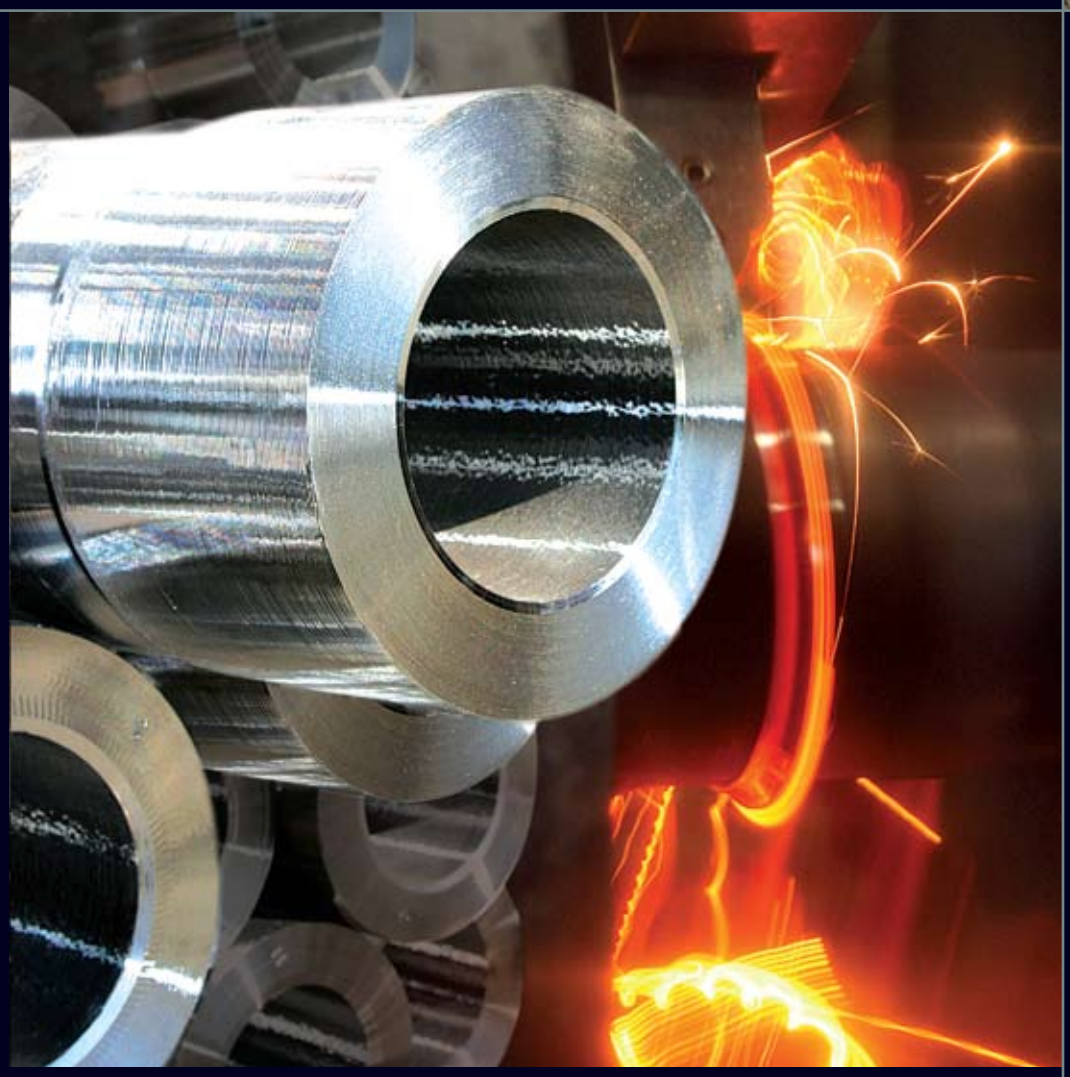
VAM



DRILLING

DRILL PIPE • HEAVY WEIGHT • DRILL COLLARS • ACCESSORIES • PERFORMANCE DRILLING SYSTEMS

VAM® DRILLING
Vallourec Group

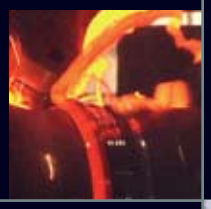
VAM Drilling

VAM Drilling is a fully integrated provider of drillstem products; and a strategic subsidiary of Vallourec & Mannesmann Tubes (V&M Tubes), a leading provider of oil country tubular goods (OCTG) worldwide.

VAM Drilling offers a complete range of high-performance products and services for the toughest drilling applications, including drill pipe, heavy weight, drill collars, accessories and performance drilling systems. Primary manufacturing facilities are located in France, the United States and the Netherlands. Worldwide sales offices and the VAM Services network ensure a close relationship and excellent field support to our customers.

VAM Drilling's innovative R&D and marketing group is dedicated to developing unique tubular solutions and services to improve drilling efficiency. For today's toughest drilling challenges, or those in the future, VAM Drilling is committed to developing cost-effective performance drilling solutions.

VAM® DRILLING
Vallourec Group



VAM DRILLING

Brazil • Canada • China • Dubai • France • Germany • Singapore • United Kingdom • United States

VAM® DRILLING
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DRILLING

VAM

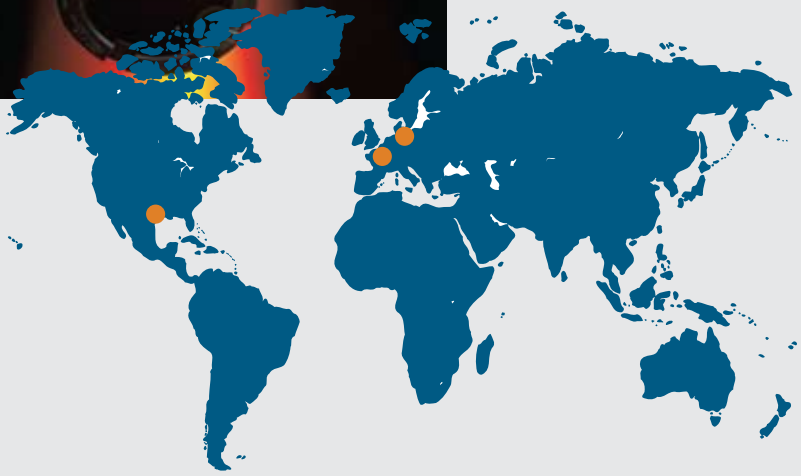
VAM Drilling

VAM Drilling is one of the world's largest fully integrated manufacturers of drill pipe and associated drillstem products. All products are designed to meet the most demanding specifications for today's drilling market.

VAM Drilling is part of the oil and gas division of Vallourec & Mannesmann Tubes, a subsidiary of the Vallourec Group. Vallourec is a world leader in the design and production of seamless steel tubes for diversified industrial applications (oil and gas, power generation, petrochemicals, automotive and mechanical engineering industries).

The VAM Drilling product lines combine a full range of drilling tubulars and accessories. From the rig floor to the bottomhole assembly (BHA), VAM Drilling products are available in a variety of steel grades with standard API or proprietary high performance connections.

With manufacturing facilities in France, Holland and the United States, VAM Drilling supplies drilling products worldwide with an internationally renowned reputation for quality and service.



VAM Drilling is part of Vallourec & Mannesmann Tubes, a world leader in the production of seamless steel tubes and tubular products.

VAM Drilling is more than a manufacturer of drilling tubulars, supplying a complete range of proprietary drillstem products. As well profiles and drilling programs become more challenging, VAM Drilling designs and provides tailor-made systems to meet these challenges.

VAM Drilling offers the following standard product lines:

Drill Pipe - 2-7/8" to 6-5/8", Range 2 and 3

Heavy Weight - 3-1/2" to 6-5/8", welded or integral

Drill Collars - 3-1/8" to 14", slick or spiral

API and High-Performance Connections - API connections; API-compatible high-torque connections (VAM EIS®); proprietary high-torque connections (VAM Express™); and proprietary gas-tight connections (VAM Riser WO-SR and WO-HP).

Steel Grades - API, sour service, high strength, critical service and non-mag material grades.

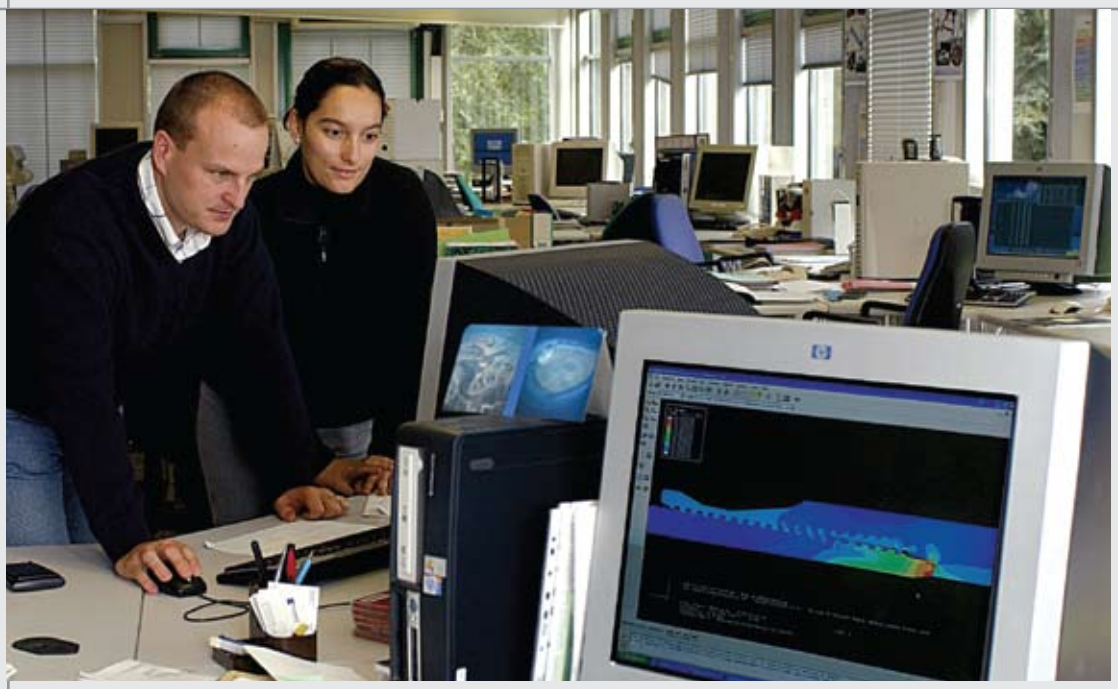
Drillstem Accessories - Kellys 3" to 6", square or hexagonal; safety valves; Kelly valves; drop-in check valves; IBOPs; pup joints; crossovers; and subs.

Performance Drilling Systems - Hydroclean™ drill pipe and heavy weight in sizes 2-7/8" thru 6-5/8", in range 2 and range 3; drill pipe risers with high pressure gas-tight seals.

VAM Express™ proprietary high torque connections

VAM Drilling is a fully integrated manufacturer of both API and high performance drilling products.

Connecting Customer Needs



Engineering

API has long met the needs for the oil and gas industry. However, today's wells are deeper and more complex with higher pressures and temperatures, requiring more exacting material properties and mechanical performance. The demand for a highly engineered product has never been greater.

VAM Drilling is an industry leader in downhole product design and manufacturing. With an engineering base that is recognized throughout the industry, VAM Drilling has world class design capabilities to improve both performance and mechanical properties of its products.

A continuous re-examination of design parameters, material requirements and final construction ensures that the maximum effort is directed to extend the limits and functions of all drillstring components beyond API and ISO.

Research & Development

With a research and development capability that covers the entire process from steel elaboration to final product manufacture, VAM Drilling connects the dots between customer needs for drilling products and the processes required to produce them.

VAM Drilling's research and development resources include industry experts and experienced engineering personnel along with a complete array of testing facilities. Further capabilities are also available in-house to apply combined drilling loads and simulated field conditions on full-scale samples. When a new product leaves the lab you can rest assured it has been fully tested, analyzed, field tested and evaluated to be ready for service.

VAM Drilling connects the dots between customer needs for drilling products and the processes required to produce them.

TECHNICAL SUPPORT

VAM Drilling's commitment to customer service continues long after the product leaves the plant. Supported by a worldwide network of VAM Services' accessory and repair shops that are strategically situated near all major oil and gas centers, VAM Drilling ensures that there is a reliable and readily licensed facility always available to cut VAM proprietary connections.

In cooperation with the VAM Drilling Marketing & Technical Support departments, VAM Services assists in providing on-site technical support; quality procedures; dispatch of documentation and gauges; and regular audits to ensure that VAM Drilling products are manufactured at a consistent quality level around the world.

FIELD SERVICE

VAM Drilling, in close coordination with VAM Field Service International, provides a worldwide field support network through service centers in Aberdeen and Great Yarmouth in the United Kingdom; Abu Dhabi and Oman in the Middle East; the United States; Singapore; Canada; Mexico; Brazil; West Africa; and China.

VAM Drilling approved and qualified field service engineers are located in strategic centers around the world and are available at a moment's notice no matter where the worldwide region of interest. Field Service engineers are available to offer customer support and provide a full range of services including:

- Running and handling procedures
- Break-in guidelines
- Connection inspection
- Performance analysis/trouble-shooting
- On-site training of rig crews

VAM Drilling provides accessory and repair shops plus a worldwide field support network.

Quality

VAM Drilling provides accessory and repair shops plus a worldwide field support network.

The performance of VAM Drilling products is critical to the drilling process, no matter what the condition or where. Whether the application is for a shallow well in the Middle East or a deepwater HP/HT well in the Gulf of Mexico, VAM Drilling's product quality is never in question.

By monitoring quality at all stages of product manufacture – from the seamless green tube to finished drill pipe and drillstem components, VAM Drilling ensures a superior product. Adherence to the most rigorous industry standards or unique customer specifications (as well as VAM Drilling's stringent design specifications) ensures that the products delivered to the field are immediately suitable for use.

Where applicable, VAM Drilling products are manufactured in compliance with the following API standards:

- API Specification 5D
- API Specification 7
- API Recommended Practice 7G

In addition, VAM Drilling products can be supplied with the following specifications:

- NS1
- DS1
- IRP
- Customer-supplied specification

VAM Drilling facilities meet the following Quality Standards:

- API Specification Q1
- ISO 9001 – 2000

By monitoring quality at all stages of manufacturing, VAM Drilling ensures a superior product.

VAM Drilling manufactures some of the finest downhole products in the industry, using high-tech, safety-oriented facilities. The health and safety of all employees is paramount to the manufacturing process. To that end, VAM Drilling has developed a policy to:

- Consistently comply with international agreements and national laws, while respecting and fulfilling country specific needs;
- Deploy Continuous Improvement Teams (CIT) in the context of a Total Quality Management (TQM) program;
- Constantly optimize the performance of the workforce, with vocational training programs and efficient Competency Management (CM) systems.

At VAM Drilling, the environmental impact of operations is a key element of the decision process whenever new development or redevelopment is under consideration. VAM Drilling is committed to a sustainable future and that starts with ensuring that all endeavors have a positive impact on the environment.

The health and safety of all employees is paramount to the manufacturing process.

Supply Chain — Vertical integration

VAM Drilling is truly vertically integrated, providing drillstem products from the mill to the well. VAM Drilling, through parent company V&M Tubes, has its own mills, ensuring continuous supply of raw materials and mitigation of costs.

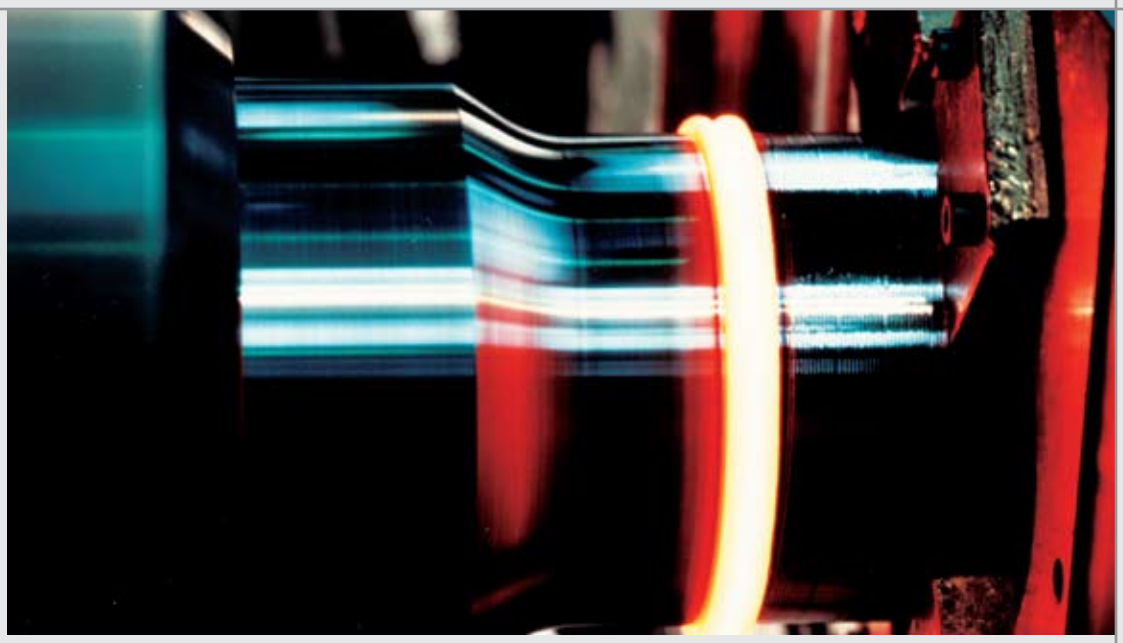
VAM Drilling receives green tubes from V&M Tubes' mills in Saint-Saulve, France; Mülheim, Germany; and Belo Horizonte, Brazil and from other selected steel sources. Tubes are upset and heat-treated to the required specifications at VAM Drilling's manufacturing plants in Europe and the United States. Tool joint forgings are supplied by VAM Drilling France and United States producers, and are machined and phosphated prior to friction welding in VAM Drilling plants in Houston and Aulnoye, France.

After the tubes have been upset, heat-treated and welded to the tool joint, the finished product is heat-treated, inspected and coated internally and externally before shipment. Manufacturing includes both API and high performance products, such as VAM Drilling's proprietary connections VAM EIS® and VAM Express™; H_2S-resistant materials; or high strength steel grades.

For bottomhole assembly (BHA) components, VAM Drilling's plant in Cosne-sur-Loire, France, manufactures its patented Hydroclean™ product line, Kellys, heavy weight drill pipe, rotary subs, non-magnetic drill collars, spiral-grooved drill collars, slick collars, safety valves and more.

VAM Drilling has its own mills, ensuring a continuous supply of raw materials, improving delivery and mitigating costs.

DRILL PIPE



VAM Drilling provides a complete line of drillstring products, including a full range of jointed drill pipe in nominal sizes from 2-3/8" to 6-5/8" and in a wide range of wall thicknesses.

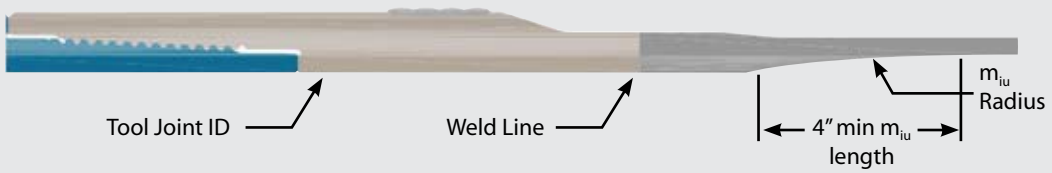
VAM Drilling drill pipe is designed to provide superior technical performance and a service life time exceeding most current industry standards. VAM Drilling drill pipe is available with:

- Proprietary oversized minimum internal upset (m_{iu}), where applicable;
- Longer tool joints, providing a maximum re-cut capability for longer service life; and
- Higher toughness specification on pipe body, weld and tool joint, providing greater safety margins in extreme drilling conditions.

VAM Drilling tool joints meet or exceed API specifications and tolerance requirements. Each joint is inspected to monitor visual and dimensional properties, and tested to ensure the proper mechanical characteristics. All VAM Drilling tool joints are:

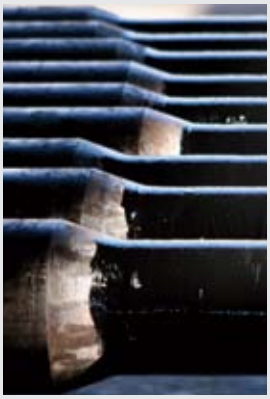
- 100 percent thread-gauged;
- 100 percent magnetic-particle inspected;
- Phos-coated (anti-galling treatment); and
- Hardness-tested.

VAM Drilling Drill Pipe Upset Profile



One of the more critical sections in welded drill pipe is the transition zone between the tool joint and the pipe body. A smooth, gradual transition ensures the minimum stress concentration and greatly improves the fatigue life of the pipe.

VAM Drilling drill pipe meets or exceeds API specifications to satisfy the most stringent drilling conditions.



Drill Pipe — Designed to go deep

VAM Drilling engineers and metallurgists – using leading edge laboratory and manufacturing facilities – provide high-tech products for the oil and gas industry. In particular, VAM Drilling drill pipe features specially engineered materials.

All standard API grades (E-75, X-95, G-105, and S-135) and special sour service grades, such as VM-95 DP SS and VM-105 DP SS, are manufactured in range 2 and range 3 lengths and are available in a variety of pipe sizes. Sour service drilling is one of VAM Drilling's specialties. V&M sour service proprietary grades are the result of years of research and development.

VAM Drilling is increasingly supplying top-of-the-range grades such as VM-150 to meet the performance and economic demands associated with ever more challenging projects, such as deep offshore or ultra-deep drilling.

Drill Pipe Materials Table

Specifications	Drill Pipe Material	Yield Strength Min/Max (ksi)	Ultimate Strength Min/Max (ksi)	Max Hardness[1]	Min Avg Charpy (ft-lbs @ 75°F)	SSC Threshold[2] (% SMYS[3])
API	E-75	75/105	100/-	-	40	-
	X-95	95/125	105/-	-	40	-
	G-105	105/135	110/-	-	40	-
	S-135	135/165	145/-	-	40	-
	Tool Joints	120/-	140/-	341 HB	40	-
VAM Drilling Proprietary Materials	VM-135	135/165	145/-		54[4][5]	-
	VM-150	150/170	160/-	42 HRC	44[5]	-
	VM-95 DP SS	95/110	105/130	25 HRC	59[5]	85%
	VM-105 DP SS	105/120	115/140	28 HRC	59[5]	85%
	Tool Joints SS	110/125	125/145	30 HRC	66[5]	65%

[1] Average value from three single point readings
[2] As per NACE Test Method TM-0177
[3] SMYS - Specified Minimum Yield Strength
[4] Based on 3/4 size specimens
[5] At -4°F

VAM Drilling is continually developing superior grades to meet the performance and economic demands of increasingly harsh conditions.

Hardbanding

Hardbanding is designed to increase tool joint life. It is applied prior to welding the tool joint onto the pipe body. Several bands of material (generally 3" to 4" total length) are applied to the box tool joint and an optional band (approx. 3/4" length) may be applied to the elevator taper. Hardbanding on the pin tool joint is available on request. When properly applied under tightly controlled conditions it provides a uniform, low porosity wear resistant surface.

Hardbanding supplied by VAM Drilling is available in either raised or flush configuration and "casing friendly" solutions can be selected. In addition to our proprietary tungsten carbide hardbanding (Series 1000, 3000 and 5000), VAM Drilling is also a qualified applicator for:

- Arnco 100XT™ and 300XT™;
- Armacor M Star; and
- Tuboscope TCS 8000 and TCS Ti.

NC50 and Smaller

6-5/8" REG and
5-1/2", 6-5/8" FH

VAM Drilling provides American Petroleum Institute (API) connections in different pipe lengths, diameters and metallurgy and is licensed for:

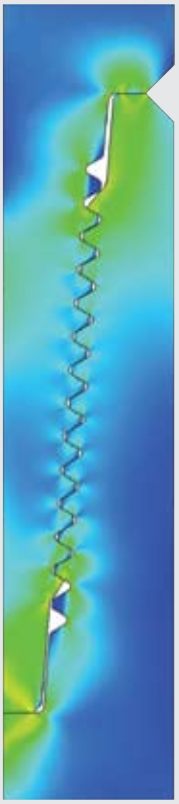
- API Specification 5D;
- API Specification 7; and
- API Recommended Practice 7G

In addition to industry-accepted API tool joint connections, VAM Drilling provides its advanced VAM EIS® and VAM Express™ high torque threads upon request.

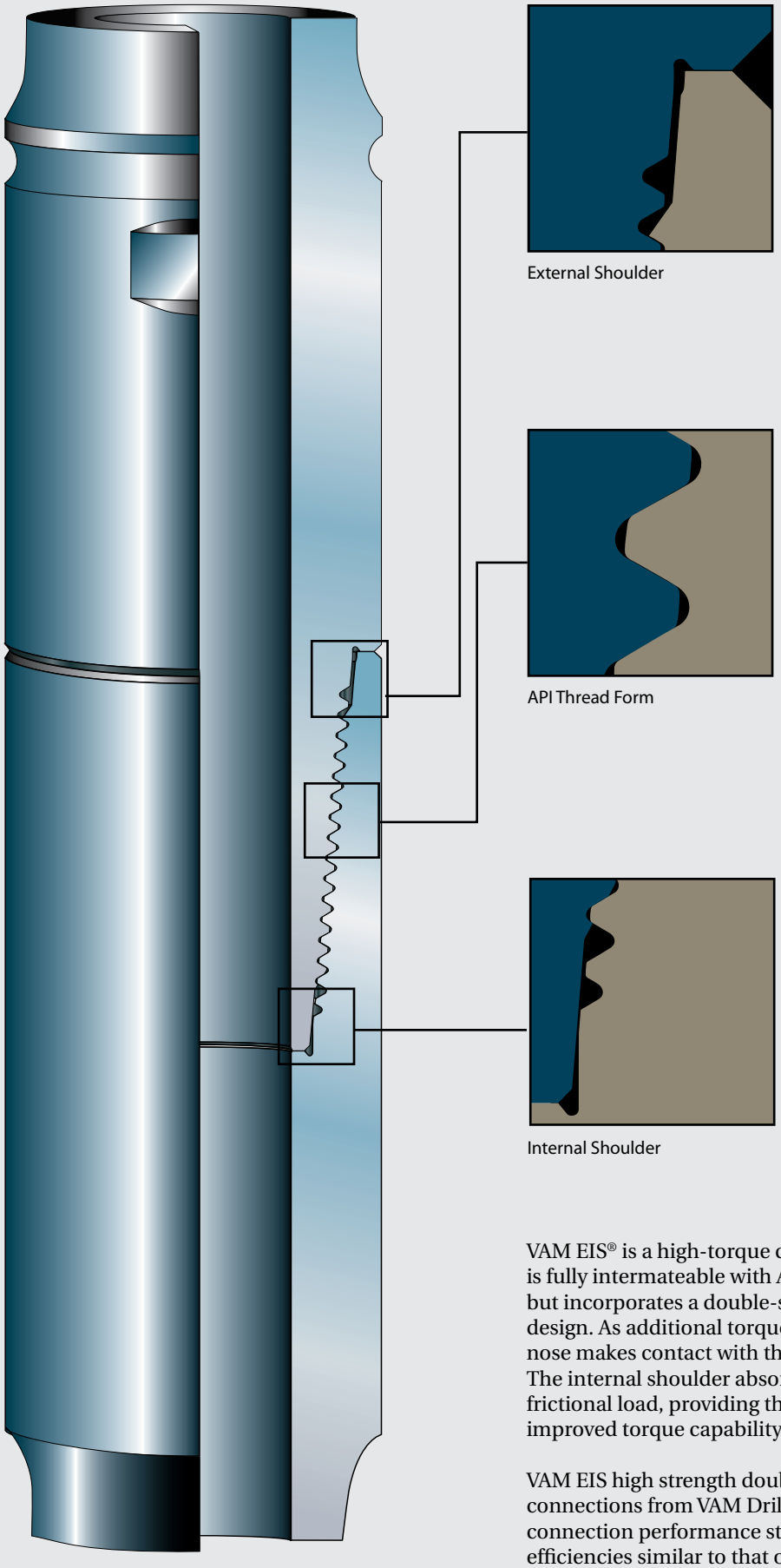
For detailed dimensional information, see API Specification 7.

VAM Drilling provides the full range of API connections.

VAM EIS®



VAM EIS® high-torque connections are fully inter-mateable with API drill pipe connections.



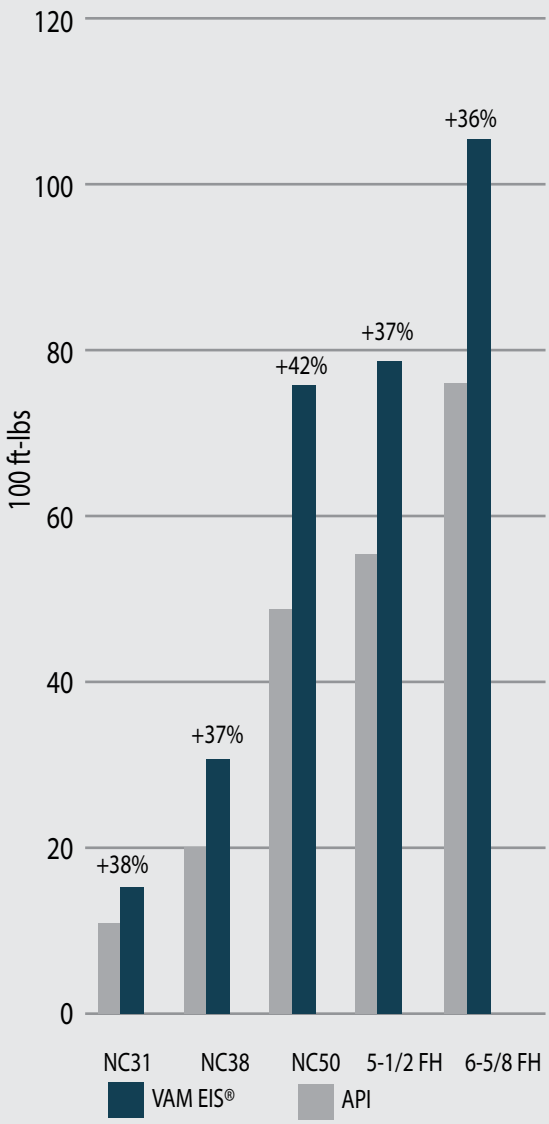
VAM EIS® is a high-torque connection that is fully intermateable with API connections but incorporates a double-shoulder tool joint design. As additional torque is applied, the pin nose makes contact with the internal shoulder. The internal shoulder absorbs the higher frictional load, providing the connection with improved torque capability.

VAM EIS high strength double shoulder connections from VAM Drilling set a new connection performance standard at cost efficiencies similar to that of API connections.

The additional torsional strength provides exceptional performance in the most difficult well conditions, such as highly deviated or extended reach wells. This design also benefits service life with a significantly greater wear capability. VAM EIS® is available in drill pipe sizes from 2-7/8" to 6-5/8" OD, including 5-7/8", and in a wide range of steel grades, including sour service and high strength. The VAM EIS tool joint design provides:

- **Higher Torque.** Using the VAM EIS connections with current API ODs and IDs results in torque capacity 30% percent higher (or more) than API.
- **Larger ID.** Using VAM EIS improves hydraulic performance while maintaining the required torque.
- **Smaller OD.** Slimmer profile than current API connections, while maintaining required strength, controlling torque and drag and improving fishability.
- **Extended Service Life.** Using the VAM EIS with standard ODs and IDs results in an OD wear capability 30% higher than API, which combined with a 2" longer-than-standard tool joint, provides unbeatable service life.
- **Sour Service.** A lower grade tool joint (105 ksi or even 95 ksi) exhibits the same level of torque as an API connection in 120 ksi, enabling optimum drilling parameters in sour environments.
- **Flexibility.** Intermateable with API connections, new or used.

Torsional Performance - VAM EIS® vs API



Tool Joint Comparison

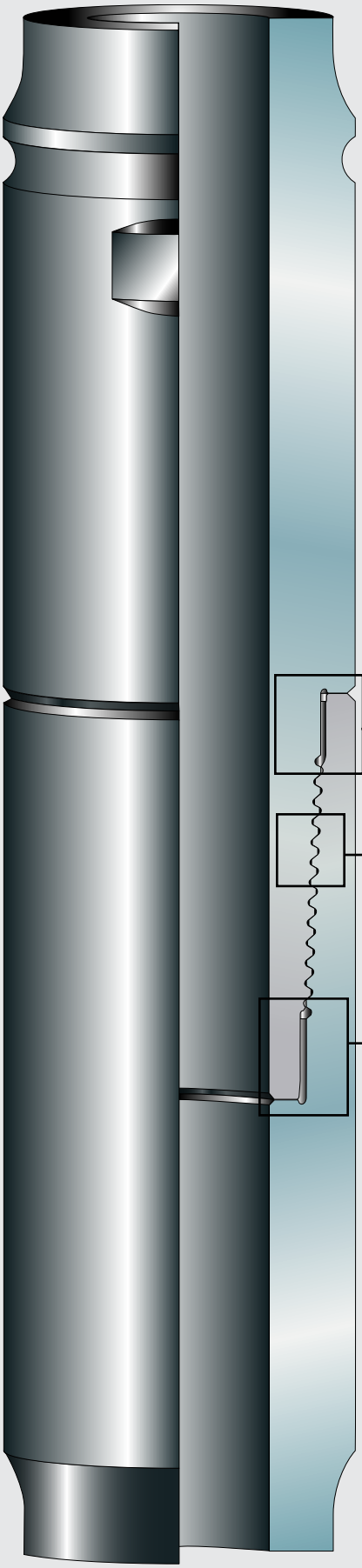
	API (120 ksi)	API Sour (105 ksi)	VAM EIS® (105 ksi)
Tool Joint			
OD (in)	6-5/8	6-5/8	6-5/8
ID (in)	3-1/2	3-1/2	3-1/2
Torsional Yield (ft-lbs)	44,500	38,900	55,100
Make-up Torque (ft-lbs)	26,700	23,300	33,000

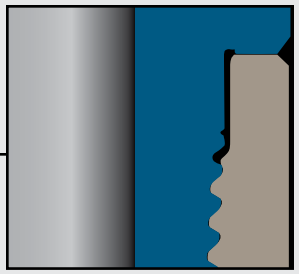
Note: Data based on API NC50 and NC50 VAM EIS® connections. OD and ID were selected to be the same for comparative purpose only.

VAM EIS® is a first generation double shoulder connection that is fully compatible with API connections.

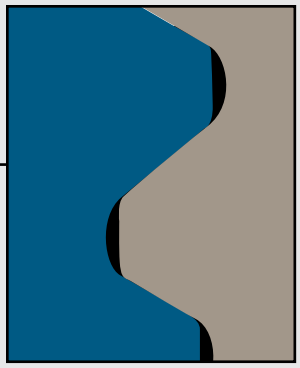
VAM Express™

VAM Express™ high performance connections run like API.

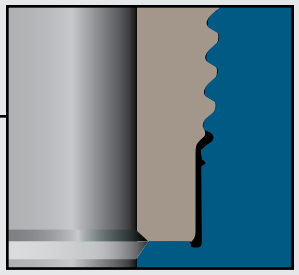




Primary Sealing External Shoulder



VAM Express™ Thread Form

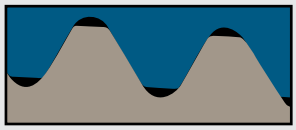


Secondary Internal Shoulder

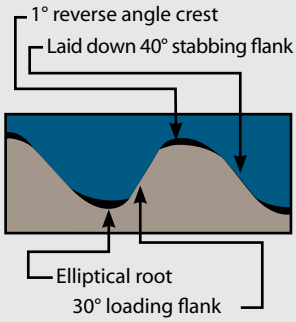
Developed using the latest VAM connection technology, the patented VAM Express™ connection incorporates a proprietary thread profile and high-performance double shoulder design producing the most rugged high-torque connection available today. The primary torque shoulder provides initial seal and pre-load during make-up to full recommended torque and the secondary torque shoulder provides high torque capacity.

Trip time is money. With the easy stabbing and quick make-up of the VAM Express high performance connections, drilling contractors can save valuable rig time, resulting in significant cost saving on each well.

The VAM Express™ thread form features a large, rounded stab crest and a laid down stab flank which allows easy stabbing of the connection. A back beveled crest reduces the chance of wedging the thread and increases the freedom of movement, allowing easy connection make-up. The elliptical root increases resistance to rotational-induced bending fatigue.



API Thread Form



VAM Express Thread Form

The patented VAM Express connection design provides:

- **Quick rig make-up.** 5-6 turns from stab-in to full make-up similar to API connections with trip-time savings up to 16% better than other high-performance connections.
- **High torque.** Torque capacity averages 1 1/2 to 2 times that of API connections.
- **User friendly.** Reduces stabbing damage and the need for stabbing or de-stabbing guides because of thread form design.
- **Durability.** Reduces wedging risk, resulting in less thread damage and a low re-cut rate.
- **Strength.** Allows change of OD/ID for improved hydraulic performance.

Typical Tool Joint Data and Comparison

Pipe Size (in)	Connection		Tool Joint		Make-up Torque	Torsional Strength	Tensile Strength
	Type	Size	OD (in)	ID (in)	(ft-lbs)	(ft-lbs)	(lbs)
3-1/2	API	NC38	4-3/4	2-9/16	11,500	19,200	649,000
	VAM Express™	VX38	4-3/4	2-9/16	19,500	32,500	679,000
		VX39	4-7/8	2-13/16	20,200	33,700	693,000
4	API	NC40	5-1/4	2-9/16	16,600	27,700	838,000
	VAM Express™	VX39	5	2-3/4	22,300	37,200	729,000
		VX40	5-1/4	2-13/16	25,600	42,600	914,000
5-1/2	API	5-1/2 FH	7-1/4	3-1/2	43,300	72,200	1,620,000
	VAM Express™	VX54	6-3/4	4	55,800	89,400	1,320,000
5-7/8	API	NA	NA	NA	NA	NA	NA
	VAM Express™	VX57	7	4-1/4	59,000	94,600	1,378,000

VAM Express™ combines quick make-up with exceptional strength and durability.

Make and Break — Saves you money

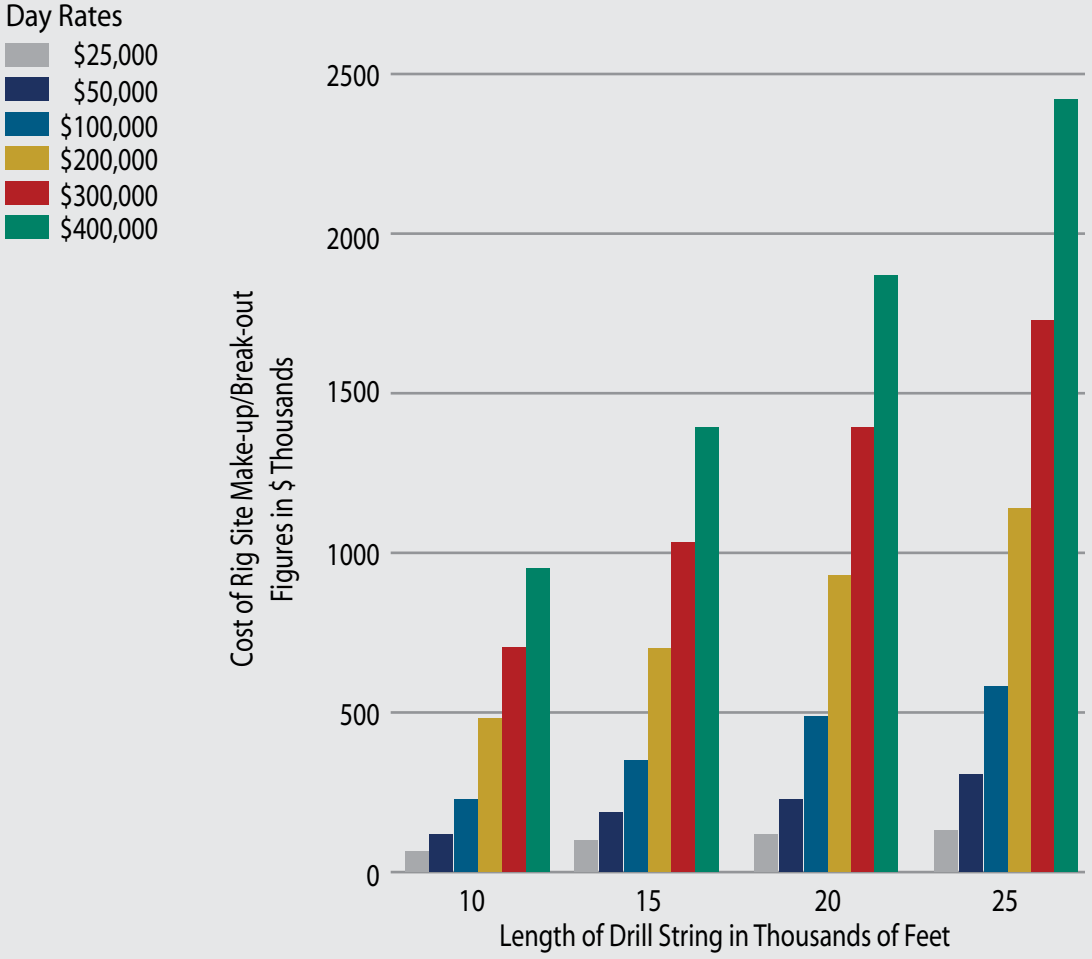
VAM Drilling's make-up/break-out service is performed consistently using the same procedure for each joint of pipe, thus avoiding material handling mishaps and the potential variability of procedure by different rig crews. If galling does occur during the process, it is repaired or replaced immediately saving additional rig time or transportation. Pipe that has been properly broken-in lasts longer.

Time is money on the drilling rig. It takes about 10 minutes per joint to break-in pipe at the rig site. If you are breaking in a 15,000-foot drillstring (about 500 joints), that's 5,000 minutes (or 83 hours) of rig and crew time. The chart below demonstrates the cost of pipe break-in at different rig day rates.

The procedure for make-up/break-out of tool joints includes:

- Joints are finish-machined, inspected and phos-coated prior to operation.
- Threads of each box and pin member are cleaned thoroughly to remove any oil, grease or other matter.
- Box and pin threads are thoroughly coated with drill pipe thread compound.
- Joints are made-up hand tight and then power-tightened to 100% of recommended make-up torque and broken-out to hand-tight condition for three successive make and break cycles.
- Joints are finally broken apart, cleaned thoroughly and inspected to ensure that no galling of the threads and sealing shoulders has occurred.

Make-up/Break-out Costs At Rig



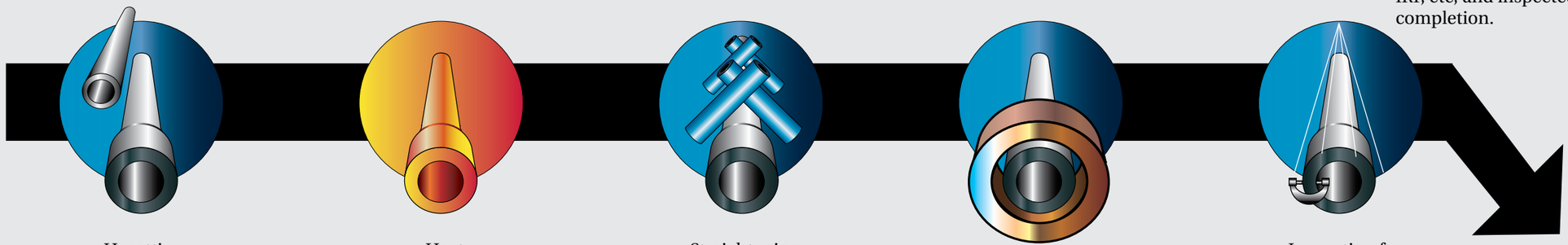
Factory make-up/ break-out of VAM Drilling tool joints provides excellent insurance against damage to drill pipe connections.

Drill Pipe Manufacturing Flow Chart

Vallourec Group

PIPE BODY

Drill pipe is manufactured to customer requirements and where applicable to specifications such as API, NS1, DS1, IRP, etc; and inspected 100% after completion.



Upsetting

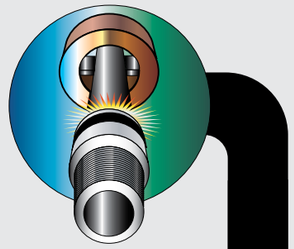
Heat Treatment

Straightening

Magnetic Particle Inspection

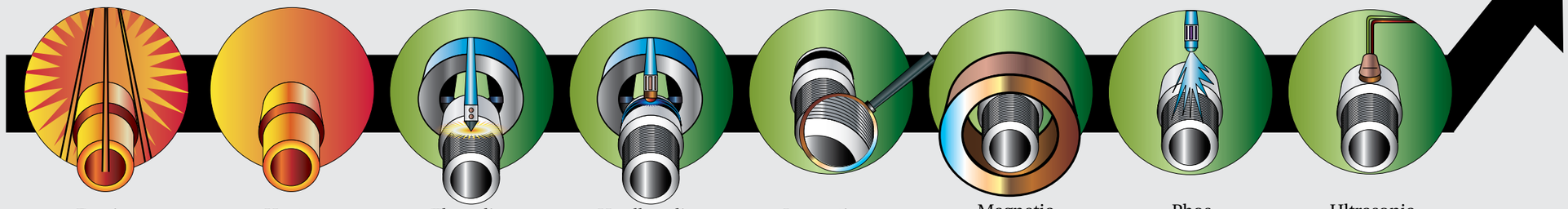
Inspection for Longitudinal Defect Transverse Defect Wall Thickness Grade Verification

ASSEMBLY



Friction Welding

TOOL JOINT



Forging

Heat Treatment

Threading

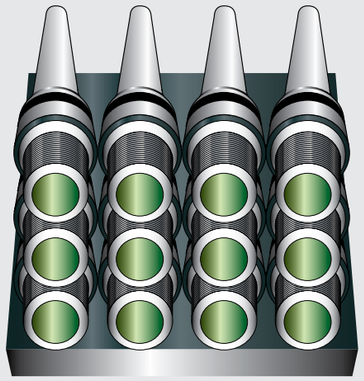
Hardbanding

Inspection

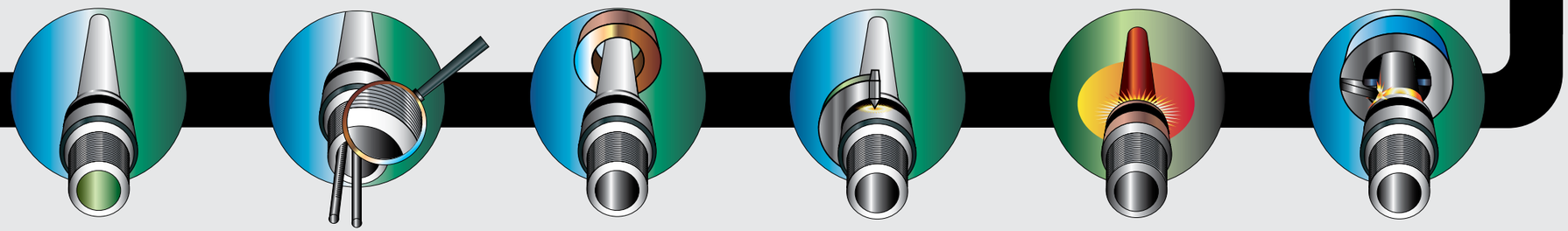
Magnetic Particle Inspection

Phos Coating

Ultrasonic Inspection



Shipping



Internal Plastic Coating

Final Inspection

Wet Magnetic Particle Inspection

Hardness Check

Heat Treatment of Weld

Flash Removal

Performance Data Sheets - Overview

The VAM Drilling Performance Data Sheet is provided to the customer as a supplement to the information found in published standards. Provided below is an overview of some of that information.

Data Sheet Definitions

- New Pipe. Pipe that has never been run in a well. Once new pipe is run below the rotary table it should be considered as premium grade or lower (depending upon the wear of the drill pipe).
- Premium Class Pipe. Pipe with a wall thickness that is a minimum of 80% of new pipe's wall thickness.
- Torsional Ratio. Ratio of the tool joint connection's torsional yield strength divided by the pipe's torsional yield strength. API recommends that this ratio is equal to or greater than 0.80.
- Balanced OD. Tool Joint OD where the torque-to-yield of the box is equal to the torque-to-yield of the pin.
- Tool Joint OD. For new pipe, this is selected by the customer. For used pipe, the actual tool joint OD and the Drill Pipe Wear Chart should be used to determine the recommended make-up torque. The premium tool joint OD and associated make-up values correspond to: the actual tool joint OD to meet 0.80 torsional ratio of premium pipe; or a specific tool joint OD determined by the initial connection OD.

Drill Pipe Dimensions & Materials

Pipe	New		Premium	
OD	5	in	4.855	in
Wall Thickness	0.362	in	0.290	in
ID	4.276	in	4.276	in
Grade	S-135			
Cross Sectional Areas	5.275	in^2	4.154	in^2

Tool Joint	New		Premium	
Connection	NC50 VAM EIS®			
OD	6-5/8	in	5-7/8	in
ID	3-1/2	in	3-1/2	in
Box Tong Length (L_b)	12	in	12	in
Pin Tong Length (L_p)	9	in	9	in
Make-up Loss (MUL)	5.126	in	5.126	in
Grade	130	ksi	130	ksi

Drill Pipe Assembly Data

Handling			Hydraulics		
Sh to Sh Length	31.62	ft	Open End Displacement	0.35	US gal/ft
Total Weight	722	lbs	Closed End Displacement	1.07	US gal/ft
Adjusted Weight	22.83	lbs/ft	Capacity	0.72	US gal/ft

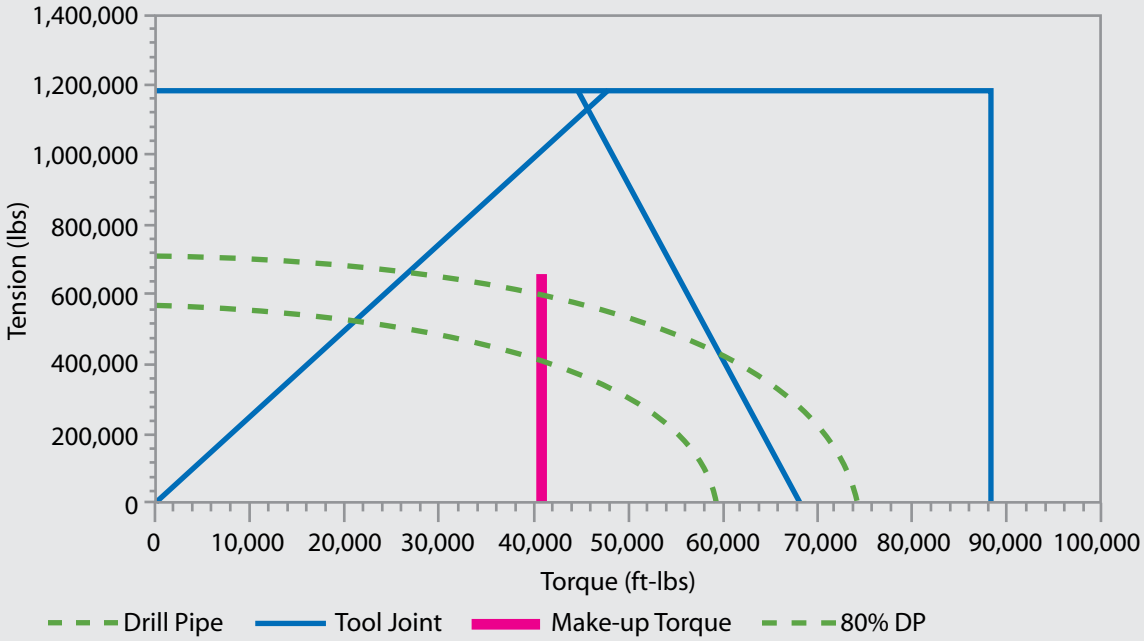
Drill Pipe Mechanical Performance

Pipe	New		Premium	
Tensile Strength	712,000	lbs	561,000	lbs
Torsional Strength	74,100	ft-lbs	58,100	ft-lbs
80% Torsional Strength	59,280	ft-lbs	46,480	ft-lbs
Collapse Pressure	15,700	psi	10,000	psi
Internal Pressure	17,100	psi	15,600	psi

Tool Joint	New		Premium	
Tensile Strength	1,202,000	lbs	1,202,000	lbs
Torsional Strength	68,200	ft-lbs	47,800	ft-lbs
Maximum Make-up Torque	42,900	ft-lbs	30,135	ft-lbs
Recommended Make-up Torque	40,900	ft-lbs	28,700	ft-lbs
Minimum Make-up Torque	38,900	ft-lbs	27,265	ft-lbs
Balance OD	6.256	in	6.256	in
Torsional Ratio TJ/pipe	0.92		0.82	

DRILL PIPE COMBINED LOAD CHART

- Top horizontal solid (blue) line - Tensile load that will yield the pin connection.
- Right vertical (blue) line - Torque that will yield the box.
- Parabolic (dash green) curves – Tensile and torque combination loadings that will yield the new and premium pipe.
- Vertical (pink) line - Make-up torque.
- Left angled (blue) line – Tensile and torque combination loadings that will separate the torque shoulder(s) of the connection.
- Right-angled (blue) line – Tensile and torque combination loadings that will yield the pin connection.

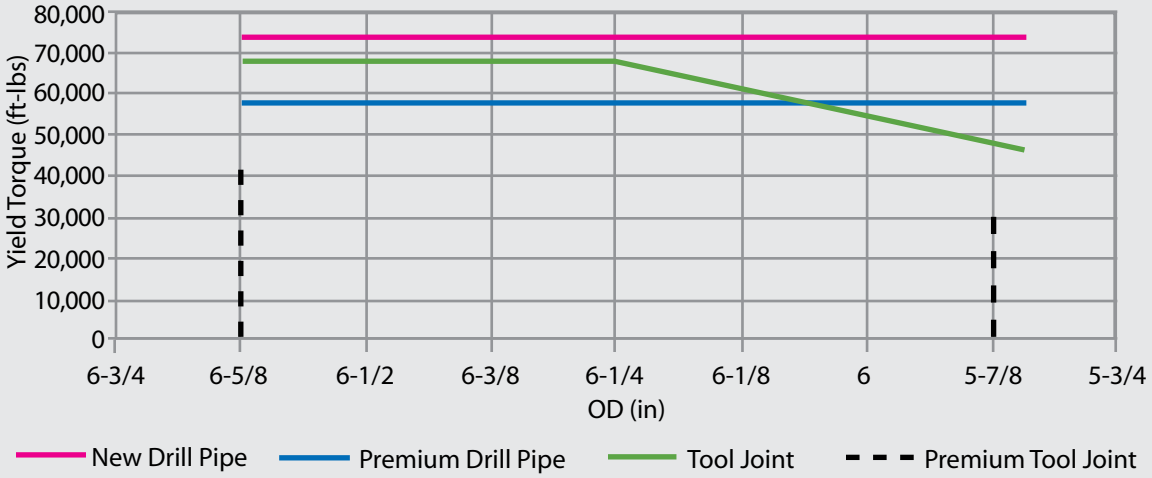


Performances calculated with a friction factor and safety factor of 1.0

DRILL PIPE WEAR CHART

This chart shows the torque-to-yield for new drill pipe and premium drill pipe. It also shows the recommended make-up torque of the connection for various ODs over a reasonable amount of wear.

Calculations for the Performance Sheets are based upon — but not limited to — the API RP7G Specification.



VAM DRILLING Vallourec Group

Drill Pipe and Tool Joint Data - 2-3/8” - 2-7/8”

PIPE BODY											TOOL JOINT										ASSEMBLY									
														Tong Length												Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
2-3/8	6.65	E-75	EU	0.280	1.815	1-5/8	6,250	138,000	15,600	15,500	2-3/8 OH	3-1/4	1-3/4	9	10	120	3,890	6,480	295,000	p	1.04	7.11	224	0.13	0.24	0.11	3-3/16	3,350	2-3/8
2-3/8	6.65	E-75	EU	0.280	1.815	1-11/16	6,250	138,000	15,600	15,500	2-3/8 SL H-90	3-1/4	1-13/16	9	10	120	4,110	6,860	270,000	b	1.10	7.05	222	0.13	0.24	0.11	3-5/32	3,700	2-3/8
2-3/8	6.65	E-75	EU	0.280	1.815	1-5/8	6,250	138,000	15,600	15,500	NC26	3-3/8	1-3/4	9	10	120	4,130	6,880	314,000	p	1.10	7.23	228	0.13	0.24	0.11	3-5/16	3,560	2-3/8
2-3/8	6.65	X-95	EU	0.280	1.815	1-5/8	7,920	175,000	19,800	19,600	2-3/8 OH	3-1/4	1-3/4	9	10	120	3,890	6,480	295,000	p	0.82	7.11	224	0.13	0.24	0.11	3-3/16	3,350	2-3/8
2-3/8	6.65	X-95	EU	0.280	1.815	1-11/16	7,920	175,000	19,800	19,600	2-3/8 SL H-90	3-1/4	1-13/16	9	10	120	4,110	6,860	270,000	b	0.87	7.05	222	0.13	0.24	0.11	3-5/32	3,700	2-3/8
2-3/8	6.65	X-95	EU	0.280	1.815	1-5/8	7,920	175,000	19,800	19,600	NC26	3-3/8	1-3/4	9	10	120	4,130	6,880	314,000	p	0.87	7.23	228	0.13	0.24	0.11	3-5/16	3,560	2-3/8
2-3/8	6.65	G-105	EU	0.280	1.815	1-5/8	8,750	194,000	21,800	21,700	2-3/8 OH	3-1/4	1-3/4	9	10	120	3,890	6,480	295,000	P	0.74	7.11	224	0.13	0.24	0.11	3-3/16	3,350	2-3/8
2-3/8	6.65	G-105	EU	0.280	1.815	1-11/16	8,750	194,000	21,800	21,700	2-3/8 SL H-90	3-1/4	1-13/16	9	10	120	4,110	6,860	270,000	B	0.78	7.05	222	0.13	0.24	0.11	3-5/32	3,700	2-3/8
2-3/8	6.65	G-105	EU	0.280	1.815	1-5/8	8,750	194,000	21,800	21,700	NC26	3-3/8	1-3/4	9	10	120	4,130	6,880	314,000	P	0.79	7.23	228	0.13	0.24	0.11	3-5/16	3,560	2-3/8
2-3/8	6.65	S-135	EU	0.280	1.815	1-5/8	11,300	249,000	28,100	27,900	2-3/8 OH	3-1/4	1-3/4	9	10	120	3,890	6,480	295,000	P	0.58	7.11	224	0.13	0.24	0.11	3-1/4	3,890	2-3/8
2-3/8	6.65	S-135	EU	0.280	1.815	1-11/16	11,300	249,000	28,100	27,900	2-3/8 SL H-90	3-1/4	1-13/16	9	10	120	4,110	6,860	270,000	B	0.61	7.05	222	0.13	0.24	0.11	3-1/4	4,110	2-3/8
2-3/8	6.65	S-135	EU	0.280	1.815	1-5/8	11,300	249,000	28,100	27,900	NC26	3-5/8	1-3/4	9	10	120	4,260	7,100	314,000	B	0.63	7.50	236	0.13	0.25	0.11	3-13/32	4,260	2-3/8
2-7/8	10.40	E-75	IU	0.362	2.151	1-3/8	11,600	214,000	16,500	16,500	2-7/8 PAC	3-1/8	1-1/2	9	11	120	3,420	5,690	273,000	B	0.49	10.63	335	0.18	0.34	0.16	3-1/8	3,420	2-7/8
2-7/8	10.40	E-75	IU	0.362	2.151	1-3/8	11,600	214,000	16,500	16,500	2-7/8 PAC VAM EIS	3-1/8	1-1/2	9	11	130	5,720	9,530	296,000	b	0.82	10.63	335	0.18	0.34	0.16	3-3/32	5,710	2-7/8
2-7/8	10.40	E-75	EU	0.362	2.151	2-1/32	11,600	214,000	16,500	16,500	2-7/8 SL H-90	4-1/8	2-5/32	9	11	120	6,730	11,200	383,000	b	0.97	11.22	353	0.19	0.36	0.17	3-5/8	4,920	2-7/8
2-7/8	10.40	E-75	IU	0.362	2.151	1-5/8	11,600	214,000	16,500	16,500	NC26	3-3/8	1-3/4	9	10	120	4,130	6,880	314,000	P	0.60	10.63	335	0.18	0.34	0.16	3-3/8	4,130	2-7/8
2-7/8	10.40	E-75	EU	0.362	2.151	2	11,600	214,000	16,500	16,500	NC31	4-1/8	2-1/8	9	11	120	7,070	11,800	447,000	b	1.02	11.25	354	0.19	0.36	0.17	3-27/32	4,970	2-7/8
2-7/8	10.40	E-75	EU	0.362	2.151	1-7/8	11,600	214,000	16,500	16,500	NC31 VAM EIS	4-1/8	2	9	11	130	11,800	19,600	537,000	b	1.70	11.39	359	0.19	0.36	0.17	3-31/32	10,200	2-7/8
2-7/8	10.40	X-95	IU	0.362	2.151	1-3/8	14,600	272,000	20,900	20,900	2-7/8 PAC	3-1/8	1-1/2	9	11	120	3,420	5,690	273,000	B	0.39	10.63	335	0.18	0.34	0.16	3-1/8	3,420	2-7/8
2-7/8	10.40	X-95	IU	0.362	2.151	1-3/8	14,600	272,000	20,900	20,900	2-7/8 PAC VAM EIS	3-1/8	1-1/2	9	11	130	5,720	9,530	296,000	B	0.65	10.63	335	0.18	0.34	0.16	3-3/32	5,710	2-7/8
2-7/8	10.40	X-95	EU	0.362	2.151	1-7/8	14,600	272,000	20,900	20,900	2-7/8 SL H-90	4	2	9	11	120	7,870	13,100	444,000	b	0.90	11.23	354	0.19	0.36	0.17	3-11/16	5,700	2-7/8
2-7/8	10.40	X-95	IU	0.362	2.151	1-3/8	14,600	272,000	20,900	20,900	NC26	3-5/8	1-1/2	9	10	120	5,380	8,960	390,000	B	0.61	11.10	350	0.18	0.35	0.17	3-5/8	5,380	2-7/8
2-7/8	10.40	X-95	IU	0.362	2.151	1-3/8	14,600	272,000	20,900	20,900	NC26 VAM EIS	3-5/8	1-1/2	9	10	130	8,310	13,900	423,000	b	0.95	11.10	350	0.18	0.35	0.17	3-5/16	6,290	2-7/8
2-7/8	10.40	X-95	EU	0.362	2.151	1-7/8	14,600	272,000	20,900	20,900	NC31	4-1/8	2	9	11	120	7,890	13,200	496,000	b	0.90	11.39	359	0.19	0.36	0.17	3-29/32	5,730	2-7/8
2-7/8	10.40	X-95	EU	0.362	2.151	1-7/8	14,600	272,000	20,900	20,900	NC31 VAM EIS	4-1/8	2	9	11	130	11,800	19,600	537,000	b	1.34	11.39	359	0.19	0.36	0.17	3-31/32	10,200	2-7/8
2-7/8	10.40	G-105	IU	0.362	2.151	1-3/8	16,200	300,000	23,100	23,100	2-7/8 PAC	3-1/8	1-1/2	9	11	120	3,420	5,690	273,000	B	0.35	10.63	335	0.18	0.34	0.16	3-1/8	3,420	2-7/8
2-7/8	10.40	G-105	IU	0.362	2.151	1-3/8	16,200	300,000	23,100	23,100	2-7/8 PAC VAM EIS	3-1/8	1-1/2	9	11	130	5,720	9,530	296,000	B	0.59	10.63	335	0.18	0.34	0.16	3-1/8	5,720	2-7/8
2-7/8	10.40	G-105	EU	0.362	2.151	1-7/8	16,200	300,000	23,100	23,100	2-7/8 SL H-90	4	2	9	11	120	7,870	13,100	444,000	b	0.81	11.23	354	0.19	0.36	0.17	3-23/32	6,100	2-7/8
2-7/8	10.40	G-105	IU	0.362	2.151	1-3/8	16,200	300,000	23,100	23,100	NC26	3-5/8	1-1/2	9	10	120	5,380	8,960	390,000	B	0.55	11.10	350	0.18	0.35	0.17	3-5/8	5,380	2-7/8
2-7/8	10.40	G-105	IU	0.362	2.151	1-3/8	16,200	300,000	23,100	23,100	NC26 VAM EIS	3-5/8	1-1/2	9	10	130	8,310	13,900	423,000	b	0.86	11.10	350	0.18	0.35	0.17	3-5/16	6,290	2-7/8
2-7/8	10.40	G-105	EU	0.362	2.151	1-7/8	16,200	300,000	23,100	23,100	NC31	4-1/8	2	9	11	120	7,890	13,200	496,000	b	0.81	11.39	359	0.19	0.36	0.17	3-15/16	6,110	2-7/8
2-7/8	10.40	G-105	EU	0.362	2.151	1-7/8	16,200	300,000	23,100	23,100	NC31 VAM EIS	4-1/8	2	9	11	130	11,800	19,600	537,000	b	1.21	11.39	359	0.19	0.36	0.17	3-31/32	10,200	2-7/8
2-7/8	10.40	G-105	IU	0.362	2.151	1-3/8	16,200	300,000	23,100	23,100	VAM Express VX24	3-1/8	1-1/2	11	12	130	5,780	9,630	309,000	P	0.60	10.71	337	0.18	0.34	0.16	3-1/8	5,780	2-7/8
2-7/8	10.40	G-105	IU	0.362	2.151	1-3/8	16,200	300,000	23,100	23,100	VAM Express VX26	3-1/2	1-1/2	11	12	130	9,040	15,100	427,000	p	0.93	11.15	351	0.18	0.35	0.17	3-1/4	6,490	2-7/8
2-7/8	10.40	S-135	IU	0.362	2.151	1-3/8	20,800	386,000	29,700	29,700	2-7/8 PAC	3-1/8	1-1/2	9	11	120	3,420	5,690	273,000	B	0.27	10.63	335	0.18	0.34	0.16	3-1/8	3,420	2-7/8
2-7/8	10.40	S-135	IU	0.362	2.151	1-3/8	20,800	386,000	29,700	29,700	2-7/8 PAC VAM EIS	3-1/8	1-1/2	9	11	130	5,720	9,530	296,000	B	0.46	10.63	335	0.18	0.34	0.16	3-1/8	5,720	2-7/8
2-7/8	10.40	S-135	EU	0.362	2.151	1-1/2	20,800	386,000	29,700	29,700	2-7/8 SL H-90	4-1/8	1-5/8	9	11	120	10,300	17,100	572,000	b	0.82	11.77	371	0.18	0.36	0.18	3-27/32	7,750	2-7/8
2-7/8	10.40	S-135	IU	0.362	2.151	1-3/8	20,800	386,000	29,700	29,700	NC26	3-5/8	1-1/2	9	10	120	5,380	8,960	390,000	B	0.43	11.10	350	0.18	0.35	0.17	3-5/8	5,380	2-7/8
2-7/8	10.40	S-135	IU	0.362	2.151	1-3/8	20,800	386,000	29,700	29,700	NC26 VAM EIS	3-5/8	1-1/2	9	10	130	8,310	13,900	423,000	B	0.67	11.10	350	0.18	0.35	0.17	3-15/32	7,860	2-7/8
2-7/8	10.40	S-135	EU	0.362	2.151	1-1/2	20,800	386,000	29,700	29,700	NC31	4-3/8	1-5/8	9	11	120	10,100	16,800	624,000	b	0.81	12.12	382	0.18	0.37	0.19	4-1/16	7,690	2-7/8
2-7/8	10.40	S-135	EU	0.362	2.151	1-7/8	20,800	386,000	29,700	29,700	NC31 VAM EIS	4-1/8	2	9	11	130	11,800	19,600	537,000	b	0.94	11.39	359	0.19	0.36	0.17	3-31/32	10,200	2-7/8
2-7/8	10.40	S-135	IU	0.362	2.151	1-3/8	20,800	386,000	29,700	29,700	VAM Express VX24	3-1/8	1-1/2	11	12	130	5,780	9,630	309,000	P	0.46	10.71	337	0.18	0.34	0.16	3-1/8	5,780	2-7/8
2-7/8	10.40	S-135	IU	0.362	2.151	1-3/8	20,800	386,000	29,700	29,700	VAM Express VX26	3-5/8	1-1/2	11	12	130	9,040	15,100	427,000	B	0.72	11.31	356	0.18	0.35	0.17	3-3/8	7,730	2-7/8
2-7/8	10.40	S-135	EU	0.362	2.151	1-7/8	20,800	386,000	29,700	29,700	VAM Express VX31	4-1/8	2	11	13	130	13,300	22,200	542,000	b	1.07	11.66	367	0.19	0.36	0.18	3-3/4	8,970	2-7/8

Notes:
All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital “P” or “B” under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
VAM EIS® and VAM Express™ are proprietary threads of VAM Drilling.
Tong spaces are a minimum of 2” longer than API standard.
Make-up torque values are recommended by VAM Drilling.

VAM DRILLING Vallourec Group

Drill Pipe and Tool Joint Data - 3-1/2”

PIPE BODY											TOOL JOINT										ASSEMBLY								
														Tong Length											Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
3-1/2	13.30	E-75	EU	0.368	2.764	2-11/16	18,600	272,000	14,100	13,800	3-1/2 SL H-90	4-3/4	2-13/16	10	12-1/2	120	9,670	16,100	469,000	b	0.87	14.24	449	0.31	0.53	0.22	4-9/32	7,110	3-1/2
3-1/2	13.30	E-75	IU	0.368	2.764	2	18,600	272,000	14,100	13,800	NC31	4-1/8	2-1/8	9	11	120	7,070	11,800	447,000	B	0.64	13.98	440	0.30	0.51	0.21	4-1/32	7,070	3-1/2
3-1/2	13.30	E-75	IU	0.368	2.764	1-7/8	18,600	272,000	14,100	13,800	NC31 VAM EIS	4-1/8	2	9	11	130	11,800	19,600	537,000	b	1.06	14.12	445	0.30	0.51	0.22	3-31/32	10,200	3-1/2
3-1/2	13.30	E-75	EU	0.368	2.764	2-9/16	18,600	272,000	14,100	13,800	NC38	4-3/4	2-11/16	10	12-1/2	120	10,800	18,100	587,000	b	0.97	14.44	455	0.31	0.53	0.22	4-1/2	7,270	3-1/2
3-1/2	13.30	E-75	EU	0.368	2.764	2-7/16	18,600	272,000	14,100	13,800	NC38 VAM EIS	4-3/4	2-9/16	10	12-1/2	130	17,000	28,300	703,000	p	1.53	14.63	461	0.31	0.53	0.22	4-19/32	14,100	3-1/2
3-1/2	13.30	X-95	EU	0.368	2.764	2-7/16	23,500	344,000	17,900	17,500	3-1/2 SL H-90	4-3/4	2-9/16	10	12-1/2	120	12,400	20,700	596,000	b	0.88	14.63	461	0.31	0.53	0.22	4-3/8	8,740	3-1/2
3-1/2	13.30	X-95	IU	0.368	2.764	1-7/8	23,500	344,000	17,900	17,500	NC31	4-1/8	2	9	11	120	7,890	13,200	496,000	B	0.56	14.12	445	0.30	0.51	0.22	4-1/8	7,890	3-1/2
3-1/2	13.30	X-95	EU	0.368	2.764	2-7/16	23,500	344,000	17,900	17,500	NC38	5	2-9/16	10	12-1/2	120	12,100	20,100	649,000	b	0.86	15.07	475	0.31	0.54	0.23	4-19/32	8,820	3-1/2
3-1/2	13.30	X-95	EU	0.368	2.764	2-7/16	23,500	344,000	17,900	17,500	NC38 VAM EIS	4-3/4	2-9/16	10	12-1/2	130	17,000	28,300	703,000	p	1.21	14.63	461	0.31	0.53	0.22	4-19/32	14,100	3-1/2
3-1/2	13.30	G-105	EU	0.368	2.764	2-7/16	26,000	380,000	19,800	19,300	3-1/2 SL H-90	4-3/4	2-9/16	10	12-1/2	120	12,400	20,700	596,000	B	0.80	14.63	461	0.31	0.53	0.22	4-7/16	9,860	3-1/2
3-1/2	13.30	G-105	IU	0.368	2.764	1-7/8	26,000	380,000	19,800	19,300	NC31	4-1/8	2	9	11	120	7,890	13,200	496,000	B	0.51	14.12	445	0.30	0.51	0.22	4-1/8	7,890	3-1/2
3-1/2	13.30	G-105	EU	0.368	2.764	2-5/16	26,000	380,000	19,800	19,300	NC38	5	2-7/16	10	12-1/2	120	13,200	22,000	708,000	b	0.85	15.26	481	0.30	0.54	0.23	4-21/32	9,880	3-1/2
3-1/2	13.30	G-105	EU	0.368	2.764	2-7/16	26,000	380,000	19,800	19,300	NC38 VAM EIS	4-3/4	2-9/16	10	12-1/2	130	17,000	28,300	703,000	p	1.09	14.63	461	0.31	0.53	0.22	4-19/32	14,100	3-1/2
3-1/2	13.30	G-105	EU	0.368	2.764	2-5/8	26,000	380,000	19,800	19,300	VAM Express VX38	4-5/8	2-3/4	12	15	130	15,800	26,300	591,000	p	1.01	14.43	455	0.31	0.53	0.22	4-3/8	11,300	3-1/2
3-1/2	13.30	G-105	EU	0.368	2.764	2-11/16	26,000	380,000	19,800	19,300	VAM Express VX39	4-7/8	2-13/16	12	15	130	20,100	33,500	713,000	p	1.29	14.81	467	0.31	0.54	0.23	4-9/16	13,900	3-1/2
3-1/2	13.30	S-135	EU	0.368	2.764	2	33,400	489,000	25,400	24,800	3-1/2 SL H-90	5	2-1/8	10	12-1/2	120	16,700	27,800	789,000	b	0.83	15.68	494	0.30	0.54	0.24	4-19/32	12,700	3-1/2
3-1/2	13.30	S-135	IU	0.368	2.764	1-7/8	33,400	489,000	25,400	24,800	NC31	4-1/8	2	9	11	120	7,890	13,200	496,000	B	0.39	14.12	445	0.30	0.51	0.22	4-1/8	7,890	3-1/2
3-1/2	13.30	S-135	EU	0.368	2.764	2	33,400	489,000	25,400	24,800	NC38	5	2-1/8	10	12-1/2	120	15,900	26,500	842,000	B	0.79	15.68	494	0.30	0.54	0.24	4-13/16	12,600	3-1/2
3-1/2	13.30	S-135	EU	0.368	2.764	2-7/16	33,400	489,000	25,400	24,800	NC38 VAM EIS	4-3/4	2-9/16	10	12-1/2	130	17,000	28,300	703,000	p	0.85	14.63	461	0.31	0.53	0.22	4-19/32	14,100	3-1/2
3-1/2	13.30	S-135	EU	0.368	2.764	2-5/8	33,400	489,000	25,400	24,800	VAM Express VX38	4-3/4	2-3/4	12	15	130	15,900	26,500	591,000	B	0.79	14.67	462	0.31	0.54	0.22	4-15/32	12,900	3-1/2
3-1/2	13.30	S-135	EU	0.368	2.764	2-9/16	33,400	489,000	25,400	24,800	VAM Express VX39	4-7/8	2-11/16	12	15	130	21,200	35,400	783,000	p	1.06	15.03	474	0.31	0.54	0.23	4-9/16	15,100	3-1/2
3-1/2	15.50	E-75	EU	0.449	2.602	2-7/16	21,100	323,000	16,800	16,800	NC38	5	2-9/16	10	12-1/2	120	12,100	20,100	649,000	b	0.95	17.13	540	0.28	0.54	0.26	4-17/32	7,790	3-1/2
3-1/2	15.50	E-75	EU	0.449	2.602	2-7/16	21,100	323,000	16,800	16,800	NC38 VAM EIS	4-3/4	2-9/16	10	12-1/2	130	17,000	28,300	703,000	p	1.34	16.70	526	0.28	0.53	0.26	4-19/32	14,100	3-1/2
3-1/2	15.50	X-95	EU	0.449	2.602	2-5/16	26,700	409,000	21,200	21,300	NC38	5	2-7/16	10	12-1/2	120	13,200	22,000	708,000	b	0.83	17.32	546	0.27	0.54	0.26	4-21/32	9,880	3-1/2
3-1/2	15.50	X-95	EU	0.449	2.602	2-7/16	26,700	409,000	21,200	21,300	NC38 VAM EIS	4-3/4	2-9/16	10	12-1/2	130	17,000	28,300	703,000	p	1.06	16.70	526	0.28	0.53	0.26	4-19/32	14,100	3-1/2
3-1/2	15.50	G-105	EU	0.449	2.602	2	29,500	452,000	23,500	23,600	NC38	5	2-1/8	10	12-1/2	120	15,900	26,500	842,000	b	0.90	17.74	559	0.27	0.54	0.27	4-23/32	11,000	3-1/2
3-1/2	15.50	G-105	EU	0.449	2.602	2-7/16	29,500	452,000	23,500	23,600	NC38 VAM EIS	4-3/4	2-9/16	10	12-1/2	130	17,000	28,300	703,000	p	0.96	16.70	526	0.28	0.53	0.26	4-19/32	14,100	3-1/2
3-1/2	15.50	G-105	EU	0.449	2.602	2-7/16	29,500	452,000	23,500	23,600	NC40	5-1/4	2-9/16	9	12	120	16,600	27,700	838,000	b	0.94	17.43	549	0.28	0.54	0.27	4-15/16	11,400	3-1/2
3-1/2	15.50	G-105	EU	0.449	2.602	2-9/16	29,500	452,000	23,500	23,600	VAM Express VX38	4-3/4	2-11/16	12	15	130	17,200	28,600	626,000	b	0.97	16.82	530	0.28	0.54	0.26	4-3/8	11,800	3-1/2
3-1/2	15.50	G-105	EU	0.449	2.602	2-11/16	29,500	452,000	23,500	23,600	VAM Express VX39	4-7/8	2-13/16	12	15	130	20,100	33,500	713,000	p	1.13	16.85	531	0.28	0.54	0.26	4-9/16	13,900	3-1/2
3-1/2	15.50	S-135	EU	0.449	2.602	2	38,000	581,000	30,200	30,300	NC38	5	2-1/8	10	12-1/2	120	15,900	26,500	842,000	B	0.70	17.74	559	0.27	0.54	0.27	4-29/32	14,300	3-1/2
3-1/2	15.50	S-135	EU	0.449	2.602	2-5/16	38,000	581,000	30,200	30,300	NC38 VAM EIS	5	2-7/16	10	12-1/2	130	19,900	33,200	767,000	b	0.88	17.32	546	0.27	0.54	0.26	4-19/32	15,000	3-1/2
3-1/2	15.50	S-135	EU	0.449	2.602	2-1/8	38,000	581,000	30,200	30,300	NC40	5-1/2	2-1/4	9	12	120	19,600	32,700	980,000	b	0.86	18.34	578	0.27	0.55	0.28	5-3/32	14,400	3-1/2

Notes:
All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital “P” or “B” under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
VAM EIS® and VAM Express™ are proprietary threads of VAM Drilling.
Tong spaces are a minimum of 2” longer than API standard.
Make-up torque values are recommended by VAM Drilling.

VAM DRILLING Vallourec Group

Drill Pipe and Tool Joint Data - 4”

PIPE BODY											TOOL JOINT										ASSEMBLY								
														Tong Length												Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
4	14.00	E-75	IU	0.330	3.340	2-5/16	23,300	285,000	11,400	10,800	4 SH	4-5/8	2-7/16	10	12-1/2	120	10,100	16,900	571,000	B	0.72	15.46	487	0.43	0.67	0.24	4-7/16	8,780	4
4	14.00	E-75	IU	0.330	3.340	2-7/16	23,300	285,000	11,400	10,800	NC38 VAM EIS	4-3/4	2-9/16	10	12-1/2	130	17,000	28,300	703,000	p	1.22	15.49	488	0.43	0.67	0.24	4-19/32	14,100	4
4	14.00	E-75	IU	0.330	3.340	2-11/16	23,300	285,000	11,400	10,800	NC40	5-1/4	2-13/16	9	12	120	14,000	23,300	712,000	b	1.00	15.84	499	0.44	0.68	0.24	4-27/32	9,600	4
4	14.00	E-75	EU	0.330	3.340	3-1/8	23,300	285,000	11,400	10,800	NC46	6	3-1/4	9	12	120	19,900	33,200	901,000	b	1.43	16.79	529	0.45	0.71	0.26	5-13/32	12,100	4
4	14.00	X-95	IU	0.330	3.340	2-5/16	29,500	361,000	14,400	13,700	4 SH	4-5/8	2-7/16	10	12-1/2	120	10,100	16,900	571,000	B	0.57	15.46	487	0.43	0.67	0.24	4-5/8	10,100	4
4	14.00	X-95	IU	0.330	3.340	2-7/16	29,500	361,000	14,400	13,700	NC38 VAM EIS	4-3/4	2-9/16	10	12-1/2	130	17,000	28,300	703,000	p	0.96	15.49	488	0.43	0.67	0.24	4-19/32	14,100	4
4	14.00	X-95	IU	0.330	3.340	2-9/16	29,500	361,000	14,400	13,700	NC40	5-1/4	2-11/16	9	12	120	15,300	25,500	776,000	b	0.87	16.03	505	0.44	0.68	0.24	4-15/16	11,400	4
4	14.00	X-95	EU	0.330	3.340	3-1/8	29,500	361,000	14,400	13,700	NC46	6	3-1/4	9	12	120	19,900	33,200	901,000	b	1.13	16.79	529	0.45	0.71	0.26	5-13/32	12,100	4
4	14.00	G-105	IU	0.330	3.340	2-5/16	32,600	400,000	15,900	15,200	4 SH	4-5/8	2-7/16	10	12-1/2	120	10,100	16,900	571,000	B	0.52	15.46	487	0.43	0.67	0.24	4-5/8	10,100	4
4	14.00	G-105	IU	0.330	3.340	2-7/16	32,600	400,000	15,900	15,200	NC38 VAM EIS	5	2-9/16	10	12-1/2	130	17,700	29,600	703,000	b	0.91	15.93	502	0.43	0.68	0.24	4-19/32	14,100	4
4	14.00	G-105	IU	0.330	3.340	2-5/16	32,600	400,000	15,900	15,200	NC40	5-1/2	2-7/16	9	12	120	17,900	29,800	897,000	b	0.91	16.87	531	0.43	0.69	0.26	5	12,600	4
4	14.00	G-105	EU	0.330	3.340	3-1/8	32,600	400,000	15,900	15,200	NC46	6	3-1/4	9	12	120	19,900	33,200	901,000	b	1.02	16.79	529	0.45	0.71	0.26	5-7/16	12,800	4
4	14.00	G-105	IU	0.330	3.340	2-11/16	32,600	400,000	15,900	15,200	VAM Express VX39	4-7/8	2-13/16	12	15	130	20,100	33,500	713,000	p	1.03	15.66	493	0.44	0.68	0.24	4-9/16	13,900	4
4	14.00	G-105	IU	0.330	3.340	2-7/8	32,600	400,000	15,900	15,200	VAM Express VX40	5-1/4	3	11	14	130	25,400	42,300	818,000	p	1.30	15.91	501	0.44	0.69	0.24	4-31/32	19,000	4
4	14.00	S-135	IU	0.330	3.340	2-5/16	41,900	514,000	20,100	19,500	4 SH	4-5/8	2-7/16	10	12-1/2	120	10,100	16,900	571,000	B	0.40	15.46	487	0.43	0.67	0.24	4-5/8	10,100	4
4	14.00	S-135	IU	0.330	3.340	2-5/16	41,900	514,000	20,100	19,500	NC38 VAM EIS	5	2-7/16	10	12-1/2	130	19,900	33,200	767,000	B	0.79	16.11	507	0.43	0.68	0.25	4-21/32	16,200	4
4	14.00	S-135	IU	0.330	3.340	2-5/16	41,900	514,000	20,100	19,500	NC40	5-1/2	2-7/16	9	12	120	17,900	29,800	897,000	B	0.71	16.87	531	0.43	0.69	0.26	5-3/16	16,300	4
4	14.00	S-135	IU	0.330	3.340	2-9/16	41,900	514,000	20,100	19,500	NC40 VAM EIS	5-1/4	2-11/16	9	12	130	22,300	37,100	841,000	b	0.89	16.03	505	0.44	0.68	0.24	4-7/8	16,600	4
4	14.00	S-135	EU	0.330	3.340	2-7/8	41,900	514,000	20,100	19,500	NC46	6	3	9	12	120	23,400	39,000	1,050,000	b	0.93	17.24	543	0.45	0.71	0.26	5-9/16	15,800	4
4	14.00	S-135	IU	0.330	3.340	2-5/16	41,900	514,000	20,100	19,500	VAM Express VX38	4-3/4	2-7/16	12	15	130	20,800	34,600	757,000	p	0.83	16.04	505	0.43	0.67	0.25	4-1/2	16,100	4
4	14.00	S-135	IU	0.330	3.340	2-11/16	41,900	514,000	20,100	19,500	VAM Express VX39	4-7/8	2-13/16	12	15	130	20,100	33,500	713,000	P	0.80	15.66	493	0.44	0.68	0.24	4-11/16	16,300	4
4	14.00	S-135	IU	0.330	3.340	2-7/8	41,900	514,000	20,100	19,500	VAM Express VX40	5-1/4	3	11	14	130	25,400	42,300	818,000	p	1.01	15.91	501	0.44	0.69	0.24	4-31/32	19,000	4
4	15.70	E-75	IU	0.380	3.240	2-11/16	25,800	324,000	12,900	12,500	4 H-90	5-1/2	2-13/16	9	12	120	21,200	35,300	914,000	b	1.37	17.87	563	0.42	0.69	0.27	5-1/16	11,800	4
4	15.70	E-75	IU	0.380	3.240	2-9/16	25,800	324,000	12,900	12,500	NC40	5-1/4	2-11/16	9	12	120	15,300	25,500	776,000	b	0.99	17.60	554	0.41	0.68	0.27	4-7/8	10,200	4
4	15.70	E-75	EU	0.380	3.240	3-1/8	25,800	324,000	12,900	12,500	NC46	6	3-1/4	9	12	120	19,900	33,200	901,000	b	1.29	18.35	578	0.43	0.71	0.28	5-13/32	12,100	4
4	15.70	X-95	IU	0.380	3.240	2-11/16	32,700	411,000	16,300	15,800	4 H-90	5-1/2	2-13/16	9	12	120	21,200	35,300	914,000	b	1.08	17.87	563	0.42	0.69	0.27	5-3/32	12,500	4
4	15.70	X-95	IU	0.380	3.240	2-5/16	32,700	411,000	16,300	15,800	NC40	5-1/4	2-7/16	9	12	120	17,600	29,400	897,000	p	0.90	17.97	566	0.41	0.68	0.27	5	12,600	4
4	15.70	X-95	EU	0.380	3.240	3-1/8	32,700	411,000	16,300	15,800	NC46	6	3-1/4	9	12	120	19,900	33,200	901,000	b	1.02	18.35	578	0.43	0.71	0.28	5-7/16	12,800	4
4	15.70	G-105	IU	0.380	3.240	2-11/16	36,100	454,000	18,100	17,500	4 H-90	5-1/2	2-13/16	9	12	120	21,200	35,300	914,000	b	0.98	17.87	563	0.42	0.69	0.27	5-5/32	13,900	4
4	15.70	G-105	IU	0.380	3.240	2-5/16	36,100	454,000	18,100	17,500	NC40	5-1/2	2-7/16	9	12	120	17,900	29,800	897,000	b	0.82	18.44	581	0.41	0.69	0.28	5-1/16	13,800	4
4	15.70	G-105	EU	0.380	3.240	3-1/8	36,100	454,000	18,100	17,500	NC46	6	3-1/4	9	12	120	19,900	33,200	901,000	b	0.92	18.35	578	0.43	0.71	0.28	5-15/32	13,500	4
4	15.70	G-105	IU	0.380	3.240	2-11/16	36,100	454,000	18,100	17,500	VAM Express VX39	4-7/8	2-13/16	12	15	130	20,100	33,500	713,000	p	0.93	17.21	542	0.42	0.68	0.26	4-9/16	13,900	4
4	15.70	G-105	IU	0.380	3.240	2-7/8	36,100	454,000	18,100	17,500	VAM Express VX40	5-1/4	3	11	14	130	25,400	42,300	818,000	p	1.17	17.46	550	0.42	0.69	0.27	4-31/32	19,000	4
4	15.70	S-135	IU	0.380	3.240	2-9/16	46,500	583,000	23,200	22,400	4 H-90	5-3/4	2-11/16	9	12	120	22,800	38,000	978,000	b	0.82	18.56	585	0.41	0.70	0.28	5-5/16	17,600	4
4	15.70	S-135	IU	0.380	3.240	1-7/8	46,500	583,000	23,200	22,400	NC40	5-1/2	2	9	12	120	21,800	36,300	1,080,000	B	0.78	19.01	599	0.40	0.69	0.29	5-1/4	17,600	4
4	15.70	S-135	IU	0.380	3.240	2-7/16	46,500	583,000	23,200	22,400	NC40 VAM EIS	5-1/2	2-9/16	9	12	130	24,900	41,500	908,000	b	0.89	18.26	575	0.41	0.69	0.28	4-7/8	17,700	4
4	15.70	S-135	EU	0.380	3.240	2-7/8	46,500	583,000	23,200	22,400	NC46	6	3	9	12	120	23,400	39,000	1,050,000	b	0.84	18.81	592	0.42	0.71	0.29	5-21/32	18,100	4
4	15.70	S-135	IU	0.380	3.240	2-5/16	46,500	583,000	23,200	22,400	VAM Express VX38	4-7/8	2-7/16	12	15	130	21,800	36,300	757,000	B	0.78	17.84	562	0.41	0.68	0.27	4-19/32	17,800	4
4	15.70	S-135	IU	0.380	3.240	2-5/8	46,500	583,000	23,200	22,400	VAM Express VX39	5	2-3/4	12	15	130	22,600	37,700	748,000	b	0.81	17.58	554	0.41	0.68	0.27	4-23/32	17,500	4
4	15.70	S-135	IU	0.380	3.240	2-3/4	46,500	583,000	23,200	22,400	VAM Express VX40	5-1/4	2-7/8	11	14	130	26,700	44,500	893,000	p	0.96	17.69	557	0.42	0.69	0.27	4-31/32	20,300	4

Notes: All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital “P” or “B” under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
VAM EIS® and VAM Express™ are proprietary threads of VAM Drilling.
Tong spaces are a minimum of 2” longer than API standard.
Make-up torque values are recommended by VAM Drilling.

VAM DRILLING Vallourec Group

Drill Pipe and Tool Joint Data - 4-1/2”

PIPE BODY											TOOL JOINT										ASSEMBLY								
														Tong Length											Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
4-1/2	16.60	E-75	IEU	0.337	3.826	2-7/8	30,800	331,000	10,400	9,830	4-1/2 FH	6	3	9	12	120	20,600	34,400	976,000	b	1.12	19.30	608	0.57	0.87	0.29	5-3/8	12,100	4-1/2
4-1/2	16.60	E-75	IEU	0.337	3.826	3-1/8	30,800	331,000	10,400	9,830	4-1/2 H-90	6	3-1/4	9	12	120	23,100	38,500	938,000	b	1.25	18.85	594	0.58	0.87	0.29	5-13/32	13,800	4-1/2
4-1/2	16.60	E-75	IEU	0.337	3.826	3-5/8	30,800	331,000	10,400	9,830	4-1/2 OH	5-7/8	3-3/4	9	12	120	16,200	26,900	714,000	b	0.87	17.59	554	0.59	0.86	0.27	5-15/32	12,600	4-1/2
4-1/2	16.60	E-75	IEU	0.337	3.826	2-7/8	30,800	331,000	10,400	9,830	NC46	6-1/4	3	9	12	120	23,400	39,000	1,050,000	b	1.27	19.85	625	0.57	0.88	0.30	5-13/32	12,100	4-1/2
4-1/2	16.60	E-75	IEU	0.337	3.826	2-7/8	30,800	331,000	10,400	9,830	NC46 VAM EIS	6-1/4	3	9	12	130	36,100	60,200	1,140,000	b	1.96	19.85	625	0.57	0.88	0.30	5-7/16	24,200	4-1/2
4-1/2	16.60	E-75	EU	0.337	3.826	3-5/8	30,800	331,000	10,400	9,830	NC50	6-5/8	3-3/4	9	12	120	22,400	37,300	939,000	b	1.21	19.50	614	0.59	0.89	0.30	5-13/16	14,100	4-1/2
4-1/2	16.60	E-75	EU	0.337	3.826	3-3/8	30,800	331,000	10,400	9,830	NC50 VAM EIS	6-5/8	3-1/2	9	12	130	40,900	68,200	1,200,000	b	2.21	20.03	631	0.59	0.89	0.31	5-27/32	27,700	4-1/2
4-1/2	16.60	X-95	IEU	0.337	3.826	2-7/8	39,000	419,000	12,800	12,500	4-1/2 FH	6	3	9	12	120	20,600	34,400	976,000	b	0.88	19.30	608	0.57	0.87	0.29	5-1/2	14,900	4-1/2
4-1/2	16.60	X-95	IEU	0.337	3.826	3-1/8	39,000	419,000	12,800	12,500	4-1/2 H-90	6	3-1/4	9	12	120	23,100	38,500	938,000	b	0.99	18.85	594	0.58	0.87	0.29	5-15/32	15,400	4-1/2
4-1/2	16.60	X-95	IEU	0.337	3.826	3-3/8	39,000	419,000	12,800	12,500	4-1/2 OH	5-7/8	3-1/2	9	12	120	20,200	33,700	885,000	b	0.86	18.10	570	0.59	0.86	0.28	5-9/16	14,900	4-1/2
4-1/2	16.60	X-95	IEU	0.337	3.826	3-1/8	39,000	419,000	12,800	12,500	NC46	6-1/4	3-1/4	9	12	120	19,900	33,200	901,000	b	0.85	19.39	611	0.58	0.88	0.30	5-17/32	15,000	4-1/2
4-1/2	16.60	X-95	IEU	0.337	3.826	2-7/8	39,000	419,000	12,800	12,500	NC46 VAM EIS	6-1/4	3	9	12	130	36,100	60,200	1,140,000	b	1.54	19.85	625	0.57	0.88	0.30	5-7/16	24,200	4-1/2
4-1/2	16.60	X-95	EU	0.337	3.826	3-5/8	39,000	419,000	12,800	12,500	NC50	6-5/8	3-3/4	9	12	120	22,400	37,300	939,000	b	0.96	19.50	614	0.59	0.89	0.30	5-27/32	14,900	4-1/2
4-1/2	16.60	X-95	EU	0.337	3.826	3-3/8	39,000	419,000	12,800	12,500	NC50 VAM EIS	6-5/8	3-1/2	9	12	130	40,900	68,200	1,200,000	b	1.75	20.03	631	0.59	0.89	0.31	5-27/32	27,700	4-1/2
4-1/2	16.60	G-105	IEU	0.337	3.826	2-7/8	43,100	463,000	13,800	13,800	4-1/2 FH	6	3	9	12	120	20,600	34,400	976,000	B	0.80	19.30	608	0.57	0.87	0.29	5-9/16	16,400	4-1/2
4-1/2	16.60	G-105	IEU	0.337	3.826	2-7/8	43,100	463,000	13,800	13,800	4-1/2 H-90	6	3	9	12	120	27,000	44,900	1,090,000	b	1.04	19.30	608	0.57	0.87	0.29	5-1/2	16,300	4-1/2
4-1/2	16.60	G-105	IEU	0.337	3.826	3-1/8	43,100	463,000	13,800	13,800	4-1/2 OH	6	3-1/4	9	12	120	24,100	40,100	1,040,000	b	0.93	18.85	594	0.58	0.87	0.29	5-5/8	16,500	4-1/2
4-1/2	16.60	G-105	IEU	0.337	3.826	2-7/8	43,100	463,000	13,800	13,800	NC46	6-1/4	3	9	12	120	23,400	39,000	1,050,000	b	0.90	19.85	625	0.57	0.88	0.30	5-19/32	16,500	4-1/2
4-1/2	16.60	G-105	IEU	0.337	3.826	2-7/8	43,100	463,000	13,800	13,800	NC46 VAM EIS	6-1/4	3	9	12	130	36,100	60,200	1,140,000	b	1.40	19.85	625	0.57	0.88	0.30	5-7/16	24,200	4-1/2
4-1/2	16.60	G-105	EU	0.337	3.826	3-5/8	43,100	463,000	13,800	13,800	NC50	6-5/8	3-3/4	9	12	120	22,400	37,300	939,000	b	0.86	19.50	614	0.59	0.89	0.30	5-29/32	16,600	4-1/2
4-1/2	16.60	G-105	EU	0.337	3.826	3-3/8	43,100	463,000	13,800	13,800	NC50 VAM EIS	6-5/8	3-1/2	9	12	130	40,900	68,200	1,200,000	b	1.58	20.03	631	0.59	0.89	0.31	5-27/32	27,700	4-1/2
4-1/2	16.60	G-105	IEU	0.337	3.826	3-5/8	43,100	463,000	13,800	13,800	VAM Express VX46	6	3-3/4	11	14	130	31,600	50,700	923,000	b	1.18	18.30	576	0.59	0.87	0.28	5-5/8	22,800	4-1/2
4-1/2	16.60	S-135	IEU	0.337	3.826	2-3/8	55,500	595,000	16,800	17,700	4-1/2 FH	6-1/4	2-1/2	9	12	120	26,500	44,200	1,240,000	B	0.80	20.66	651	0.56	0.88	0.32	5-3/4	20,900	4-1/2
4-1/2	16.60	S-135	IEU	0.337	3.826	2-7/8	55,500	595,000	16,800	17,700	4-1/2 H-90	6-1/4	3	9	12	120	27,000	44,900	1,090,000	b	0.81	19.85	625	0.57	0.88	0.30	5-11/16	21,300	4-1/2
4-1/2	16.60	S-135	IEU	0.337	3.826	2-7/8	55,500	595,000	16,800	17,700	4-1/2 OH	6	3	9	12	120	26,400	44,000	1,190,000	P	0.79	19.30	608	0.57	0.87	0.29	5-13/16	21,300	4-1/2
4-1/2	16.60	S-135	IEU	0.337	3.826	2-5/8	55,500	595,000	16,800	17,700	NC46	6-1/4	2-3/4	9	12	120	26,600	44,400	1,180,000	B	0.80	20.27	638	0.57	0.88	0.31	5-25/32	21,200	4-1/2
4-1/2	16.60	S-135	IEU	0.337	3.826	2-7/8	55,500	595,000	16,800	17,700	NC46 VAM EIS	6-1/4	3	9	12	130	36,100	60,200	1,140,000	b	1.09	19.85	625	0.57	0.88	0.30	5-7/16	24,200	4-1/2
4-1/2	16.60	S-135	EU	0.337	3.826	3-3/8	55,500	595,000	16,800	17,700	NC50	6-5/8	3-1/2	9	12	120	26,700	44,500	1,110,000	b	0.80	20.03	631	0.59	0.89	0.31	6-1/16	21,000	4-1/2
4-1/2	16.60	S-135	EU	0.337	3.826	3-3/8	55,500	595,000	16,800	17,700	NC50 VAM EIS	6-5/8	3-1/2	9	12	130	40,900	68,200	1,200,000	b	1.23	20.03	631	0.59	0.89	0.31	5-27/32	27,700	4-1/2
4-1/2	16.60	S-135	IEU	0.337	3.826	3-3/8	55,500	595,000	16,800	17,700	VAM Express VX46	6	3-1/2	11	14	130	37,600	60,200	1,110,000	p	1.09	18.87	594	0.59	0.87	0.29	5-5/8	26,600	4-1/2

Notes:
All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital “P” or “B” under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
VAM EIS® and VAM Express™ are proprietary threads of VAM Drilling.
Tong spaces are a minimum of 2” longer than API standard.
Make-up torque values are recommended by VAM Drilling.

VAM DRILLING Vallourec Group

Drill Pipe and Tool Joint Data - 4-1/2" (continued)

PIPE BODY											TOOL JOINT										ASSEMBLY								
														Tong Length											Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
4-1/2	20.00	E-75	IEU	0.430	3.640	3-1/8	36,900	412,000	13,000	12,500	4-1/2 H-90	6	3-1/4	9	12	120	23,100	38,500	938,000	b	1.04	22.15	698	0.53	0.87	0.34	5-13/32	13,800	4-1/2
4-1/2	20.00	E-75	IEU	0.430	3.640	3-3/8	36,900	412,000	13,000	12,500	4-1/2 OH	6	3-1/2	9	12	120	20,200	33,700	885,000	b	0.91	21.67	683	0.54	0.87	0.33	5-17/32	14,100	4-1/2
4-1/2	20.00	E-75	IEU	0.430	3.640	2-7/8	36,900	412,000	13,000	12,500	NC46	6-1/4	3	9	12	120	23,400	39,000	1,050,000	b	1.06	23.15	729	0.52	0.88	0.35	5-1/2	14,300	4-1/2
4-1/2	20.00	E-75	IEU	0.430	3.640	2-7/8	36,900	412,000	13,000	12,500	NC46 VAM EIS	6-1/4	3	9	12	130	36,100	60,200	1,140,000	b	1.63	23.15	729	0.52	0.88	0.35	5-7/16	24,200	4-1/2
4-1/2	20.00	E-75	EU	0.430	3.640	3-1/2	36,900	412,000	13,000	12,500	NC50	6-5/8	3-5/8	9	12	120	24,500	40,900	1,030,000	b	1.11	23.07	727	0.54	0.89	0.35	5-13/16	14,100	4-1/2
4-1/2	20.00	E-75	EU	0.430	3.640	3-3/8	36,900	412,000	13,000	12,500	NC50 VAM EIS	6-5/8	3-1/2	9	12	130	40,900	68,200	1,200,000	b	1.85	23.33	735	0.54	0.89	0.36	5-27/32	27,700	4-1/2
4-1/2	20.00	X-95	IEU	0.430	3.640	3-1/8	46,700	522,000	16,400	15,900	4-1/2 H-90	6	3-1/4	9	12	120	23,100	38,500	938,000	b	0.82	22.15	698	0.53	0.87	0.34	5-9/16	17,900	4-1/2
4-1/2	20.00	X-95	IEU	0.430	3.640	3-1/8	46,700	522,000	16,400	15,900	4 -1/2 OH	6-1/4	3-1/4	9	12	120	24,100	40,100	1,040,000	b	0.86	22.69	715	0.53	0.88	0.35	5-11/16	18,100	4-1/2
4-1/2	20.00	X-95	IEU	0.430	3.640	2-5/8	46,700	522,000	16,400	15,900	NC46	6-1/4	2-3/4	9	12	120	26,600	44,400	1,180,000	b	0.95	23.57	742	0.52	0.88	0.36	5-21/32	18,100	4-1/2
4-1/2	20.00	X-95	IEU	0.430	3.640	2-7/8	46,700	522,000	16,400	15,900	NC46 VAM EIS	6-1/4	3	9	12	130	36,100	60,200	1,140,000	b	1.29	23.15	729	0.52	0.88	0.35	5-7/16	24,200	4-1/2
4-1/2	20.00	X-95	EU	0.430	3.640	3-3/8	46,700	522,000	16,400	15,900	NC50	6-5/8	3-1/2	9	12	120	26,700	44,500	1,110,000	b	0.95	23.33	735	0.54	0.89	0.36	5-15/16	17,500	4-1/2
4-1/2	20.00	X-95	EU	0.430	3.640	3-3/8	46,700	522,000	16,400	15,900	NC50 VAM EIS	6-3/8	3-1/2	9	12	130	40,600	67,700	1,200,000	b	1.45	22.76	717	0.54	0.88	0.35	5-27/32	27,700	4-1/2
4-1/2	20.00	G-105	IEU	0.430	3.640	2-7/8	51,700	577,000	18,100	17,600	4-1/2 H-90	6	3	9	12	120	27,000	44,900	1,090,000	b	0.87	22.61	712	0.52	0.87	0.35	5-5/8	19,600	4-1/2
4-1/2	20.00	G-105	IEU	0.430	3.640	2-7/8	51,700	577,000	18,100	17,600	4-1/2 OH	6-1/4	3	9	12	120	27,700	46,100	1,190,000	b	0.89	23.15	729	0.52	0.88	0.35	5-3/4	19,700	4-1/2
4-1/2	20.00	G-105	IEU	0.430	3.640	2-3/8	51,700	577,000	18,100	17,600	NC46	6-1/4	2-1/2	9	12	120	29,600	49,300	1,310,000	b	0.95	23.96	755	0.51	0.88	0.37	5-23/32	19,600	4-1/2
4-1/2	20.00	G-105	IEU	0.430	3.640	2-7/8	51,700	577,000	18,100	17,600	NC46 VAM EIS	6-1/4	3	9	12	130	36,100	60,200	1,140,000	b	1.17	23.15	729	0.52	0.88	0.35	5-7/16	24,200	4-1/2
4-1/2	20.00	G-105	EU	0.430	3.640	3-3/8	51,700	577,000	18,100	17,600	NC50	6-5/8	3-1/2	9	12	120	26,700	44,500	1,110,000	b	0.86	23.33	735	0.54	0.89	0.36	6-1/32	20,100	4-1/2
4-1/2	20.00	G-105	EU	0.430	3.640	3-3/8	51,700	577,000	18,100	17,600	NC50 VAM EIS	6-3/8	3-1/2	9	12	130	40,600	67,700	1,200,000	b	1.31	22.76	717	0.54	0.88	0.35	5-27/32	27,700	4-1/2
4-1/2	20.00	G-105	IEU	0.430	3.640	3-3/8	51,700	577,000	18,100	17,600	VAM Express VX46	6	3-1/2	11	14	130	37,600	60,200	1,110,000	p	1.17	22.14	697	0.54	0.87	0.34	5-5/8	26,600	4-1/2
4-1/2	20.00	S-135	IEU	0.430	3.640	2-5/8	66,400	742,000	23,300	22,600	4-1/2 H-90	6-3/8	2-3/4	9	12	120	30,500	50,900	1,220,000	B	0.77	23.85	751	0.51	0.88	0.36	5-13/16	24,900	4-1/2
4-1/2	20.00	S-135	IEU	0.430	3.640	2-5/8	66,400	742,000	23,300	22,600	4-1/2 OH	6-3/8	2-3/4	9	12	120	31,000	51,700	1,330,000	B	0.78	23.85	751	0.51	0.88	0.36	5-31/32	25,500	4-1/2
4-1/2	20.00	S-135	IEU	0.430	3.640	2-1/8	66,400	742,000	23,300	22,600	NC46	6-1/4	2-1/4	9	12	120	32,300	53,800	1,420,000	b	0.81	24.31	766	0.50	0.88	0.37	5-15/16	25,300	4-1/2
4-1/2	20.00	S-135	IEU	0.430	3.640	2-7/8	66,400	742,000	23,300	22,600	NC46 VAM EIS	6-1/4	3	9	12	130	36,100	60,200	1,140,000	b	0.91	23.15	729	0.52	0.88	0.35	5-15/32	25,000	4-1/2
4-1/2	20.00	S-135	EU	0.430	3.640	2-7/8	66,400	742,000	23,300	22,600	NC50	6-5/8	3	9	12	120	34,500	57,500	1,420,000	b	0.87	24.29	765	0.52	0.89	0.37	6-7/32	25,600	4-1/2
4-1/2	20.00	S-135	EU	0.430	3.640	3-3/8	66,400	742,000	23,300	22,600	NC50 VAM EIS	6-3/8	3-1/2	9	12	130	40,600	67,700	1,200,000	b	1.02	22.76	717	0.54	0.88	0.35	5-27/32	27,700	4-1/2
4-1/2	20.00	S-135	IEU	0.430	3.640	3-1/8	66,400	742,000	23,300	22,600	VAM Express VX46	6-1/4	3-1/4	11	14	130	47,800	76,700	1,280,000	b	1.15	23.29	734	0.53	0.88	0.36	5-5/8	30,000	4-1/2

Notes:
All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital "P" or "B" under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
VAM EIS® and VAM Express™ are proprietary threads of VAM Drilling.
Tong spaces are a minimum of 2" longer than API standard.
Make-up torque values are recommended by VAM Drilling.

VAM DRILLING Vallourec Group

Drill Pipe and Tool Joint Data - 5”

PIPE BODY											TOOL JOINT										ASSEMBLY							
														Tong Length											Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
5	19.50	E-75	IEU	0.362	4.276	3-5/8	41,200	396,000	9,960	9,500	5-1/2 FH	7	3-3/4	10	12	120	37,700	62,900	1,450,000	p	1.53	23.43	738	0.73	1.08	0.36	6-13/32	17,100	5
5	19.50	E-75	IEU	0.362	4.276	3-5/8	41,200	396,000	9,960	9,500	NC50	6-5/8	3-3/4	9	12	120	22,400	37,300	939,000	b	0.91	22.32	703	0.73	1.07	0.34	5-7/8	15,800	5
5	19.50	E-75	IEU	0.362	4.276	3-3/8	41,200	396,000	9,960	9,500	NC50 VAM EIS	6-3/8	3-1/2	9	12	130	40,600	67,700	1,200,000	b	1.64	22.28	702	0.72	1.06	0.34	5-27/32	27,700	5
5	19.50	X-95	IEU	0.362	4.276	3-5/8	52,100	501,000	12,000	12,000	5-1/2 FH	7	3-3/4	10	12	120	37,700	62,900	1,450,000	p	1.21	23.43	738	0.73	1.08	0.36	6-1/2	20,200	5
5	19.50	X-95	IEU	0.362	4.276	3-3/8	52,100	501,000	12,000	12,000	NC50	6-3/8	3-1/2	9	12	120	26,700	44,500	1,110,000	b	0.85	22.28	702	0.72	1.06	0.34	6-1/32	20,100	5
5	19.50	X-95	IEU	0.362	4.276	3-3/8	52,100	501,000	12,000	12,000	NC50 VAM EIS	6-3/8	3-1/2	9	12	130	40,600	67,700	1,200,000	b	1.30	22.28	702	0.72	1.06	0.34	5-27/32	27,700	5
5	19.50	G-105	IEU	0.362	4.276	3-5/8	57,600	554,000	13,000	13,300	5-1/2 FH	7	3-3/4	10	12	120	37,700	62,900	1,450,000	p	1.09	23.43	738	0.73	1.08	0.36	6-9/16	22,300	5
5	19.50	G-105	IEU	0.362	4.276	3-1/8	57,600	554,000	13,000	13,300	NC50	6-5/8	3-1/4	9	12	120	30,700	51,200	1,270,000	b	0.89	23.35	735	0.71	1.07	0.36	6-3/32	21,900	5
5	19.50	G-105	IEU	0.362	4.276	3-3/8	57,600	554,000	13,000	13,300	NC50 VAM EIS	6-3/8	3-1/2	9	12	130	40,600	67,700	1,200,000	b	1.17	22.28	702	0.72	1.06	0.34	5-27/32	27,700	5
5	19.50	G-105	IEU	0.362	4.276	3-7/8	57,600	554,000	13,000	13,300	VAM Express VX50	6-1/2	4	11	14	130	42,700	68,400	1,130,000	b	1.19	22.03	694	0.73	1.07	0.34	6-1/32	29,000	5
5	19.50	S-135	IEU	0.362	4.276	3-3/8	74,100	712,000	15,700	17,100	5-1/2 FH	7-1/4	3-1/2	10	12	120	43,300	72,200	1,620,000	b	0.97	24.67	777	0.72	1.09	0.38	6-3/4	28,700	5
5	19.50	S-135	IEU	0.362	4.276	2-5/8	74,100	712,000	15,700	17,100	NC50	6-5/8	2-3/4	9	12	120	38,000	63,400	1,550,000	b	0.86	24.23	763	0.70	1.07	0.37	6-5/16	28,400	5
5	19.50	S-135	IEU	0.362	4.276	3-3/8	74,100	712,000	15,700	17,100	NC50 VAM EIS	6-5/8	3-1/2	9	12	130	40,900	68,200	1,200,000	b	0.92	22.85	720	0.72	1.07	0.35	5-7/8	28,700	5
5	19.50	S-135	IEU	0.362	4.276	3-5/8	74,100	712,000	15,700	17,100	VAM Express VX50	6-1/2	3-3/4	11	14	130	49,200	78,900	1,330,000	p	1.06	22.64	713	0.73	1.07	0.35	6-1/32	33,300	5
5	25.60	E-75	IEU	0.500	4.000	3-3/8	52,300	530,000	13,500	13,100	5-1/2 FH	7	3-1/2	10	12	120	37,700	62,900	1,620,000	p	1.20	29.39	926	0.64	1.08	0.45	6-1/2	20,200	5
5	25.60	E-75	IEU	0.500	4.000	3-3/8	52,300	530,000	13,500	13,100	NC50	6-5/8	3-1/2	9	12	120	26,700	44,500	1,110,000	b	0.85	28.28	891	0.64	1.07	0.43	6-1/32	20,100	5
5	25.60	E-75	IEU	0.500	4.000	3-3/8	52,300	530,000	13,500	13,100	NC50 VAM EIS	6-5/8	3-1/2	9	12	130	40,900	68,200	1,200,000	b	1.30	28.28	891	0.64	1.07	0.43	5-27/32	27,700	5
5	25.60	X-95	IEU	0.500	4.000	3-3/8	66,200	672,000	17,100	16,600	5-1/2 FH	7	3-1/2	10	12	120	37,700	62,900	1,620,000	p	0.95	29.39	926	0.64	1.08	0.45	6-21/32	25,500	5
5	25.60	X-95	IEU	0.500	4.000	2-7/8	66,200	672,000	17,100	16,600	NC50	6-5/8	3	9	12	120	34,500	57,500	1,420,000	b	0.87	29.24	921	0.62	1.07	0.45	6-7/32	25,600	5
5	25.60	X-95	IEU	0.500	4.000	3-3/8	66,200	672,000	17,100	16,600	NC50 VAM EIS	6-5/8	3-1/2	9	12	130	40,900	68,200	1,200,000	b	1.03	28.28	891	0.64	1.07	0.43	5-27/32	27,700	5
5	25.60	G-105	IEU	0.500	4.000	3-3/8	73,200	742,000	18,900	18,400	5-1/2 FH	7-1/4	3-1/2	10	12	120	43,300	72,200	1,620,000	b	0.99	30.06	947	0.64	1.09	0.46	6-23/32	27,600	5
5	25.60	G-105	IEU	0.500	4.000	2-5/8	73,200	742,000	18,900	18,400	NC50	6-5/8	2-3/4	9	12	120	38,000	63,400	1,550,000	b	0.87	29.66	934	0.62	1.07	0.45	6-9/32	27,400	5
5	25.60	G-105	IEU	0.500	4.000	3-3/8	73,200	742,000	18,900	18,400	NC50 VAM EIS	6-5/8	3-1/2	9	12	130	40,900	68,200	1,200,000	b	0.93	28.28	891	0.64	1.07	0.43	5-27/32	27,700	5
5	25.60	G-105	IEU	0.500	4.000	3-5/8	73,200	742,000	18,900	18,400	VAM Express VX50	6-1/2	3-3/4	11	14	130	49,200	78,900	1,330,000	p	1.08	28.02	882	0.64	1.07	0.43	6-1/32	33,300	5
5	25.60	S-135	IEU	0.500	4.000	3-1/8	94,100	954,000	24,300	23,600	5-1/2 FH	7-1/4	3-1/4	10	12	120	47,200	78,700	1,780,000	p	0.84	30.58	963	0.63	1.09	0.47	6-15/16	35,400	5
5	25.60	S-135	IEU	0.500	4.000	2-5/8	94,100	954,000	24,300	23,600	NC50	6-5/8	2-3/4	9	12	120	38,000	63,400	1,550,000	B	0.67	29.66	934	0.62	1.07	0.45	6-17/32	35,200	5
5	25.60	S-135	IEU	0.500	4.000	3-1/8	94,100	954,000	24,300	23,600	NC50 VAM EIS	6-5/8	3-1/4	9	12	130	48,500	80,900	1,370,000	b	0.86	28.78	907	0.63	1.07	0.44	6	35,800	5
5	25.60	S-135	IEU	0.500	4.000	3-3/8	94,100	954,000	24,300	23,600	VAM Express VX50	6-5/8	3-1/2	11	14	130	57,700	92,400	1,510,000	p	0.98	28.92	911	0.63	1.08	0.44	6-1/32	37,200	5

Notes:
All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital “P” or “B” under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
VAM EIS® and VAM Express™ are proprietary threads of VAM Drilling.
Tong spaces are a minimum of 2” longer than API standard.
Make-up torque values are recommended by VAM Drilling.

VAM DRILLING Vallourec Group

Drill Pipe and Tool Joint Data - 5-1/2” - 5-7/8”

PIPE BODY											TOOL JOINT										ASSEMBLY								
														Tong Length												Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
5-1/2	21.90	E-75	IEU	0.361	4.778	3-7/8	50,700	437,000	8,410	8,610	5-1/2 FH	7	4	10	12	120	33,400	55,700	1,270,000	b	1.10	25.17	793	0.90	1.29	0.38	6-15/32	19,200	5-1/2
5-1/2	21.90	E-75	IEU	0.361	4.778	3-7/8	50,700	437,000	8,410	8,610	5-1/2 FH VAM EIS	7	4	10	12	130	49,500	82,400	1,370,000	b	1.63	25.17	793	0.90	1.29	0.38	6-7/16	32,800	5-1/2
5-1/2	21.90	X-95	IEU	0.361	4.778	3-5/8	64,200	554,000	10,000	10,900	5-1/2 FH	7	3-3/4	10	12	120	37,700	62,900	1,450,000	p	0.98	25.75	811	0.89	1.29	0.39	6-5/8	24,400	5-1/2
5-1/2	21.90	X-95	IEU	0.361	4.778	3-7/8	64,200	554,000	10,000	10,900	5-1/2 FH VAM EIS	7	4	10	12	130	49,500	82,400	1,370,000	b	1.28	25.17	793	0.90	1.29	0.38	6-7/16	32,800	5-1/2
5-1/2	21.90	G-105	IEU	0.361	4.778	3-3/8	71,000	612,000	10,800	12,100	5-1/2 FH	7-1/4	3-1/2	10	12	120	43,300	72,200	1,620,000	b	1.02	26.96	849	0.88	1.29	0.41	6-23/32	27,600	5-1/2
5-1/2	21.90	G-105	IEU	0.361	4.778	3-7/8	71,000	612,000	10,800	12,100	5-1/2 FH VAM EIS	7	4	10	12	130	49,500	82,400	1,370,000	b	1.16	25.17	793	0.90	1.29	0.38	6-7/16	32,800	5-1/2
5-1/2	21.90	G-105	IEU	0.361	4.778	4-3/8	71,000	612,000	10,800	12,100	VAM Express VX57	7	4-1/2	12	15	130	47,200	75,600	1,180,000	b	1.06	24.67	777	0.92	1.30	0.38	6-15/32	32,700	5-1/2
5-1/2	21.90	S-135	IEU	0.361	4.778	2-7/8	91,300	787,000	12,700	15,500	5-1/2 FH	7-1/2	3	10	12	120	52,100	86,800	1,930,000	b	0.95	28.68	903	0.87	1.31	0.44	6-15/16	35,400	5-1/2
5-1/2	21.90	S-135	IEU	0.361	4.778	3-7/8	91,300	787,000	12,700	15,500	5-1/2 FH VAM EIS	7	4	10	12	130	49,500	82,400	1,370,000	b	0.90	25.17	793	0.90	1.29	0.38	6-1/2	35,000	5-1/2
5-1/2	21.90	S-135	IEU	0.361	4.778	3-7/8	91,300	787,000	12,700	15,500	VAM Express VX54	6-3/4	4	12	15	130	55,500	89,000	1,340,000	p	0.97	25.32	798	0.90	1.28	0.39	6-7/32	36,200	5-1/2
5-1/2	21.90	S-135	IEU	0.361	4.778	4-3/8	91,300	787,000	12,700	15,500	VAM Express VX57	7	4-1/2	12	15	130	47,200	75,600	1,180,000	b	0.83	24.67	777	0.92	1.30	0.38	6-9/16	36,200	5-1/2
5-1/2	24.70	E-75	IEU	0.415	4.670	3-7/8	56,600	497,000	10,500	9,900	5-1/2 FH	7	4	10	12	120	33,400	55,700	1,270,000	b	0.98	27.59	869	0.86	1.29	0.42	6-9/16	22,300	5-1/2
5-1/2	24.70	E-75	IEU	0.415	4.670	3-7/8	56,600	497,000	10,500	9,900	5-1/2 FH VAM EIS	7	4	10	12	130	49,500	82,400	1,370,000	b	1.46	27.59	869	0.86	1.29	0.42	6-7/16	32,800	5-1/2
5-1/2	24.70	X-95	IEU	0.415	4.670	3-3/8	71,700	630,000	12,900	12,500	5-1/2 FH	7-1/4	3-1/2	10	12	120	43,300	72,200	1,620,000	b	1.01	29.38	925	0.85	1.29	0.45	6-23/32	27,600	5-1/2
5-1/2	24.70	X-95	IEU	0.415	4.670	3-7/8	71,700	630,000	12,900	12,500	5-1/2 FH VAM EIS	7	4	10	12	130	49,500	82,400	1,370,000	b	1.15	27.59	869	0.86	1.29	0.42	6-7/16	32,800	5-1/2
5-1/2	24.70	G-105	IEU	0.415	4.670	3-3/8	79,200	696,000	14,000	13,900	5-1/2 FH	7-1/4	3-1/2	10	12	120	43,300	72,200	1,620,000	b	0.91	29.38	925	0.85	1.29	0.45	6-25/32	29,800	5-1/2
5-1/2	24.70	G-105	IEU	0.415	4.670	3-7/8	79,200	696,000	14,000	13,900	5-1/2 FH VAM EIS	7	4	10	12	130	49,500	82,400	1,370,000	b	1.04	27.59	869	0.86	1.29	0.42	6-7/16	32,800	5-1/2
5-1/2	24.70	G-105	IEU	0.415	4.670	4-3/8	79,200	696,000	14,000	13,900	VAM Express VX57	7	4-1/2	12	15	130	47,200	75,600	1,180,000	b	0.95	27.05	852	0.88	1.30	0.41	6-15/32	32,700	5-1/2
5-1/2	24.70	S-135	IEU	0.415	4.670	2-7/8	102,000	895,000	17,000	17,800	5-1/2 FH	7-1/2	3	10	12	120	52,100	86,800	1,930,000	b	0.85	31.09	979	0.83	1.31	0.48	7-1/32	38,900	5-1/2
5-1/2	24.70	S-135	IEU	0.415	4.670	3-5/8	102,000	895,000	17,000	17,800	5-1/2 FH VAM EIS	7	3-3/4	10	12	130	58,300	97,200	1,570,000	p	0.95	28.17	887	0.85	1.29	0.43	6-1/2	39,300	5-1/2
5-1/2	24.70	S-135	IEU	0.415	4.670	3-7/8	102,000	895,000	17,000	17,800	VAM Express VX54	6-3/4	4	12	15	130	55,500	89,000	1,340,000	p	0.87	27.71	873	0.86	1.28	0.42	6-11/32	40,500	5-1/2
5-1/2	24.70	S-135	IEU	0.415	4.670	4-1/8	102,000	895,000	17,000	17,800	VAM Express VX57	7	4-1/4	12	15	130	58,800	94,200	1,400,000	p	0.92	27.78	875	0.87	1.30	0.42	6-17/32	40,300	5-1/2
5-7/8	23.40	G-105	IEU	0.361	5.153	4-3/8	82,000	657,000	9,360	11,300	VAM Express VX57	7	4-1/2	12	15	130	47,200	75,600	1,180,000	b	0.92	26.35	830	1.05	1.45	0.40	6-15/32	32,700	5-7/8
5-7/8	23.40	S-135	IEU	0.361	5.153	4-1/8	105,000	844,000	10,800	14,500	VAM Express VX57	7	4-1/4	12	15	130	58,800	94,200	1,400,000	p	0.89	27.06	853	1.04	1.45	0.41	6-9/16	41,500	5-7/8
5-7/8	26.70	G-105	IEU	0.415	5.045	4-3/8	91,700	747,000	12,400	13,000	VAM Express VX57	7	4-1/2	12	15	130	47,200	75,600	1,180,000	b	0.82	28.93	911	1.01	1.45	0.44	6-9/16	36,200	5-7/8
5-7/8	26.70	S-135	IEU	0.415	5.045	4-1/8	118,000	961,000	14,900	16,700	VAM Express VX57	7	4-1/4	12	15	130	58,800	94,200	1,400,000	P	0.80	29.65	934	1.00	1.45	0.45	6-11/16	46,300	5-7/8

Notes:
All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital “P” or “B” under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
VAM EIS® and VAM Express™ are proprietary threads of VAM Drilling.
Tong spaces are a minimum of 2” longer than API standard.
Make-up torque values are recommended by VAM Drilling.

VAM DRILLING Vallourec Group

Drill Pipe and Tool Joint Data - 6-5/8”

PIPE BODY											TOOL JOINT										ASSEMBLY								
														Tong Length											Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
6-5/8	25.20	E-75	IEU	0.330	5.965	4-7/8	70,600	489,000	4,790	6,540	6-5/8 FH	8	5	10	13	120	43,900	73,200	1,450,000	b	1.04	29.17	919	1.40	1.85	0.45	7-7/16	26,800	6-5/8
6-5/8	25.20	E-75	IEU	0.330	5.965	4-7/8	70,600	489,000	4,790	6,540	6-5/8 FH VAM EIS	8	5	10	13	130	64,700	108,000	1,570,000	b	1.53	29.17	919	1.40	1.85	0.45	7-3/8	42,900	6-5/8
6-5/8	25.20	X-95	IEU	0.330	5.965	4-7/8	89,400	620,000	5,320	8,280	6-5/8 FH	8	5	10	13	120	43,900	73,200	1,450,000	b	0.82	29.17	919	1.40	1.85	0.45	7-5/8	35,100	6-5/8
6-5/8	25.20	X-95	IEU	0.330	5.965	4-7/8	89,400	620,000	5,320	8,280	6-5/8 FH VAM EIS	8	5	10	13	130	64,700	108,000	1,570,000	b	1.21	29.17	919	1.40	1.85	0.45	7-3/8	42,900	6-5/8
6-5/8	25.20	G-105	IEU	0.330	5.965	4-5/8	98,800	685,000	5,500	9,150	6-5/8 FH	8-1/4	4-3/4	10	13	120	51,300	85,500	1,680,000	b	0.86	30.71	967	1.39	1.86	0.47	7-11/16	38,000	6-5/8
6-5/8	25.20	G-105	IEU	0.330	5.965	4-7/8	98,800	685,000	5,500	9,150	6-5/8 FH VAM EIS	8	5	10	13	130	64,700	108,000	1,570,000	b	1.09	29.17	919	1.40	1.85	0.45	7-3/8	42,900	6-5/8
6-5/8	25.20	G-105	IEU	0.330	5.965	5-3/8	98,800	685,000	5,500	9,150	VAM Express VX65	8	5-1/2	12	17	130	66,800	107,000	1,450,000	b	1.08	28.68	903	1.42	1.86	0.44	7-1/2	45,100	6-5/8
6-5/8	25.20	G-105	IEU	0.330	5.965	5-3/4	98,800	685,000	5,500	9,150	VAM Express VX69	8-1/4	5-7/8	12	17	130	72,500	116,000	1,500,000	p	1.17	28.14	887	1.45	1.88	0.43	7-27/32	49,600	6-5/8
6-5/8	25.20	S-135	IEU	0.330	5.965	4-1/8	127,000	881,000	6,040	11,800	6-5/8 FH	8-1/2	4-1/4	10	13	120	65,000	108,000	2,100,000	b	0.85	32.94	1,038	1.37	1.87	0.50	7-29/32	48,200	6-5/8
6-5/8	25.20	S-135	IEU	0.330	5.965	4-5/8	127,000	881,000	6,040	11,800	6-5/8 FH VAM EIS	8-1/4	4-3/4	10	13	130	79,300	132,000	1,820,000	b	1.04	30.71	967	1.39	1.86	0.47	7-3/8	49,400	6-5/8
6-5/8	25.20	S-135	IEU	0.330	5.965	5-3/8	127,000	881,000	6,040	11,800	VAM Express VX65	8	5-1/2	12	17	130	66,800	107,000	1,450,000	b	0.84	28.68	903	1.42	1.86	0.44	7-5/8	51,300	6-5/8
6-5/8	25.20	S-135	IEU	0.330	5.965	5-5/8	127,000	881,000	6,040	11,800	VAM Express VX69	8-1/4	5-3/4	12	17	130	76,900	123,000	1,640,000	p	0.97	28.65	902	1.44	1.88	0.44	7-27/32	54,100	6-5/8
6-5/8	27.70	E-75	IEU	0.362	5.901	4-7/8	76,300	534,000	5,890	7,170	6-5/8 FH	8	5	10	13	120	43,900	73,200	1,450,000	b	0.96	30.97	976	1.38	1.85	0.47	7-1/2	29,600	6-5/8
6-5/8	27.70	E-75	IEU	0.362	5.901	4-7/8	76,300	534,000	5,890	7,170	6-5/8 FH VAM EIS	8	5	10	13	130	64,700	108,000	1,570,000	b	1.41	30.97	976	1.38	1.85	0.47	7-3/8	42,900	6-5/8
6-5/8	27.70	X-95	IEU	0.362	5.901	4-5/8	96,600	677,000	6,760	9,080	6-5/8 FH	8-1/4	4-3/4	10	13	120	51,300	85,500	1,680,000	b	0.88	32.50	1,024	1.36	1.86	0.50	7-11/16	38,000	6-5/8
6-5/8	27.70	X-95	IEU	0.362	5.901	4-7/8	96,600	677,000	6,760	9,080	6-5/8 FH VAM EIS	8	5	10	13	130	64,700	108,000	1,570,000	b	1.12	30.97	976	1.38	1.85	0.47	7-3/8	42,900	6-5/8
6-5/8	27.70	G-105	IEU	0.362	5.901	4-5/8	107,000	748,000	7,100	10,000	6-5/8 FH	8-1/4	4-3/4	10	13	120	51,300	85,500	1,680,000	b	0.80	32.50	1,024	1.36	1.86	0.50	7-3/4	40,900	6-5/8
6-5/8	27.70	G-105	IEU	0.362	5.901	4-7/8	107,000	748,000	7,100	10,000	6-5/8 FH VAM EIS	8	5	10	13	130	64,700	108,000	1,570,000	b	1.01	30.97	976	1.38	1.85	0.47	7-3/8	42,900	6-5/8
6-5/8	27.70	G-105	IEU	0.362	5.901	5-3/8	107,000	748,000	7,100	10,000	VAM Express VX65	8	5-1/2	12	17	130	66,800	107,000	1,450,000	b	1.00	30.44	959	1.40	1.86	0.47	7-1/2	45,100	6-5/8
6-5/8	27.70	G-105	IEU	0.362	5.901	5-3/4	107,000	748,000	7,100	10,000	VAM Express VX69	8-1/4	5-7/8	12	17	130	72,500	116,000	1,500,000	p	1.09	29.91	942	1.42	1.88	0.46	7-27/32	49,600	6-5/8
6-5/8	27.70	S-135	IEU	0.362	5.901	4-1/8	137,000	962,000	7,810	12,900	6-5/8 FH	8-1/2	4-1/4	10	13	120	65,000	108,000	2,100,000	B	0.79	34.73	1,094	1.34	1.87	0.53	8	52,700	6-5/8
6-5/8	27.70	S-135	IEU	0.362	5.901	4-5/8	137,000	962,000	7,810	12,900	6-5/8 FH VAM EIS	8-1/4	4-3/4	10	13	130	79,300	132,000	1,820,000	b	0.96	32.50	1,024	1.36	1.86	0.50	7-7/16	52,300	6-5/8
6-5/8	27.70	S-135	IEU	0.362	5.901	5-1/8	137,000	962,000	7,810	12,900	VAM Express VX65	8	5-1/4	12	17	130	78,800	126,000	1,720,000	p	0.92	31.36	988	1.38	1.86	0.48	7-17/32	54,300	6-5/8
6-5/8	27.70	S-135	IEU	0.362	5.901	5-1/2	137,000	962,000	7,810	12,900	VAM Express VX69	8-1/2	5-5/8	12	17	130	91,800	147,000	1,790,000	b	1.07	31.88	1,004	1.40	1.89	0.49	7-27/32	58,300	6-5/8

Notes:
All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital “P” or “B” under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
VAM EIS® and VAM Express™ are proprietary threads of VAM Drilling.
Tong spaces are a minimum of 2” longer than API standard.
Make-up torque values are recommended by VAM Drilling.

VAM DRILLING Vallourec Group

Drill Pipe and Tool Joint Data — Sour service - 3-1/2” - 4”

PIPE BODY											TOOL JOINT										ASSEMBLY								
														Tong Length											Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
3-1/2	15.50	VM-95 DP SS	EU	0.449	2.602	2-5/16	26,700	409,000	21,200	21,300	NC38	5	2-7/16	10	12-1/2	110	12,100	20,200	649,000	B	0.76	17.32	546	0.27	0.54	0.26	4-23/32	10,000	3-1/2
3-1/2	15.50	VM-95 DP SS	EU	0.449	2.602	2-7/16	26,700	409,000	21,200	21,300	NC38 VAM EIS	4-3/4	2-9/16	10	12-1/2	110	14,400	24,000	595,000	p	0.90	16.70	526	0.28	0.53	0.26	4-19/32	11,900	3-1/2
3-1/2	15.50	VM-105 DP	EU	0.449	2.602	2-1/8	29,500	452,000	23,500	23,600	NC38	5	2-1/4	10	12-1/2	110	13,600	22,700	725,000	B	0.77	17.58	554	0.27	0.54	0.27	4-25/32	11,100	3-1/2
3-1/2	15.50	VM-105 DP	EU	0.449	2.602	2-5/16	29,500	452,000	23,500	23,600	NC38 VAM EIS	4-3/4	2-7/16	10	12-1/2	110	15,200	25,300	649,000	p	0.86	16.88	532	0.27	0.53	0.26	4-19/32	12,700	3-1/2
3-1/2	15.50	VM-105 DP SS	EU	0.449	2.602	2-1/8	29,500	452,000	23,500	23,600	NC38	5	2-1/4	10	12-1/2	110	13,600	22,700	725,000	B	0.77	17.58	554	0.27	0.54	0.27	4-25/32	11,100	3-1/2
3-1/2	15.50	VM-105 DP SS	EU	0.449	2.602	2-5/16	29,500	452,000	23,500	23,600	NC38 VAM EIS	4-3/4	2-7/16	10	12-1/2	110	15,200	25,300	649,000	p	0.86	16.88	532	0.27	0.53	0.26	4-19/32	12,700	3-1/2
4	14.00	VM-95 DP	IU	0.330	3.340	2-1/8	29,500	361,000	14,400	13,700	NC38	5	2-1/4	10	12-1/2	110	13,600	22,700	725,000	B	0.77	16.37	516	0.43	0.68	0.25	4-13/16	11,600	4
4	14.00	VM-95 DP	IU	0.330	3.340	2-7/16	29,500	361,000	14,400	13,700	NC38 VAM EIS	5	2-9/16	10	12-1/2	110	15,000	25,000	595,000	b	0.85	15.93	502	0.43	0.68	0.24	4-19/32	11,900	4
4	14.00	VM-95 DP	IU	0.330	3.340	2-7/16	29,500	361,000	14,400	13,700	NC40	5-1/4	2-9/16	9	12	110	15,200	25,400	768,000	b	0.86	16.22	511	0.44	0.68	0.25	5	11,500	4
4	14.00	VM-95 DP	IU	0.330	3.340	2-9/16	29,500	361,000	14,400	13,700	NC40 VAM EIS	5-1/4	2-11/16	9	12	110	18,800	31,400	712,000	b	1.06	16.03	505	0.44	0.68	0.24	4-7/8	14,100	4
4	14.00	VM-95 DP SS	IU	0.330	3.340	2-1/8	29,500	361,000	14,400	13,700	NC38	5	2-1/4	10	12-1/2	110	13,600	22,700	725,000	B	0.77	16.37	516	0.43	0.68	0.25	4-13/16	11,600	4
4	14.00	VM-95 DP SS	IU	0.330	3.340	2-7/16	29,500	361,000	14,400	13,700	NC38 VAM EIS	5	2-9/16	10	12-1/2	110	15,000	25,000	595,000	b	0.85	15.93	502	0.43	0.68	0.24	4-19/32	11,900	4
4	14.00	VM-95 DP SS	IU	0.330	3.340	2-7/16	29,500	361,000	14,400	13,700	NC40	5-1/4	2-9/16	9	12	110	15,200	25,400	768,000	b	0.86	16.22	511	0.44	0.68	0.25	5	11,500	4
4	14.00	VM-95 DP SS	IU	0.330	3.340	2-9/16	29,500	361,000	14,400	13,700	NC40 VAM EIS	5-1/4	2-11/16	9	12	110	18,800	31,400	712,000	b	1.06	16.03	505	0.44	0.68	0.24	4-7/8	14,100	4
4	14.00	VM-105 DP	IU	0.330	3.340	2-1/8	32,600	400,000	15,900	15,200	NC38	5	2-1/4	10	12-1/2	110	13,600	22,700	725,000	B	0.70	16.37	516	0.43	0.68	0.25	4-7/8	12,600	4
4	14.00	VM-105 DP	IU	0.330	3.340	2-5/16	32,600	400,000	15,900	15,200	NC38 VAM EIS	5	2-7/16	10	12-1/2	110	16,900	28,100	649,000	b	0.86	16.11	507	0.43	0.68	0.25	4-19/32	12,700	4
4	14.00	VM-105 DP	IU	0.330	3.340	2-5/16	32,600	400,000	15,900	15,200	NC40	5-1/4	2-7/16	9	12	110	16,100	26,900	822,000	p	0.83	16.40	517	0.43	0.68	0.25	5-1/16	12,600	4
4	14.00	VM-105 DP	IU	0.330	3.340	2-9/16	32,600	400,000	15,900	15,200	NC40 VAM EIS	5-1/4	2-11/16	9	12	110	18,800	31,400	712,000	b	0.96	16.03	505	0.44	0.68	0.24	4-7/8	14,100	4
4	14.00	VM-105 DP SS	IU	0.330	3.340	2-1/8	32,600	400,000	15,900	15,200	NC38	5	2-1/4	10	12-1/2	110	13,600	22,700	725,000	B	0.70	16.37	516	0.43	0.68	0.25	4-7/8	12,600	4
4	14.00	VM-105 DP SS	IU	0.330	3.340	2-5/16	32,600	400,000	15,900	15,200	NC38 VAM EIS	5	2-7/16	10	12-1/2	110	16,900	28,100	649,000	b	0.86	16.11	507	0.43	0.68	0.25	4-19/32	12,700	4
4	14.00	VM-105 DP SS	IU	0.330	3.340	2-5/16	32,600	400,000	15,900	15,200	NC40	5-1/4	2-7/16	9	12	110	16,100	26,900	822,000	p	0.83	16.40	517	0.43	0.68	0.25	5-1/16	12,600	4
4	14.00	VM-105 DP SS	IU	0.330	3.340	2-9/16	32,600	400,000	15,900	15,200	NC40 VAM EIS	5-1/4	2-11/16	9	12	110	18,800	31,400	712,000	b	0.96	16.03	505	0.44	0.68	0.24	4-7/8	14,100	4
4	15.70	VM-95 DP	IU	0.380	3.240	2-1/8	32,700	411,000	16,300	15,800	NC38	5	2-1/4	10	12-1/2	110	13,600	22,700	725,000	B	0.69	17.93	565	0.40	0.68	0.27	4-7/8	12,600	4
4	15.70	VM-95 DP	IU	0.380	3.240	2-5/16	32,700	411,000	16,300	15,800	NC38 VAM EIS	5	2-7/16	10	12-1/2	110	16,900	28,100	649,000	b	0.86	17.67	557	0.41	0.68	0.27	4-19/32	12,700	4
4	15.70	VM-95 DP	IU	0.380	3.240	2-5/16	32,700	411,000	16,300	15,800	NC40	5-1/4	2-7/16	9	12	110	16,100	26,900	822,000	p	0.82	17.97	566	0.41	0.68	0.27	5-1/16	12,600	4
4	15.70	VM-95 DP	IU	0.380	3.240	2-9/16	32,700	411,000	16,300	15,800	NC40 VAM EIS	5-1/4	2-11/16	9	12	110	18,800	31,400	712,000	b	0.96	17.60	554	0.41	0.68	0.27	4-7/8	14,100	4
4	15.70	VM-95 DP SS	IU	0.380	3.240	2-1/8	32,700	411,000	16,300	15,800	NC38	5	2-1/4	10	12-1/2	110	13,600	22,700	725,000	B	0.69	17.93	565	0.40	0.68	0.27	4-7/8	12,600	4
4	15.70	VM-95 DP SS	IU	0.380	3.240	2-5/16	32,700	411,000	16,300	15,800	NC38 VAM EIS	5	2-7/16	10	12-1/2	110	16,900	28,100	649,000	b	0.86	17.67	557	0.41	0.68	0.27	4-19/32	12,700	4
4	15.70	VM-95 DP SS	IU	0.380	3.240	2-5/16	32,700	411,000	16,300	15,800	NC40	5-1/4	2-7/16	9	12	110	16,100	26,900	822,000	p	0.82	17.97	566	0.41	0.68	0.27	5-1/16	12,600	4
4	15.70	VM-95 DP SS	IU	0.380	3.240	2-9/16	32,700	411,000	16,300	15,800	NC40 VAM EIS	5-1/4	2-11/16	9	12	110	18,800	31,400	712,000	b	0.96	17.60	554	0.41	0.68	0.27	4-7/8	14,100	4
4	15.70	VM-105 DP	IU	0.380	3.240	2-1/8	36,100	454,000	18,100	17,500	NC38	5	2-1/4	10	12-1/2	110	13,600	22,700	725,000	B	0.63	17.93	565	0.40	0.68	0.27	4-15/16	13,600	4
4	15.70	VM-105 DP	IU	0.380	3.240	2-5/16	36,100	454,000	18,100	17,500	NC38 VAM EIS	5	2-7/16	10	12-1/2	110	16,900	28,100	649,000	B	0.78	17.67	557	0.41	0.68	0.27	4-21/32	13,700	4
4	15.70	VM-105 DP	IU	0.380	3.240	2-5/16	36,100	454,000	18,100	17,500	NC40	5-1/4	2-7/16	9	12	110	16,100	26,900	822,000	P	0.74	17.97	566	0.41	0.68	0.27	5-1/8	13,800	4
4	15.70	VM-105 DP	IU	0.380	3.240	2-9/16	36,100	454,000	18,100	17,500	NC40 VAM EIS	5-1/4	2-11/16	9	12	110	18,800	31,400	712,000	b	0.87	17.60	554	0.41	0.68	0.27	4-7/8	14,100	4
4	15.70	VM-105 DP SS	IU	0.380	3.240	2-1/8	36,100	454,000	18,100	17,500	NC38	5	2-1/4	10	12-1/2	110	13,600	22,700	725,000	B	0.63	17.93	565	0.40	0.68	0.27	4-15/16	13,600	4
4	15.70	VM-105 DP SS	IU	0.380	3.240	2-5/16	36,100	454,000	18,100	17,500	NC38 VAM EIS	5	2-7/16	10	12-1/2	110	16,900	28,100	649,000	B	0.78	17.67	557	0.41	0.68	0.27	4-21/32	13,700	4
4	15.70	VM-105 DP SS	IU	0.380	3.240	2-5/16	36,100	454,000	18,100	17,500	NC40	5-1/4	2-7/16	9	12	110	16,100	26,900	822,000	P	0.74	17.97	566	0.41	0.68	0.27	5-1/8	13,800	4
4	15.70	VM-105 DP SS	IU	0.380	3.240	2-9/16	36,100	454,000	18,100	17,500	NC40 VAM EIS	5-1/4	2-11/16	9	12	110	18,800	31,400	712,000	b	0.87	17.60	554	0.41	0.68	0.27	4-7/8	14,100	4

Notes:
All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital “P” or “B” under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
VAM EIS® and VAM Express™ are proprietary threads of VAM Drilling.
Tong spaces are a minimum of 2” longer than API standard.
Make-up torque values are recommended by VAM Drilling.

VAM DRILLING
Vallourec Group

Drill Pipe and Tool Joint Data — Sour Service - 4-1/2”

PIPE BODY											TOOL JOINT										ASSEMBLY								
														Tong Length											Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
4-1/2	16.60	VM-95 DP	IEU	0.337	3.826	2-7/8	39,000	419,000	12,800	12,500	NC46	6	3	9	12	110	21,400	35,700	961,000	b	0.92	19.30	608	0.57	0.87	0.29	5-19/32	15,200	4-1/2
4-1/2	16.60	VM-95 DP SS	IEU	0.337	3.826	2-7/8	39,000	419,000	12,800	12,500	NC46	6	3	9	12	110	21,400	35,700	961,000	b	0.92	19.30	608	0.57	0.87	0.29	5-19/32	15,200	4-1/2
4-1/2	16.60	VM-95 DP SS	IEU	0.337	3.826	3-1/8	39,000	419,000	12,800	12,500	NC46 VAM EIS	6	3-1/4	9	12	110	24,800	41,400	826,000	b	1.06	18.85	594	0.58	0.87	0.29	5-7/16	18,100	4-1/2
4-1/2	16.60	VM-105 DP	IEU	0.337	3.826	2-7/8	43,100	463,000	13,800	13,800	NC46	6	3	9	12	110	21,400	35,700	961,000	b	0.83	19.30	608	0.57	0.87	0.29	5-21/32	16,600	4-1/2
4-1/2	16.60	VM-105 DP	IEU	0.337	3.826	3-1/8	43,100	463,000	13,800	13,800	NC46 VAM EIS	6	3-1/4	9	12	110	24,800	41,400	826,000	b	0.96	18.85	594	0.58	0.87	0.29	5-7/16	18,100	4-1/2
4-1/2	16.60	VM-105 DP SS	IEU	0.337	3.826	2-7/8	43,100	463,000	13,800	13,800	NC46	6	3	9	12	110	21,400	35,700	961,000	b	0.83	19.30	608	0.57	0.87	0.29	5-21/32	16,600	4-1/2
4-1/2	16.60	VM-105 DP SS	IEU	0.337	3.826	3-1/8	43,100	463,000	13,800	13,800	NC46 VAM EIS	6	3-1/4	9	12	110	24,800	41,400	826,000	b	0.96	18.85	594	0.58	0.87	0.29	5-7/16	18,100	4-1/2
4-1/2	20.00	VM-95 DP	IEU	0.430	3.640	2-5/8	46,700	522,000	16,400	15,900	NC46	6-1/4	2-3/4	9	12	110	24,400	40,700	1,090,000	b	0.87	23.57	742	0.52	0.88	0.36	5-23/32	18,000	4-1/2
4-1/2	20.00	VM-95 DP	IEU	0.430	3.640	3-1/8	46,700	522,000	16,400	15,900	NC46 VAM EIS	6	3-1/4	9	12	110	24,800	41,400	826,000	b	0.89	22.15	698	0.53	0.87	0.34	5-7/16	18,100	4-1/2
4-1/2	20.00	VM-95 DP SS	IEU	0.430	3.640	2-5/8	46,700	522,000	16,400	15,900	NC46	6-1/4	2-3/4	9	12	110	24,400	40,700	1,090,000	b	0.87	23.57	742	0.52	0.88	0.36	5-23/32	18,000	4-1/2
4-1/2	20.00	VM-95 DP SS	IEU	0.430	3.640	3-1/8	46,700	522,000	16,400	15,900	NC46 VAM EIS	6	3-1/4	9	12	110	24,800	41,400	826,000	b	0.89	22.15	698	0.53	0.87	0.34	5-7/16	18,100	4-1/2
4-1/2	20.00	VM-105 DP	IEU	0.430	3.640	2-5/8	51,700	577,000	18,100	17,600	NC46	6-1/4	2-3/4	9	12	110	24,400	40,700	1,090,000	B	0.79	23.57	742	0.52	0.88	0.36	5-25/32	19,500	4-1/2
4-1/2	20.00	VM-105 DP	IEU	0.430	3.640	2-7/8	51,700	577,000	18,100	17,600	NC46 VAM EIS	6	3	9	12	110	30,300	50,600	961,000	b	0.98	22.61	712	0.52	0.87	0.35	5-7/16	20,500	4-1/2
4-1/2	20.00	VM-105 DP SS	IEU	0.430	3.640	2-5/8	51,700	577,000	18,100	17,600	NC46	6-1/4	2-3/4	9	12	110	24,400	40,700	1,090,000	B	0.79	23.57	742	0.52	0.88	0.36	5-25/32	19,500	4-1/2
4-1/2	20.00	VM-105 DP SS	IEU	0.430	3.640	2-7/8	51,700	577,000	18,100	17,600	NC46 VAM EIS	6	3	9	12	110	30,300	50,600	961,000	b	0.98	22.61	712	0.52	0.87	0.35	5-7/16	20,500	4-1/2

Notes: All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital “P” or “B” under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
VAM EIS® and VAM Express™ are proprietary threads of VAM Drilling.
Tong spaces are a minimum of 2” longer than API standard.
Make-up torque values are recommended by VAM Drilling.

VAM DRILLING Vallourec Group

Drill Pipe and Tool Joint Data — Sour Service - 5 - 5-1/2”

PIPE BODY											TOOL JOINT										ASSEMBLY								
														Tong Length											Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
5	19.50	VM-95 DP	IEU	0.362	4.276	3-1/8	52,100	501,000	12,000	12,000	NC50	6-5/8	3-1/4	9	12	110	28,200	46,900	1,160,000	b	0.90	23.35	735	0.71	1.07	0.36	6-3/32	20,100	5
5	19.50	VM-95 DP	IEU	0.362	4.276	3-3/8	52,100	501,000	12,000	12,000	NC50 VAM EIS	6-3/8	3-1/2	9	12	110	34,400	57,300	1,020,000	b	1.10	22.28	702	0.72	1.06	0.34	5-27/32	23,500	5
5	19.50	VM-95 DP SS	IEU	0.362	4.276	3-1/8	52,100	501,000	12,000	12,000	NC50	6-5/8	3-1/4	9	12	110	28,200	46,900	1,160,000	b	0.90	23.35	735	0.71	1.07	0.36	6-3/32	20,100	5
5	19.50	VM-95 DP SS	IEU	0.362	4.276	3-3/8	52,100	501,000	12,000	12,000	NC50 VAM EIS	6-3/8	3-1/2	9	12	110	34,400	57,300	1,020,000	b	1.10	22.28	702	0.72	1.06	0.34	5-27/32	23,500	5
5	19.50	VM-105 DP	IEU	0.362	4.276	3-1/8	57,600	554,000	13,000	13,300	NC50	6-5/8	3-1/4	9	12	110	28,200	46,900	1,160,000	b	0.81	23.35	735	0.71	1.07	0.36	6-5/32	21,800	5
5	19.50	VM-105 DP	IEU	0.362	4.276	3-3/8	57,600	554,000	13,000	13,300	NC50 VAM EIS	6-3/8	3-1/2	9	12	110	34,400	57,300	1,020,000	b	0.99	22.28	702	0.72	1.06	0.34	5-27/32	23,500	5
5	19.50	VM-105 DP SS	IEU	0.362	4.276	3-1/8	57,600	554,000	13,000	13,300	NC50	6-5/8	3-1/4	9	12	110	28,200	46,900	1,160,000	b	0.81	23.35	735	0.71	1.07	0.36	6-5/32	21,800	5
5	19.50	VM-105 DP SS	IEU	0.362	4.276	3-3/8	57,600	554,000	13,000	13,300	NC50 VAM EIS	6-3/8	3-1/2	9	12	110	34,400	57,300	1,020,000	b	0.99	22.28	702	0.72	1.06	0.34	5-27/32	23,500	5
5-1/2	21.90	VM-95 DP	IEU	0.361	4.778	3-7/8	64,200	554,000	10,000	10,900	5 1/2 FH	7	4	10	12	110	30,600	51,000	1,160,000	B	0.79	25.17	793	0.90	1.29	0.38	6-11/16	24,300	5-1/2
5-1/2	21.90	VM-95 DP	IEU	0.361	4.778	3-7/8	64,200	554,000	10,000	10,900	5 1/2 FH VAM EIS	7	4	10	12	110	41,900	69,800	1,160,000	b	1.09	25.17	793	0.90	1.29	0.38	6-7/16	27,700	5-1/2
5-1/2	21.90	VM-95 DP SS	IEU	0.361	4.778	3-7/8	64,200	554,000	10,000	10,900	5 1/2 FH	7	4	10	12	110	30,600	51,000	1,160,000	B	0.79	25.17	793	0.90	1.29	0.38	6-11/16	24,300	5-1/2
5-1/2	21.90	VM-95 DP SS	IEU	0.361	4.778	3-7/8	64,200	554,000	10,000	10,900	5 1/2 FH VAM EIS	7	4	10	12	110	41,900	69,800	1,160,000	b	1.09	25.17	793	0.90	1.29	0.38	6-7/16	27,700	5-1/2
5-1/2	21.90	VM-105 DP	IEU	0.361	4.778	3-5/8	71,000	612,000	10,800	12,100	5 1/2 FH	7-1/4	3-3/4	10	12	110	35,300	58,800	1,330,000	b	0.83	26.42	832	0.89	1.29	0.40	6-25/32	27,400	5-1/2
5-1/2	21.90	VM-105 DP	IEU	0.361	4.778	3-7/8	71,000	612,000	10,800	12,100	5 1/2 FH VAM EIS	7	4	10	12	110	41,900	69,800	1,160,000	b	0.98	25.17	793	0.90	1.29	0.38	6-7/16	27,700	5-1/2
5-1/2	21.90	VM-105 DP SS	IEU	0.361	4.778	3-5/8	71,000	612,000	10,800	12,100	5 1/2 FH	7-1/4	3-3/4	10	12	110	35,300	58,800	1,330,000	b	0.83	26.42	832	0.89	1.29	0.40	6-25/32	27,400	5-1/2
5-1/2	21.90	VM-105 DP SS	IEU	0.361	4.778	3-7/8	71,000	612,000	10,800	12,100	5 1/2 FH VAM EIS	7	4	10	12	110	41,900	69,800	1,160,000	b	0.98	25.17	793	0.90	1.29	0.38	6-7/16	27,700	5-1/2
5-1/2	24.70	VM-95 DP	IEU	0.415	4.670	3-7/8	71,700	630,000	12,900	12,500	5 1/2 FH	7	4	10	12	110	30,600	51,000	1,160,000	B	0.71	27.59	869	0.86	1.29	0.42	6-25/32	27,400	5-1/2
5-1/2	24.70	VM-95 DP	IEU	0.415	4.670	3-7/8	71,700	630,000	12,900	12,500	5 1/2 FH VAM EIS	7	4	10	12	110	41,900	69,800	1,160,000	b	0.97	27.59	869	0.86	1.29	0.42	6-7/16	27,700	5-1/2
5-1/2	24.70	VM-95 DP SS	IEU	0.415	4.670	3-7/8	71,700	630,000	12,900	12,500	5 1/2 FH	7	4	10	12	110	30,600	51,000	1,160,000	B	0.71	27.59	869	0.86	1.29	0.42	6-25/32	27,400	5-1/2
5-1/2	24.70	VM-95 DP SS	IEU	0.415	4.670	3-7/8	71,700	630,000	12,900	12,500	5 1/2 FH VAM EIS	7	4	10	12	110	41,900	69,800	1,160,000	b	0.97	27.59	869	0.86	1.29	0.42	6-7/16	27,700	5-1/2
5-1/2	24.70	VM-105 DP	IEU	0.415	4.670	3-3/8	79,200	696,000	14,000	13,900	5 1/2 FH	7-1/2	3-1/2	10	12	110	39,700	66,200	1,480,000	b	0.84	30.09	948	0.85	1.31	0.46	6-7/8	30,400	5-1/2
5-1/2	24.70	VM-105 DP	IEU	0.415	4.670	3-7/8	79,200	696,000	14,000	13,900	5 1/2 FH VAM EIS	7	4	10	12	110	41,900	69,800	1,160,000	b	0.88	27.59	869	0.86	1.29	0.42	6-17/32	30,600	5-1/2
5-1/2	24.70	VM-105 DP SS	IEU	0.415	4.670	3-3/8	79,200	696,000	14,000	13,900	5 1/2 FH	7-1/2	3-1/2	10	12	110	39,700	66,200	1,480,000	b	0.84	30.09	948	0.85	1.31	0.46	6-7/8	30,400	5-1/2
5-1/2	24.70	VM-105 DP SS	IEU	0.415	4.670	3-7/8	79,200	696,000	14,000	13,900	5 1/2 FH VAM EIS	7	4	10	12	110	41,900	69,800	1,160,000	b	0.88	27.59	869	0.86	1.29	0.42	6-17/32	30,600	5-1/2

Notes:
All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital “P” or “B” under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
VAM EIS® and VAM Express™ are proprietary threads of VAM Drilling.
Tong spaces are a minimum of 2” longer than API standard.
Make-up torque values are recommended by VAM Drilling.

VAM DRILLING
Vallourec Group

Drill Pipe and Tool Joint Data — High performance - 5” - 6-5/8”

PIPE BODY											TOOL JOINT										ASSEMBLY								
														Tong Length											Displacement		Premium		
Nominal Size (in)	Weight (lbs/ft)	Grade	Upset	Wall Thickness (in)	ID (in)	Drift (in)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Collapse (psi)	Burst (psi)	Connection	OD (in)	ID (in)	Pin (in)	Box (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (ft-lbs)	Pin Box Weak	Torsional Ratio	Approximate Weight/Foot (lbs/ft)	Approximate Weight (lbs)	Capacity (gal/ft)	Closed End (gal/ft)	Open End (gal/ft)	OD (in)	Make-up (ft-lbs)	Nominal Size (in)
5	19.50	VM-150	IEU	0.362	4.276	3-3/8	82,300	791,000	16,900	19,000	NC50 VAM EIS	6-1/2	3-1/2	9	12	130	40,800	67,900	1,200,000	b	0.82	22.56	711	0.72	1.06	0.34	5-31/32	31,500	5
5	19.50	VM-150	IEU	0.362	4.276	3-5/8	82,300	791,000	16,900	19,000	VAM Express VX50	6-5/8	3-3/4	11	14	130	52,300	83,800	1,330,000	b	1.02	22.98	724	0.73	1.08	0.35	6-1/32	33,300	5
5-1/2	24.70	VM-150	IEU	0.415	4.670	3-5/8	113,000	994,000	18,400	19,800	5 1/2 FH VAM EIS	7-1/4	3-3/4	10	12	130	59,500	99,100	1,570,000	b	0.88	28.83	908	0.85	1.29	0.44	6-19/32	42,700	5-1/2
5-1/2	24.70	VM-150	IEU	0.415	4.670	4-1/8	113,000	994,000	18,400	19,800	VAM Express VX57	7	4-1/4	12	15	130	58,800	94,200	1,400,000	p	0.83	27.78	875	0.87	1.30	0.42	6-21/32	45,000	5-1/2
6-5/8	30.27	VM-150	IEU	0.460	5.705	4-7/8	185,000	1,340,000	15,400	18,200	VAM Express VX65	8-1/2	5	12	17	130	99,600	159,000	1,980,000	b	0.86	39.48	1,244	1.29	1.89	0.60	7-25/32	74,300	6-5/8

Notes:
All drill pipe is range 2 unless otherwise specified, 31-1/2 ft shoulder to shoulder.
Capital “P” or “B” under Connection Pin Box Weak column indicates Torsional Ratio less than 0.80.
API recommends a Torsional Ratio of 0.80 or greater.
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Drill Pipe — Inquiry form

PRODUCT DESCRIPTION

	ITEM	1	2	3	4
	Quantity - units / footage - feet				
Pipe	Nominal OD - inches				
	Nominal weight - lbs/ft				
	Nominal wall thickness - inches				
	Minimum wall thickness- %				
	Pipe grade				
	Range	☐ 2 ☐ 3	☐ 2 ☐ 3	☐ 2 ☐ 3	☐ 2 ☐ 3
	Type of upset				
	Connection				
	Minimum internal upset - m_{iu}				
Tool Joints	Box TJ OD - inches				
	Box TJ ID - inches				
	Box tong length - inches				
	Box taper - degrees	☐ 18° ☐ 90°	☐ 18° ☐ 90°	☐ 18° ☐ 90°	☐ 18° ☐ 90°
	Box hardbanding type				
	Box hardbanding length - inches				
	Box hardbanding application				
	Box taper hardbanding	☐ with ☐ without	☐ with ☐ without	☐ with ☐ without	☐ with ☐ without
	Make & Break	☐ with ☐ without	☐ with ☐ without	☐ with ☐ without	☐ with ☐ without
	Pin TJ OD - inches				
	Pin TJ ID - inches				
	Pin tong length - inches				
	Pin taper - degrees	☐ 35° ☐ 90°	☐ 35° ☐ 90°	☐ 35° ☐ 90°	☐ 35° ☐ 90°
	Pin hardbanding type				
	Pin hardbanding application				
	Pin hardbanding length - inches				
	Pin taper hardbanding	☐ with ☐ without	☐ with ☐ without	☐ with ☐ without	☐ with ☐ without
	Pin marking				
	Cold rolling threads	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	Thread protector type (pressed steel, plastic)				
General	Internal coating				
	Tolerance on quantity				
	Applicable specification (API, DS1, NS1 etc.)				
	Packing				
	Comments				

HEAVY WEIGHT

HWDP

Heavy Weight Drill Pipe (HWDP)

VAM Drilling's heavy weight drill pipe (HWDP) provides a gradual transition from heavy rigid drill collars to the more flexible drill pipe. This gradual change significantly reduces the stress concentration which would otherwise occur.

Because HWDP bends more easily, it simplifies directional control and reduces fatigue problems associated with non-conventional and high-angle drilling. HWDP is most commonly used in directional drilling where it also helps to control torque and prevent differential sticking.

The three-point contact profile reduces drag, and the center upset prevents excessive buckling. Heavy weight drill pipe placed between the drill collars and the drill pipe reduces operational risks related to fatigue in this stress-prone area.

VAM Drilling heavy weight drill pipe simplifies directional control and minimizes fatigue problems common to high-angle or horizontal drilling.

Heavy Weight Drill Pipe (HWDP) — Gradual transition

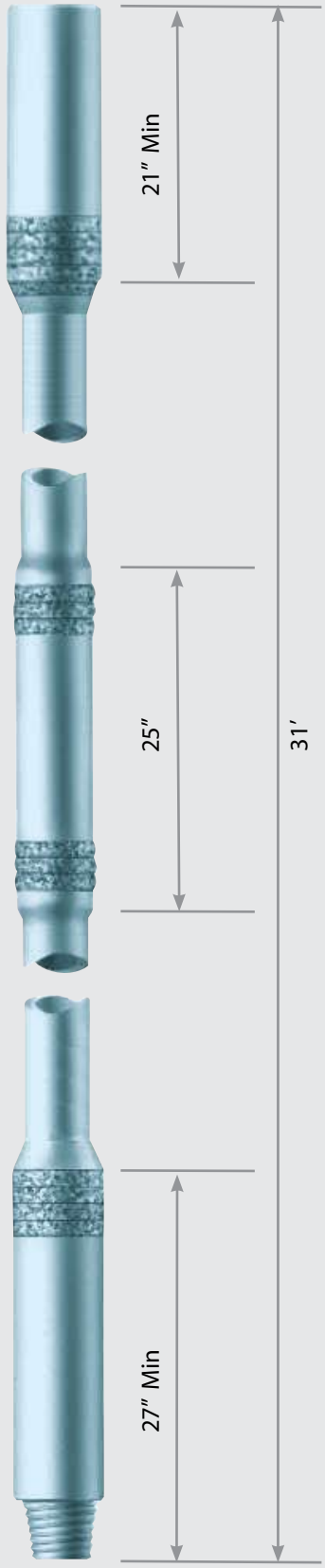
The VAM Drilling heavy weight drill pipe (HWDP) assembly consists of two tool joints and a thick-walled tube with a raised central section. VAM Drilling heavy weight drill pipe incorporates the following features:

General Properties

- Pipe body OD from 2-7/8” to 6-5/8”;
- Welded construction as standard; integral on request;
- Central upset has two bands totalling 3” each of proud hardbanding to protect casing and prevent wear;
- Standard service steel grades (AISI 1340 pipe body, AISI 4145H-modified tool joints);
- Sour service or non-magnetic steel grades (proprietary ERS 425™ and Amagnit™ 501); and
- Internal coating optional.

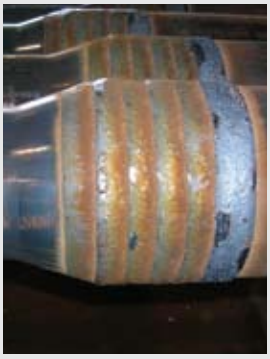
Tool Joint Properties

- Extra-length tool joints permit a maximum re-cut capability;
- API or high performance VAM® connections (VAM EIS®, VAM Express™);
- Enhanced fatigue resistance (threads cold-rolled, pin relief groove and box bore-back);
- 4” of proud casing-friendly hardbanding on pin OD and box OD, plus 1” flush on the box taper; and
- Phos-coating to prevent galling.



Heavy weight drill pipe with upset center and hardbanding

Hardbanding on HWDP protects the tool joint and minimizes casing wear.



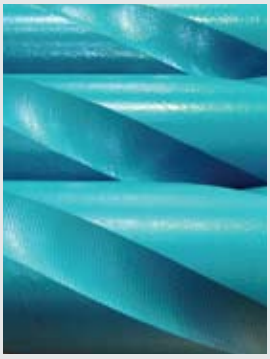
Heavy weight spiral (HWSP) drill pipe from VAM Drilling is designed for tough drilling environments in vertical and directional wells.

For vertical wells, VAM Drilling's HWSP is a transition member; for directional holes it is a weight member and provides additional stiffness to prevent buckling. The HWSP design employs many of the same features as VAM Drilling's heavy weight drill pipe. All sizes are manufactured by friction welding tool joints on each end of a specially machined heavy wall pipe.

The pipe body has an enlarged center section with three spiral groves and incorporates all the features of the conventional HWDP with the following additional advantages:

- Increased weight and stiffness;
- Reduced buckling and differential sticking;
- Improved torque and drag control; and
- Better hole cleaning.

Spiraling helps reduce differential sticking and improves hole cleaning.



Materials

Conventional heavy weight drill pipe (HWDP) from VAM Drilling is supplied with AISI 1340 steel or equivalent in the pipe body and AISI 4145H modified tool joints. VAM Drilling HWDP is normally provided with welded tool joints but an integral version can be supplied on request.

For sour service applications, VAM Drilling's ERS 425™ proprietary grade has been developed to provide bottomhole assembly (BHA) products with improved impact strength, fracture toughness and resistance to sulfide stress cracking. The mechanical properties of ERS 425 meet or exceed the requirements of API Specification 7. In NACE test TM 0177, the resistance of ERS 425 to sulfide stress cracking significantly surpasses the resistance of AISI 4145H-modified steel. VAM Drilling's ERS 425 HWDP continues to provide superior performance in sour service applications around the world.

In addition, VAM Drilling supplies special non-magnetic HWDP (Amagnit™ 501) for extreme service or directional drilling applications.

Heavy Weight Drill Pipe Materials

Specification	Construction	Heavy Weight Drill Pipe Material	Yield Strength Min/Max (ksi)	Ultimate Strength Min/Max (ksi)	Elongation (%)	Reduction of area (%)	Hardness Min/Max (Brinell HB)	Min Avg Charpy (ft-lbs @+75°F)
Standard	Welded	Tool Joint: AISI 4145H Bar	120/-	140/-	13	45	285/340	41
		Pipe Body: AISI 1340 Mod Tube	65/-	95/-	18	-	277/-	24
	Integral	AISI 4145H Bar	120/-	140/-	13	45	285/340	41
Sour Service	Welded	Tool Joint: ERS 425™	110/120	132/140	13	45	285/340	48
		Pipe Body: AISI 4130 SS Tube	80/95	95/-	18	-	-/240	24
Non-magnetic	Integral	Amagnit™ 501	112/116	130/135	25	50	275/-	73

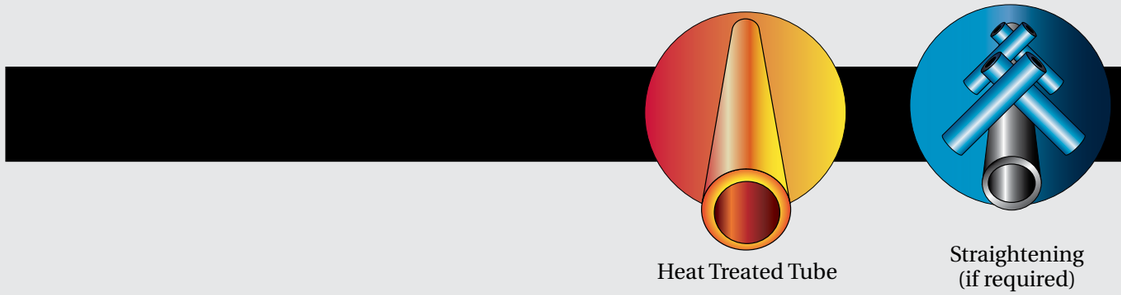
VAM Drilling provides HWDP in standard, sour service or non-magnetic grades.

Heavy Weight Drill Pipe Manufacturing Flow Chart

Vallourec Group

Heavy weight drill pipe is manufactured to customer requirements and where applicable to specifications such as API, NS1, DS1, IRP, etc; and inspected 100% after completion.

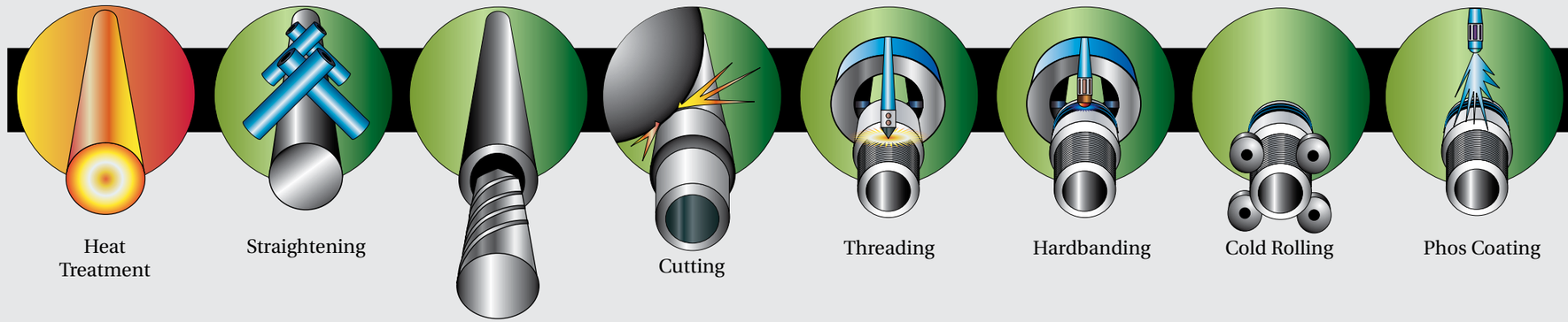
CENTRAL BODY



Heat Treated Tube

Straightening (if required)

TOOL JOINT



Heat Treatment

Straightening

Boring

Cutting

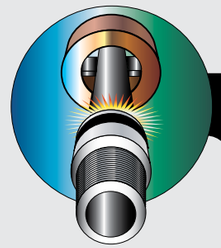
Threading

Hardbanding

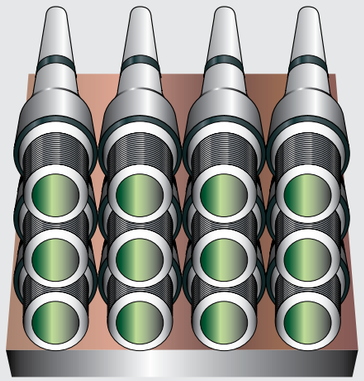
Cold Rolling

Phos Coating

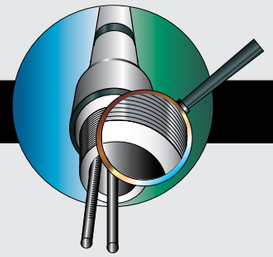
ASSEMBLY



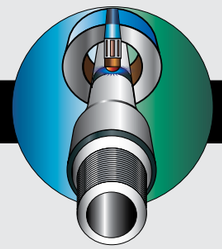
Friction Welding



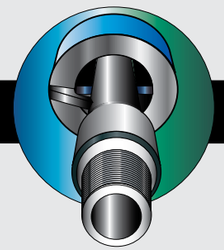
Shipping



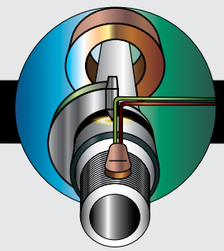
Final Inspection



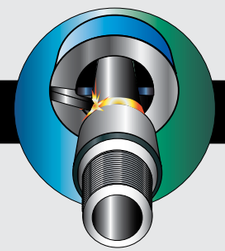
Central Body Hardbanding



Machining



Ultrasonic Inspection
Magnetic Particle Inspection
Hardness Check



Flash Removal

Heat Treatment of Weld

Heavy Weight Drill Pipe Data - 2-7/8" - 3-1/2"

		PIPE BODY					TOOL JOINT									ASSEMBLY						
																STANDARD			SPIRAL			
Nominal Size (in)	Construction	ID (in)	Upset Dia (in)	Material Yield Strength (ksi)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Connection	OD (in)	ID (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Box Length (in)	Pin Length (in)	Central Upset Min Length (in)	Total Weight (approximate lbs)	Weight/Foot (lbs)	Unspiraled Upset Length (in)	Total Weight (approximate lbs)	Weight/Foot (lbs)	Nominal Size (in)
2-7/8	Integral	1-1/2	3-3/8	110	22,900	520,000	2-7/8 PAC	3-1/8	1-1/2	110	3,130	5,220	250,000	21	27	24	534	17.34	25	636	20.63	2-7/8
2-7/8	Integral	1-1/2	3-3/8	110	22,900	520,000	2-7/8 PAC VAM EIS	3-1/8	1-1/2	110	5,960	8,060	250,000	21	27	24	534	17.36	25	635	20.66	2-7/8
2-7/8	Integral	1-1/2	3-3/8	110	22,900	520,000	VAM Express VX24	3-1/8	1-1/2	110	5,900	8,150	262,000	21	27	24	533	17.44	25	635	20.75	2-7/8
2-7/8	Integral	1-1/2	3-3/8	110	22,900	520,000	NC26	3-5/8	1-1/2	110	4,930	8,220	358,000	21	27	24	569	18.51	25	671	21.81	2-7/8
2-7/8	Integral	1-1/2	3-3/8	110	22,900	520,000	NC26 VAM EIS	3-5/8	1-1/2	110	8,400	11,700	358,000	21	27	24	569	18.52	25	670	21.82	2-7/8
2-7/8	Integral	1-1/2	3-3/8	110	22,900	520,000	VAM Express VX26	3-1/2	1-1/2	110	9,330	12,800	361,000	21	27	24	558	18.25	25	659	21.57	2-7/8
2-7/8	Integral	1-1/2	3-3/8	110	22,900	520,000	VAM Express VX26	3-5/8	1-1/2	110	9,330	12,800	361,000	21	27	24	567	18.55	25	668	21.86	2-7/8
2-7/8	Integral	2	3-3/8	110	18,900	369,000	VAM Express VX28	3-1/2	2	110	6,960	9,350	318,000	21	27	24	413	13.52	25	514	16.83	2-7/8
2-7/8	Integral	2	3-3/8	110	18,900	369,000	VAM Express VX28	3-5/8	2	110	8,170	11,400	318,000	21	27	24	422	13.81	25	523	17.12	2-7/8
2-7/8	Integral	2-1/16	3-3/8	110	18,100	346,000	NC31	4-1/8	2-1/16	110	6,860	11,400	432,000	21	27	24	443	14.42	25	544	17.72	2-7/8
2-7/8	Integral	2-1/16	3-3/8	110	18,100	346,000	NC31 VAM EIS	4-1/8	2-1/16	110	10,900	15,500	432,000	21	27	24	442	14.40	25	543	17.71	2-7/8
2-7/8	Integral	2-1/16	3-3/8	110	18,100	346,000	VAM Express VX31	4	2-1/16	110	12,400	16,900	437,000	21	27	24	429	14.04	25	530	17.36	2-7/8
2-7/8	Integral	2-1/8	3-3/8	110	17,300	324,000	2-7/8 OH	3-7/8	2-1/8	110	4,950	8,260	328,000	21	27	24	401	13.05	25	503	16.35	2-7/8
2-7/8	Integral	2-1/8	3-3/8	110	17,300	324,000	2-7/8 SL H-90	4	2-1/8	110	6,380	10,600	362,000	21	27	24	412	13.39	25	513	16.68	2-7/8
2-7/8	Integral	2-1/8	3-3/8	110	17,300	324,000	2-7/8 SL H-90	4-1/8	2-1/8	110	6,380	10,600	362,000	21	27	24	422	13.73	25	524	17.03	2-7/8
2-7/8	Integral	2-1/8	3-3/8	110	17,300	324,000	NC31	4-1/8	2-1/8	110	6,480	10,800	410,000	21	27	24	421	13.72	25	523	17.02	2-7/8
2-7/8	Integral	2-1/8	3-3/8	110	17,300	324,000	VAM Express VX31	4-1/8	2-1/8	110	12,000	16,500	414,000	21	27	24	417	13.67	25	519	16.99	2-7/8
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC31	4-1/8	2-1/16	120	7,490	12,500	472,000	21	27	24	735	23.95	25	863	28.12	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC31 VAM EIS	4-1/8	2-1/16	120	11,900	17,000	472,000	21	27	24	735	23.97	25	863	28.14	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-11/16	120	10,800	18,100	587,000	21	27	24	763	24.87	25	891	29.04	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-1/16	120	11,500	19,200	867,000	21	27	24	792	25.81	25	920	29.99	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-1/8	120	11,500	19,200	842,000	21	27	24	789	25.73	25	917	29.91	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-3/16	120	11,500	19,200	817,000	21	27	24	786	25.65	25	914	29.82	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-1/4	120	11,500	19,200	791,000	21	27	24	784	25.56	25	912	29.73	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-5/16	120	11,500	19,200	764,000	21	27	24	781	25.47	25	909	29.64	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-3/8	120	11,500	19,200	736,000	21	27	24	778	25.37	25	906	29.55	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-7/16	120	11,500	19,200	708,000	21	27	24	775	25.28	25	903	29.45	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	4-3/4	2-9/16	120	11,500	19,200	649,000	21	27	24	769	25.08	25	897	29.25	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	5	2-7/16	120	13,200	22,000	708,000	21	27	24	800	26.09	25	928	30.26	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	VAM Express VX38	4-5/8	2-3/4	120	17,500	24,300	546,000	21	27	24	745	24.42	25	873	28.61	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	VAM Express VX38	4-3/4	2-3/4	120	17,600	24,500	546,000	21	27	24	756	24.79	25	884	28.99	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	5	2-1/4	120	14,900	24,800	791,000	21	27	24	809	26.37	25	937	30.54	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38 VAM EIS	4-3/4	2-9/16	120	18,500	26,100	649,000	21	27	24	768	25.08	25	896	29.26	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	5	2-1/8	120	15,900	26,500	842,000	21	27	24	814	26.55	25	942	30.72	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38	5	2-1/16	120	16,100	26,800	867,000	21	27	24	817	26.63	25	945	30.80	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38 VAM EIS	4-3/4	2-1/4	120	22,000	29,600	791,000	21	27	24	782	25.56	25	910	29.74	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	VAM Express VX39	4-7/8	2-13/16	120	22,900	30,900	658,000	21	27	24	765	25.07	25	893	29.26	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	NC38 VAM EIS	4-3/4	2-1/16	120	23,800	31,400	867,000	21	27	24	790	25.81	25	918	29.99	3-1/2
3-1/2	Welded	2-1/16	4	55	19,600	345,000	VAM Express VX39	4-7/8	2-11/16	120	24,700	32,700	723,000	21	27	24	772	25.28	25	900	29.47	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC31	4-1/8	2-1/16	120	7,490	12,500	472,000	21	27	24	677	22.03	25	805	26.20	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC31 VAM EIS	4-1/8	2-1/16	120	11,900	17,000	472,000	21	27	24	676	22.05	25	804	26.22	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	4-3/4	2-11/16	120	10,800	18,100	587,000	21	27	24	704	22.95	25	832	27.12	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	4-3/4	2-1/16	120	11,500	19,200	867,000	21	27	24	733	23.90	25	861	28.07	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	4-3/4	2-1/8	120	11,500	19,200	842,000	21	27	24	730	23.81	25	858	27.99	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	4-3/4	2-3/16	120	11,500	19,200	817,000	21	27	24	728	23.73	25	856	27.90	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	4-3/4	2-1/4	120	11,500	19,200	791,000	21	27	24	725	23.64	25	853	27.81	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	4-3/4	2-5/16	120	11,500	19,200	764,000	21	27	24	722	23.55	25	850	27.72	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	4-3/4	2-3/8	120	11,500	19,200	736,000	21	27	24	719	23.45	25	847	27.63	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	4-3/4	2-7/16	120	11,500	19,200	708,000	21	27	24	716	23.36	25	844	27.53	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	4-3/4	2-9/16	120	11,500	19,200	649,000	21	27	24	710	23.16	25	838	27.33	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	5	2-7/16	120	13,200	22,000	708,000	21	27	24	741	24.17	25	869	28.34	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	VAM Express VX38	4-3/4	2-3/4	120	17,600	24,500	546,000	21	27	24	697	22.85	25	825	27.05	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	5	2-1/4	120	14,900	24,800	791,000	21	27	24	750	24.45	25	878	28.62	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38 VAM EIS	4-3/4	2-9/16	120	18,500	26,100	649,000	21	27	24	709	23.16	25	837	27.34	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	5	2-1/8	120	15,900	26,500	842,000	21	27	24	755	24.63	25	883	28.80	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38	5	2-1/16	120	16,100	26,800	867,000	21	27	24	758	24.71	25	886	28.88	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38 VAM EIS	4-3/4	2-1/4	120	22,000	29,600	791,000	21	27	24	723	23.63	25	851	27.81	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	VAM Express VX39	4-7/8	2-13/16	120	22,900	30,900	658,000	21	27	24	706	23.13	25	834	27.32	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	NC38 VAM EIS	4-3/4	2-1/16	120	23,800	31,400	867,000	21	27	24	731	23.89	25	859	28.07	3-1/2
3-1/2	Welded	2-1/4	4	55	18,500	310,000	VAM Express VX39	4-7/8	2-11/16	120	24,700	32,700	723,000	21	27	24	712	23.34	25	840	27.53	3-1/2

VAM DRILLING Vallourec Group

HEAVY WEIGHT DATA - 4" - 4-1/2"

Nominal Size (in)	Construction	PIPE BODY					TOOL JOINT					TOOL JOINT (continued)				ASSEMBLY						Nominal Size (in)
																STANDARD			SPIRAL			
		ID (in)	Upset Dia (in)	Material Yield Strength (ksi)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Connection	OD (in)	ID (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Box Length (in)	Pin Length (in)	Central Upset Min Length (in)	Total Weight (approximate lbs)	Weight/Foot (lbs)	Unspiraled Upset Length (in)	Total Weight (approximate lbs)	Weight/Foot (lbs)	
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC38	4-3/4	2-9/16	120	11,500	19,200	649,000	21	27	24	899	29.31	25	1,048	34.18	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC38	4-7/8	2-9/16	120	12,100	20,100	649,000	21	27	24	911	29.71	25	1,061	34.59	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC38	5	2-9/16	120	12,100	20,100	649,000	21	27	24	924	30.12	25	1,073	35.00	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC38	4-7/8	2-7/16	120	13,200	22,000	708,000	21	27	24	917	29.91	25	1,067	34.79	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC38	5	2-7/16	120	13,200	22,000	708,000	21	27	24	930	30.32	25	1,079	35.20	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC38	5	2-1/4	120	14,900	24,800	791,000	21	27	24	938	30.60	25	1,088	35.48	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC38 VAM EIS	5	2-9/16	120	19,100	27,300	649,000	21	27	24	923	30.13	25	1,072	35.02	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC40	5-1/2	2-7/16	120	17,900	29,800	897,000	21	27	24	982	32.06	25	1,132	36.95	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC38 VAM EIS	5	2-7/16	120	21,800	30,600	708,000	21	27	24	929	30.33	25	1,078	35.22	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	VAM Express VX39	4-7/8	2-13/16	120	22,900	30,900	658,000	21	27	24	896	29.34	25	1,045	34.24	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	VAM Express VX38	4-3/4	2-7/16	120	23,700	31,900	698,000	21	27	24	902	29.57	25	1,051	34.47	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC46	6	3-1/4	120	19,900	33,200	901,000	21	27	24	995	32.51	25	1,145	37.39	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC40 VAM EIS	5-1/4	2-11/16	120	24,000	34,200	776,000	21	27	24	941	30.77	25	1,090	35.67	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC46	6	3	120	23,400	39,000	1,050,000	21	27	24	1,011	33.00	25	1,160	37.88	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	VAM Express VX40	5-1/4	3	120	28,600	39,100	755,000	21	27	24	922	30.24	25	1,071	35.15	4
4	Welded	2-1/2	4-1/2	55	28,200	421,000	NC46 VAM EIS	6	3	120	39,500	55,200	1,050,000	21	27	24	1,008	32.98	25	1,158	37.87	4
4	Welded	2-9/16	4-1/2	55	27,600	407,000	NC38	4-3/4	2-9/16	120	11,500	19,200	649,000	21	27	24	875	28.55	25	1,025	33.43	4
4	Welded	2-9/16	4-1/2	55	27,600	407,000	NC38	4-7/8	2-9/16	120	12,100	20,100	649,000	21	27	24	888	28.95	25	1,037	33.83	4
4	Welded	2-9/16	4-1/2	55	27,600	407,000	NC38	5	2-9/16	120	12,100	20,100	649,000	21	27	24	900	29.36	25	1,050	34.24	4
4	Welded	2-9/16	4-1/2	55	27,600	407,000	NC38 VAM EIS	5	2-9/16	120	19,100	27,300	649,000	21	27	24	899	29.37	25	1,049	34.26	4
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC40	5-1/2	2-13/16	120	14,000	23,300	711,000	21	27	24	1,275	41.63	25	1,446	47.23	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC46	6-1/4	3-1/4	120	19,900	33,200	901,000	21	27	24	1,339	43.71	25	1,510	49.30	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC40 VAM EIS	5-1/4	2-11/16	120	24,000	34,200	776,000	21	27	24	1,253	41.00	25	1,425	46.60	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC50	6-5/8	3-3/4	120	22,400	37,300	939,000	21	27	24	1,354	44.20	25	1,525	49.79	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC46	6-1/4	3	120	23,400	39,000	1,050,000	21	27	24	1,354	44.20	25	1,525	49.79	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	VAM Express VX40	5-1/4	3	120	28,600	39,100	755,000	21	27	24	1,235	40.53	25	1,407	46.15	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC46	6-1/4	2-7/8	120	25,000	41,700	1,120,000	21	27	24	1,361	44.43	25	1,532	50.03	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC46	6-1/4	2-13/16	120	25,800	43,000	1,150,000	21	27	24	1,364	44.54	25	1,535	50.14	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC46	6-1/4	2-3/4	120	26,600	44,400	1,180,000	21	27	24	1,368	44.65	25	1,539	50.25	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC50	6-5/8	3-1/2	120	26,700	44,500	1,110,000	21	27	24	1,371	44.77	25	1,542	50.36	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	VAM Express VX46	6	3-3/4	120	35,100	46,800	852,000	21	27	24	1,270	41.71	25	1,441	47.34	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC46	6-1/4	2-1/2	120	29,600	49,300	1,310,000	21	27	24	1,380	45.07	25	1,552	50.66	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC46	6-1/4	2-1/4	120	32,300	53,800	1,420,000	21	27	24	1,392	45.44	25	1,563	51.04	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	VAM Express VX46	6	3-1/2	120	42,900	55,600	1,020,000	21	27	24	1,286	42.26	25	1,458	47.89	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC46 VAM EIS	6-1/4	3	120	39,700	55,600	1,050,000	21	27	24	1,351	44.20	25	1,523	49.81	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC50	6-5/8	3	120	34,500	57,500	1,420,000	21	27	24	1,403	45.80	25	1,574	51.39	4-1/2
4-1/2	Welded	2-1/2	5	55	42,800	605,000	NC50 VAM EIS	6-5/8	3-1/2	120	44,900	62,900	1,110,000	21	27	24	1,369	44.76	25	1,540	50.37	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC40	5-1/2	2-13/16	120	14,000	23,300	711,000	21	27	24	1,153	37.66	25	1,325	43.26	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC40 VAM EIS	5-1/4	2-11/16	120	24,000	34,200	776,000	21	27	24	1,132	37.02	25	1,303	42.62	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC50	6-5/8	3-3/4	120	22,400	37,300	939,000	21	27	24	1,232	40.23	25	1,403	45.82	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC46	6-1/4	3	120	23,400	39,000	1,050,000	21	27	24	1,232	40.23	25	1,403	45.83	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	VAM Express VX40	5-1/4	3	120	28,600	39,100	755,000	21	27	24	1,113	36.52	25	1,285	42.15	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC46	6-1/4	2-13/16	120	25,800	43,000	1,150,000	21	27	24	1,243	40.57	25	1,414	46.17	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC46	6-1/4	2-3/4	120	26,600	44,400	1,180,000	21	27	24	1,246	40.69	25	1,417	46.28	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC50	6-5/8	3-1/2	120	26,700	44,500	1,110,000	21	27	24	1,249	40.80	25	1,421	46.39	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	VAM Express VX46	6	3-3/4	120	35,100	46,800	852,000	21	27	24	1,147	37.69	25	1,319	43.32	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	VAM Express VX46	6	3-1/2	120	42,900	55,600	1,020,000	21	27	24	1,164	38.24	25	1,335	43.87	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC46 VAM EIS	6-1/4	3	120	39,700	55,600	1,050,000	21	27	24	1,230	40.22	25	1,401	45.82	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC50	6-5/8	3	120	34,500	57,500	1,420,000	21	27	24	1,281	41.83	25	1,452	47.42	4-1/2
4-1/2	Welded	2-13/16	5	55	40,100	533,000	NC50 VAM EIS	6-5/8	3-1/2	120	44,900	62,900	1,110,000	21	27	24	1,247	40.78	25	1,418	46.39	4-1/2

VAM DRILLING Vallourec Group

Heavy Weight Data - 5” - 5-1/2”

Nominal Size (in)	Construction	PIPE BODY					TOOL JOINT									ASSEMBLY						Nominal Size (in)
																STANDARD			SPIRAL			
		ID (in)	Upset Dia (in)	Material Yield Strength (ksi)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Connection	OD (in)	ID (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Box Length (in)	Pin Length (in)	Central Upset Min Length (in)	Total Weight (approximate lbs)	Weight/Foot (lbs)	Unspiraled Upset Length (in)	Total Weight (approximate lbs)	Weight/Foot (lbs)	
5	Welded	3	5-1/2	55	56,500	691,000	NC50	6-5/8	3	120	34,500	57,500	1,420,000	21	27	24	1,550	50.61	25	1,743	56.92	5
5	Welded	3	5-1/2	55	56,500	691,000	NC50 VAM EIS	6-3/8	3-1/2	120	44,600	62,500	1,110,000	21	27	24	1,484	48.53	25	1,677	54.86	5
5	Welded	3	5-1/2	55	56,500	691,000	NC50 VAM EIS	6-5/8	3-1/2	120	44,900	62,900	1,110,000	21	27	24	1,516	49.59	25	1,710	55.92	5
5	Welded	3	5-1/2	55	56,500	691,000	5-1/2 FH	7	3-3/4	120	37,700	62,900	1,450,000	21	27	24	1,550	50.70	25	1,744	57.02	5
5	Welded	3	5-1/2	55	56,500	691,000	VAM Express VX50	6-1/2	4	120	47,700	63,100	1,040,000	21	27	24	1,460	47.99	25	1,653	54.35	5
5	Welded	3	5-1/2	55	56,500	691,000	NC50	6-5/8	2-3/4	120	38,000	63,400	1,550,000	21	27	24	1,564	51.06	25	1,757	57.37	5
5	Welded	3	5-1/2	55	56,500	691,000	5-1/2 FH	7-1/4	3-1/2	120	43,300	72,200	1,620,000	21	27	24	1,603	52.43	25	1,797	58.75	5
5	Welded	3	5-1/2	55	56,500	691,000	VAM Express VX50	6-1/2	3-3/4	120	56,400	72,800	1,230,000	21	27	24	1,477	48.57	25	1,671	54.93	5
5	Welded	3	5-1/2	55	56,500	691,000	NC50 VAM EIS	6-5/8	3-1/4	120	54,000	74,700	1,270,000	21	27	24	1,532	50.12	25	1,726	56.44	5
5	Welded	3	5-1/2	55	56,500	691,000	VAM Express VX50	6-5/8	3-1/2	120	66,700	85,300	1,400,000	21	27	24	1,510	49.63	25	1,703	55.99	5
5	Welded	3	5-1/2	55	56,500	691,000	5-1/2 FH VAM EIS	7	3-3/4	120	64,500	89,700	1,450,000	21	27	24	1,548	50.70	25	1,741	57.03	5
5	Welded	3	5-1/2	55	56,500	691,000	5-1/2 FH VAM EIS	7-1/4	3-3/4	120	65,600	91,500	1,450,000	21	27	24	1,583	51.85	25	1,776	58.18	5
5	Welded	3	5-1/2	55	56,500	691,000	5-1/2 FH VAM EIS	7	3-1/2	120	70,500	95,700	1,620,000	21	27	24	1,565	51.26	25	1,758	57.59	5
5-1/2	Welded	3-5/8	6	55	70,100	739,000	VAM Express VX57	7	4-1/2	120	52,600	69,800	1,090,000	21	27	24	1,568	51.56	25	1,784	58.64	5-1/2
5-1/2	Welded	3-5/8	6	55	70,100	739,000	5-1/2 FH	7-1/4	3-1/2	120	43,300	72,200	1,620,000	21	27	24	1,686	55.12	25	1,901	62.16	5-1/2
5-1/2	Welded	3-5/8	6	55	70,100	739,000	5-1/2 FH VAM EIS	7	4	120	53,700	76,100	1,270,000	21	27	24	1,612	52.79	25	1,827	59.85	5-1/2
5-1/2	Welded	3-5/8	6	55	70,100	739,000	VAM Express VX54	6-3/4	4	120	63,500	82,100	1,240,000	21	27	24	1,576	51.72	25	1,791	58.79	5-1/2
5-1/2	Welded	3-5/8	6	55	70,100	739,000	5-1/2 FH	7-1/2	3	120	52,100	86,800	1,930,000	21	27	24	1,754	57.34	25	1,969	64.39	5-1/2
5-1/2	Welded	3-5/8	6	55	70,100	739,000	VAM Express VX57	7	4-1/4	120	66,600	86,900	1,290,000	21	27	24	1,588	52.22	25	1,804	59.30	5-1/2
5-1/2	Welded	3-5/8	6	55	70,100	739,000	5-1/2 FH VAM EIS	7	3-3/4	120	64,500	89,700	1,450,000	21	27	24	1,630	53.39	25	1,846	60.45	5-1/2
5-1/2	Welded	3-7/8	6	55	65,100	658,000	VAM Express VX57	7	4-1/2	120	52,600	69,800	1,090,000	21	27	24	1,430	47.02	25	1,646	54.10	5-1/2
5-1/2	Welded	3-7/8	6	55	65,100	658,000	5-1/2 FH	7-1/4	3-1/2	120	43,300	72,200	1,620,000	21	27	24	1,548	50.63	25	1,764	57.67	5-1/2
5-1/2	Welded	3-7/8	6	55	65,100	658,000	5-1/2 FH VAM EIS	7	4	120	53,700	76,100	1,270,000	21	27	24	1,474	48.29	25	1,690	55.35	5-1/2
5-1/2	Welded	3-7/8	6	55	65,100	658,000	VAM Express VX54	6-3/4	4	120	63,500	82,100	1,240,000	21	27	24	1,438	47.20	25	1,654	54.27	5-1/2
5-1/2	Welded	3-7/8	6	55	65,100	658,000	5-1/2 FH	7-1/2	3	120	52,100	86,800	1,930,000	21	27	24	1,616	52.85	25	1,832	59.90	5-1/2
5-1/2	Welded	3-7/8	6	55	65,100	658,000	VAM Express VX57	7	4-1/4	120	66,600	86,900	1,290,000	21	27	24	1,450	47.68	25	1,666	54.76	5-1/2
5-1/2	Welded	3-7/8	6	55	65,100	658,000	5-1/2 FH VAM EIS	7	3-3/4	120	64,500	89,700	1,450,000	21	27	24	1,493	48.89	25	1,708	55.95	5-1/2

VAM DRILLING Vallourec Group

Heavy Weight Data - 6-5/8”

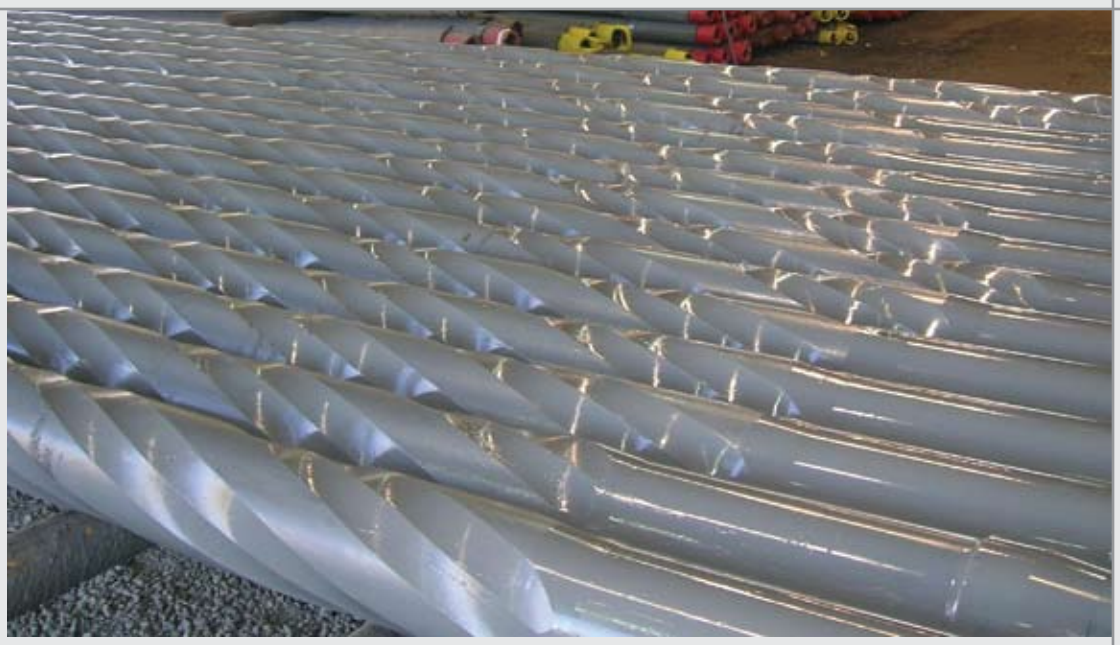
Nominal Size (in)	Construction	PIPE BODY					TOOL JOINT									ASSEMBLY						Nominal Size (in)
																STANDARD			SPIRAL			
		ID (in)	Upset Dia (in)	Material Yield Strength (ksi)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Connection	OD (in)	ID (in)	Material Yield Strength (ksi)	Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Tensile Strength (lbs)	Box Length (in)	Pin Length (in)	Central Upset Min Length (in)	Total Weight (approximate lbs)	Weight/Foot (lbs)	Unspiraled Upset Length (in)	Total Weight (approximate lbs)	Weight/Foot (lbs)	
6-5/8	Welded	4-1/2	7	55	119,000	1,020,000	6-5/8 FH VAM EIS	8-1/4	4-1/2	120	104,000	143,000	1,900,000	21	27	24	2,240	73.38	-	-	-	6-5/8
6-5/8	Welded	4-1/2	7	55	119,000	1,020,000	VAM Express VX65	8	4-1/2	120	121,000	146,000	2,150,000	21	27	24	2,192	72.15	-	-	-	6-5/8
6-5/8	Welded	5	7	55	102,000	816,000	6-5/8 FH	8-1/4	4-3/4	120	51,300	85,500	1,680,000	21	27	24	1,864	60.95	25	2,070	67.68	6-5/8
6-5/8	Welded	5	7	55	102,000	816,000	6-5/8 FH VAM EIS	8	5	120	70,100	99,600	1,450,000	21	27	24	1,797	58.87	25	2,003	65.61	6-5/8
6-5/8	Welded	5	7	55	102,000	816,000	6-5/8 FH	8-1/2	4-1/4	120	65,000	108,000	2,100,000	21	27	24	1,949	63.73	25	2,155	70.46	6-5/8
6-5/8	Welded	5	7	55	102,000	816,000	6-5/8 FH VAM EIS	8-1/4	4-3/4	120	87,500	122,000	1,680,000	21	27	24	1,860	60.93	25	2,066	67.68	6-5/8
6-5/8	Welded	5	7	55	102,000	816,000	VAM Express VX65	8	5	120	101,000	127,000	1,830,000	21	27	24	1,789	58.89	25	1,995	65.67	6-5/8
6-5/8	Welded	5	7	55	102,000	816,000	VAM Express VX65	8	4-1/2	120	121,000	146,000	2,150,000	21	27	24	1,832	60.30	25	2,038	67.08	6-5/8
6-5/8	Welded	5	7	55	102,000	816,000	VAM Express VX65	8-1/4	5	120	114,000	147,000	1,830,000	21	27	24	1,828	60.16	25	2,034	66.94	6-5/8
6-5/8	Welded	5	7	55	102,000	816,000	VAM Express VX65	8-1/2	5	120	114,000	147,000	1,830,000	21	27	24	1,868	61.47	25	2,074	68.24	6-5/8
6-5/8	Welded	5	7	55	102,000	816,000	VAM Express VX65	8-1/4	4-3/4	120	124,000	158,000	2,060,000	21	27	24	1,850	60.88	25	2,056	67.66	6-5/8

Heavy Weight Drill Pipe (HWDP) — Inquiry form

PRODUCT DESCRIPTION

	ITEM	1	2	3	4
Pipe	Quantity (joints)				
	Nominal OD - inches				
	Tube ID - inches				
	Overall length - feet				
	HWDP type	☐ slick ☐ spiral	☐ slick ☐ spiral	☐ slick ☐ spiral	☐ slick ☐ spiral
	Construction	☐ welded ☐ integral	☐ welded ☐ integral	☐ welded ☐ integral	☐ welded ☐ integral
	Central wear pad OD x length - inches				
	Type of hardbanding on center wear pad				
	Hardbanding application on center wear pad				
	Hardbanding center upset length - inches				
	Connection				
Tool Joints	Tool joint OD - inches				
	Tool joint ID - inches				
	Box tool joint length - inches				
	Pin tool joint length - inches				
	Type of hardbanding tool joint				
	Hardbanding application on tool joint				
	Hardbanding length - inches				
	Box taper hardbanding	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	Make & break	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	Relief groove pin	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	Bore back box	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	Thread protectors				
	Thread protector type (pressed steel, plastic)				
General	Internal coating				
	Applicable specification (API, DS1, NS1 etc.)				
	Packing				
	Comments				

DRILL COLLARS



Drill collars are thick-walled tubular pieces machined from solid steel bars, forming a component of the drillstring that provides weight-on-bit for improved drilling performance.

VAM Drilling has been making drill collars for more than 50 years and was the first company to make small diameter pierced drill collars from solid bar. Bars are trepanned on equipment specially designed by VAM Drilling.

Today, VAM Drilling provides a full range of slick and spiral drill collars in AISI 4145H-modified steel, ERS 425™ sour service steel and non-magnetic alloys.

Drill collars from VAM Drilling are available with the following features:

- ODs from 2-7/8" to 14";
- Mechanical properties guaranteed to 1" below surface at ambient temperature;
- Enhanced fatigue resistance (threads cold-rolled, pin-relief groove and box bore back);
- Phos-coated threads to prevent galling; and
- Hardbanding is available upon request.

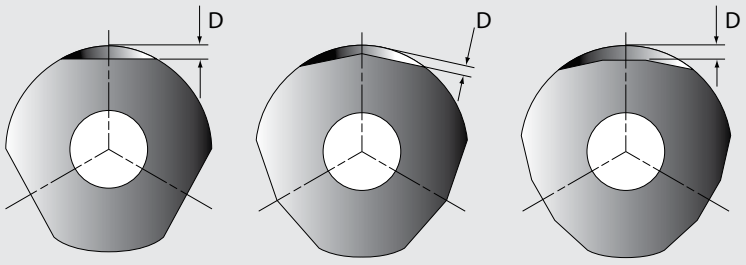
VAM Drilling has been making drill collars for more than 50 years.

Spiral Drill Collars

In order to reduce differential pressure sticking, the surface of drill collars can be spiral-grooved. VAM Drilling spiral drill collars are the perfect solution for deep, directional or deviated drilling.

Cross sections of the drill collars show the reduced contact area with the wall of the hole.

The grooving consists of three right-hand spirals, machined on VAM Drilling's unique triple-headed milling machines. Stress relief features improve bending strength of pin and box connections and, therefore, durability. Bore back on box and stress relief grooves on pin are defined by API.



6-3/4" and less | 7" to 8-1/2" | 8-3/4" and larger

Spiral drill collars reduce wall contact area and eliminate differential sticking.

Spiral Drill Collar Typical Size

OD (in)	4-3/4	6-1/4	6-3/4	7-1/4	7-1/2	8	9-1/2	10	11
Depth of Cut (in)	7/32 ± 1/32	9/32 ± 1/16	5/16 ± 1/16	11/32 ± 1/16	11/32 ± 1/16	3/8 ± 1/16	13/32 ± 3/32	7/16 ± 3/32	15/32 ± 3/32
Spiral Pitch (in)	38 ± 1	42 ± 1	46 ± 1	64 ± 1	64 ± 1	68 ± 1	72 ± 1	76 ± 1	80 ± 1

Note: Loss of weight is approximately 4% compared to slick drill collars.
Length of spiralled section allows reconditioning of connections.

VAM Drilling drill collars for standard use are made of AISI 4145 H chromium molybdenum alloy steel. The concentration of residual elements, such as sulphur and phosphorus, is reduced during the steel-making process, producing homogeneous steel with excellent physical properties.

VAM Drilling can supply drill collars for use on sour gas wells where resistance to hydrogen embrittlement, caused by the presence of H_2S, is expected. VAM Drilling's ERS 425™ sour service grade material has been developed to provide bottomhole assembly (BHA) products with improved impact strength (KCV), fracture toughness (K1c) and resistance to sulfide stress cracking (SSC) in wells with a sour service environment. The mechanical properties of ERS 425 meet or exceed the requirements of API Specification 7. In NACE tests TM 0177, the resistance of ERS 425 to SSC significantly surpasses the resistance of standard 4145H-modified steel. ERS 425 drill collars have provided superior performance in sour service applications around the world. In addition, VAM Drilling supplies special non-magnetic (Amagnit™ 501) drill collars for extreme service or directional drilling applications.

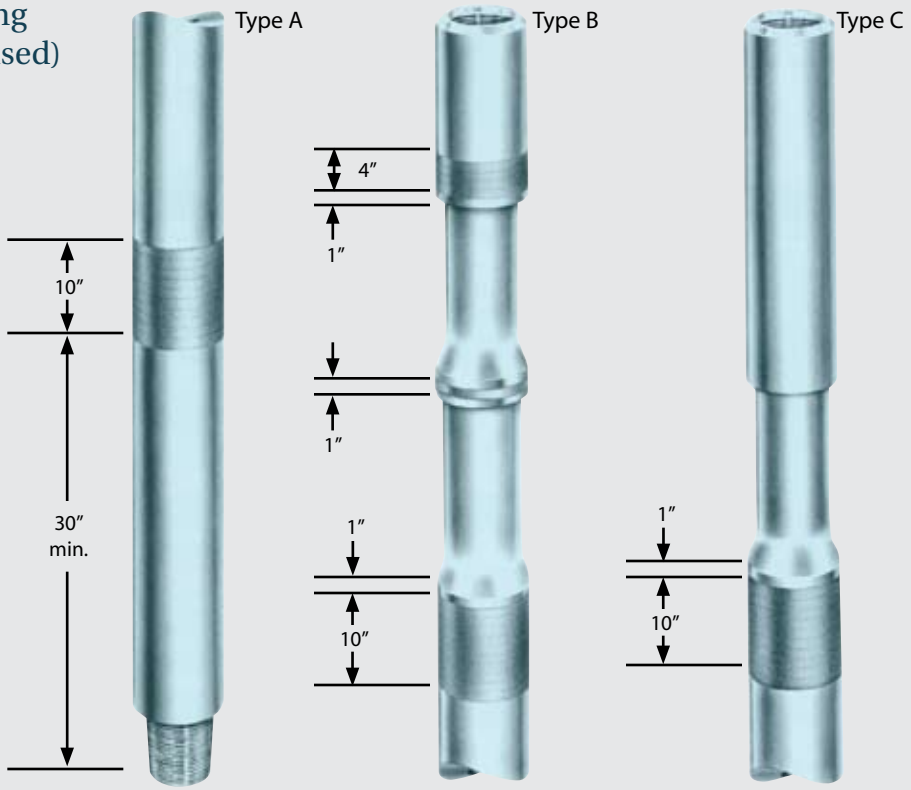
Hardbanding is recommended on drill collars with slip and elevator recesses and is applied in a 4" long wear pad above the elevator recess, a 1" long wear pad above the slip recess and a 10" long wear pad under the slip recess.

For drill collars with slip recess only, hardbanding is applied to a 10" long wear pad under the slip recess and a 4" long wear pad above the slip recess. For drill collars without any recess hardbanding is applied in a 10" long wear pad located 30" from the end of the pin.

Drill Collar Materials Table

Application	Drill Collar Material	Yield Strength Min	Ultimate Strength Min	Hardness (Brinell)	Min Elongation	Min Reduction	Min Charpy (@+75°F)
		(ksi)	(ksi)	(HB)	(A%)	(%)	(ft-lbs)
Standard	AISI 4145H Bar	110	140	285 to 340	13	45	41
Sour service	ERS 425™	110	140	285 to 340	13	45	48
Non-magnetic	Amagnit™ 501	112 to 116	130 to 135	275 min	25	50	73

Hardbanding (flush or raised)



VAM Drilling's ERS 425™ sour service material provides BHA products with improved impact strength, fracture toughness and resistance to sulfide stress cracking.

Slip & Elevator Recesses

VAM Drilling offers optional slip and elevator recesses to improve handling efficiency and safety. Slip and elevator recesses are machined in accordance with API standard RP7G.

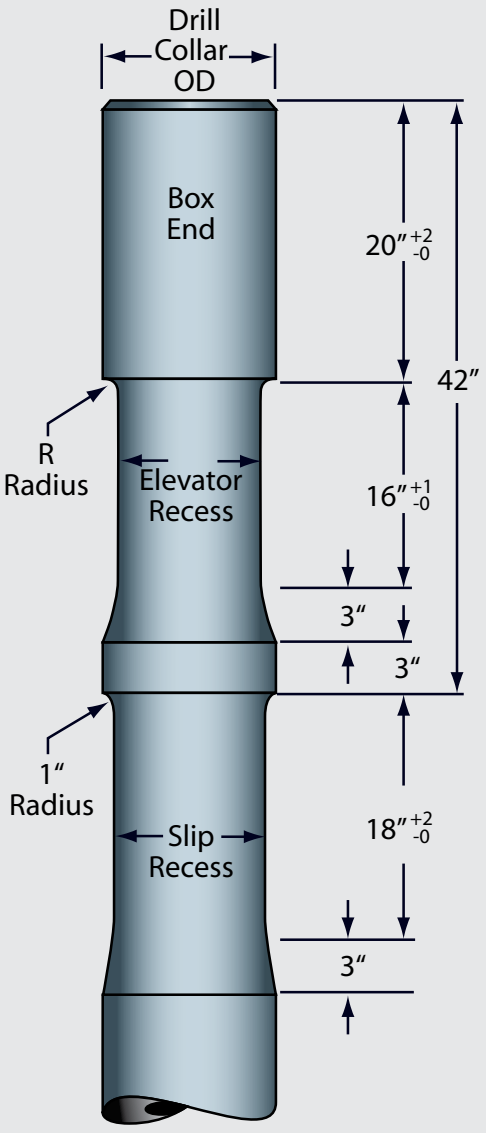
The upper radius of the elevator recess is cold-rolled to increase product life. Slip and elevator recesses can be used together or separately. Special drill pipe elevator designs can be supplied for automated handling operations to decrease non-productive time.

Recess Specifications

OD (in)	Elevator Recess			Slip Recess	
	OD (in)	Depth (in)	Radius (in)	OD (in)	Depth (in)
4-1/8	3-11/16	7/32	1/8	3-3/4	3/16
4-1/4	3-13/16	7/32	1/8	3-7/8	3/16
4-3/4	4-1/4	1/4	1/8	4-3/8	3/16
5-3/4	5-1/4	1/4	1/8	5-1/4	1/4
6	5-3/8	5/16	1/8	5-1/2	1/4
6-1/4	5-5/8	5/16	1/8	5-3/4	1/4
6-1/2	5-7/8	5/16	1/8	6	1/4
6-3/4	6	3/8	3/16	6-1/4	1/4
7	6-1/4	3/8	3/16	6-1/2	1/4
7-1/4	6-1/2	3/8	3/16	6-3/4	1/4
7-1/2	6-3/4	3/8	3/16	7	1/4
7-3/4	7	3/8	3/16	7-1/4	1/4
8	7-1/4	3/8	3/16	7-1/2	1/4
8-1/2	7-3/4	3/8	3/16	8	1/4
8-3/4	7-7/8	7/16	1/4	8-1/4	1/4
9	8-1/8	7/16	1/4	8-1/2	1/4
9-1/4	8-3/8	7/16	1/4	8-3/4	1/4
9-1/2	8-5/8	7/16	1/4	9	1/4
9-3/4	8-7/8	7/16	1/4	9-1/4	1/4
10	9-1/8	7/16	1/4	9-1/2	1/4
10-1/2	9-5/8	7/16	1/4	10	1/4
11	10-1/8	7/16	1/4	10-1/2	1/4

Slip and elevator recesses are machined according to API RP7G - Table 28.

Longer elevator and/or longer slip recess can be proposed based on automatic handling device dimension. Contact your agent or VAM Drilling sales office.



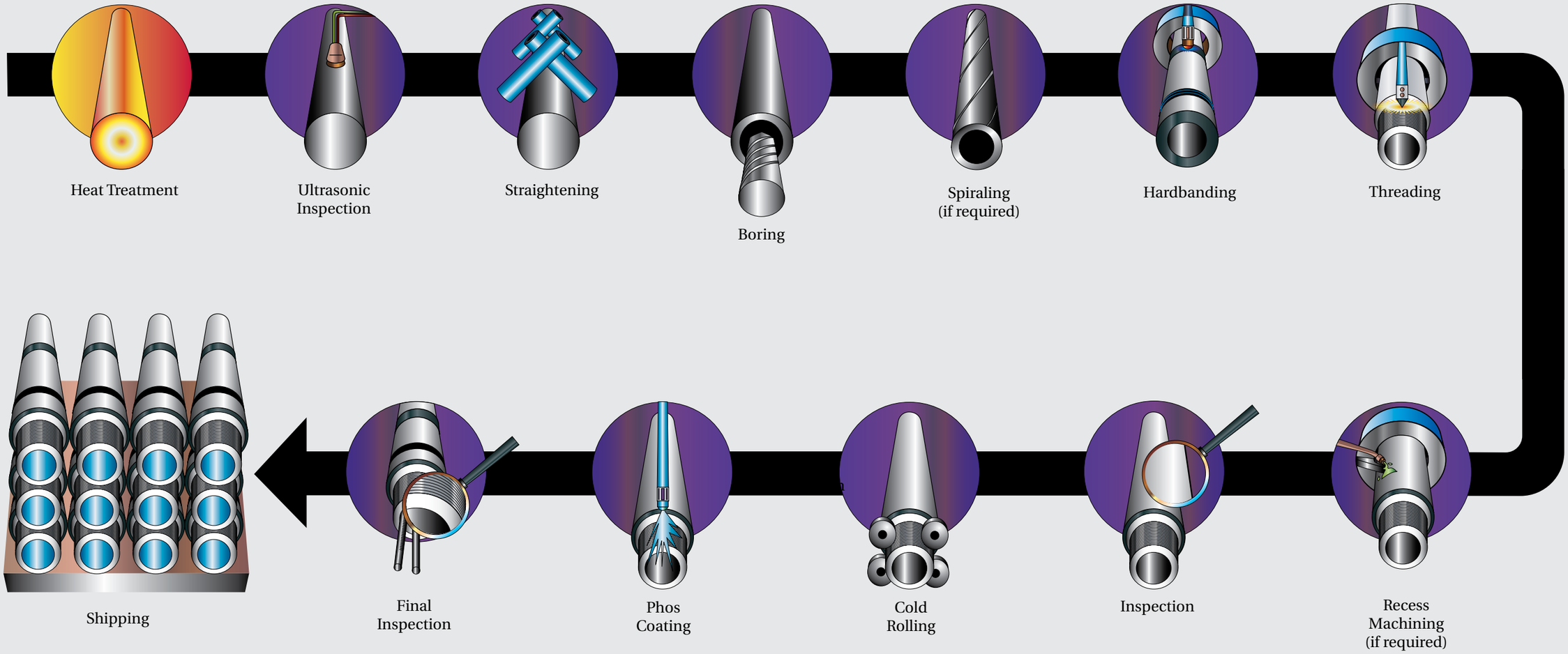
VAM Drilling slip and elevator recesses improve downhole handling efficiency and safety.

Drill Collar Manufacturing Flow Chart

Vallourec Group

DRILL COLLARS

Drill collars are manufactured to customer requirements and where applicable to specifications such as API, NS1, DS1, IRP, etc; and inspected 100% after completion.



Drill Collar Data - 2-7/8” - 6-1/2”

Nominal OD (in)	ID (in)	Connection	Bevel Diameter (in)	Weak	Recommended Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Bending Stress Ratio	Total Weight (lbs)	Weight/Foot (lbs/ft)
2-7/8	1	2-3/8 PAC	2-45/64	B	2,700	4,700	2	598	19
2-7/8	1-1/2	2-3/8 PAC	2-45/64	P	2,100	3,600	2.58	495	16
3-1/8	1	2-3/8 REG	3	B	3,000	5,300	2.57	720	23
3-1/8	1-1/8	2-3/8 REG	3	B	3,000	5,300	2.65	698	23
3-1/8	1-1/4	2-3/8 REG	3	B	3,000	5,300	2.75	674	22
3-1/8	1-1/4	NC23	3	B	3,300	5,900	2.57	674	22
3-3/8	1-1/4	NC26	3-17/64	B	3,600	6,300	1.92	807	26
3-3/8	1-1/2	NC26	3-17/64	B	3,600	6,300	2.07	750	24
3-1/2	1-1/2	NC26	3-17/64	B	4,600	8,100	2.42	821	27
3-1/2	1-3/4	NC26	3-17/64	P	3,700	6,500	2.76	754	25
3-3/4	1-1/4	2-7/8 REG	3-37/64	P	5,800	10,100	2.91	1,025	33
3-3/4	1-1/2	NC26	3-29/64	P	4,700	8,200	3.18	970	32
4-1/8	1-1/2	NC31	3-61/64	B	7,400	13,000	2.1	1,211	39
4-1/8	2	NC31	3-61/64	P	6,900	12,100	2.44	1,067	35
4-1/4	2	NC31	3-61/64	P	6,900	12,100	2.75	1,153	38
4-3/4	2	NC35	4-33/64	P	10,800	19,100	2.58	1,521	50
4-3/4	2-1/4	NC38	4-37/64	B	10,000	17,600	1.92	1,433	47
4-7/8	2-1/4	NC38	4-37/64	B	11,900	21,000	2.14	1,531	50
5	2-1/4	NC38	4-49/64	P	12,900	22,700	2.38	1,633	53
5-1/4	2-1/4	NC38	4-61/64	P	12,900	22,700	2.88	1,842	60
5-3/4	2-1/4	NC40	5-25/64	P	17,000	30,000	3.04	2,290	75
6	2-1/4	NC44	5-11/16	P	23,500	41,300	2.49	2,530	83
6	2-13/16	NC44	5-11/16	P	18,200	32,000	2.84	2,297	75
6	2-1/4	NC46	5-23/32	B	23,400	41,200	2.02	2,530	83
6-1/4	2-1/4	NC44	5-7/8	P	23,500	41,300	2.91	2,780	91
6-1/4	2-13/16	NC46	5-29/32	P	22,400	39,500	2.64	2,547	83
6-1/2	2-13/16	4-1/2 H-90	6	P	23,200	45,300	2.97	2,808	92
6-1/2	2-1/4	NC46	6-3/32	P	28,000	49,300	2.77	3,041	99
6-1/2	2-13/16	NC46	6-3/32	P	22,400	39,500	3.07	2,808	92
6-1/2	2-13/16	NC50	6-7/64	B	29,700	52,200	2.03	2,808	92

Drill Collar Data - 6-3/4” - 11-1/4”

Nominal OD (in)	ID (in)	Connection	Bevel Diameter (in)	Weak	Recommended Make-up Torque (ft-lbs)	Torsional Strength (ft-lbs)	Bending Stress Ratio	Total Weight (lbs)	Weight/Foot (lbs/ft)
6-3/4	2-1/4	NC46	6-9/32	P	28,000	49,300	3.18	3,312	108
6-3/4	2-1/4	NC50	6-19/64	B	36,700	64,700	2.21	3,312	108
6-3/4	2-13/16	NC50	6-19/64	P	32,300	56,800	2.37	3,079	101
6-3/4	3	NC50	6-19/64	P	30,000	52,700	2.46	2,990	98
7	2-1/4	NC50	6-31/64	P	38,400	61,400	2.54	3,593	117
7	2-13/16	NC50	6-31/64	P	32,300	51,600	2.73	3,360	110
7-1/4	2-13/16	5-1/2 H-90	6-5/8	P	36,500	64,900	2.74	3,649	119
7-1/4	2-13/16	NC50	6-43/64	P	32,300	51,600	3.12	3,651	119
7-3/4	2-13/16	6-5/8 REG	7-21/64	P	53,300	85,400	2.3	4,259	139
8	2-13/16	6-5/8 REG	7-33/64	P	53,300	85,400	2.6	4,580	150
8	3	6-5/8 REG	7-33/64	P	50,700	81,100	2.66	4,491	147
8	3-3/8	6-5/8 REG	7-33/64	P	44,900	71,900	2.81	4,296	140
8	2-13/16	NC56	7-31/64	P	48,200	77,200	3.02	4,580	150
8-1/4	2-13/16	6-5/8 REG	7-45/64	P	53,300	85,400	2.93	4,912	161
8-1/4	3	6-5/8 REG	7-45/64	P	50,700	81,100	2.99	4,823	158
8-1/4	2-13/16	NC61	7-13/16	B	65,400	104,700	2.32	4,905	161
9	2-13/16	NC61	8-3/8	P	68,400	109,400	3.17	5,960	195
9	2-13/16	7-5/8 REG	8-7/16	B	84,400	135,100	2.28	5,964	195
9	3	7-5/8 REG	8-7/16	B	84,400	135,100	2.31	5,875	192
9-1/2	2-1/2	7-5/8 REG	8-13/16	P	96,300	154,100	2.75	6,855	224
9-1/2	2-13/16	7-5/8 REG	8-13/16	P	91,600	146,600	2.78	6,719	220
9-1/2	3	7-5/8 REG	8 13/16	P	88,600	141,700	2.81	6,630	217
9-1/2	3-1/2	7-5/8 REG	8-13/16	P	79,500	127,300	2.93	6,365	208
9-1/2	4	7-5/8 REG	8-13/16	P	69,200	110,700	3.13	6,059	198
9-1/2	3	NC70	8-31/32	B	102,400	163,800	2.34	6,617	217
9-3/4	3	NC70	9-5/32	P	105,700	169,100	2.57	7,009	230
10	3	8-5/8 REG	9-33/64	B	109,300	175,000	1.98	7,423	243
10	3	NC70	9-11/32	P	105,700	169,100	2.81	7,411	243
11	3	8-5/8 REG LT	10-1/2	B	130,700	209,100	2.84	9,136	299
11	3	NC77	10-17/64	P	145,500	232,800	2.78	9,108	299
11-1/4	3-1/4	8-5/8 REG LT	10-1/2	P	142,400	227,900	3.11	9,463	310

Drill Collar — Inquiry form

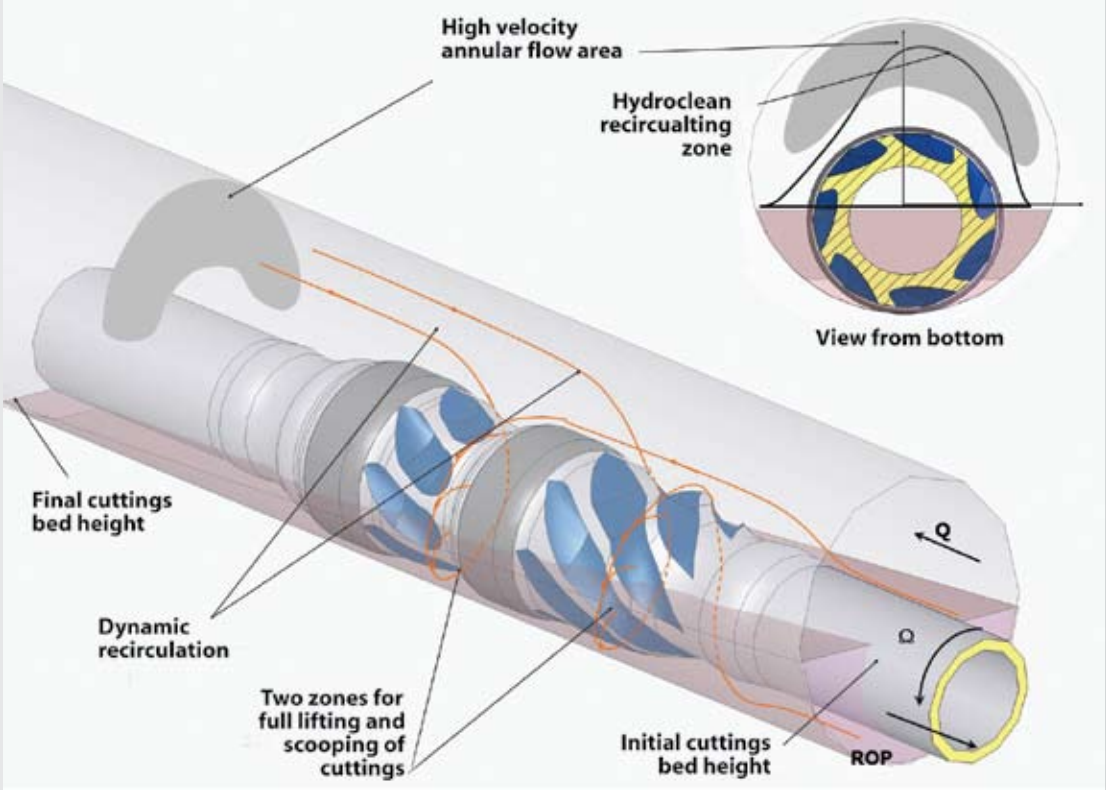
PRODUCT DESCRIPTION

ITEM	1	2	3	4
Quantity (joints)				
Nominal OD - inches				
ID - inches				
Overall length - feet				
Hardbanding type				
Hardbanding application				
Hardbanding - inches				
Hardbanding location				
Slip recess	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
Elevator recess	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
Steel material	☐ non mag ☐ 4145	☐ non mag ☐ 4145	☐ non mag ☐ 4145	☐ non mag ☐ 4145
Collar type	☐ slick ☐ spiral	☐ slick ☐ spiral	☐ slick ☐ spiral	☐ slick ☐ spiral
Connection				
Relief groove pin	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
Bore back box	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
Fish neck	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
Fish neck OD - inches				
Fish neck length - inches				
Make & break	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
Thread protector type (pressed steel, cast steel)				
Applicable specification (API, DS1, NS1 etc.)				
Packing				
Comments				

PERFORMANCE

DRILLING SYSTEMS

PERFORMANCE
DRILLING
SYSTEMS



Hydroclean™ drill pipe and heavy weight drill pipe is a new generation hole-cleaning and torque-management tool patented by VAM Drilling. Hydroclean reduces or eliminates problems associated with cuttings build-up and excess torque and drag in complex or non-conventional wells.

Integrally machined on full length joints, the upsets have specially designed grooves or blades that are the primary feature of Hydroclean. In these bladed sections, the combination of rotational speed, flow rate and the specially designed angles produce a number of mechanical and hydrodynamic effects that significantly improve hole-cleaning and greatly reduce the amount of non-productive time associated with a build-up of cuttings.

These effects increase the quantity of cuttings reintroduced into the flowstream, resulting in a wellbore that cleans up better and faster. For the operator, this translates into improved drilling performance and significant cost savings.

The bearing section has a slightly larger OD and is supplied with a "casing friendly" hardbanding material. The slightly larger OD provides:

- Protection against borewall damage
- Protection of the bladed section

These bearing sections also spread out the bearing load and improve tool life. Each bearing section is specially designed to allow easy repair using standard automated hardbanding machines.

When properly spaced in the drillstring, Hydroclean provides:

- Reduced operating costs with reduction of wiper trips, backreaming and sweeps
- Improved hole-cleaning efficiency (60%), reduction in torque-and-drag loads (30%) and decreases non-productive time (20%)
- Optimized hydraulics and pressure management, reduction of pressure losses by more than 50%.

With VAM Drilling's Hydroclean™ there's no need to sweep to clean, as Hydroclean reduces or eliminates problems with cuttings buildup.

Hydroclean™ — Reducing non-productive time

Hydroclean™ drill pipe is manufactured with welded construction and comprised of patented dual OD tool joints and three specially designed central upsets machined directly onto the pipe body. Hydroclean heavy weight features a mono block construction consisting of patented dual OD tool joints with two extra length central upsets and the Hydroclean profile machined directly onto the pipe body. Both products are available in Range 2 and Range 3 lengths.

Hydroclean drill pipe is suitable to run with standard handling equipment and is designed to be integrated directly into the drillstring. Placement recommendations are available from any VAM Drilling regional office.

Hydroclean heavy weight drill pipe is run with conventional heavy weight drill pipe. The rugged design of the two extended Hydroclean sections makes it ideally suited to assist with hole-cleaning in the BHA. Experience has shown that placing Hydroclean heavy weight drill pipe as near as possible to the large OD BHA components will significantly reduce the risk of pack-off in this critical area.

Patented dual OD tool joint prevents wear.

Specially designed grooves improve cuttings transport efficiency.

Hydroclean™ heavy weight drill pipe is run with conventional heavy weight drill pipe as near as possible to the large OD BHA components.

Dimensional Data - Hydroclean™ Drill Pipe

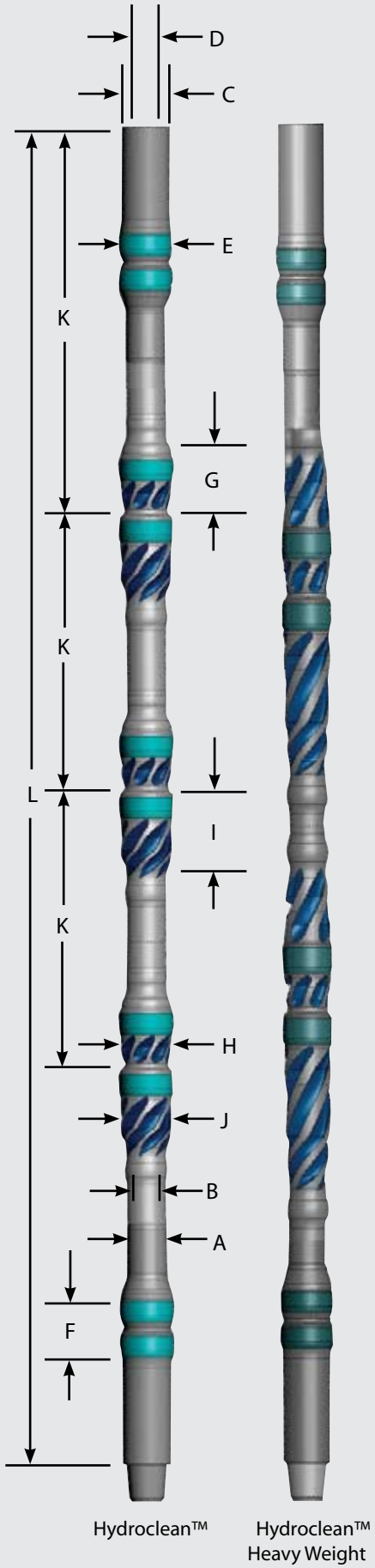
Feature	Size			
	5 in	5-1/2 in	5-7/8 in	6-5/8 in
A Nominal OD	5	5-1/2	5-7/8	6-5/8
B Tube ID	4	4-1/2	4-3/4	5-5/16
C Tool Joint OD	6-5/8	7	7-1/4	8
D Tool Joint ID	3	3-1/2	4-3/8	4-1/4
E Dual OD	7	7-3/4	8	8-3/4
F Dual OD Length	5-1/2	5-1/2	5-1/2	5-1/2
G Bearing Zone Length	8	8	8	8
H Bearing Zone OD	7	7-3/4	8	8-3/4
I Hydroclean Length	12	12	12	12
J Max. Hydroclean OD	6-1/2	7-1/4	7-1/2	8-1/4
K Central Upset Spacing (ft)	7-1/2	7-1/2	7-1/2	7-1/2
L Joint Length (ft)	31	31	31	31

Note: All dimensions in inches unless otherwise noted.

Dimensional Data - Hydroclean™ Heavy Weight

Feature	Size		
	5 in	5-1/2 in	6-5/8 in
Nominal OD	5	5-1/2	6-5/8
Connection	NC50	5-1/2 FH	5-1/2 FH
Tube ID	3	3-3/4	4-1/2
Central Upset OD	6-5/8	7	8
Tool Joint OD	6-5/8	7	8
Tool Joint ID	3	3-3/4	4-1/2
Weight (lbs/ft)	57.97	61.59	82.97
Length (ft)	31	31	31

Note: All dimensions in inches unless otherwise noted.



Specially designed angles produce mechanical and hydrodynamic effects to improve hole cleaning.

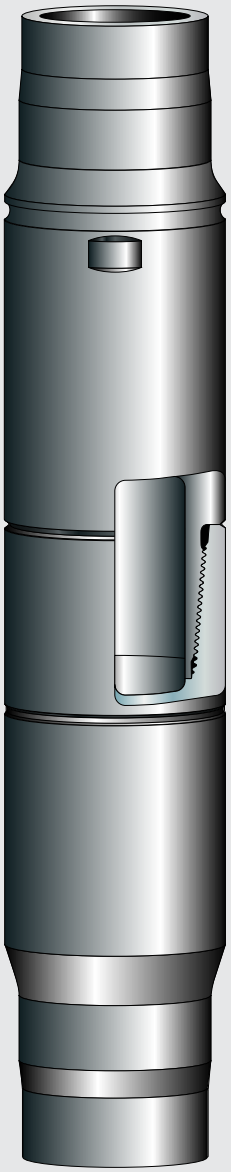
HYDROCLEAN™ DATA

			Center Upset(s)					Tool Joint			Minimum Yield Strength		Body Mechanical Data		Tool Joint Mechanical Data			
Nominal OD (in)	Approximate Weight (Includes Tube & Tool Joints) (lbs/ft)	Tube ID (in)	Number	OD (in)	Length (in)	Elevator Upset OD (in)	Connection	OD (Dual OD) (in)	ID (in)	Length (Pin/Box) (in)	Tube (psi)	Tool Joint (psi)	Tensile Yield (lbs)	Torsional Yield (ft-lbs)	Tensile Yield (lbs)	Torsional Yield (ft-lbs)	Make-up Torque (ft-lbs)	Nominal OD (in)
2-7/8	11.6	2-1/8	2	3-1/2	8	2-11/16	H533	3-1/4 (3-1/2)	2-1/8	27/21	110,000	110,000	324,000	17,300	-	10,100	5,900	2-7/8
3-1/2	25.7	2-1/2	3	5-5/8	8	3-5/8	NC38	5 (5-5/8)	2-1/4	27/21	120,000	120,000	565,500	35,900	687,700	22,000	13,200	3-1/2
5	39.9	4	3	7	8	5-1/8	NC50	6-5/8 (7)	3	27/21	120,000	120,000	848,200	83,600	1,278,200	52,600	31,700	5
5-1/2	43.9	4-1/2	3	7-3/4	8	5-5/8	5-1/2 FH VAM EIS	7 (7-3/4)	3-3/4	27/21	120,000	130,000	942,500	104,000	-	-	-	5-1/2
6-5/8	61.7	5-5/16	3	8-3/4	8	6-3/4	6-5/8 FH	8 (8-3/4)	4-1/4	27/21	120,000	120,000	1,476,700	193,200	1,887,700	87,900	52,700	6-5/8

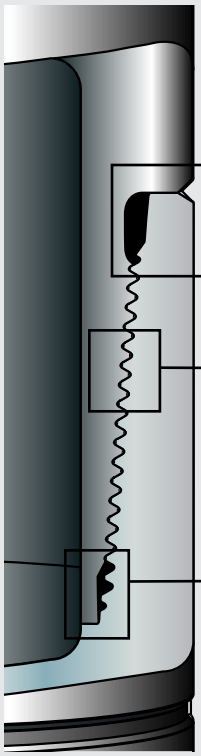
HYDROCLEAN™ HEAVY WEIGHT DATA

			Center Upset(s)					Tool Joint			Minimum Yield Strength		Body Mechanical Data		Tool Joint Mechanical Data			
Nominal OD (in)	Approximate Weight (Includes Tube & Tool Joints) (lbs/ft)	Tube ID (in)	Number	OD (in)	Length (in)	Elevator Upset OD (in)	Connection	OD (in)	ID (in)	Length (Pin/Box) (in)	Tube (psi)	Tool Joint (psi)	Tensile Yield (lbs)	Torsional Yield (ft-lbs)	Tensile Yield (lbs)	Torsional Yield (ft-lbs)	Make-up Torque (ft-lbs)	Nominal OD (in)
2-7/8	23.5	1-5/8	2	4-3/8	15	3-3/16	NC31	4-3/8	1-5/8	28/24	110,000	110,000	486,000	22,200	560,900	15,500	9,300	2-7/8
3-1/2	30.4	2-1/16	2	5	15	3-5/8	NC38	5	2-1/16	28/24	110,000	110,000	690,800	39,200	700,300	22,400	13,450	3-1/2
5	53.5	3	2	6-5/8	15	5-1/8	NC50	6-5/8	3	28/24	110,000	110,000	1,382,300	113,000	937,400	48,500	29,100	5
5-1/2	56.6	3-3/4	2	7	15	5-5/8	5-1/2 FH	7	3-3/4	28/24	110,000	110,000	1,398,500	135,400	1,166,300	52,400	31,500	5-1/2
5-7/8	56.1	4-1/4	2	7-1/4	15	6	VAM Express VX57	7-1/4	4-1/4	28/24	110,000	110,000	1,421,400	152,900	-	-	-	5-7/8
6-5/8	74.1	4-1/2	2	8	15	6-3/4	6-5/8 FH	8	4-1/2	28/24	110,000	110,000	2,042,400	237,700	1,541,400	79,800	47,900	6-5/8

VAM Riser WO-SR — For deepwater workover & completion



VAM Riser WO-SR with Teflon® seal for gas-tight performance up to 10,000 psi.



VAM Drilling drill pipe risers have been designed to improve the efficiency of well intervention and production testing processes in deep offshore operations. This innovative application for drill pipe has been successfully developed to replace the traditional technology composed of a drilling riser and a tubing string with a metal-to-metal seal. The equipment provides improved performance thanks to its design and running properties, including weight reduction, time saving and a high degree of reliability. VAM Drilling drill pipe risers have been in use for almost 10 years with the highest level of efficiency.

The drill pipe riser features the VAM Riser WO-SR connection which includes a gas-tight seal rated up to 10,000 psi test pressure and ensures extreme fatigue resistance and high tension efficiency. Whether in open-sea mode or in a drilling riser, the drill pipe riser provides user friendly features, such as:

- Robust and replaceable sealing mechanism
- VAM EIS® thread characteristics with easy handling, multiple make-up, thread durability and cost-effective maintenance

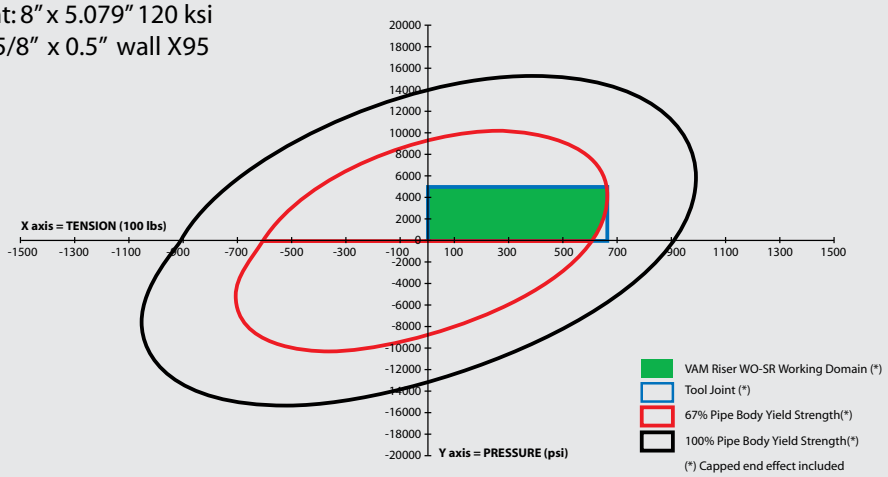
A comprehensive testing program has been performed to qualify the VAM Riser WO-SR connections and to guarantee their suitability in the most severe operational conditions. The testing program includes:

- Multiple make & break
- Sealability under combined loads (tension and compression)
- Sealability under thermo-cycles
- Fatigue

VAM Riser WO-SR can also be used in any land or shallow offshore well for production testing as an alternative to tubing strings with metal-to-metal seals. Field experience has demonstrated substantial savings in time and cost as a result of using VAM Riser completion strings compared to conventional solutions.

VAM Riser WO-SR Working Domain

Tool joint: 8" x 5.079" 120 ksi
Pipe: 6-5/8" x 0.5" wall X95



When well intervention or production testing requires high pressure sealing equipment to ensure safe and reliable operations (gas, high pressure wells), VAM Drilling recommends combining its proprietary drill pipe riser design with the VAM Riser WO-HP tool joint connection.

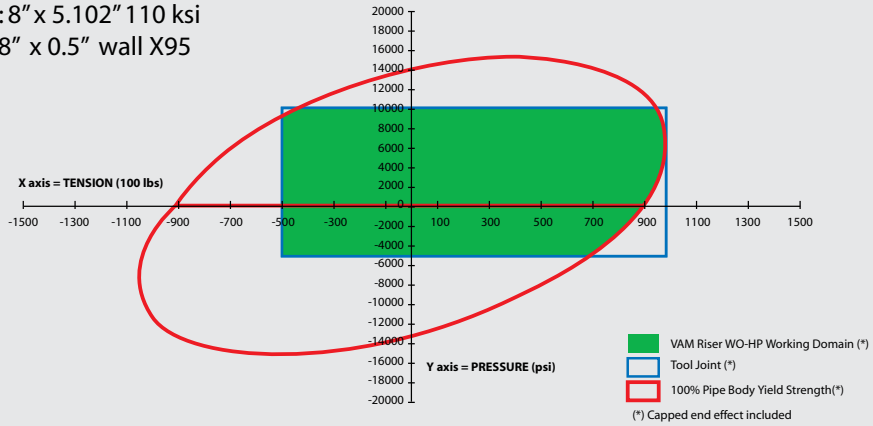
The VAM Riser WO-HP connection exceeds most of the VAM Riser WO-SR performance criteria and offers specifically higher tension efficiency, extreme fatigue resistance and a gas-tight metal-to-metal seal rated up to 15,000 psi test pressure.

A comprehensive testing program has been performed to qualify the VAM Riser WO-HP connections and to guarantee its suitability to the most severe operational conditions. The testing program includes:

- Multiple make & break
- Sealability combined with fatigue and make & break cycles
- Sealability under combined loads (tension and compression)
- Sealability under thermo-cycles
- Fatigue

VAM Riser WO-HP Working Domain

Tool joint: 8" x 5.102" 110 ksi
Pipe: 6-5/8" x 0.5" wall X95



VAM Riser WO-HP is designed for severe operational conditions.

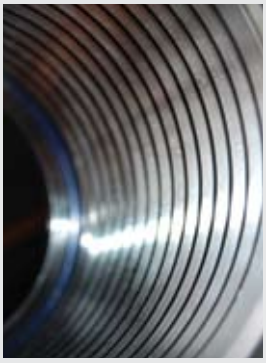
Non-Magnetic Materials — For directional drilling

For directional drilling applications, VAM Drilling supplies BHA components made from Amagnit™ 501, a chrome manganese carbon austenitic alloy obtained by combining a proprietary chemical analysis and a rotary hammer forging process.

Amagnit 501 is specifically designed for extreme service. This chrome manganese, low carbon austenitic alloy ensures non-magnetic steel which is resistant to stress corrosion cracking and provides superior mechanical properties with low magnetic permeability, excellent machineability and no tendency for galling. Consistent non-magnetic behavior is essential in this special alloy steel as well as material that is free of hot spots. These non-magnetic characteristics of Amagnit 501 are certified by VAM Drilling upon delivery for the life of the product.

Laboratory tests and actual field use confirm that Amagnit 501 provides excellent resistance to stress corrosion cracking in an aggressive chloride environment.

VAM Drilling's Amagnit™ 501 non-magnetic alloy provides resistance to stress corrosion cracking and exhibits considerable anti-galling characteristics.



The metallurgical and material integrity of Amagnit™ 501 is achieved by careful raw material selection, closely controlled remelting procedures and efficient forging. Exact time – temperature – forging cycles are achieved on a high speed, high precision rotary forge.

The melting technology and warm forging process used in making Amagnit 501 alloy eliminate the precipitation of carbides on grain boundaries, thus producing a non-sensitized microstructure. This is achieved through the rigorous selection of the time/temperature/force cycle used during the warm-working process.

Amagnit 501 was exposed to proprietary test methods of a major directional drilling company (U-bend, C-ring, etc) and out-performed competitive grades. A detailed report of the test results is available on request.

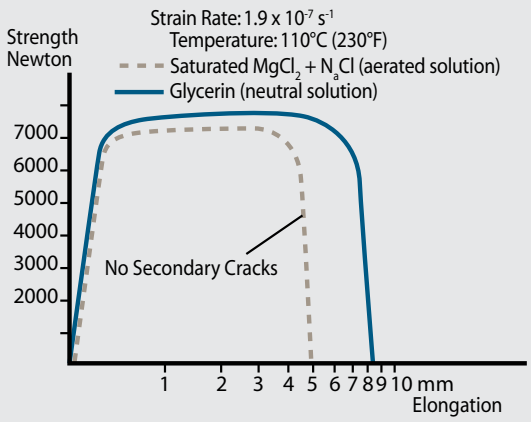
The ultimate performance of the Amagnit 501 depends as much on Quality Assurance and Quality Control as on its patented chemistry and forging process. In addition, systematic stress corrosion tests on each bar provide constant correlation between its actual chemistry force/time/temperature cycles and its corrosion resistance.

Non-Magnetic Material Properties

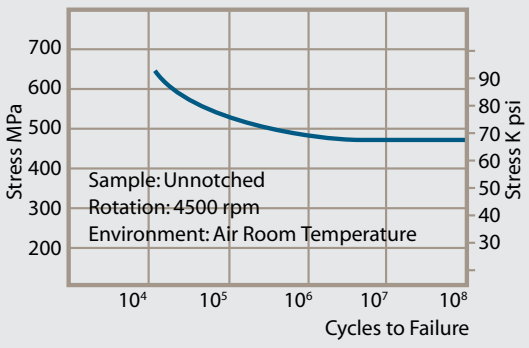
Room Temperature. ASTM A 370

Drill Collar OD Range	Yield Strength Min (at 0.2%)		Tensile Strength Min		Min Elongation	Min. Reduction	Min Charpy
(in)	(MPa)	(psi)	(MPa)	(psi)	(%)	(%)	(ft-lbs)
3-1/2 thru 6-7/8	800	116,000	930	135,000	25	50	73
7 thru 11	770	112,000	900	130,000	25	50	

Slow Strain Rate Test



Rotating Beam Fatigue Test



Superior corrosion and galling resistance make Amagnit™ 501 the obvious choice for downhole equipment.

	Hole Section	17-1/2″	12-1/4″	8-1/2″	Other
Drilling Parameters	Section length - feet				
	Section length above 40 degrees - feet				
	Hole angle - degrees				
	Maximum build/drop rate - degrees per 100 ft				
	Average ROP - feet per hour				
	Maximum rpm				
	Minimum rpm				
	Maximum flow rate - gpm				
	Minimum flow rate - gpm				
	Mud type				
	Mud weight				
Drillstem Data	Nominal OD - inches				
	Nominal weight - lbs/ft				
	Tool joint OD - inches				
	Tool joint ID - inches				
	Pipe grade				
	Connection				
	Range				
	Rotary steerable or drilling motor				
	BHA length - feet				
	Quantity of HWDP - joints				
	HWDP connection				
	Comments				

SERVICES & ACCESSORIES

The VAM Drilling precision-machined Kelly is a heavy square or hexagonal steel tube supported by the swivel through the rotary table and connected to the first joint of drill pipe in the drillstring.

Straightness is the key to VAM Drilling's manufacturing process. Straightness is checked before, during and after each machining operation. Flats are precision-milled to API specifications. All milling is performed on specially designed rigid Kelly mills.

VAM Drilling offers square and hexagonal Kellys up to 46' and features include:

- Manufactured from AISI 4145H-modified, fully heat-treated alloy steel with a Brinell hardness range of 285-341 and a minimum average Charpy impact value of 40 ft-lbs;
- Ends and drive sections, IDs and connections machined and inspected to API specifications;
- Kelly bars ultrasonically inspected over full length and section; and
- Shipped in a protective steel-cased scabbard; rathole scabbards can be provided upon request.

VAM Drilling Kellys are manufactured on equipment specially designed for this application.

VAM DRILLING Vallourec Group

Square Kellys Data

Nominal Size (in)	Length (ft)		Top Upset				Bottom Upset			Drive Section		Approximate Weight (lbs)	
			Standard		Optional								
	Drive Section	Overall	LH Connection	Tool Joint OD (in)	LH Connection	Tool Joint OD (in)	RH Connection	Tool Joint OD (in)	Bore (in)	Across Corners (in)	Across Flats (in)	Standard	Optional
3	37	40	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4	NC31 - 2-7/8 IF	4-1/8	1-3/4	3.875	3	1090	995
3	43	46	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4		4-1/8	1-3/4	3.875	3	1225	1125
3-1/2	37	40	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4	NC38 - 3-1/2 IF	4-3/4	2-1/4	4.437	3-1/2	1315	1215
3-1/2	43	46	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4		4 -/4	2-1/4	4.437	3-1/2	1475	1380
4-1/4	37	40	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4	NC46 - 4 IF or	6 - 6-1/4	2-13/16	5.500	4-1/4	1810	1710
4-1/4	43	46	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4	NC50 - 4-1/2 IF	6-3/8 - 6-1/2	2-13/16	5.500	4-1/4	2050	1950
5-1/4	37	40	6-5/8 REG	7-3/4			NC50 - 4-1/2 IF or	7	3-1/4	6.750	5-1/4	2745	
5-1/4	43	46	6-5/8 REG	7-3/4			5-1/2 FH	7	3-1/4	6.750	5-1/4	3140	
6	37	40	6-5/8 REG	7-3/4			6-5/8 FH	8	3-1/2	7.625	6	3680	
6	43	46	6-5/8 REG	7-3/4			6-5/8 FH	8	3-1/2	7.625	6	4220	

VAM DRILLING Vallourec Group

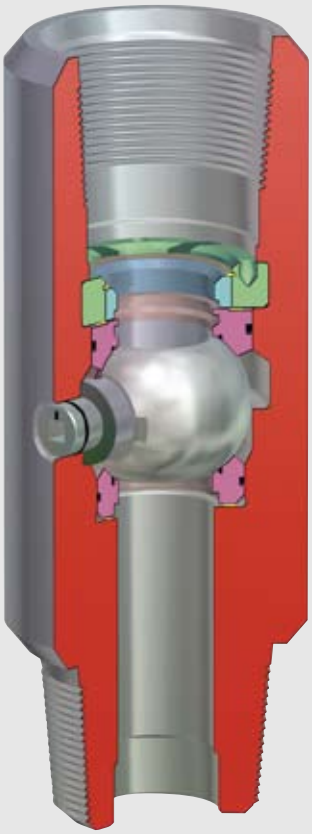
Hexagonal Kellys Data

Nominal Size (in)	Length (ft)		Top Upset				Bottom Upset			Drive Section		Approximate Weight (lbs)	
			Standard		Optional								
	Drive Section	Overall	LH Connection	Tool Joint OD (in)	LH Connection	Tool Joint OD (in)	RH Connection	Tool Joint OD (in)	Bore (in)	Across Corners (in)	Across Flats (in)	Standard	Optional
3	37	40	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4	NC26 - 2-3/8 IF	3-3/8	1-1/2	3.375	3	970	870
3	43	46	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4		3-3/8	1-1/2	3.375	3	1090	995
3-1/2	37	40	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4	NC31 - 2-7/8 IF	4-1/8	1-3/4	3.937	3-1/2	1270	1170
3-1/2	43	46	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4		4-1/8	1-3/4	3.937	3-1/2	1465	1365
4-1/4	37	40	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4	NC38 - 3-1/2 IF	4-3/4	2-1/4	4.781	4-1/4	1630	1530
4-1/4	43	46	6-5/8 REG	7-3/4	4-1/2 REG	5-3/4		4-3/4	2-1/4	4.781	4-1/4	1850	1755
5-1/4	37	40	6-5/8 REG	7-3/4			NC46 - 4 IF or	6 - 6-1/4	2-13/16 or	5.900	5-1/4	2250	
5-1/4	43	46	6-5/8 REG	7-3/4			NC50 - 4-1/2 IF	6-3/8 - 6-1/2	3-1/4	5.900	5-1/4	2570	
6	37	40	6-5/8 REG	7-3/4			5-1/2 FH	7	3-1/2	6.812	6	2900	
6	43	46	6-5/8 REG	7-3/4			5-1/2 FH	7	3-1/2	6.812	6	3320	

Safety Valves

KC4S

KC2S



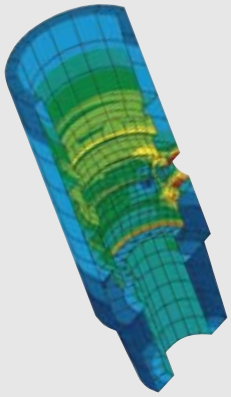
VAM Drilling is a major manufacturer of drilling safety valves, including Kelly valves, retrievable drop-in check valves and inside BOP valves. Each of these valves is available in three different versions:

- Standard. Suitable for normal drilling conditions. The valve body is made of AISI 4145H-modified alloy steel, heat-treated to 285-341 Brinell hardness and a minimum impact strength value of 42J as per ASTM 370 Charpy V-Notch, at -10°C. Inner surfaces of bodies are treated to enhance mud corrosion resistance and maintenance operations.

- H_2S Trim. This version has been designed for low H_2S concentration. Internal parts are made of corrosion-resistant materials matching the NACE MR0175 standard, fitted in a standard body.

- NACE Version. The NACE version fully meets the NACE MR0175 standard to resist higher H_2S concentration. The body is made of UNS S17400, heat-treated to meet both NACE standard and API Spec 7 (latest editions).

VAM Drilling manufactures Kelly valves, retrievable drop-in check valves and inside BOP valves used throughout the world.



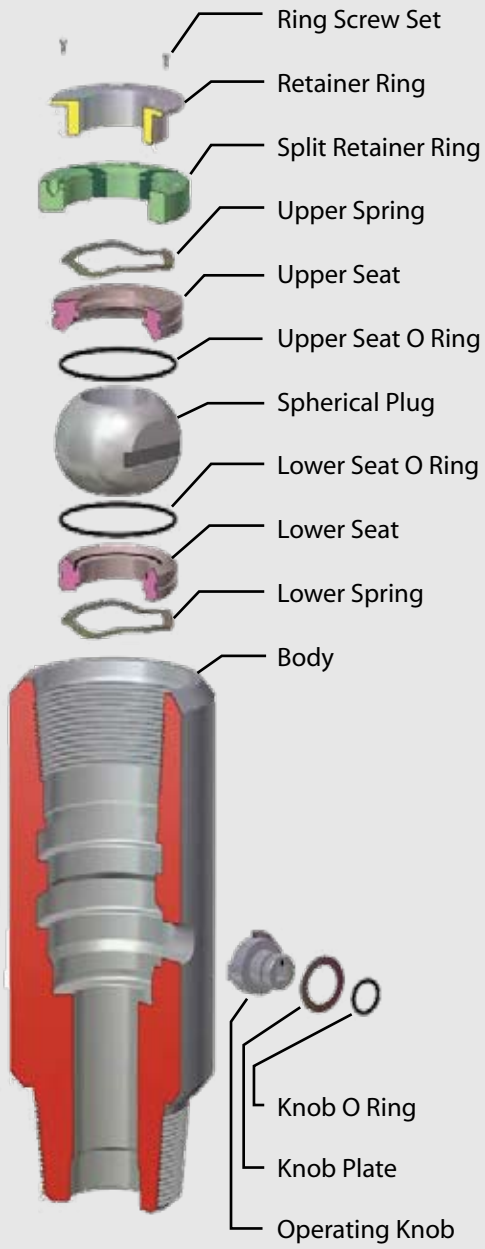
VAM Drilling provides both one-piece and two-piece Kelly valves designed for the maximum passage of drilling fluids without pressure loss. Valves are supplied with either API or VAM Drilling proprietary double shoulder connections.

VAM Drilling has two types of Kelly valves, KC2S with PTFE rings inserted in both upper and lower seats and KC4S with metal-to-metal seals. Both come in either standard or H_2S resistant versions.

The KC2S PTFE-ring provides good sealing capability, even at low pressures. In the KC4S metal-to-metal seal valve, sealing is performed by controlled elastic deformation of the special plug. This technology, combined with enhanced-seat guidance gives excellent sealing characteristics for the life of the valve. VAM Drilling Kelly valves are available in either Class 1 or Class 2 test specifications.

VAM Drilling Kelly valves features:

- Simple construction for trouble-free operation and easy servicing;
- Sealed lubrication packing;
- Complete stainless steel valve parts for H_2S service;
- 10,000 and 15,000 psi working pressure; and
- Supplied with operating wrench and thread protectors.



VAM Drilling has two types of Kelly valves, one with PTFE rings inserted in both upper and lower seats and the other with metal-to-metal seals.

Upper and Lower Kelly Valve Data

Lower Kelly Valve

Lower Kelly Cock	NC26 (2-3/8 IF)	NC38 (3-1/2 IF)	NC38 (3-1/2 IF)	NC46 (4 IF)	NC46 (4 IF)	NC50 (4-1/2 IF)	5-1/2 FH	NC56
OD (in)	3-3/8	4-3/4	5-3/8	6-3/8	6-5/8	6-5/8	7-1/4	7-3/8
ID (in)	1-1/4	1-3/4	2-1/8	2-1/4	2-7/16	2-13/16	2-13/16	3-1/16
ID passage (in)	2-1/4	2-7/8	3-3/8	4-3/16	-	4-9/16	4-9/16	-
Length S to S (in)	13	13	15	15	16	16	16	16
Weight (lbs)	13	23	35	49	56	53	67	67
Series	201	202	203	204	205	206	206	207

Upper Kelly Valve

Upper Kelly Cock	NC26 (2-3/8 IF)	NC38 (3-1/2 IF)	NC38 (3-1/2 IF)	NC46 (4 IF)
OD (in)	5-3/4	7-3/4	7-3/4	7-3/4
ID (in)	2-1/8	2-13/16	3-1/16	3-1/4
Connection	4-1/2 REG LH	6-5/8 REG LH	6-5/8 REG LH	6-5/8 REG LH
Length S to S (in)	15	16	16	16
Weight (lbs)	85	173	169	165
Series	203	206	207	208

Ordering Information

On orders and inquiries please specify the following:

- KC2S
- Trim (standard, H_2S, Full Nace)
- Series
- Outside diameter
- Connection type and size

Optional features are available upon request.

VAM Drilling has two different check valves – an inside BOP valve and a retrievable, drop-in check valve.

Inside BOP Valve (BVR)

The inside BOP valve (BVR) is a heavy duty check valve for protection against drillstring kicks at rig floor level. It can be left in the drillstring as long as necessary to re-establish control of the well-pressure balance.

- OD sizes from 3-3/8” to 9-1/2”;
- ID sizes from 1-1/2” to 2-13/16”; and
- 10,000 and 15,000 psi working pressure.

Retrievable, Drop-in Check Valve (RDCV)

The retrievable, drop-in check valve (RDCV) is used to control back flows from high-pressure formations. It also allows downward fluid circulation within the drillstring. When the back-flow is under control, the drop-in check valve may be retrieved with wireline.

Features include:

- OD sizes from 1-9/32” to 3-7/64”;
- ID sizes from 3/8” to 1-11/16”;
- 10,000 and 15,000 psi working pressure; and
- Optional features include non-API connections, landing sub ODs and landing sub special length.

VAM Drilling check valves ensure rig safety by providing protection from kicks in high pressure formations.

Check Valves Data

RDCV Operational Data

Series	901	902	903	904	905	906	907	908
Check Valve OD (in)	1-9/32	1-25/32	2-5/32	2-15/64	2-15/32	2-27/32	3-3/64	3-7/64
Requested drill string ID (in)	1-11/32	1-27/32	2-7/32	2-19/64	2-17/32	2-29/32	3-7/64	3-11/64
Check valve ID (in)	3/8	5/8	3/4	7/8	1-1/8	1-3/8	1-9/16	1-11/16
Check valve weight (lbs)	5.3	6.6	15.4	19.0	24.4	28.2	32.7	38.0
(kg)	2.4	3.0	7.0	8.6	11.0	12.8	14.8	15.8
Connection	NC 26 | NC 31	NC 31 | NC 38	NC 38	4-1/2 REG | NC 46	NC46 | NC50	NC 50 | 6-5/8 REG	NC 50 | 6-5/8 REG	NC 50 | 6-5/8 REG
Landing sub OD mini (in)	3-3/8 | 4-1/18	4-1/8 | 4-3/4	4-3/4	5-3/4 | 6	6 | 6-1/2	6-1/2 | 8	6-1/2 | 8	6-1/2 | 8
Landing sub length between shoulders (in)	17	18	22	24	24	25	26-1/2	26-1/2
Landing sub weight (lbs)	37 | 59	58 | 86	89	152 | 168	162 | 186	185 | 271	189 | 278	186 | 278
(kg)	17 | 27	26 | 39	40	69 | 76	73 | 88	88 | 104	90 | 146	89 | 146
Landing sub drift diameter (in)	1-5/32	1-29/64	1-27/32	2-11/64	2-1/8	2-33/64	2-11/16	2-25/32
Overshot weight (lbs)	1.3	3.8	4.8	5.8	8.8	9.3	10.1	11.0
(kg)	0.6	1.7	2.2	2.6	4.0	4.2	4.6	5.0

Ordering Information

On orders and inquiries please specify the following:

- RDCV
- Trim (standard, H_2S, Full Nace)
- Series
- Landing sub OD
- Landing sub connection type and size

Optional features are available upon request.

Inside BOP

	NC26 (2-3/8 IF)	NC31 (2-7/8 IF)	NC38 (3-1/2 IF)	NC46 (4 IF)	NC50 (4-1/2 IF)	5-1/2 FH	6-5/8 REG	7-5/8 REG
OD (in)	3-3/8	4-1/8	4-3/4	6-1/4	6-1/2	7	8	9-1/2
ID (in)	1-1/2	1-3/4	2-1/4	2-13/16	2-13/16	2-13/16	2-13/16	2-13/16
Length S to S (in)	31	33	33	35	35	37	38	38
Weight (in)	31	99	137	256	268	338	475	697
Trim Series	1	2	3	4	4	4	4	4

Ordering Information

On orders and inquiries please specify the following:

- BVR
- Trim (standard, H_2S, Full Nace)
- Series
- Connection type and size

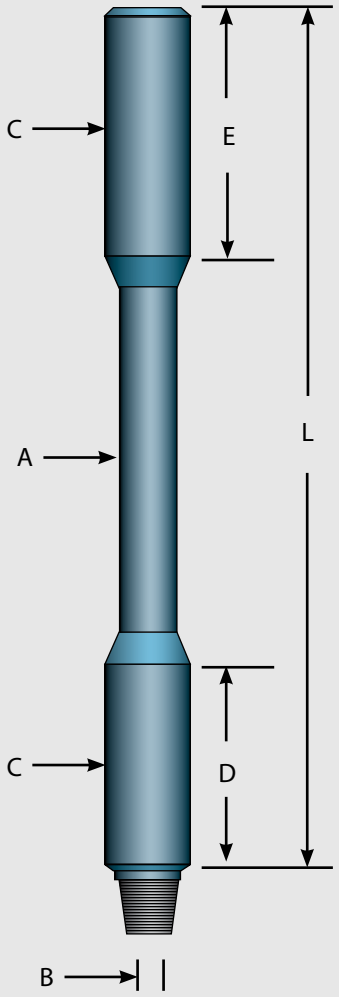
Optional features are available upon request.

VAM Drilling pup joints are available in standard lengths of 5', 10', 15' and 20'; however, other configurations are available upon request. Rotary subs are available in a full range of connection combinations and standard lengths.

All VAM Drilling subs and pup joints are made from AISI 4145H-modified alloy, heat-treated to a Brinell Hardness range of 285-341 with a Charpy V-Notch minimum impact strength of 40 ft-lbs at 70°F guaranteed to one inch below the surface. Subs or pup joints are heat-treated to 120,000 psi minimum yield. Connections can be cold-rolled after machining, if requested. All connections are phos-coated to prevent galling during initial make-up.

VAM Drilling crossover subs, Kelly saver subs, bit subs and pup joints are shipped with thread protectors installed.

PUP JOINT



Typical Pup Joint Specifications

Nominal Size A (in)	ID B (in)	Tool Joint OD C (in)	Pin TJ Tong D (in)	Box TJ Tong E (in)	Connection	Estimated Weight of Lengths			
						5'	10'	15'	20'
3-1/2	2-9/16	4-3/4	10	12-1/2	NC38 (3-1/2 IF)	141	214	287	361
	2-7/16	5	10	12-1/2	NC38 (3-1/2 IF)	159	233	306	379
4	2-13/16	5-1/4	9	12	NC40 (4 FH)	175	283	391	499
	2-11/16	5-1/2	9	12	NC40 (4 FH)	199	317	434	551
4-1/2	3-1/4	6-1/4	9	12	NC46 (4 IF)	237	367	496	625
	3	6-1/4	9	12	NC46 (4 IF)	259	409	559	709
	2-3/4	6-1/4	9	12	NC46 (4 IF)	278	448	617	786
5	3-1/2	6-1/2	9	12	NC50 (4-1/2 IF)	247	367	487	608
	3-1/4	6-1/2	9	12	NC50 (4-1/2 IF)	257	377	497	618
	2-3/4	6-5/8	9	12	NC50 (4-1/2 IF)	283	403	528	644
5-1/2	3-1/2	7-1/4	10	12	5-1/2 FH	370	611	851	1091
	3	7-1/2	10	12	5-1/2 FH	435	713	1003	1286
6-5/8	3-1/2	8	10	12	6-5/8 FH	644	966	1388	1811

VAM Drilling rotary subs or pup joints are available in any size or configuration required.

Lift Subs, Lift Plugs & Thread Protectors

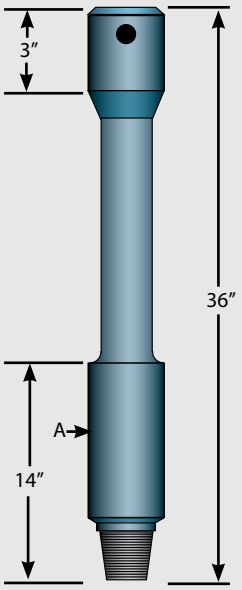
VAM Drilling heavy-duty lift subs and lift plugs are made of AISI 4145H-modified steel and manufactured to the same specifications used for VAM Drilling drill collars and are available in sizes from 3-1/8" to 11".

VAM Drilling precision-machined cast steel thread protectors are ideal for handling and protecting swivels, drill collars, tool joints and wear subs. The unique handle speeds the safe movement of all equipment.

Far less expensive than the cost of re-cutting threads, VAM Drilling thread protectors are available for all standard oilfield connections and are gauged to ensure a quality product.
VAM Drilling products are normally shipped with standard protectors and cast-steel protectors are available as an option.

Lift certification provided on request.

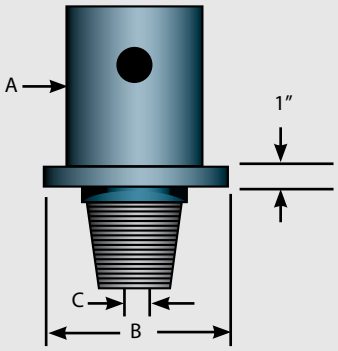
Lift Subs



Lift Sub

Drill Collar Size A (in)	Approximate Weight (lbs)
3-1/2 -3-7/8	40
4 - 4-3/8	50
4-1/2 - 4-7/8	84
5 - 5-3/8	88
5-1/2 - 5-7/8	120
6 - 6-3/8	150
6-1/2 - 6-7/8	168
7 - 7-3/8	169
7-1/2 - 7-7/8	242
8 - 8-3/8	257
8-1/2 - 8-7/8	280
9 - 9-3/8	305
9-1/2 - 9-7/8	320
10	338
11	368

Lift Plugs



Lift Plugs

Drill Collar Size A (in)	Lifting Plate Diameter B (in)	Approximate Weight (lbs)	Connection Bore C (in)
3-1/2 - 3-7/8	5-1/2	35	1-1/2
4 - 4-3/8	6	40	2
4-1/2 - 4-7/8	6-1/2	50	2-1/4
5 - 5-3/8	7	58	2-1/4
5-1/2 - 5-7/8	7-1/2	70	2-1/4
6 - 6-3/8	8	82	2-1/4
6-1/2 - 6-7/8	8-1/2	90	2-1/4
7 - 7-3/8	9	100	2-13/16
7-1/2 - 7-7/8	9-1/2	118	2-13/16
8 - 8-3/8	10	128	2-13/16
8-1/2 - 8-7/8	10-1/2	132	2-13/16
9 - 9-3/8	11	150	2-13/16
9-1/2 - 9-7/8	11-1/2	165	2-13/16
10	12	178	2-13/16
11	13	245	2-13/16

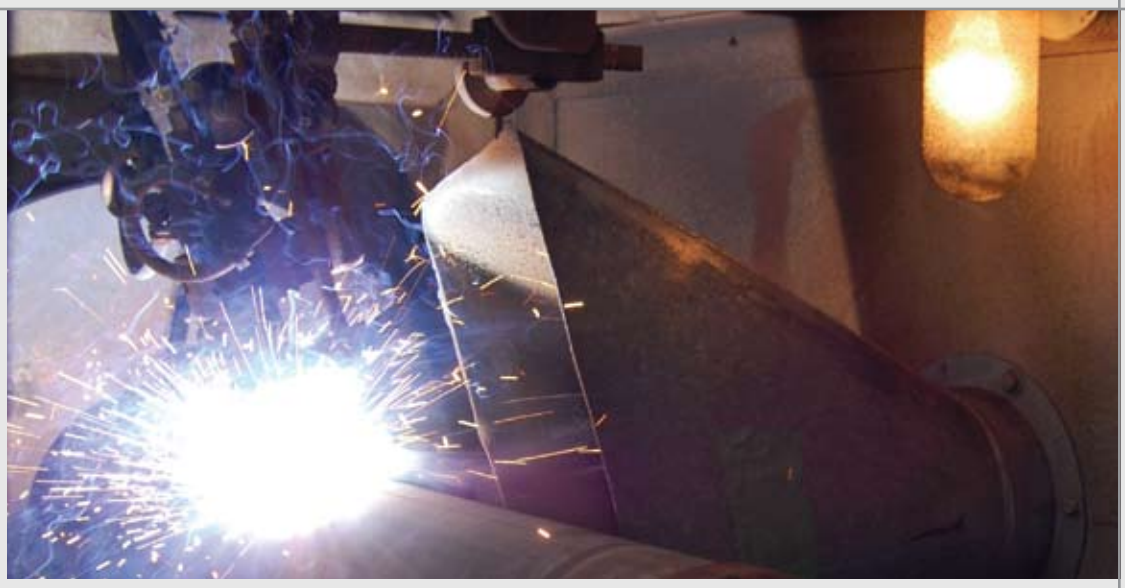
Thread Protectors

Drill Collar OD Range (in)	Connection	Pin Protector Weight (lbs)	Box Protector Weight (lbs)	Weight per Set (lbs)
3-1/2 - 3-7/8	NC23	4	6	10
	2-2/4 REG	4	6	10
	NC26	4	6	10
	2-3/8 IF	4	7	11
4 - 4-3/4	2-7/8 XH	7	6	13
	2-7/8 IF	7	6	13
	NC31	7	6	13
	3-1/2 REG	7	8	15
4-1/2 - 5-1/4	NC35	10	9	19
	3-1/2 XH	10	9	19
	NC38	10	9	19
	3-1/2 IF	10	9	19
5 - 5-3/4	3-1/2 H-90	14	11	25
	NC40	14	11	25
	4 FH	14	11	25
5-3/4 - 6-1/4	4 H-90	17	13	31
	4-1/2 REG	17	13	31
	NC44	17	13	31
	4-1/2 FH	17	13	31
6-1/4 - 6-3/4	4 IF	18	14	31
	NC46	18	14	31
	4-1/2 H-90	18	14	31
6-3/4 - 7-1/2	5 H-90	21	18	39
	5-1/2 REG	21	18	39
	5-1/2 H-90	21	18	39
	NC50	21	18	39
	4-1/2 IF	21	18	39
7-3/4 - 8-1/4	5-1/2 FH	28	23	51
	6-5/8 REG	28	23	51
	6-5/8 H-90	28	23	51
	NC56	28	23	51
8-1/4 - 9	7 H-90	29	25	54
	NC61	29	25	54
9 -10	7-5/8 REG	35	31	66
	7-5/8 H-90	35	31	66
	NC70	35	31	66
10 -11	8-5/8 REG	55	46	101
	8-5/8 H-90	55	46	101

VAM Drilling thread protectors are available for all standard oilfield connections.

Pin Protector

Box Protector



VAM Drilling hardbanding increases tool joint life and is applied prior to the tool joint being welded to the pipe body. It is applied under closely controlled conditions resulting in a uniform, low porosity, wear-resistant surface.

VAM Drilling offers hardbanding for drill pipe on tool joint box sections; however, special requests for tool joint pin sections are also available. Hardbanding applied on the tool joint box section is welded, extending 3” to 4” over the wear area including 3⁄4” on the tapered shoulder. Recent changes to industry drilling practices have seen many clients eliminate the requirement for hardbanding on the tapered section as this has shown to cause extensive wear on the elevator bowl.

VAM Drilling hardbanding is available in either a flush or raised configuration, using fine, standard or large spherical tungsten carbide pellets. With the flush design (F-1000, F-3000 or F-5000), the surface is flush with or slightly above the tool joint surface. With the raised configuration (R-1000, R-3000 or R-5000), the tungsten carbide surface is raised to approximately 1/32” above the tool joint surface.

VAM Drilling’s special hardbanding, “Super Smooth” (Series 5000), is a non-abrasive hardbanding in which the tungsten carbide pellets are buried below the joint surface and are covered over with a layer of hard metal. This special hardbanding is recommended when casing wear is a problem.

VAM Drilling offers a full-range of standard and “specialty” hardbandings, in either flush or raised configurations.

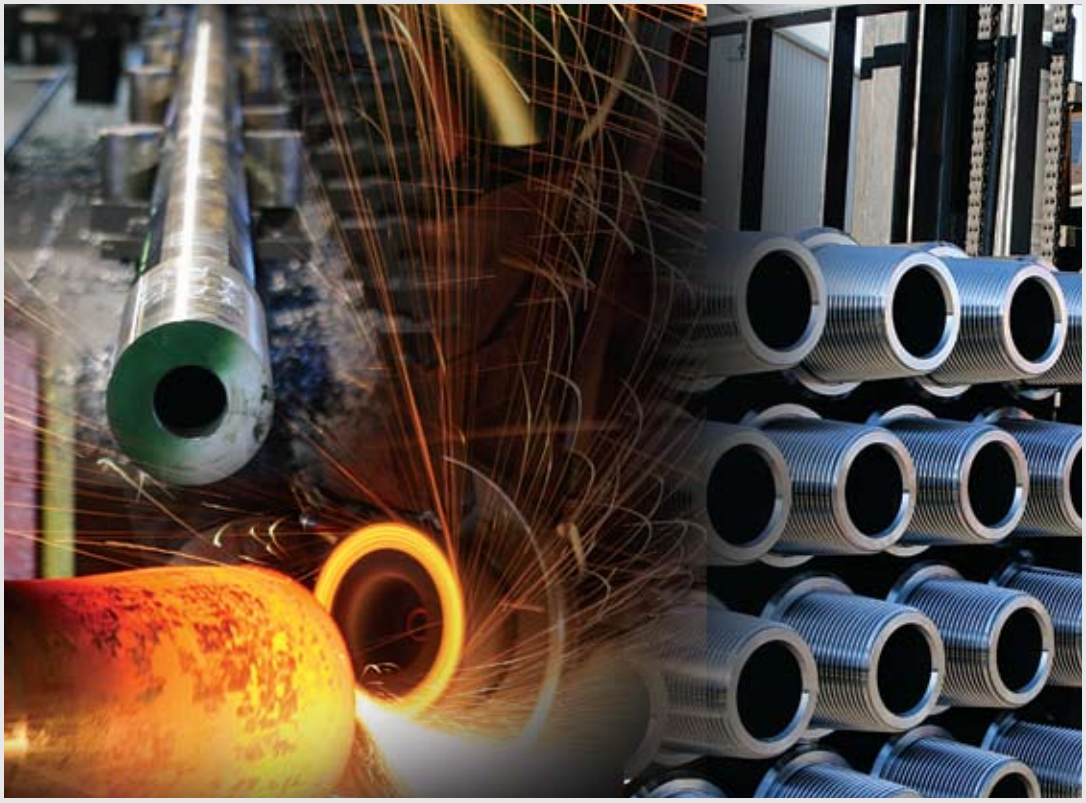
Hardbanding

Hardbandings supplied by VAM Drilling provide a uniform, wear resistant surface.

Hardbanding is designed to increase tool joint life. It is applied on prior to welding the tool joint onto the pipe body. Several bands of material (generally 3" to 4" total length) are applied to the box tool joint and an optional band (approx. 3/4" length) may be applied to the elevator taper. Hardbanding on the pin tool joint is available on request. When properly applied under tightly controlled conditions it provides a uniform, low porosity wear resistant surface.

Hardbanding supplied by VAM Drilling is available in either raised or flush configuration and "casing friendly" solutions can be selected. In addition to our proprietary tungsten carbide hardbanding (Series 1000, 3000 and 5000), VAM Drilling is also a qualified applicator for:

- Arnco100XT and 300XT;
- Armacor M Star; and
- Tuboscope TCS 8000 and TCS Ti



HEADQUARTERS

VAM Drilling France S.A.S.
27 avenue du Général Leclerc
92660 Boulogne-Billancourt
FRANCE
Phone: +33 1 49 09 35 61
Fax: +33 1 49 09 37 15

MANUFACTURING FACILITIES

FRANCE

Vallourec Mannesmann
Oil & Gas France S.A.S.
Drill Plant
54 rue Anatole France
59620 Aulnoye-Aymeries
France
Phone: +33 3 27 69 77 79
Fax: +33 3 27 69 77 29

VAM Drilling France S.A.S.
Cosne & Villechaud Plants
7, rue des Frères Lumière
58200 Cosne-sur-Loire
France
Phone: +33 3 86 39 52 00
Fax: +33 3 86 39 52 01

Vallourec Mannesmann
Oil & Gas France S.A.S.
Tarbes Plant
12 boulevard Renaudet
65000 Tarbes
France
Phone: +33 5 62 38 65 73
Fax: +33 5 62 38 65 57

USA

VAM Drilling USA Inc.
Houston Plant
6300 Navigation Blvd
Houston, Texas 77011
USA
Phone: +1 713 844 3700
Fax: +1 713 921 0988

HOLLAND

Vallourec Mannesmann
Oil & Gas Nederland B.V.
Heerhugowaard Plant
Kelvinstraat 8-16-1704 RS
Heerhugowaard
The Netherlands
Phone: +31 72 571 82 55
Fax: +31 72 574 34 21

Contacts - Regional sales offices

Regional sales offices

North & South America

VAM Drilling USA Inc.
6300 Navigation Blvd
Houston, Texas 77011
USA
Phone: +1 713 844 3700
Fax: +1 713 921 0988
Email: contact.usa@vamdrilling.com

Brazil

V&M do Brasil S.A.
Rua Lauro Müller, 116-sala 2508
Edificio Rio Sul Center - Botafogo
22290-160 Rio de Janeiro-RJ - Brazil
Phone: +55 21 3873 83 00
Fax: +55 21 3351 72 61
Email: contact.usa@vamdrilling.com

North Europe

Vallourec Mannesmann Oil & Gas UK Ltd
Prospect Place, Westhill Industrial Estate
Westhill, Aberdeen AB32 6SY
UK
Phone: +44 1224 279 340
Fax: +44 1224 279 384
Email: contact.uk@vamdrilling.com

Western Europe

VAM Drilling France S.A.S.
27 avenue du Général Leclerc
92660 Boulogne-Billancourt
France
Phone: +33 1 49 09 38 00
Fax: +33 1 49 09 36 94
Email: contact.france@vamdrilling.com
Email: contact.italy@vamdrilling.com

Far East

VAM Drilling Singapore Pte Ltd
360 Orchard Road
12-02 International Building
Singapore 238869
Phone: +65 6733 47 78
Fax: +65 6738 91 75
Email: contact.singapore@vamdrilling.com

Canada

VAM Canada Inc.
1904 444 5th Ave SW
Calgary Alberta
Canada T2P-2T8
Phone: +1 403 233 0119
Fax: +1 403 266 2332
Email: contact.canada@vamdrilling.com

Middle East

VAM Dubai L.L.C
World Trade Center
Level 14, Office 14:01, PO BOX 9405
Dubai, UAE
Phone: +97 14 3320313
Fax: +97 14 3320314
Email: contact.dubai@vamdrilling.com

Europe & CIS

Vallourec Mannesmann Oil & Gas Germany GmbH
Theodorstrasse 90
40472 Düsseldorf
Germany
Phone: +49 211 960 2352
Fax: +49 211 960 3924
Email: contact.cis@vamdrilling.com

Africa

VAM Drilling France S.A.S.
7 rue des Frères Lumières
58200 Cosne-sur-Loire
France
Phone: +33 3 86 39 52 00
Fax: +33 3 86 39 52 01
Email: contact.france@vamdrilling.com

China

V&M (Beijing) Co. Ltd
Room 301, East Ocean Center
24A Jianguomenwai Avenue
Beijing 100004 China
Phone: +86 10 5923 3000
Fax: +86 10 5923 3063
Email: contact.china@vamdrilling.com