3/8" EXP H.D. GUN, 12 SPF 140°/20° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-1/8" 12 Gm HMX BH Maximum Pressure Rating 20,000 psi, Carrier Material H. T. Steel  
 Manufacturer Charge Part No. FLO-3112-410B Date of Manufacture 06/05/2001 Shot Density Tested 12 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 140/20 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained In Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17 lb/ft, L-80 API Grade, Date of Concrete Test 07/24/2001  
 Target Data 30" OD, Briquet Compressive Strength 6,510 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	1.29	0.51	0.29	1.46	0.03	1.05	0.77	0.13	1.52	0.13
Casing Hole Diameter, Short Axis, in.	0.63	0.65	0.60	0.60	0.57	0.63	0.62	0.56	0.61	0.61	0.62
Casing Hole Diameter, Long Axis, in.	0.65	0.65	0.64	0.62	0.65	0.67	0.66	0.60	0.63	0.61	0.64
Average Casing Hole Diameter, in.	0.64	0.65	0.62	0.61	0.61	0.65	0.64	0.58	0.62	0.61	0.63
Total Depth, in.	5.55	6.30	5.18	6.80	5.05	5.55	6.55	4.92	6.30	6.43	5.92
Burr Height, in.	0.06	0.08	0.07	0.05	0.09	0.04	0.07	0.08	0.06	0.06	0.07

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.77	1.05	0.03	1.46	0.29	0.51	1.29					XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.54	0.56	0.61	0.50	0.61	0.55	0.65					0.60
Casing Hole Diameter, Long Axis, in.	0.62	0.58	0.65	0.52	0.65	0.65	0.65					0.63
Average Casing Hole Diameter, in.	0.58	0.57	0.63	0.51	0.63	0.60	0.65					0.61
Total Depth, in.	6.05	5.55	5.74	5.80	6.61	6.05	5.68					5.89
Burr Height, in.	0.09	0.07	0.05	0.07	0.08	0.09	0.06					0.07

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 6.21 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-3/8" EXP H.D. @ 12 SPF 140°/20° with CHARGE 3-1/8" 12 Gm HMX BH P/N FLO-3112-410B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 22.7 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3-3/8" EXP, 6 SPF 60° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 22.7 Gm RDX BH EXP Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-3323-310B Date of Manufacture 09/30/2000 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC,E) Recommended Minimum ID for Running 3.8 inches  
 Phasing Tested 60° degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4-1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 11/07/2000  
 Target Data 48" OD, Briquet Compressive Strength 7,880 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45	0.14	0.00
Casing Hole Diameter, Short Axis, in. -----	0.76	0.66	0.60	0.72	0.66	0.65	0.72	0.68	0.61	0.68	0.66	0.70
Casing Hole Diameter, Long Axis, in. -----	0.82	0.74	0.64	0.72	0.75	0.74	0.72	0.73	0.67	0.70	0.69	0.73
Average Casing Hole Diameter, in. -----	0.79	0.70	0.62	0.72	0.71	0.70	0.72	0.71	0.64	0.69	0.68	0.72
Total Depth, in. -----	6.50	6.25	5.50	6.00	6.00	5.75	6.13	6.50	6.75	6.13	5.75	5.88
Burr Height, in. -----	0.05	0.07	0.06	0.07	0.05	0.04	0.05	0.07	0.06	0.07	0.04	0.05

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45	0.14	0.00	XXXXX
Casing Hole Diameter, Short Axis, in. -----	0.68	0.64	0.67	0.70	0.69	0.74	0.68	0.68	0.64	0.67	0.69	0.73	0.68
Casing Hole Diameter, Long Axis, in. -----	0.73	0.65	0.68	0.77	0.75	0.76	0.72	0.68	0.66	0.69	0.73	0.75	0.72
Average Casing Hole Diameter, in. -----	0.71	0.65	0.68	0.74	0.72	0.75	0.70	0.68	0.65	0.68	0.71	0.74	0.70
Total Depth, in. -----	6.43	7.00	6.00	5.38	5.63	5.50	6.13	6.63	7.38	6.13	6.63	6.25	6.18
Burr Height, in. -----	0.07	0.05	0.05	0.08	0.06	0.04	0.05	0.07	0.06	0.06	0.05	0.06	0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 6.84 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

3-3/8" EXP @ 6 SPF 60° with CHARGE 3-3/8" 22.7 Gm RDX BH EXP P/N FLO-3323-310B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 26.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 3 3/8" 6 or 4 SPF BH Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3 3/8" 26 Gm RDX BH EXP BountyHunter® Maximum Pressure Rating 25,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-3326-310B Date of Manufacture 6/6/97 Shot Density Tested 6 Shots per foot  
 Gun Type Expendable Hollow Carrier (EHC) Recommended Minimum ID for Running \_\_\_\_\_ inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 4 1/2" OD, Weight 11.6 lb/ft, L-80 API Grade, Date of Concrete Test 8/26/97  
 Target Data 36" OD, Briquet Compressive Strength 5340 psi, Age of Target 44 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.14	0.45	0.63	0.45	0.14	0.00	0.14	0.45	0.63	0.45
Casing Hole Diameter, Short Axis, in.	0.79	0.82	0.68	0.73	0.84	0.78	0.79	0.89	0.94	0.74	0.69
Casing Hole Diameter, Long Axis, in.	0.81	0.84	0.72	0.98	0.94	0.84	0.86	0.89	1.02	0.76	0.76
Average Casing Hole Diameter, in.	0.80	0.83	0.70	0.86	0.89	0.81	0.83	0.89	0.98	0.75	0.73
Total Depth, in.	9.25	10.50	9.75	7.25	10.75	10.25	10.00	9.75	10.25	12.00	12.25
Burr Height, in.	0.07	0.08	0.03	0.06	0.12	0.07	0.08	0.11	0.16	0.03	0.04

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.14	0.00	0.14	0.45	0.63	0.45	0.14	0.00				XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.68	0.64	0.80	0.84	0.80	0.72	0.72	0.74				0.77
Casing Hole Diameter, Long Axis, in.	0.76	0.68	0.82	0.86	0.96	0.78	0.80	0.80				0.84
Average Casing Hole Diameter, in.	0.72	0.66	0.81	0.85	0.88	0.75	0.76	0.77				0.80
Total Depth, in.	11.50	11.25	11.75	9.75	10.00	11.00	10.75	10.25				10.43
Burr Height, in.	0.06	0.01	0.08	0.06	0.07	0.04	0.02	0.03				0.06

Remarks \_\_\_\_\_

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Berea Bulk Porosity _____ %	Faceplate Hole Diameter, Short Axis, in. _____							
Date of Beria Test _____	Faceplate Hole Diameter, Long Axis, in. _____							
	Average Faceplate Hole Diameter, in. _____							
	Total Depth, in. _____							

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

____ CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP- Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<input checked="" type="checkbox"/> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
____ PRELIMINARY					

3-3/8" EXP @ 6 SPF 60° with CHARGE 3-3/8" 26 Gm RDX BH EXP BountyHunter® P/N FLO-3326-310B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 19.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 4" PORT PLUG GUN, 4 SPF 120° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4" 19 Gm RDX PPG w/o sleeve Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. PPG-4019-301 Date of Manufacture 08/25/2006 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Steel Carrier, Reusable (HC, R) Recommended Minimum ID for Running 4.7 inches  
 Phasing Tested 120 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Also available in 90 degree phasing. Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17.0 lb/ft, L-80 API Grade, Date of Concrete Test 09/27/2006  
 Target Data 72" OD, Briquet Compressive Strength 6,690 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.64	0.64	0.00	0.64	0.64	0.00	0.64	0.64	0.00	0.64	0.64
Casing Hole Diameter, Short Axis, in. ---	0.48	0.45	0.43	0.48	0.43	0.42	0.50	0.40	0.46	0.42	0.43	0.46
Casing Hole Diameter, Long Axis, in. ---	0.48	0.47	0.44	0.51	0.43	0.46	0.52	0.42	0.48	0.44	0.44	0.48
Average Casing Hole Diameter, in. -----	0.48	0.46	0.44	0.50	0.43	0.44	0.51	0.41	0.47	0.43	0.44	0.47
Total Depth, in. -----	22.05	28.30	20.55	23.05	23.30	22.18	23.80	25.30	25.18	22.55	26.43	24.93
Burr Height, in. -----	0.06	0.07	0.04	0.05	0.06	0.05	0.04	0.07	0.03	0.05	0.05	0.06

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.64	0.64										XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.50	0.49	0.40										0.45
Casing Hole Diameter, Long Axis, in. ---	0.52	0.49	0.44										0.47
Average Casing Hole Diameter, in. -----	0.51	0.49	0.42										0.46
Total Depth, in. -----	24.30	27.68	25.68										24.35
Burr Height, in. -----	0.04	0.05	0.06										0.05

Remarks Tested with 80 RDX LS detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 25.85

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

4" PPG @ 4 SPF 120° with CHARGE 4" 19 Gm RDX DP PPG P/N PPG-4019-301

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available To All (From Titan) Explosive Weight 19 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 4" PORT PLUG GUN, 4 SPF 120° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4" 19 Gm RDX SDP Prospector® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. PPG-4019-321T Date of Manufacture 5/16/00 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Reusable (HC, R) Recommended Minimum ID for Running 4.7 inches  
 Phasing Tested 120 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks PRELIMINARY DATA - UNOFFICIAL TEST. Same as PPG-4019-320T. Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17.0 lb/ft, L-80 API Grade, Date of Concrete Test 5/17/00  
 Target Data 72" OD, Briquet Compressive Strength 7,300 psi, Age of Target 56 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.64	0.64	0.00	0.64	0.64	0.00	0.64	0.64	0.00	0.64
Casing Hole Diameter, Short Axis, in.	0.36	0.39	0.35	0.46	0.36	0.35	0.45	0.35	0.40	0.44	0.41
Casing Hole Diameter, Long Axis, in.	0.37	0.39	0.36	0.46	0.38	0.35	0.46	0.37	0.41	0.44	0.43
Average Casing Hole Diameter, in.	0.37	0.39	0.36	0.46	0.37	0.35	0.46	0.36	0.41	0.44	0.42
Total Depth, in.	22.92	21.06	25.54	25.08	23.21	21.96	23.30	21.36	28.20	22.63	20.65
Burr Height, in.	0.04	0.05	0.06	0.03	0.05	0.05	0.03	0.05	0.06	0.04	0.07

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.64											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.39											0.39
Casing Hole Diameter, Long Axis, in.	0.39											0.40
Average Casing Hole Diameter, in.	0.39											0.40
Total Depth, in.	28.97											23.74
Burr Height, in.	0.04											0.05

Remarks Penetration normalized to 6300 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 24.59

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
<u>      </u> %	Faceplate Hole Diameter, Short Axis, in.							
	Faceplate Hole Diameter, Long Axis, in.							
Date of Beria Test	Average Faceplate Hole Diameter, in.							
	Total Depth, in.							

**CERTIFICATION**

Type of Certification:  Self  Third Party  
 I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

<u>      </u> CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP- Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<u>      </u> RECERTIFIED	<u>(Company Officer)</u>	<u>(Title)</u>	<u>(Date)</u>	<u>(Company)</u>	<u>(Address)</u>
<input checked="" type="checkbox"/> PRELIMINARY					

4" PPG @ 4 SPF 120° with CHARGE 4" 19 Gm RDX SDP Prospector® P/N PPG-4019-321T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 22.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 4" PORT PLUG GUN, 4 SPF 90° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4" 22 Gm RDX DP PPG w/o slv Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. PPG-4022-301 Date of Manufacture 11/11/93 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Reusable (HC, R) Recommended Minimum ID for Running 4.7 inches  
 Phasing Tested 90 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Also 10-4022-300. Also available in 120 degree phasing. Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17.0 lb/ft, L-80 API Grade, Date of Concrete Test 12/9/93  
 Target Data 60" OD, Briquet Compressive Strength 7400 psi, Age of Target 45 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.41	0.89	0.41	0.00	0.41	0.89	0.41	0.00	0.41	0.89
Casing Hole Diameter, Short Axis, in.	0.42	0.45	0.45	0.47	0.46	0.41	0.53	0.48	0.50	0.46	0.47
Casing Hole Diameter, Long Axis, in.	0.43	0.46	0.48	0.50	0.47	0.42	0.55	0.50	0.51	0.46	0.49
Average Casing Hole Diameter, in.	0.43	0.46	0.47	0.49	0.47	0.42	0.54	0.49	0.51	0.46	0.48
Total Depth, in.	20.55	20.43	19.18	21.05	21.05	22.55	21.93	22.68	20.05	22.93	23.55
Burr Height, in.	0.04	0.03	0.02	0.02	0.04	0.03	0.03	0.03	0.02	0.04	0.02

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.41	0.00	0.41									XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.45	0.42	0.48									0.46
Casing Hole Diameter, Long Axis, in.	0.45	0.42	0.48									0.47
Average Casing Hole Diameter, in.	0.45	0.42	0.48									0.47
Total Depth, in.	20.55	22.05	21.30									21.42
Burr Height, in.	0.03	0.04	0.03									0.03

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 23.31 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
<u>        </u> %	Faceplate Hole Diameter, Short Axis, in.							
	Faceplate Hole Diameter, Long Axis, in.							
Date of Beria Test	Average Faceplate Hole Diameter, in.							
	Total Depth, in.							

**CERTIFICATION**

Type of Certification: X Self          Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

<u>        </u> CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<u>X</u> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
<u>        </u> PRELIMINARY					

4" PPG @ 4 SPF 90° with CHARGE 4" 22 Gm RDX DP PPG P/N PPG-4022-301

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 22.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 4" PORT PLUG GUN, 4 SPF 120° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4" 22 Gm RDX BH PPG w/o slv Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. PPG-4022-310B Date of Manufacture 9/25/2000 Shot Density Tested 4 Shots per foot  
 Gun Type Expendable Hollow Carrier (EHC) Recommended Minimum ID for Running 4.7 inches  
 Phasing Tested 120 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Also 10-4022-310B. Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5 1/2" OD, Weight 17.0 lb/ft, L-80 API Grade, Date of Concrete Test 11/07/2000  
 Target Data 48" OD, Briquet Compressive Strength 7,760 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.88	0.18	0.18	0.88	0.18	0.18	0.88	0.18	0.18	0.88	0.18
Casing Hole Diameter, Short Axis, in.	0.52	0.66	0.60	0.54	0.62	0.67	0.55	0.61	0.63	0.54	0.65
Casing Hole Diameter, Long Axis, in.	0.56	0.68	0.66	0.54	0.72	0.69	0.57	0.69	0.67	0.56	0.69
Average Casing Hole Diameter, in.	0.54	0.67	0.63	0.54	0.67	0.68	0.56	0.65	0.65	0.55	0.67
Total Depth, in.	6.30	5.80	5.80	6.30	7.18	6.43	6.18	7.05	6.68	6.80	6.68
Burr Height, in.	.05	.04	.06	.07	.05	.08	.07	.06	.05	.07	.06

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.18											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.63											0.60
Casing Hole Diameter, Long Axis, in.	0.65											0.64
Average Casing Hole Diameter, in.	0.64											0.62
Total Depth, in.	6.80											6.50
Burr Height, in.	.07											.06

Remarks Shot #1 at 180° phasing. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 7.16 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Berea Bulk Porosity _____ %	Faceplate Hole Diameter, Short Axis, in. _____							
Date of Beria Test _____	Faceplate Hole Diameter, Long Axis, in. _____							
	Average Faceplate Hole Diameter, in. _____							
	Total Depth, in. _____							

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) (Title) (Date) (Company) (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

4" PPG @ 4 SPF 120° with CHARGE 4" 22 Gm RDX BH PPG P/N PPG-4022-310B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available To All (From Titan) Explosive Weight 22.7 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 4" PORT PLUG GUN, 4 SPF 120° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4" 22.7 Gm RDX SDP Prospector® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. PPG-4023-321T Date of Manufacture 5/18/2001 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Reusable (HC, R) Recommended Minimum ID for Running 4.7 inches  
 Phasing Tested 120 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Same as PPG-4023-320T. Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17.0 lb/ft, L-80 API Grade, Date of Concrete Test 7/25/2001  
 Target Data 84" OD, Briquet Compressive Strength 5,050 psi, Age of Target 29 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.00	0.64	0.64	0.00	0.64	0.64	0.00	0.64	0.64	0.00	0.64
Casing Hole Diameter, Short Axis, in.	0.39	0.39	0.39	0.39	0.37	0.36	0.40	0.37	0.40	0.36	0.37
Casing Hole Diameter, Long Axis, in.	0.41	0.40	0.40	0.41	0.38	0.38	0.42	0.37	0.42	0.38	0.38
Average Casing Hole Diameter, in.	0.40	0.40	0.40	0.40	0.38	0.37	0.41	0.37	0.41	0.37	0.38
Total Depth, in.	32.80	33.43	34.80	32.55	33.18	34.55	33.05	33.68	35.05	32.93	33.30
Burr Height, in.	0.05	0.06	0.04	0.03	0.06	0.05	0.04	0.06	0.06	0.04	0.07

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.64											XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.48											0.39
Casing Hole Diameter, Long Axis, in.	0.50											0.40
Average Casing Hole Diameter, in.	0.49											0.40
Total Depth, in.	34.80											33.68
Burr Height, in.	0.05											0.05

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000 psi) = 33.74

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

4" PPG @ 4 SPF 120° with CHARGE 4" 22.7 Gm RDX SDP Prospector® P/N PPG-4023-321T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 22.7 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 4" EXP GUN, 6 SPF 60° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 22.7 Gm RDX GH Outlaw® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3323-331 Date of Manufacture 04/09/2004 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 4.6 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17 lb/ft, L-80 API Grade, Date of Concrete Test 5/27/2004  
 Target Data 84" OD, Briquet Compressive Strength 5870 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.19	0.64	0.89	0.64	0.19	0.00	0.19	0.64	0.89	0.64	0.19
Casing Hole Diameter, Short Axis, in. ---	0.54	0.54	0.43	0.38	0.43	0.51	0.56	0.56	0.41	0.38	0.42	0.53
Casing Hole Diameter, Long Axis, in. ---	0.55	0.56	0.43	0.41	0.45	0.52	0.56	0.57	0.43	0.42	0.44	0.55
Average Casing Hole Diameter, in. -----	0.55	0.55	0.43	0.40	0.44	0.52	0.56	0.57	0.42	0.40	0.43	0.54
Total Depth, in. -----	26.43	29.55	27.18	35.80	29.80	33.30	33.55	20.80	24.18	35.80	34.80	32.30
Burr Height, in. -----	0.05	0.06	0.07	0.06	0.06	0.04	0.05	0.06	0.05	0.06	0.07	0.05

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.19	0.64	0.89	-----	-----	-----	-----	-----	-----	-----	-----	XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.50	0.54	0.50	0.39	-----	-----	-----	-----	-----	-----	-----	-----	0.48
Casing Hole Diameter, Long Axis, in. ---	0.53	0.55	0.51	0.42	-----	-----	-----	-----	-----	-----	-----	-----	0.49
Average Casing Hole Diameter, in. -----	0.52	0.55	0.51	0.41	-----	-----	-----	-----	-----	-----	-----	-----	0.49
Total Depth, in. -----	33.55	32.80	33.30	32.30	-----	-----	-----	-----	-----	-----	-----	-----	30.97
Burr Height, in. -----	0.05	0.06	0.06	0.06	-----	-----	-----	-----	-----	-----	-----	-----	0.06

Remarks Tested with 80-RDX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 31.93

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY

4" EXP @ 6 SPF 60° with CHARGE 3-3/8" 22.7 Gm RDX GH Outlaw® P/N EXP-3323-331

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 25 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 4" EXP GUN, 6 SPF 60° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 25 Gm RDX GH Outlaw® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3325-331 Date of Manufacture 04/19/2004 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 4.6 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17 lb/ft, L-80 API Grade, Date of Concrete Test 5/26/2004  
 Target Data 108" OD, Briquet Compressive Strength 6045 psi, Age of Target 29 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.19	0.64	0.89	0.64	0.19	0.00	0.19	0.64	0.89	0.64	0.19
Casing Hole Diameter, Short Axis, in. ---	0.59	0.57	0.56	0.54	0.49	0.49	0.58	0.55	0.57	0.53	0.54	0.49
Casing Hole Diameter, Long Axis, in. ---	0.60	0.59	0.57	0.55	0.49	0.53	0.60	0.57	0.59	0.54	0.55	0.55
Average Casing Hole Diameter, in. -----	0.60	0.58	0.57	0.55	0.49	0.51	0.59	0.56	0.58	0.54	0.55	0.52
Total Depth, in. -----	36.30	23.80	40.93	33.93	40.05	33.30	28.68	39.55	41.18	39.05	35.80	34.30
Burr Height, in. -----	0.05	0.08	0.07	0.07	0.06	0.07	0.05	0.07	0.08	0.06	0.07	0.05

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.19	0.64	0.89	-----	-----	-----	-----	-----	-----	-----	-----	XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.60	0.56	0.57	0.52	-----	-----	-----	-----	-----	-----	-----	-----	0.55
Casing Hole Diameter, Long Axis, in. ---	0.61	0.57	0.59	0.54	-----	-----	-----	-----	-----	-----	-----	-----	0.56
Average Casing Hole Diameter, in. -----	0.61	0.57	0.58	0.53	-----	-----	-----	-----	-----	-----	-----	-----	0.56
Total Depth, in. -----	36.30	39.80	31.80	35.05	-----	-----	-----	-----	-----	-----	-----	-----	35.61
Burr Height, in. -----	0.05	0.06	0.07	0.05	-----	-----	-----	-----	-----	-----	-----	-----	0.07

Remarks Tested with 80-RDX-LS detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 36.95

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 Faceplate Hole Diameter, Long Axis, in. -----  
 Average Faceplate Hole Diameter, in. -----  
 Total Depth, in. -----

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

4" EXP @ 6 SPF 60° with CHARGE 3-3/8" 25 Gm RDX GH Outlaw® P/N EXP-3325-331

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 25 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 4" EXP GUN, 6 SPF 60° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 3-3/8" 25 Gm HMX SDP Gunslinger® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-3325-421T Date of Manufacture 04/14/2004 Shot Density Tested 6 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 4.6 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17 lb/ft, L-80 API Grade, Date of Concrete Test 5/26/2004  
 Target Data 108" OD, Briquet Compressive Strength 6045 psi, Age of Target 29 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12	
Clearance, in. -----	0.00	0.19	0.64	0.89	0.64	0.19	0.00	0.19	0.64	0.89	0.64	0.19	
Casing Hole Diameter, Short Axis, in. . . .	0.41	0.40	0.40	0.41	0.40	0.43	0.41	0.38	0.37	0.40	0.38	0.43	
Casing Hole Diameter, Long Axis, in. . . .	0.43	0.42	0.41	0.43	0.43	0.45	0.42	0.39	0.39	0.44	0.40	0.45	
Average Casing Hole Diameter, in. . . . .	0.42	0.41	0.41	0.42	0.42	0.44	0.42	0.39	0.38	0.42	0.39	0.44	
Total Depth, in. -----	42.30	47.68	40.18	50.43	48.55	36.93	38.30	45.80	46.80	47.30	51.80	45.80	
Burr Height, in. -----	0.04	0.06	0.07	0.07	0.06	0.05	0.05	0.04	0.06	0.06	0.07	0.05	
Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----													XXXXXXX
Casing Hole Diameter, Short Axis, in. . . .													0.40
Casing Hole Diameter, Long Axis, in. . . .													0.42
Average Casing Hole Diameter, in. . . . .													0.41
Total Depth, in. -----													45.16
Burr Height, in. -----													0.06

Remarks Tested with 80-HMX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 46.86

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

4" EXP @ 6 SPF 60° with CHARGE 3-3/8" 25 Gm HMX SDP Gunslinger® P/N EXP-3325-421T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 38.5 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 4" EXP GUN, 4 SPF 90° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4" 38.5 Gm HMX SDP Gunslinger® Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-4039-421T Date of Manufacture 06/10/2004 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 4.6 inches  
 Phasing Tested 90 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17 lb/ft, L-80 API Grade, Date of Concrete Test 08/04/2004  
 Target Data 132" OD, Briquet Compressive Strength 6590 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.41	0.89	0.41	0.00	0.41	0.89	0.41	0.00	0.41	0.89	0.41
Casing Hole Diameter, Short Axis, in. ---	0.41	0.40	0.40	0.43	0.40	0.44	0.43	0.43	0.44	0.43	0.43	0.41
Casing Hole Diameter, Long Axis, in. ---	0.43	0.45	0.41	0.44	0.41	0.44	0.44	0.44	0.46	0.44	0.43	0.44
Average Casing Hole Diameter, in. -----	0.42	0.43	0.41	0.44	0.41	0.44	0.44	0.44	0.45	0.44	0.43	0.43
Total Depth, in. -----	52.30	57.30	54.30	46.93	58.05	60.05	59.55	56.05	60.55	37.18	51.55	60.43
Burr Height, in. -----	0.06	0.05	0.07	0.05	0.05	0.07	0.06	0.05	0.07	0.05	0.08	0.06

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.41	0.89	0.41	-----	-----	-----	-----	-----	-----	-----	-----	XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.41	0.43	0.42	0.43	-----	-----	-----	-----	-----	-----	-----	-----	0.42
Casing Hole Diameter, Long Axis, in. ---	0.43	0.45	0.43	0.44	-----	-----	-----	-----	-----	-----	-----	-----	0.44
Average Casing Hole Diameter, in. -----	0.42	0.44	0.43	0.44	-----	-----	-----	-----	-----	-----	-----	-----	0.43
Total Depth, in. -----	54.05	58.43	50.43	56.18	-----	-----	-----	-----	-----	-----	-----	-----	54.58
Burr Height, in. -----	0.07	0.06	0.09	0.06	-----	-----	-----	-----	-----	-----	-----	-----	0.06

Remarks Tested with 80-HMX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 57.73

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY

4" EXP @ 4 SPF 90° with CHARGE 4" 38.5 Gm HMX SDP Gunslinger® P/N EXP-4039-421T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 38.5 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 4" EXP, 4 SPF 180° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name CHARGE 4-1/2" 38.5g RDX BH BTY Maximum Pressure Rating 20,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-4539-341B Date of Manufacture 12/08/2003 Shot Density Tested 4 Shots per foot  
 Gun Type Hollow Carrier, Expendable (HC, E) Recommended Minimum ID for Running 4.9 inches  
 Phasing Tested 180° degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 5-1/2" OD, Weight 17 lb/ft, L-80 API Grade, Date of Concrete Test 12/18/2003  
 Target Data 60" OD, Briquet Compressive Strength 7,250 psi, Age of Target 47 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Casing Hole Diameter, Short Axis, in. ---	1.03	1.05	1.04	1.05	1.03	1.03	1.05	1.04	1.05	1.05	1.04	1.06
Casing Hole Diameter, Long Axis, in. ---	1.06	1.05	1.06	1.09	1.04	1.07	1.06	1.04	1.06	1.07	1.05	1.06
Average Casing Hole Diameter, in. -----	1.05	1.05	1.05	1.07	1.04	1.05	1.06	1.04	1.06	1.06	1.05	1.06
Total Depth, in. -----	9.20	8.45	7.33	8.33	9.95	8.20	9.58	7.78	10.08	8.95	9.20	8.45
Burr Height, in. -----	0.07	0.06	0.08	0.06	0.06	0.07	0.05	0.06	0.08	0.06	0.07	0.08

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----													xxxxxxx
Casing Hole Diameter, Short Axis, in. ---													1.04
Casing Hole Diameter, Long Axis, in. ---													1.06
Average Casing Hole Diameter, in. -----													1.05
Total Depth, in. -----													8.79
Burr Height, in. -----													0.07

Remarks Tested with 80-RDX-XHV. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 9.52 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity _____ %	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Date of Beria Test _____	Faceplate Hole Diameter, Short Axis, in. -----							
	Faceplate Hole Diameter, Long Axis, in. -----							
	Average Faceplate Hole Diameter, in. -----							
	Total Depth, in. -----							

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED \_\_\_\_\_  
 PRELIMINARY (Company Officer) (Title) (Date) (Company) (Address)

4" EXP @ 4 SPF 180° with 4-1/2" 38.5 Gm. RDX BH BOUNTYHUNTER® Charge P/N FLO-4539-341B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 21.0 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 4-1/2" EXPENDABLE GUN, 12 SPF 135°/45° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4 1/2" 21 Gm HMX SDP Gunslinger® Maximum Pressure Rating 17,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-4521-422T Date of Manufacture 05/11/2001 Shot Density Tested 12 Shots per foot  
 Gun Type Hollow Carrier, Expendable (HC, E) Recommended Minimum ID for Running 4.9 inches  
 Phasing Tested 135°/45° degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 7" OD, Weight 32 lb/ft, L-80 API Grade, Date of Concrete Test 06/08/2001  
 Target Data 96" OD, Briquet Compressive Strength 6,290 psi, Age of Target 29 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	1.31	0.69	0.18	1.59	0.18	0.69	1.31	0.00	1.31	0.69	0.18
Casing Hole Diameter, Short Axis, in. ---	0.35	0.34	0.31	0.41	0.24	0.42	0.35	0.27	0.34	0.29	0.35	0.41
Casing Hole Diameter, Long Axis, in. ---	0.37	0.34	0.32	0.43	0.25	0.44	0.36	0.27	0.35	0.29	0.36	0.44
Average Casing Hole Diameter, in. -----	0.36	0.34	0.32	0.42	0.25	0.43	0.36	0.27	0.35	0.29	0.36	0.43
Total Depth, in. -----	27.58	19.63	24.20	33.45	34.83	22.70	30.70	34.70	34.45	34.70	36.20	28.70
Burr Height, in. -----	0.04	0.06	0.05	0.05	0.07	0.05	0.05	0.08	0.04	0.07	0.06	0.05

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	1.59	0.18	0.69	1.31									XXXXX
Casing Hole Diameter, Short Axis, in. ---	0.26	0.38	0.38	0.27									0.33
Casing Hole Diameter, Long Axis, in. ---	0.26	0.42	0.40	0.28									0.35
Average Casing Hole Diameter, in. -----	0.26	0.40	0.39	0.28									0.34
Total Depth, in. -----	33.83	26.45	29.70	31.70									30.22
Burr Height, in. -----	0.06	0.05	0.07	0.06									0.06

Remarks Tested with 80-HMX-XHV. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 31.63 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

4-1/2" EXP @ 12 SPF 135°/45° with CHARGE 4-1/2" 21 Gm HMX SDP Gunslinger® P/N EXP-4521-422T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 38.5 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 4-1/2" EXP GUN, 5 SPF 60° Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4-1/2" 38.5 Gm HMX SDP Gunslinger® Maximum Pressure Rating 19,500 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-4539-424T Date of Manufacture 3/22/2004 Shot Density Tested 5 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC,E) Recommended Minimum ID for Running 4.9 inches  
 Phasing Tested 60 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained in carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 7" OD, Weight 32 lb/ft, L-80 API Grade, Date of Concrete Test 4/19/2004  
 Target Data 144" OD, Briquet Compressive Strength 7,750 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	0.32	1.12	1.59	1.12	0.32	0.00	0.32	1.12	1.59	1.12	0.32
Casing Hole Diameter, Short Axis, in. ---	0.51	0.49	0.45	0.45	0.31	0.35	0.47	0.45	0.43	0.49	0.35	0.34
Casing Hole Diameter, Long Axis, in. ---	0.52	0.51	0.51	0.48	0.34	0.37	0.48	0.46	0.46	0.50	0.36	0.36
Average Casing Hole Diameter, in. -----	0.52	0.50	0.48	0.47	0.33	0.36	0.48	0.46	0.45	0.50	0.36	0.35
Total Depth, in. -----	60.70	58.45	52.45	47.15	60.45	44.45	38.95	55.70	57.45	59.45	57.20	55.70
Burr Height, in. -----	0.07	0.06	0.09	0.09	0.09	0.08	0.06	0.06	0.08	0.07	0.08	0.08

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.00	0.32	1.12	1.59	1.12	0.32	0.00	0.32					XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.44	0.45	0.48	0.40	0.40	0.34	0.40	0.47					0.42
Casing Hole Diameter, Long Axis, in. ---	0.45	0.47	0.50	0.41	0.41	0.34	0.40	0.48					0.44
Average Casing Hole Diameter, in. -----	0.45	0.46	0.49	0.41	0.41	0.34	0.40	0.48					0.44
Total Depth, in. -----	60.95	58.95	54.75	51.75	44.45	49.95	51.45	55.70					53.80
Burr Height, in. -----	0.07	0.08	0.07	0.09	0.07	0.06	0.08	0.08					0.08

Remarks Tested with 80-HMX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000 psi) = 59.28 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. ----- \_\_\_\_\_

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

4-1/2" EXP @ 5 SPF 60° with CHARGE 4-1/2" 38.5 Gm HMX SDP Gunslinger® P/N EXP-4539-424T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 21.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 4-1/2" EXP, 12 SPF 135°/45° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4-1/2" 21g RDX BH BountyHunter® Maximum Pressure Rating 17,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-4521-310B Date of Manufacture 5/22/2003 Shot Density Tested 12 Shots per foot  
 Gun Type Hollow Carrier, Expendable (HC, E) Recommended Minimum ID for Running 4.9 inches  
 Phasing Tested 135°/45° degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 7" OD, Weight 32 lb/ft, L-80 API Grade, Date of Concrete Test 12/15/2003  
 Target Data 48" OD, Briquet Compressive Strength 6,025 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in.	0.00	1.31	0.69	0.18	1.59	0.18	0.69	1.31	0.00	1.31	0.69	0.18
Casing Hole Diameter, Short Axis, in.	0.65	0.67	0.63	0.66	0.66	0.65	0.65	0.69	0.66	0.66	0.69	0.64
Casing Hole Diameter, Long Axis, in.	0.69	0.69	0.67	0.70	0.66	0.71	0.67	0.69	0.68	0.66	0.69	0.70
Average Casing Hole Diameter, in.	0.67	0.68	0.65	0.68	0.66	0.68	0.66	0.69	0.67	0.66	0.69	0.67
Total Depth, in.	5.55	5.95	5.35	5.15	5.95	5.45	5.75	5.55	5.45	5.35	5.15	5.25
Burr Height, in.	0.05	0.05	0.04	0.04	0.06	0.04	0.05	0.06	0.05	0.06	0.04	0.04

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in.													xxxxxxx
Casing Hole Diameter, Short Axis, in.													0.66
Casing Hole Diameter, Long Axis, in.													0.68
Average Casing Hole Diameter, in.													0.67
Total Depth, in.													5.49
Burr Height, in.													0.05

Remarks Tested with 80-RDX-XHV. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 5.69 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity	%	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Faceplate Hole Diameter, Short Axis, in.									
Faceplate Hole Diameter, Long Axis, in.									
Average Faceplate Hole Diameter, in.									
Total Depth, in.									

**CERTIFICATION**

Type of Certification:  Self  Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

____ CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<input checked="" type="checkbox"/> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
____ PRELIMINARY					

4-1/2" EXP @ 12 SPF 135°/45° with CHARGE 4-1/2" 21.0 Gm BH BountyHunter® P/N FLO-4521-310B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 24.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 4-1/2" EXP, 12 SPF 135°/45° Max. Temp, °F 325 1 hr          3 hr          24 hr          100 hr          200 hr  
 Charge Name 4-1/2" 24g RDX BH CF BountyHunter® Maximum Pressure Rating 17,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-4524-311CF Date of Manufacture 4/23/2003 Shot Density Tested 12 Shots per foot  
 Gun Type Hollow Carrier, Expendable (HC, E) Recommended Minimum ID for Running 4.9 inches  
 Phasing Tested 135°/45° degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 7" OD, Weight 32 lb/ft, L-80 API Grade, Date of Concrete Test 5/29/2003  
 Target Data 60" OD, Briquet Compressive Strength 6,860 psi, Age of Target 29 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	1.31	0.69	0.18	1.59	0.18	0.69	1.31	0.00	1.31	0.69	0.18
Casing Hole Diameter, Short Axis, in. ---	0.84	0.77	0.72	0.77	0.54	0.75	0.69	0.62	0.81	0.66	0.73	0.78
Casing Hole Diameter, Long Axis, in. ---	0.97	0.78	0.84	0.79	0.56	0.78	0.71	0.64	0.82	0.68	0.75	0.85
Average Casing Hole Diameter, in. -----	0.91	0.78	0.78	0.78	0.55	0.77	0.70	0.63	0.82	0.67	0.74	0.82
Total Depth, in. -----	6.83	6.95	7.20	6.83	7.45	7.08	6.75	6.08	6.70	8.20	7.20	6.33
Burr Height, in. -----	0.06	0.07	0.06	0.05	0.06	0.07	0.05	0.06	0.05	0.07	0.04	0.05

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.18	1.59	0.18	0.69	1.31								xxxxxxx
Casing Hole Diameter, Short Axis, in. ---	0.78	0.54	0.77	0.79	0.70								0.72
Casing Hole Diameter, Long Axis, in. ---	0.85	0.59	0.83	0.88	0.77								0.77
Average Casing Hole Diameter, in. -----	0.82	0.57	0.80	0.84	0.74								0.75
Total Depth, in. -----	6.33	7.95	5.75	7.33	6.95								7.03
Burr Height, in. -----	0.05	0.06	0.05	0.04	0.05								0.06

Remarks Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 7.51 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
Berea Bulk Porosity <u>        </u> %	Faceplate Hole Diameter, Short Axis, in. -----							
Date of Beria Test <u>        </u>	Faceplate Hole Diameter, Long Axis, in. -----							
	Average Faceplate Hole Diameter, in. -----							
	Total Depth, in. -----							

**CERTIFICATION**

Type of Certification: X Self          Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

<u>        </u> CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<u>X</u> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
<u>        </u> PRELIMINARY					

4-1/2" EXP @ 12 SPF 135°/45° with CHARGE 4-1/2" 24 Gm BH BountyHunter® P/N FLO-4524-311CF

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 17 gm, RDX powder, Case Material Zinc  
 Gun OD & Trade Name 4-1/2" EXP, 18 SPF 140°/20° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name CHARGE 4-1/2" 17g RDX BH CFLD BountyHunter® Maximum Pressure Rating 18,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-4617-311CFZ Date of Manufacture 08/09/2003 Shot Density Tested 18 Shots per foot  
 Gun Type Hollow Carrier, Expendable (HC, E) Recommended Minimum ID for Running 4.9 inches  
 Phasing Tested 140°/20° degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum ID ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 7" OD, Weight 32 lb/ft, L-80 API Grade, Date of Concrete Test 08/14/2003  
 Target Data 60" OD, Briquet Compressive Strength 7,130 psi, Age of Target 56 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.08
Casing Hole Diameter, Short Axis, in. ---	0.71	0.70	0.65	0.68	0.70	0.69	0.72	0.72	0.68	0.65	0.70	0.66
Casing Hole Diameter, Long Axis, in. ---	0.74	0.70	0.66	0.72	0.72	0.72	0.77	0.75	0.70	0.67	0.71	0.68
Average Casing Hole Diameter, in. -----	0.73	0.70	0.66	0.70	0.71	0.71	0.75	0.74	0.69	0.68	0.71	0.67
Total Depth, in. -----	7.70	7.08	8.20	6.70	7.45	6.95	7.45	7.33	6.58	7.45	7.08	6.33
Burr Height, in. -----	0.05	0.06	0.05	0.07	0.06	0.05	0.06	0.08	0.05	0.06	0.04	0.06

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.80	0.80	0.80	0.80	0.80	0.80							xxxxxxx
Casing Hole Diameter, Short Axis, in. ---	0.73	0.68	0.69	0.70	0.69	0.73							0.69
Casing Hole Diameter, Long Axis, in. ---	0.73	0.69	0.72	0.70	0.71	0.75							0.71
Average Casing Hole Diameter, in. -----	0.73	0.69	0.71	0.70	0.70	0.74							0.71
Total Depth, in. -----	8.20	6.45	7.70	7.08	7.20	7.45							7.30
Burr Height, in. -----	0.05	0.06	0.05	0.06	0.06	0.07							0.06

Remarks Tested with 80-RDX-XHV. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000 psi) = 7.87 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. ----- \_\_\_\_\_

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED \_\_\_\_\_  
X PRELIMINARY \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 20.0 gm, RDX powder, Case Material Zinc  
 Gun OD & Trade Name 4-1/2" EXP, 16 SPF 140°/20° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4-5/8" 20g RDX BH CFLD BountyHunter® Maximum Pressure Rating 18,700 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-4620-311CFZ Date of Manufacture 08/09/2003 Shot Density Tested 16 Shots per foot  
 Gun Type Hollow Carrier, Expendable (HC, E) Recommended Minimum ID for Running 4.9 inches  
 Phasing Tested 140°/20° degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 7" OD, Weight 32 lb/ft, L-80 API Grade, Date of Concrete Test 08/14/2003  
 Target Data 60" OD, Briquet Compressive Strength 7,130 psi, Age of Target 56 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in.	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Casing Hole Diameter, Short Axis, in.	0.70	0.78	0.70	0.67	0.74	0.76	0.65	0.70	0.74	0.72	0.68	0.78
Casing Hole Diameter, Long Axis, in.	0.73	0.80	0.78	0.68	0.77	0.78	0.70	0.76	0.75	0.74	0.73	0.79
Average Casing Hole Diameter, in.	0.72	0.79	0.74	0.68	0.76	0.77	0.68	0.73	0.75	0.73	0.71	0.79
Total Depth, in.	8.45	7.33	7.70	7.95	8.70	7.95	7.45	8.45	7.70	7.20	8.08	7.45
Burr Height, in.	0.06	0.05	0.06	0.04	0.06	0.04	0.06	0.06	0.05	0.06	0.05	0.04

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in.	0.80	0.80	0.80	0.80									xxxxxxx
Casing Hole Diameter, Short Axis, in.	0.73	0.65	0.71	0.68									0.71
Casing Hole Diameter, Long Axis, in.	0.74	0.70	0.74	0.70									0.74
Average Casing Hole Diameter, in.	0.74	0.74	0.73	0.69									0.73
Total Depth, in.	8.58	7.33	8.33	6.95									7.85
Burr Height, in.	0.06	0.05	0.05	0.06									0.06

Remarks Tested with 80-RDX-XHV. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 8.46 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. \_\_\_\_\_

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
 \_\_\_\_ RECERTIFIED \_\_\_\_\_  
X PRELIMINARY (Company Officer) (Title) (Date) (Company) (Address)

4-1/2" EXP @ 16 SPF 140°/20° with CHARGE 4-5/8" 20 Gm RDX BH BountyHunter® P/N FLO-4620-311CFZ

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 24.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 4-5/8" EXPENDABLE, 12 SPF 135/45° SEQUENTIAL Max. Temp, °F 325 1 hr \_\_\_\_\_ 3 hr \_\_\_\_\_ 24 hr \_\_\_\_\_ 100 hr \_\_\_\_\_ 200 hr  
 Charge Name 4-1/2" 24G RDX BH CF BountyHunter® Maximum Pressure Rating 19,500 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-4524-311CF Date of Manufacture 05/23/2003 Shot Density Tested \_\_\_\_\_ 12 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running \_\_\_\_\_ 5.0 inches  
 Phasing Tested 135/45 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode \_\_\_\_\_ X Selective, \_\_\_\_\_ X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 7" OD, Weight 32.0 lb/ft, L-80 API Grade, Date of Concrete Test 5/29/2003  
 Target Data 60" OD, Briquet Compressive Strength 6,730 psi, Age of Target 29 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.69	0.77	0.73	0.70	0.78	0.70	0.73	0.77	0.69	0.77	0.73
Casing Hole Diameter, Short Axis, in.	0.70	0.75	0.79	0.82	0.79	0.80	0.78	0.79	0.80	0.78	0.79
Casing Hole Diameter, Long Axis, in.	0.72	0.87	0.85	0.84	0.83	0.85	0.80	0.80	0.82	0.82	0.79
Average Casing Hole Diameter, in.	0.71	0.81	0.82	0.83	0.81	0.83	0.79	0.80	0.81	0.80	0.79
Total Depth, in.	7.95	6.70	6.95	6.45	6.20	7.20	7.95	7.70	7.33	7.58	7.70
Burr Height, in.	0.07	0.09	0.06	0.08	0.08	0.06	0.07	0.08	0.09	0.07	0.09

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.70	0.78	0.70	0.73	0.77							XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.83	0.77	0.83	0.76	0.75							0.78
Casing Hole Diameter, Long Axis, in.	0.85	0.81	0.86	0.78	0.79							0.82
Average Casing Hole Diameter, in.	0.84	0.79	0.85	0.77	0.77							0.80
Total Depth, in.	6.95	6.83	8.08	8.33	7.20							7.32
Burr Height, in.	0.09	0.10	0.07	0.08	0.07							0.08

Remarks 11/16" Standoff ring on gun. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.8%/1000psi) = 7.78 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity _____ %	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
	Faceplate Hole Diameter, Short Axis, in. _____							
	Faceplate Hole Diameter, Long Axis, in. _____							
Date of Beria Test _____	Average Faceplate Hole Diameter, in. _____							
	Total Depth, in. _____							

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially the same as the equipment which would be furnished to the perforate a well for any operator.

____ CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<u>X</u> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
____ PRELIMINARY					

4-5/8" EXP @ 12 SPF 135°/45° with CHARGE 4-1/2" 24 Gm RDX BH CF BountyHunter® P/N FLO-4524-311CF

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 21.0 gm, HMX powder, Case Material Steel  
 Gun OD & Trade Name 4-5/8" CJBH, 18 SPF Max. Temp, °F 400 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4-5/8" 21G HMX CJBH CF BountyHunter® Maximum Pressure Rating 17,500 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-4621-411CF Date of Manufacture 07/25/2002 Shot Density Tested 18 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 5.12 inches  
 Phasing Tested 55/5 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks 55 Degree Rotated Cluster (Cluster has 3 charges @ 120 deg.), 5° vertical plane phasing. Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 7" OD, Weight 32.0 lb/ft, L-80 API Grade, Date of Concrete Test 08/29/2002  
 Target Data 48" OD, Briquet Compressive Strength 7140 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Clearance, in.	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Casing Hole Diameter, Short Axis, in.	0.78	0.77	0.72	0.82	0.72	0.76	0.82	0.77	0.82	0.80	0.73
Casing Hole Diameter, Long Axis, in.	0.96	0.90	0.82	0.90	0.98	0.93	0.91	0.90	0.90	0.93	0.92
Average Casing Hole Diameter, in.	0.87	0.84	0.77	0.86	0.85	0.85	0.87	0.84	0.86	0.87	0.83
Total Depth, in.	5.70	6.83	7.20	6.45	5.95	7.20	6.70	5.83	6.20	5.95	6.45
Burr Height, in.	0.10	0.12	0.15	0.09	0.09	0.14	0.18	0.11	0.14	0.09	0.12

  

Shot No.	No. 12	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	Average
Clearance, in.	0.73	0.73	0.73	0.73								XXXXXXX
Casing Hole Diameter, Short Axis, in.	0.84	0.80	0.82	0.73								0.78
Casing Hole Diameter, Long Axis, in.	0.88	0.89	1.03	0.88								0.92
Average Casing Hole Diameter, in.	0.86	0.85	0.93	0.81								0.85
Total Depth, in.	7.95	6.33	6.45	6.95								6.54
Burr Height, in.	0.10	0.12	0.15	0.09								0.12

Remarks Tested with 80-HMX-XHV Detonating Cord Penetration Normalized by Method of SPE 27424 (approx. 3.6%/1000 psi) = 7.05 in.

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity	Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	Average
<u>                    </u> %	Faceplate Hole Diameter, Short Axis, in.							
	Faceplate Hole Diameter, Long Axis, in.							
	Average Faceplate Hole Diameter, in.							
	Total Depth, in.							

**CERTIFICATION**

Type of Certification:  Self  Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

           CERTIFIED BY G.R. Kissell VP - Energetics 01/01/2009 Titan Specialties Ltd. 143 HCR 4361, Milford, TX 76670  
           RECERTIFIED (Company Officer) (Title) (Date) (Company) (Address)  
 PRELIMINARY

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 28.0 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 5" EXP Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 5" 28 Gm RDX BH EXP BountyHunter® Maximum Pressure Rating 13,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. FLO-5028-310B Date of Manufacture 7/24/97 Shot Density Tested 12 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running \_\_\_\_\_ inches  
 Phasing Tested 150/30 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most Debris Usually Retained Within Carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 7" OD, Weight 32.0 lb/ft, L-80 API Grade, Date of Concrete Test 8/26/97

Target Data 36" OD, Briquet Compressive Strength 5340 psi, Age of Target 44 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12	No. 13
Clearance, in. -----	0.00	1.01	0.24	0.50	0.78	0.06	1.09	0.06	0.78	0.50	0.24	1.01	0.00
Casing Hole Diameter, Short Axis, in. -----	0.78	0.70	0.82	0.76	0.79	0.84	0.74	0.81	0.66	0.80	0.76	0.69	0.82
Casing Hole Diameter, Long Axis, in. -----	0.84	0.80	0.84	0.85	0.85	0.86	0.75	0.81	0.74	0.83	0.77	0.76	0.83
Average Casing Hole Diameter, in. -----	0.81	0.75	0.83	0.81	0.82	0.85	0.75	0.81	0.70	0.82	0.77	0.73	0.83
Total Depth, in. -----	8.45	7.45	8.70	8.70	7.95	8.58	7.83	8.95	8.33	7.95	8.45	8.20	8.70
Burr Height, in. -----	0.08	0.06	0.07	0.05	0.05	0.07	0.03	0.09	0.04	0.08	0.06	0.06	0.08

  

Shot No.	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	No. 25
Clearance, in. -----	1.01	0.24	0.50	0.78	0.06	1.09	0.06	0.78	0.50	0.24	1.01	0.00
Casing Hole Diameter, Short Axis, in. -----	0.63	0.88	0.77	0.80	0.82	0.72	0.80	0.66	0.85	0.78	0.72	0.86
Casing Hole Diameter, Long Axis, in. -----	0.64	0.93	0.79	0.90	0.92	0.74	0.86	0.67	0.87	0.89	0.80	0.87
Average Casing Hole Diameter, in. -----	0.64	0.91	0.78	0.85	0.87	0.73	0.83	0.67	0.86	0.84	0.76	0.87
Total Depth, in. -----	8.20	8.70	8.45	8.45	8.33	7.20	7.95	7.70	8.45	8.58	8.20	8.45
Burr Height, in. -----	0.01	0.12	0.04	0.06	0.06	0.04	0.06	0.02	0.09	0.07	0.03	0.08

  

Shot No.	No. 26	No. 27	No. 28	No. 29	No. 30	No. 31	No. 32	No. 33	No. 34	No. 35	No. 36	No. 37	Average
Clearance, in. -----	1.01	0.24	0.50	0.78	0.06	1.09	0.06	0.78	0.50	0.24	1.01	0.00	XXXXXXXX
Casing Hole Diameter, Short Axis, in. -----	0.68	0.81	0.86	0.78	0.80	0.73	0.84	0.68	0.88	0.76	0.77	0.84	0.78
Casing Hole Diameter, Long Axis, in. -----	0.73	0.82	0.94	0.87	0.86	0.74	0.87	0.70	0.92	0.78	0.78	0.86	0.82
Average Casing Hole Diameter, in. -----	0.71	0.82	0.90	0.83	0.83	0.74	0.86	0.69	0.90	0.77	0.78	0.85	0.80
Total Depth, in. -----	7.08	7.95	7.88	7.70	8.45	7.45	8.20	7.95	8.70	8.45	8.33	8.95	8.22
Burr Height, in. -----	0.03	0.06	0.14	0.07	0.05	0.03	0.08	0.02	0.11	0.06	0.06	0.08	0.06

Remarks \_\_\_\_\_

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

____ CERTIFIED BY	<u>G.R. Kissell</u>	<u>VP - Energetics</u>	<u>01/01/2009</u>	<u>Titan Specialties Ltd.</u>	<u>143 HCR 4361, Milford, TX 76670</u>
<u>X</u> RECERTIFIED	(Company Officer)	(Title)	(Date)	(Company)	(Address)
____ PRELIMINARY					

5" EXP @ 12 SPF 150°/30° with CHARGE 5" 28 Gm RDX BH EXP BountyHunter® P/N FLO-5028-310B

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 38.5 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 7" EXP GUN, 12 SPF 135°/45° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 4" 38.5 Gm RDX SDP Gunslinger® Maximum Pressure Rating 13,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-4039-321T Date of Manufacture 09/24/2004 Shot Density Tested 12 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 7.5 inches  
 Phasing Tested 135/45 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 9-5/8" OD, Weight 47 lb/ft, L-80 API Grade, Date of Concrete Test 11/09/2004  
 Target Data 120" OD, Briquet Compressive Strength 5,823 psi, Age of Target 28 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.00	2.15	1.13	0.29	2.63	0.29	1.13	2.15	0.00	2.15	1.13	0.29
Casing Hole Diameter, Short Axis, in. ---	0.40	0.33	0.30	0.40	0.33	0.35	0.40	0.28	0.39	0.32	0.41	0.46
Casing Hole Diameter, Long Axis, in. ---	0.43	0.44	0.34	0.44	0.37	0.36	0.42	0.36	0.40	0.33	0.42	0.48
Average Casing Hole Diameter, in. -----	0.42	0.39	0.32	0.42	0.35	0.36	0.41	0.32	0.40	0.33	0.42	0.47
Total Depth, in. -----	42.22	49.47	30.72	42.85	20.47	46.97	46.47	35.22	48.72	50.47	31.97	45.10
Burr Height, in. -----	0.09	0.08	0.10	0.09	0.11	0.08	0.08	0.07	0.08	0.10	0.09	0.08

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	2.63	0.29	1.13	2.15	0.00	2.15							XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.29	0.40	0.39	0.30	0.37	0.36							0.36
Casing Hole Diameter, Long Axis, in. ---	0.33	0.42	0.45	0.36	0.40	0.38							0.40
Average Casing Hole Diameter, in. -----	0.31	0.41	0.42	0.33	0.39	0.37							0.38
Total Depth, in. -----	30.47	37.97	50.47	50.47	48.72	40.47							41.62
Burr Height, in. -----	0.09	0.10	0.10	0.09	0.08	0.08							0.09

Remarks Tested with 80-RDX-XHV detonating cord. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 42.85

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. ----- \_\_\_\_\_

**CERTIFICATION**

Type of Certification:  Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
 RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

7" EXP @ 12 SPF 135°/45° with CHARGE 4" 38.5 Gm RDX SDP Gunslinger® P/N EXP-4039-321T

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 38.5 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 7" EXP GUN, 12 SPF 135°/45° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 7" 38.5 Gm RDX GH Outlaw® Maximum Pressure Rating 13,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-7039-331 Date of Manufacture 04/26/2004 Shot Density Tested 12 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 7.5 inches  
 Phasing Tested 135/45 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 9-5/8" OD, Weight 47 lb/ft, L-80 API Grade, Date of Concrete Test 5/26/2004  
 Target Data 96" OD, Briquet Compressive Strength 5345 psi, Age of Target 34 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	<u>0.71</u>	<u>0.93</u>	<u>0.84</u>	<u>0.75</u>	<u>0.97</u>	<u>0.75</u>	<u>0.84</u>	<u>0.93</u>	<u>0.71</u>	<u>0.93</u>	<u>0.84</u>	<u>0.75</u>
Casing Hole Diameter, Short Axis, in. ---	<u>0.74</u>	<u>0.69</u>	<u>0.77</u>	<u>0.70</u>	<u>0.71</u>	<u>0.74</u>	<u>0.65</u>	<u>0.75</u>	<u>0.75</u>	<u>0.69</u>	<u>0.76</u>	<u>0.70</u>
Casing Hole Diameter, Long Axis, in. ---	<u>0.75</u>	<u>0.77</u>	<u>0.79</u>	<u>0.71</u>	<u>0.74</u>	<u>0.78</u>	<u>0.69</u>	<u>0.76</u>	<u>0.76</u>	<u>0.70</u>	<u>0.76</u>	<u>0.70</u>
Average Casing Hole Diameter, in. -----	<u>0.75</u>	<u>0.73</u>	<u>0.78</u>	<u>0.71</u>	<u>0.73</u>	<u>0.76</u>	<u>0.67</u>	<u>0.76</u>	<u>0.76</u>	<u>0.70</u>	<u>0.76</u>	<u>0.70</u>
Total Depth, in. -----	<u>26.47</u>	<u>27.72</u>	<u>28.22</u>	<u>22.97</u>	<u>29.60</u>	<u>29.47</u>	<u>30.97</u>	<u>31.07</u>	<u>28.97</u>	<u>29.85</u>	<u>28.85</u>	<u>32.47</u>
Burr Height, in. -----	<u>0.08</u>	<u>0.10</u>	<u>0.07</u>	<u>0.09</u>	<u>0.08</u>	<u>0.07</u>	<u>0.08</u>	<u>0.08</u>	<u>0.08</u>	<u>0.08</u>	<u>0.07</u>	<u>0.08</u>

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	<u>0.97</u>	<u>0.75</u>	<u>0.84</u>	<u>0.93</u>	-----	-----	-----	-----	-----	-----	-----	-----	<u>XXXXXXX</u>
Casing Hole Diameter, Short Axis, in. ---	<u>0.71</u>	<u>0.79</u>	<u>0.81</u>	<u>0.76</u>	-----	-----	-----	-----	-----	-----	-----	-----	<u>0.73</u>
Casing Hole Diameter, Long Axis, in. ---	<u>0.74</u>	<u>0.82</u>	<u>0.82</u>	<u>0.79</u>	-----	-----	-----	-----	-----	-----	-----	-----	<u>0.76</u>
Average Casing Hole Diameter, in. -----	<u>0.73</u>	<u>0.81</u>	<u>0.82</u>	<u>0.78</u>	-----	-----	-----	-----	-----	-----	-----	-----	<u>0.75</u>
Total Depth, in. -----	<u>32.47</u>	<u>28.38</u>	<u>18.85</u>	<u>30.35</u>	-----	-----	-----	-----	-----	-----	-----	-----	<u>28.54</u>
Burr Height, in. -----	<u>0.07</u>	<u>0.08</u>	<u>0.10</u>	<u>0.09</u>	-----	-----	-----	-----	-----	-----	-----	-----	<u>0.08</u>

Remarks Tested with 80-RDX-XHV detonating cord. 0.75" gun standoffs at 135° & 225° banks. Shot #1 at 180° phasing. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 28.89

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. -----  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. -----  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. -----  
 \_\_\_\_\_ Total Depth, in. -----

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

7" EXP @ 12 SPF 135°/45° with CHARGE 7" 38.5 Gm RDX GH Outlaw® P/N EXP-7039-331

**CERTIFICATION DATA SHEET  
PERFORATING SYSTEM EVALUATION, RP-43, SECTIONS 1 AND 2**

API Form 43F

Service Company Available to All (From Titan) Explosive Weight 38.5 gm, RDX powder, Case Material Steel  
 Gun OD & Trade Name 7" EXP GUN, 12 SPF 135°/45° Max. Temp, °F 325 1 hr 3 hr 24 hr 100 hr 200 hr  
 Charge Name 7" 38.5 Gm RDX GH Outlaw II ® Maximum Pressure Rating 13,000 psi, Carrier Material H.T. Steel  
 Manufacturer Charge Part No. EXP-7039-332 Date of Manufacture 04/26/2004 Shot Density Tested 12 Shots per foot  
 Gun Type Hollow Steel Carrier, Expendable (HC, E) Recommended Minimum ID for Running 7.5 inches  
 Phasing Tested 135/45 degrees, Firing Order X Top Down, X Bottom Up Available Firing Mode X Selective, X Simultaneous  
 Debris Description Most debris usually retained within carrier Debris Weight n/a gm/charge, Debris n/a in<sup>3</sup>/charge  
 Remarks Pressure, temperature and minimum I.D. ratings depend on ratings of gun hardware. See Titan GunFacts™ sheet for gun system specifications.

**SECTION 1 - CONCRETE TARGET**

Casing Data 9-5/8" OD, Weight 47 lb/ft, L-80 API Grade, Date of Concrete Test 5/26/2004  
 Target Data 96" OD, Briquet Compressive Strength 5345 psi, Age of Target 34 days

Shot No.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11	No. 12
Clearance, in. -----	0.97	0.75	0.84	0.93	0.71	0.93	0.84	0.75	0.97	0.75	0.84	0.93
Casing Hole Diameter, Short Axis, in. ---	0.78	0.79	0.78	0.76	0.78	0.80	0.80	0.76	0.69	0.83	0.69	0.73
Casing Hole Diameter, Long Axis, in. ---	0.80	0.82	0.79	0.79	0.80	0.80	0.81	0.80	0.70	0.87	0.71	0.75
Average Casing Hole Diameter, in. -----	0.79	0.81	0.79	0.78	0.79	0.80	0.81	0.78	0.70	0.85	0.70	0.74
Total Depth, in. -----	25.47	28.38	20.97	30.35	26.47	18.35	18.22	26.27	23.22	23.35	19.72	26.22
Burr Height, in. -----	0.07	0.08	0.07	0.09	0.06	0.08	0.07	0.08	0.10	0.08	0.07	0.07

  

Shot No.	No. 13	No. 14	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21	No. 22	No. 23	No. 24	Average
Clearance, in. -----	0.71	0.93	0.84	0.75	0.97	0.75	0.84	0.93					XXXXXXX
Casing Hole Diameter, Short Axis, in. ---	0.76	0.70	0.81	0.81	0.71	0.88	0.70	0.76					0.77
Casing Hole Diameter, Long Axis, in. ---	0.77	0.73	0.82	0.90	0.74	0.90	0.72	0.78					0.79
Average Casing Hole Diameter, in. -----	0.77	0.72	0.82	0.86	0.73	0.89	0.71	0.77					0.78
Total Depth, in. -----	20.35	29.22	18.85	18.22	38.47	22.60	33.72	21.85					24.51
Burr Height, in. -----	0.08	0.08	0.10	0.08	0.07	0.08	0.07	0.08					0.08

Remarks Tested with 80-RDX-XHV detonating cord. 0.75" gun standoffs at 135° & 225° banks. Penetration normalized to 5000 psi by method of SPE 27424 (approx. 3.6%/1000psi) = 24.81

**SECTION 2 - BEREA SANDSTONE CORE TARGET**

Berea Bulk Porosity \_\_\_\_\_ % Shot No. \_\_\_\_\_ No. 1 \_\_\_\_\_ No. 2 \_\_\_\_\_ No. 3 \_\_\_\_\_ No. 4 \_\_\_\_\_ No. 5 \_\_\_\_\_ No. 6 \_\_\_\_\_ Average \_\_\_\_\_  
 Date of Beria Test \_\_\_\_\_ Faceplate Hole Diameter, Short Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Faceplate Hole Diameter, Long Axis, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Average Faceplate Hole Diameter, in. ----- \_\_\_\_\_  
 \_\_\_\_\_ Total Depth, in. ----- \_\_\_\_\_

**CERTIFICATION**

Type of Certification: X Self \_\_\_\_\_ Third Party

I certify that these tests were made according to the procedures as outlined in API RP-43: Recommended Practices for Evaluation of Well Perforators, Fifth Edition, January 1991. All of the equipment used in these tests, such as guns, jet charges, detonating cord, etc., was standard equipment with our company for the use in the gun being tested and was not changed in any manner for the test. Furthermore, the equipment was chosen at random from stock and therefore will substantially be the same as the equipment which would be furnished to the perforate a well for any operator.

\_\_\_\_ CERTIFIED BY \_\_\_\_\_ G.R. Kissell \_\_\_\_\_ VP - Energetics \_\_\_\_\_ 01/01/2009 \_\_\_\_\_ Titan Specialties Ltd. \_\_\_\_\_ 143 HCR 4361, Milford, TX 76670  
X RECERTIFIED \_\_\_\_\_ (Company Officer) \_\_\_\_\_ (Title) \_\_\_\_\_ (Date) \_\_\_\_\_ (Company) \_\_\_\_\_ (Address)  
 \_\_\_\_ PRELIMINARY \_\_\_\_\_

7" EXP @ 12 SPF 135°/45° with CHARGE 7" 38.5 Gm RDX GH Outlaw II ® P/N EXP-7039-332