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west virginia department of environmental protection

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Office of Oil and Gas  
601 57<sup>th</sup> Street, S.E.  
Charleston, WV 25304  
(304) 926-0450  
fax: (304) 926-0452

Austin Caperton, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

Friday, June 28, 2019  
PERMIT MODIFICATION APPROVAL  
Horizontal 6A / New Drill

ARSENAL RESOURCES LLC  
6031 WALLACE ROAD EXTENSION  
SUITE 603  
WEXFORD, PA 15090

Re: Permit Modification Approval for JOHNSON TFP 40 205  
47-091-01355-00-00

**Update to Casing Plan with changes to conductor, intermediate and production strings.**

ARSENAL RESOURCES LLC

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

If there are any questions, please feel free to contact me at (304) 926- 0450.

James A. Martin  
Chief

Operator's Well Number: JOHNSON TFP 40 205  
Farm Name: RENEE JOHNSON  
U.S. WELL NUMBER: 47-091-01355-00-00  
Horizontal 6A New Drill  
Date Modification Issued: 06/28/2019

Promoting a healthy environment.



June 10, 2019

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WVDEP  
Office of Oil and Gas  
ATTN: Laura Adkins  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304

**RE: Johnson TFP 40 204, Johnson TFP 40 205, and Johnson TFP 40 206 WW6B Changes**

Dear Ms. Adkins:

Enclosed, please find the revised WW6B for the Johnson TFP 40 204 (API 47-091-01356), Johnson TFP 40 205 (API 47-091-01355), and Johnson TFP 40 206 (API 47-091-01351).

The following changes occurred within the WW6B:

- Conductor casing size has changed from 26" to 24"
- Conductor weight has changed from 102.7# to 94#
- Changed intermediate casing depth from 2,050' to 2,600'
- Changed production casing weight from 23# to 20#
- Changed the production cement fill-up from TOC @ 1,900 to TOC @ 2,450
- Changed the production wall thickness from 0.415 to 0.361
- Changed the production burst pressure from 14,520 to 15,920

Should you have any questions or need any additional information, please feel free to contact me by phone or email. Thank you!

Sincerely,

A handwritten signature in blue ink that reads 'Kelly Davis'.

Kelly Davis  
Permitting Specialist  
1-304-517-8743 mobile  
1-724-940-1218 office  
kdavis@arsenalresources.com

STATE OF WEST VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS  
WELL WORK PERMIT APPLICATION

1) Well Operator: Arsenal Resources      494519412      Taylor      Fleming      Rosemont  
Operator ID      County      District      Quadrangle

2) Operator's Well Number: Johnson TFP 40 205      Well Pad Name: Johnson TFP 40

3) Farm Name/Surface Owner: Renee Johnson      Public Road Access: CR 17, Oral Lake Road

4) Elevation, current ground: 1338.79'      Elevation, proposed post-construction: 1332.5'

5) Well Type    (a) Gas    X      Oil      \_\_\_\_\_      Underground Storage      \_\_\_\_\_

Other \_\_\_\_\_

(b)If Gas    Shallow    X      Deep      \_\_\_\_\_

Horizontal    X      \_\_\_\_\_

6) Existing Pad: Yes or No    No

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):  
Target Formation- Marcellus Shale, Top- 7,824.5ft, Bottom- 7,916.5ft, Anticipated Thickness- 92ft, Associated Pressure- 0.5 psi/ft

8) Proposed Total Vertical Depth: 7,903.5 ft

9) Formation at Total Vertical Depth: Marcellus Shale

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10) Proposed Total Measured Depth: 22,494.2 ft

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11) Proposed Horizontal Leg Length: 14,012.2 ft

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12) Approximate Fresh Water Strata Depths: 45.5', 132.5', 187.5', 219.5', 817.5', 1102.5'

13) Method to Determine Fresh Water Depths: Offsetting wells reported water depths (091-00116, 091-00117, 091-00118, 091-00120)

14) Approximate Saltwater Depths: 1987.5'

15) Approximate Coal Seam Depths: Elk Lick-322.5', Harlem-398.5', Bakerstown-477.5', Brush Creek-577.5', Upper Freeport-630.5', Lower Freeport-692.5', Upper Kittanning-760.5', Middle Kittanning-825.5', Lower Kittanning-845.5', Clarion-876.5'

16) Approximate Depth to Possible Void (coal mine, karst, other): None Known

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine?    Yes      \_\_\_\_\_      No      None Known

(a) If Yes, provide Mine Info:    Name: \_\_\_\_\_  
Depth: \_\_\_\_\_  
Seam: \_\_\_\_\_  
Owner: \_\_\_\_\_

18)

**CASING AND TUBING PROGRAM**

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	24 ✓	Used		94 ✓	80	80	CTS
Fresh Water	13.375	New	J-55	54.5	1,175	1,175	CTS
Coal							
Intermediate	9.625	New	J-55	40	2600	2600 ✓	CTS
Production	5.5	New	P-110	20 ✓	22,494	22,494	TOC @ 2,450 ✓
Tubing							
Liners							

*Donald L. Reynolds*  
5-9-19

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	24	36			0	Class A, 3% CaCl2	1.2
Fresh Water	13.375	17.5	0.38	2,730	900	Class A, 3% CaCl2	1.2
Coal							
Intermediate	9.625	12.25	0.395	3,950	1,500	Class A, 3% CaCl2	1.29
Production	5.5	8.5-8.75	0.361	15,920 ✓	9,500	Class A/50:50 Poz	1.29/1.34
Tubing					5,000		
Liners					N/A		

**PACKERS**

Kind:				
Sizes:				
Depths Set:				

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19) Describe proposed well work, including the drilling and plugging back of any pilot hole:

The well will be started with a conductor rig drilling a 36" hole to Conductor programmed depth then running 24" casing and circulate cement back to surface. The conductor rig will move out and the drilling rig will move in and rig up. The drilling rig will then spud a 17 1/2" hole and drill to fresh water casing (Surface) to the programmed depth, Run 13- 3/8" casing and cement to surface. The rig will continue drilling a 12- 1/4" intermediate hole to the programmed depth, run 9- 5/8" casing and cement to surface. The rig will then continue to drill an 8- 3/4" hole to a designed KOP. We will then start drilling the curve and lateral section to the programmed total measured depth, run 5 1/2" casing and cement according to the program.

20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:

The well will be completed using a plug and perforation method and stimulated with a slickwater and sand slurry. The anticipated maximum rate will be 90 bpm and the maximum pressure will be 9,500 psi.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 33.56

22) Area to be disturbed for well pad only, less access road (acres): 6.20

23) Describe centralizer placement for each casing string:

24"- No centralizers 13 3/8" – one bow spring centralizer on every other joint 9 5/8" – one bow spring centralizer every third joint from TD to surface 5 1/2" – one semi rigid centralizer on every joint from TD of casing to end of curve. Then every other joint to KOP. Every third joint from KOP to 2,700'; there will be no centralizers from 2,700' to surface.

24) Describe all cement additives associated with each cement type:

24" will be circulated to surface. The 13 3/8" casing will be cemented to surface with Class A cement and no greater than 3% CaCl (calcium chloride). The 9 5/8" casing will be cemented to surface with Class A cement, & no greater than 3% calcium chloride. The 5 1/2" production string will be cemented back to 2,450' (+/- 150' above the casing shoe for the 9 5/8") with Class A and 50/50 Poz cement retarded (to extend pumpability) cellophane flaked for fluid loss, Bentonite gel as an extender (increased pumpability and fluid loss), a defoaming agent to decrease cement foaming during mixing to insure the cement is of proper weight to placement and possibly gypsum gas blocking additive to aid in blocking/gas migration (in combination with other additive mentioned here, helps cement achieve a "right angle" set) during the plastic phase of the cement set-up.

25) Proposed borehole conditioning procedures:

Top holes will be drilled with fresh water KOP. At KOP, the wellbore will be loaded with synthetic oil based mud, barite-weighted mud system with such properties as to build a filter-cake on the face of the bore-hole. This will provide lubricity as well as stabilizing the well bore. We will begin rotating the drill string and mud will be circulated upon reaching TD until no further cuttings are observed coming across the shaker screens. Once clean mud is circulated back to surface, we will pull three stands of drill pipe, load the hole, pull three strands and load the hole. The weight indicator on the rig will be monitored for any occurrences of drag and if any are noticed, we will re-run the previous stand of pipe pulled across and circulate 2x bottoms up while watching shakers for signs of cuttings. Once at the base curve, the string will be continuously rotated while pumping 2x bottoms up. We will pull three stands and fill the hole until we reach the vertical section of the well.

\*Note: Attach additional sheets as needed.

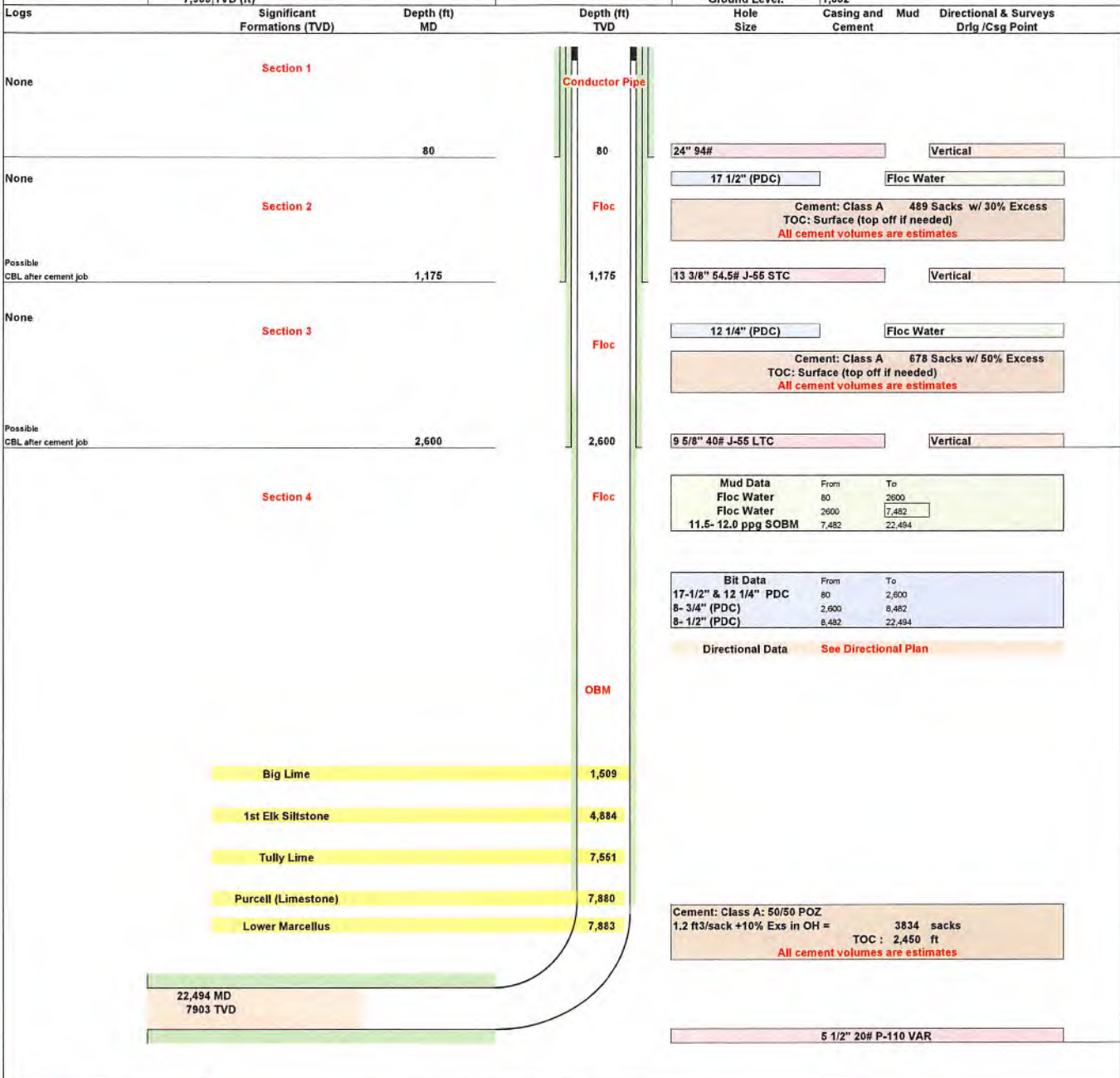
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Arsenal Resources  
Johnson TFP 40 205  
Casing Design  
Directional Plan # 1 QES

Other Names:	N/A
Surface Location:	TBD
Bottom Hole Location:	TBD
Total Depth:	22,494 MD (ft) 7,903 TVD (ft)

County:	Taylor		
State:	West Virginia		
AFE #:	XX	API #:	XX
RKB:	27		
Ground Level:	1,332		



Revision 1  
Note: Not drawn to scale  
Cement Outside Casing Seal Assembly in Annulus  
Date Last Revised: 7-May-19  
Jarrett Toms

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**TECHNICAL DATA SHEET**Connection: **VAroughneckAC**

Size: 5 1/2 in X 20.00 lb/ft

Drift: **standard**Bevel: **standard**

Grade: VA-XP-P110

Material:

	US Customary	Metric
Yield Strength Min.	110,000 psi	758 Mpa
Yield Strength Max.	140,000 psi	965 Mpa
Tensile Strength Min.	125,000 psi	862 Mpa

**Pipe:**

	US Customary	Metric		US Customary	Metric
Nominal OD:	5.500 in	139.70 mm	Wall Thickness:	0.361 in	9.17 mm
Nominal ID:	4.778 in	121.36 mm	Standard Drift:	4.653 in	118.19 mm
Nominal Weight:	20.00 lb/ft	29.76 kg/m	Pipe Body Yield Strength:	729 klb	3,241 kN
Pipe Cross Section:	5.828 in <sup>2</sup>	3,760.13 mm <sup>2</sup>			

**Connection:**

	US Customary	Metric		
OD:	6.300 in	160.02 mm	Threads per inch:	5 Threads
ID:	4.764 in	121.00 mm		
Length:	8.976 in	228.00 mm		

**Connection Performance (Uniaxial Load):**

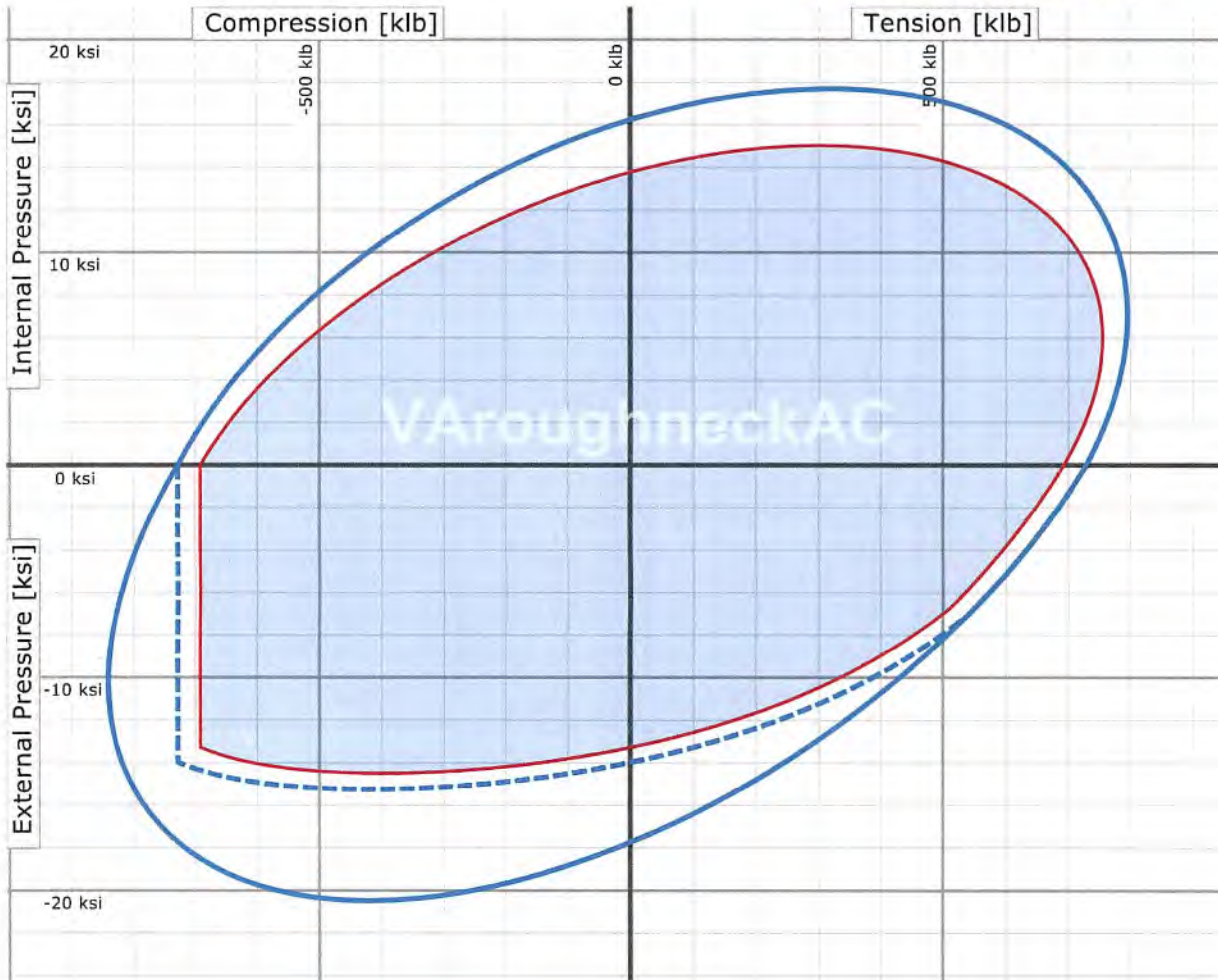
	US Customary	Metric		US Customary	Metric
Joint Strength:	729 klb	3,241 kN	Tension Efficiency:	> 100.0 %	
Collapse Resistance:	13,970 psi	96.30 Mpa	Displacement:	1.240 gal/ft	15.40 l/m
Internal Yield Pressure:	15,920 psi	107.50 Mpa	Production:	0.932 gal/ft	11.57 l/m
Load on Coupling Face:	709 klb	3,160 kN			

**Field Make Up (Friction Factor = 1.0):**

	US Customary	Metric		US Customary	Metric
Minimum Torque:	15,822 ft.lb	21,451 Nm	Make-Up Loss:	4.370 in	111.00 mm
Optimum Torque:	17,580 ft.lb	23,835 Nm	Yield Torque:	22,000 ft.lb	29,800 Nm
Maximum Torque:	19,338 ft.lb	26,218 Nm			
Min. Torque on Shoulder:	%				

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## LOAD ENVELOPE



### Recommended Field of Application

- Pipe Body Envelope
- - - Pipe Body Collapse

#### Efficiency (% Pipe Body) under Uniaxial Loads

Tension:	100.0 %
Compression:	100.0 %
Internal Pressure:	89.3 %
External Pressure:	100.0 %

#### Sealability Rating (% Efficiency) under Combined Loads

Tension:	100.0 %
Compression:	100.0 %
Internal Pressure:	100.0 %
External Pressure:	100.0 %

#### Test Conditions

Test Medium:	Fluid
Von Mises Envelope:	95.0 %
Bending:	20.00 °/100ft

The graph is calculated under consideration of the requirements of EN ISO 13679 and API 5C3. The combined loads are calculated without the consideration of wall thickness tolerances and differ from the values in the data sheet, which are calculated with tolerances determined by API. Any printout is NOT SUBJECT TO REGULAR REVISION. The generated performance envelope shall solely be used as a tool to facilitate the comparison of performance properties under combined loads, of different grades, sizes and connections of voestalpine Tubulars products. Field-specific safety/design factors as well as other loads are not considered. Thus the results shall by no means be used to replace the own string design engineering or to justify any warranty/guaranty cases.

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**TECHNICAL DATA SHEET**Connection: **VAroughneck**

Size: 5 1/2 in X 23.00 lb/ft

Drift: **standard**Bevel: **standard**

Grade: VA-HC-P110

Material:

	US Customary	Metric
Yield Strength Min.	110,000 psi	758 Mpa
Yield Strength Max.	140,000 psi	965 Mpa
Tensile Strength Min.	125,000 psi	862 Mpa

**Pipe:**

	US Customary	Metric		US Customary	Metric
Nominal OD:	5.500 in	139.70 mm	Wall Thickness:	0.415 in	10.54 mm
Nominal ID:	4.670 in	118.62 mm	Standard Drift:	4.545 in	115.44 mm
Nominal Weight:	23.00 lb/ft	34.23 kg/m	Pipe Body Yield Strength:	729 klb	3,242 kN
Pipe Cross Section:	6.630 in <sup>2</sup>	4,276.80 mm <sup>2</sup>			

**Connection:**

	US Customary	Metric		
OD:	6.260 in	159.00 mm	Threads per inch:	5 Threads
ID:	4.669 in	118.60 mm		
Length:	8.976 in	228.00 mm		

**Connection Performance (Uniaxial Load):**

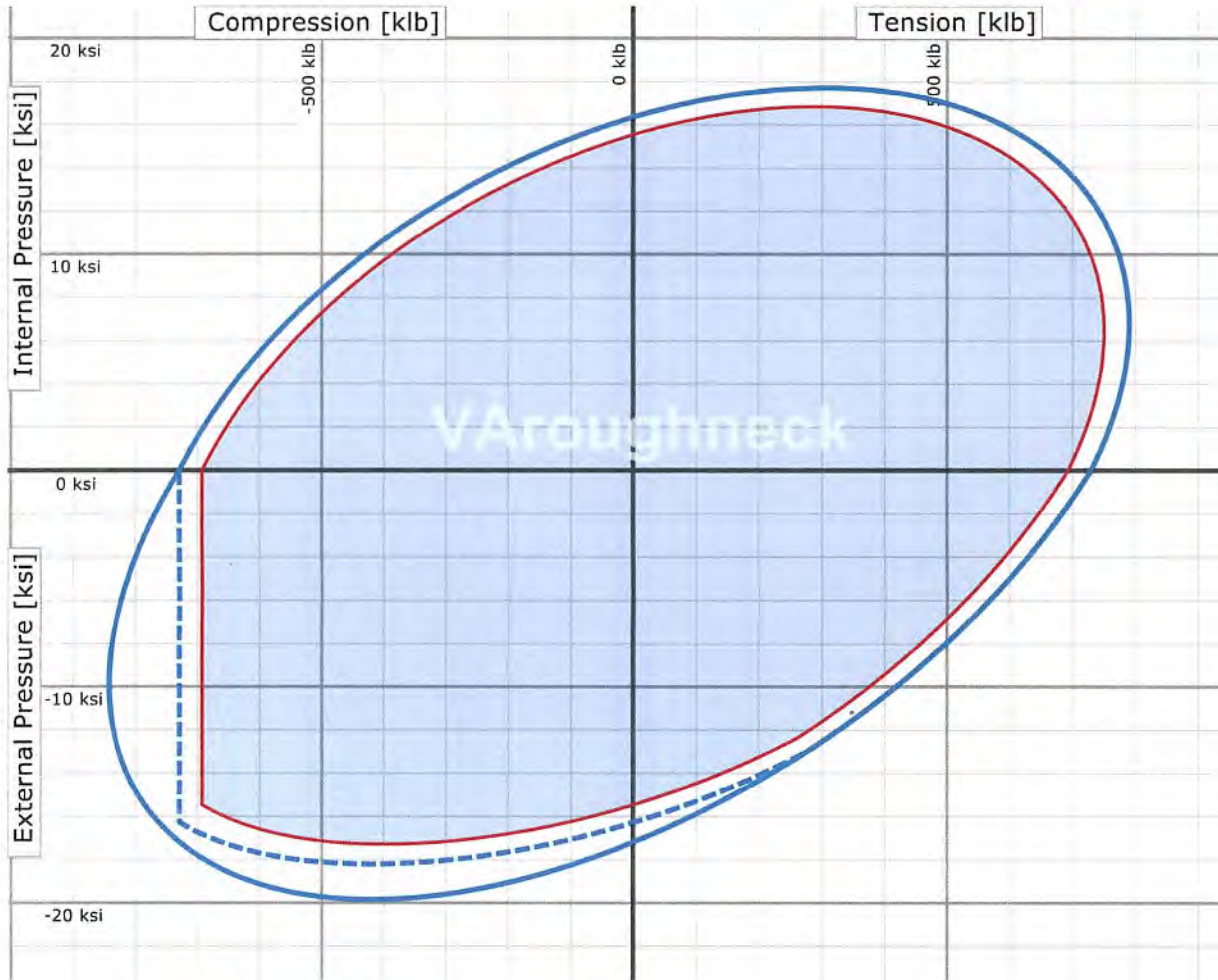
	US Customary	Metric		US Customary	Metric
Joint Strength:	729 klb	3,242 kN	Tension Efficiency:	> 100.0 %	
Collapse Resistance:	16,350 psi	112.73 Mpa	Displacement:	1.242 gal/ft	15.43 l/m
Internal Yield Pressure:	14,518 psi	100.10 Mpa	Production:	0.890 gal/ft	11.05 l/m
Load on Coupling Face:	582 klb	2,590 kN			

**Field Make Up (Friction Factor = 1.0):**

	US Customary	Metric		US Customary	Metric
Minimum Torque:	17,847 ft.lb	24,197 Nm	Make-Up Loss:	4.370 in	111.00 mm
Optimum Torque:	19,830 ft.lb	26,886 Nm	Yield Torque:	24,800 ft.lb	33,600 Nm
Maximum Torque:	21,813 ft.lb	29,574 Nm			
Min. Torque on Shoulder:	%				

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## LOAD ENVELOPE



### Recommended Field of Application

- Pipe Body Envelope
- - - Pipe Body Collapse

#### Efficiency (% Pipe Body) under Uniaxial Loads

Tension:	100.0 %
Compression:	100.0 %
Internal Pressure:	100.0 %
External Pressure:	100.0 %

#### Sealability Rating (% Efficiency) under Combined Loads

Tension:	100.0 %
Compression:	100.0 %
Internal Pressure:	100.0 %
External Pressure:	100.0 %

#### Test Conditions

Test Medium:	Fluid
Von Mises Envelope:	95.0 %
Bending:	81.00 °/100ft

The graph is calculated under consideration of the requirements of EN ISO 13679 and API 5C3. The combined loads are calculated without the consideration of wall thickness tolerances and differ from the values in the data sheet, which are calculated with tolerances determined by API. Any printout is NOT SUBJECT TO REGULAR REVISION. The generated performance envelope shall solely be used as a tool to facilitate the comparison of performance properties under combined loads, of different grades, sizes and connections of voestalpine Tubulars products. Field-specific safety/design factors as well as other loads are not considered. Thus the results shall by no means be used to replace the own string design engineering or to justify any warranty/guaranty cases.

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