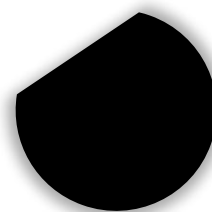


Hilong Group

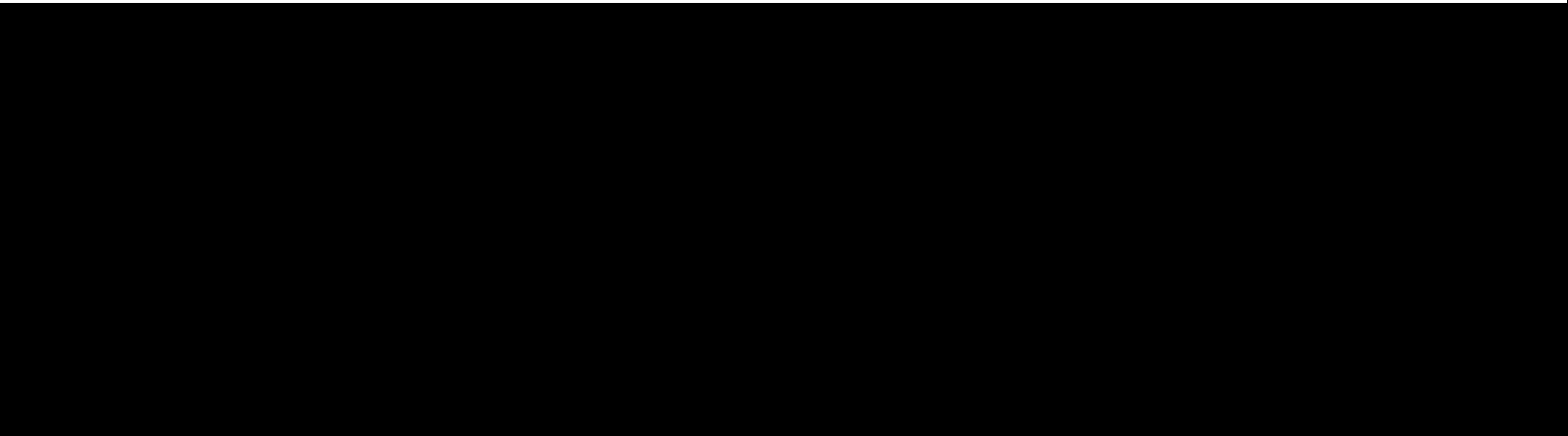


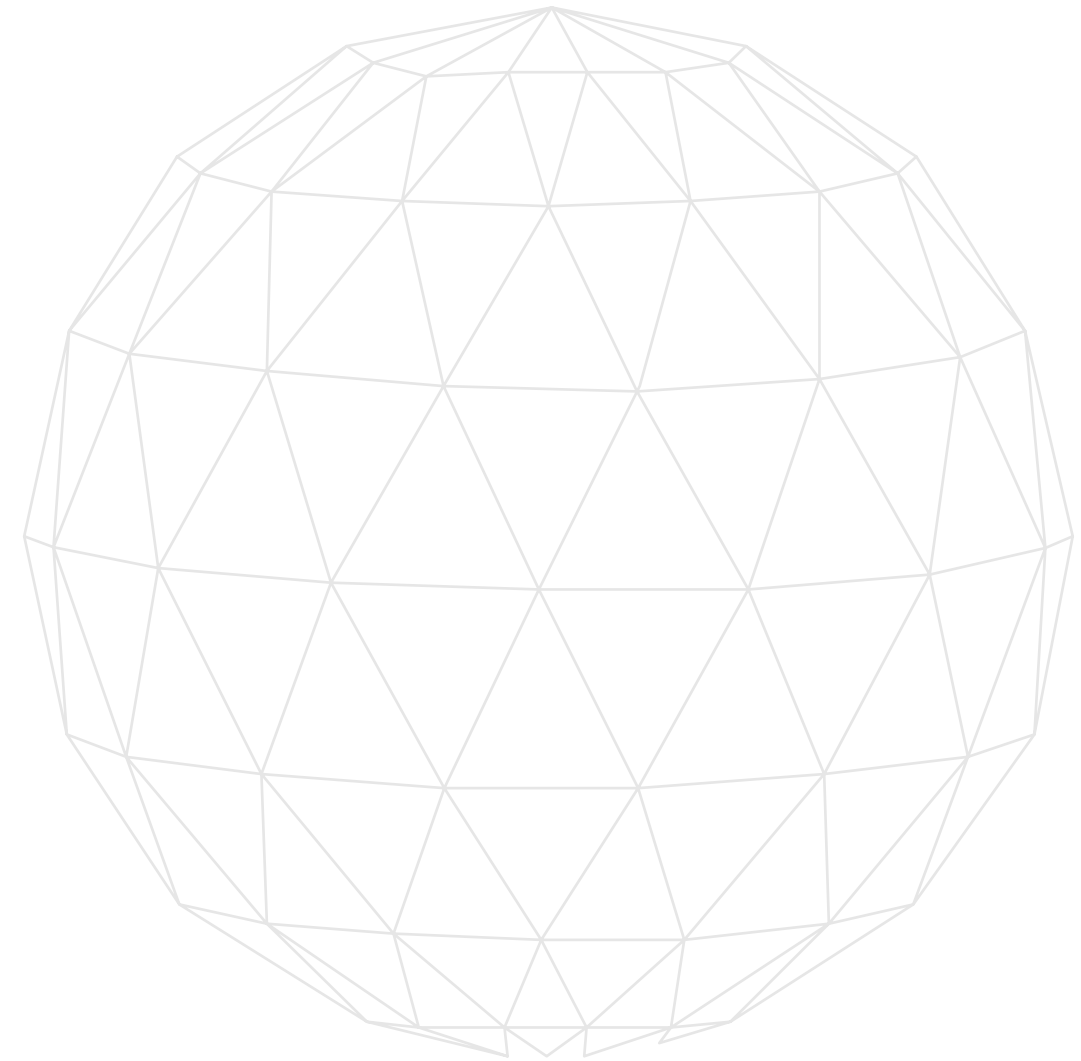
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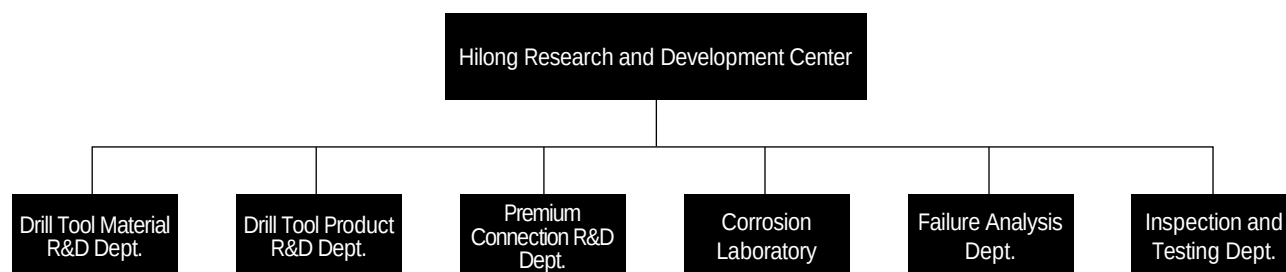
HILONG GROUP OF COMPANIES





Appendix A (Tables in SI units)

Research and Development



Hilong has a specific R&D center dedicated to research and technological innovation of drilling tools to continuously meet the needs of users and drilling operation. To drilling the wells deeper, longer and more effectively and safely is the focus and direction of our R&D.

The R&D Center is equipped with advanced anti-hydrogen sulfide stress corrosion testing equipment, scanning electron microscope, MTS tensile and twisted composite material dynamic testing system, and other internationally first class testing equipment, and was approved by the China National Accreditation Service for Conformity Assessment (CNAS).

- Hilong's proprietary connection (HLIDS®/HLMT®/HLST®/HLIST®/HLDT-GS® series) can significantly improve torsional strength and hydraulic performance, and is suitable for deep wells, extra deep wells, ERD, etc.
- Hilong's super high-strength drill pipe (HLDT-SH®Z140, HLDT-SH®V150, HLDT-SH®U165) with higher tensile and torsional strength, enables the drill pipe to be drilled deeper and farther, and is suitable for deep wells, extra deep wells, and ERD.
- Hilong's Sour Service drill pipe and Heavy weight drill pipe are suitable for oil and gas drilling in a hydrogen sulfide environment. The highest steel grade reaches 125KSI, which meets the drilling requirements of deep wells containing hydrogen sulfide, extra deep wells, and ERD.
- Using special toothless pneumatic slips, Hilong's Non-Slip-Crush drill pipe can completely protect the drill pipe body from slip tooth bites and extend drill pipe life. It can significantly improve the speed and efficiency of TIH and TOH (efficiency increased by more than 15%), reducing non-drilling time, lowering the cost of operation.
- Hilong's slip-protected drill pipe has a thick-walled slip-protected section at the box end of drill pipe, which improves the anti-crushing ability of the drill pipe, reduces the risk of "washouts" at the slip, and increases the fatigue life of the drill pipe.
- Hilong's landing string drill pipe is suitable for landing heavy casing strings in extra-deep wells and offshore drilling wells. It has a large-size outer diameter, uses extra-high strength materials, and has a special slip-protected section and sufficient tensile hoisting capacity.

- With an integrated IoT management system and intelligent reader/writer devices, Hilong's Electronic Tag Drilling Tool and IoT Management System efficiently and accurately achieves full life cycle management of drilling tools from production, warehouse in/out, allocation, use, maintenance, and inspection, to scrapping.
- Hilong's efficient cuttings bed clean drill tool reduces cutting deposits, improves drilling speed and saves drilling time. It is especially suitable for wells with large inclination and ERD.
- Hilong's slim drill pipe is specially used for small hole drilling, workover, and window sidetracking drilling and short radius horizontal well drilling.

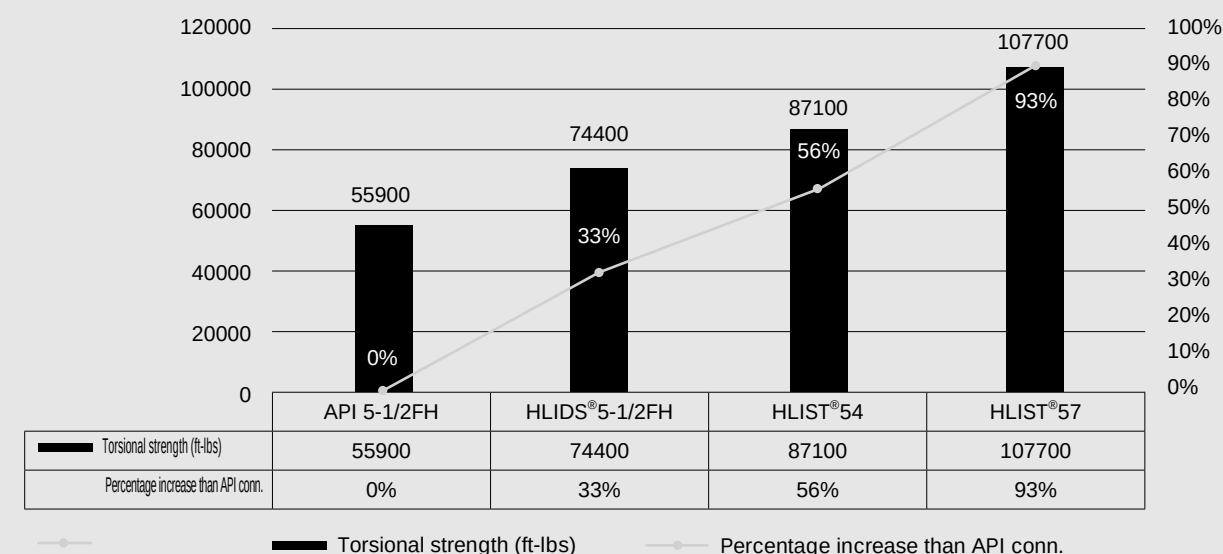
With industry development and technological innovation, there is an essential need in the industry for a drilling tool solution that performs better than standard API drilling tools, to meet the needs of deeper wells and more complex well conditions, while being more efficient and economical.

Our goal is to provide users with the most optimized products and services.

You are welcome to contact Hilong to learn more about our professional oil drilling tool solution.



Torsional Strength Comparison
with Tool Joint OD 7", ID 4", SMYS 120ksi



Hilong implements quality management control in every link of the production process starting from raw material procurement. We have fulfilled comprehensive measures in terms of personnel, equipment, materials, production process, operation standards, production environment, and incentive mechanisms, to ensure product quality. The adoption of the MES and ERP system realizes real-time monitoring of the entire production process. Every product, every production link, and every quality control point has relevant quality control, ensuring the quality of the delivered products meets the specified requirements.



HSE Policy, Goals and Commitment

People-oriented, full participation, scientific management, and sustainable development.

Pursue zero accidents, zero injuries, zero pollution, and create first-class HSE performance.

Aiding by the laws and regulations of the country and region where we are located, respect local customs and habits, and respond to customer HSE requirements.

Pursue the goal of not harming people and the environment, protect the environment, save energy, promote clean production, and commit to sustainable development.

Drill Pipe

Modern drilling requires more efficient activities (faster drilling speed, higher drilling quality, suitability for special drilling environments, and safer drilling). As the main drilling tool, the performance and quality of the drill pipe are pivotal to drilling ability, efficiency, quality, and drilling safety.

Hilong is committed to the technological innovation of drill pipes. It constantly designs and develops high-end drill pipe products to meet the requirements of modern efficient drilling, and with exceptional quality and excellent product performance, it contributes to meeting the needs from clients and modern drilling projects.

■ Hilong Drill Pipe Quality and Performance

- Excellent steel purity, metallurgical quality, microstructure uniformity, impact toughness and fatigue resistance.
- Adopt optimized Miu and Miu-R designs, combined with a special stable upsetting process, which improves the fatigue resistance on upsetting end of the drill pipe.
- Using MES and ERP systems, it can realize comprehensive information management of the entire process from order-to-shipment, including the entire manufacturing process, inspection and test acceptance, and product traceability.



Pipe-body Heat Treatment

Upset Profile and MIU Control



Drill Pipe Body Full Length Automatic Ultrasonic Test (FLUT)

- Pipe body 100% FLUT (longitudinal, transverse, oblique ultrasonic testing + ultrasonic thickness measurement) + 100% pipe end MPI (or UT), drill pipe tool joint 100%UT+100%MPI, welding zone 100%UT+100% MPI.
- Integration: drill pipe tool joint manufacturing, upsetting, heat treatment and friction welding, hardbanding wire production and application, internal coating material production and application.

■ Drill Pipe Product Range

Main drill pipe specifications (outer diameter):

2 3/8", 2 7/8", 3 1/2", 4", 4 1/2", 5", 5 1/2", 5 7/8", 6 5/8", 7 5/8", 8 5/8"

Please refer to Table A.1 or Table B.1 for a list of recommended sizes of Hilong's commonly used drill pipes.

Drill pipe product standards:

Adopt optimized Miu and Miu-R designs, combined with a special stable upsetting process, which improves the fatigue resistance on upsetting end of the drill pipe.

Drill pipe product type:

- Standard drill pipe (API Spec 5DP/NS-1/DS-1 standard drill pipe)
- Hilong proprietary drill pipe

■ Hilong's Drill Pipe Premium Connection

Advantages of Hilong Premium Connection:

- Improves the torsional strength and torque capacity of tool joint, due to which it is more suitable for HDD wells and extra deep wells.
- Increases the inside diameter of tool joint, thereby improving hydraulic performance and drilling efficiency. It is especially suitable for HDD wells and extra deep wells.
- Reduces the external diameter of tool joint, is more suitable for small hole drilling and improves the fishing ability.
- Improves the stress distribution, reduces the stress concentration factor, and improves the fatigue resistance of tool joint.

■ Hilong Special Drill Pipe Material / Steel Grade

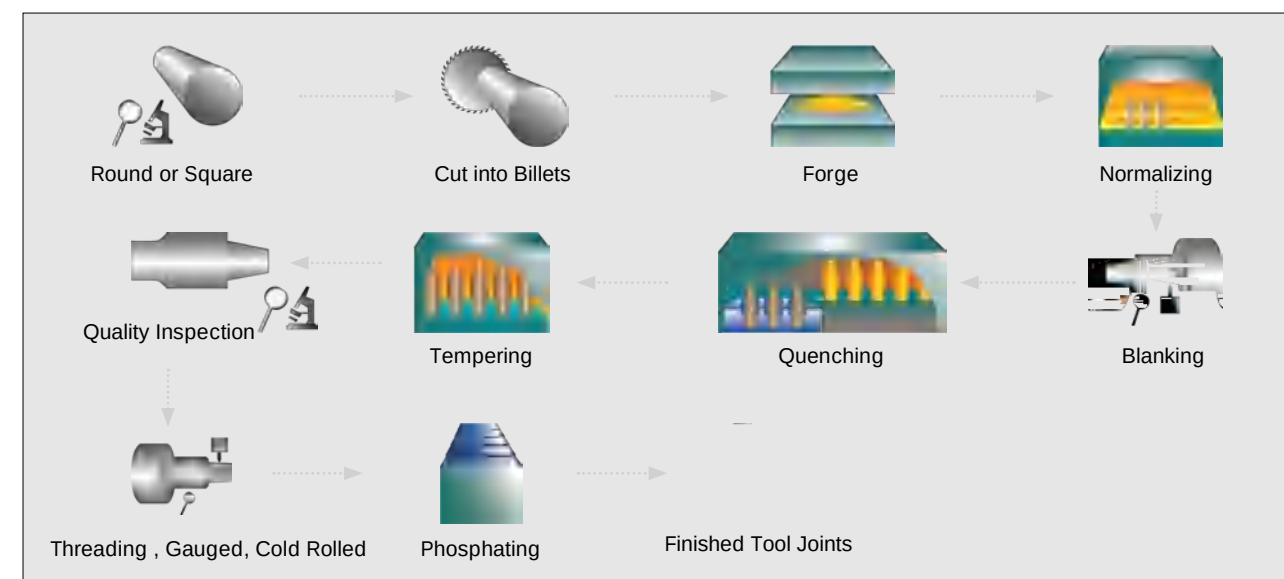
- Hilong sour service drill pipe grade

Usage: applicable for sulfur-containing and high-sulfur drilling environment.

Steel grade: HLD-T-SS[®]75, HLD-T-SS[®]95, HLD-T-SS[®]105, HLD-T-SS[®]110, HLD-T-S[®]

Drill Pipe Manufacturing Flow Chart

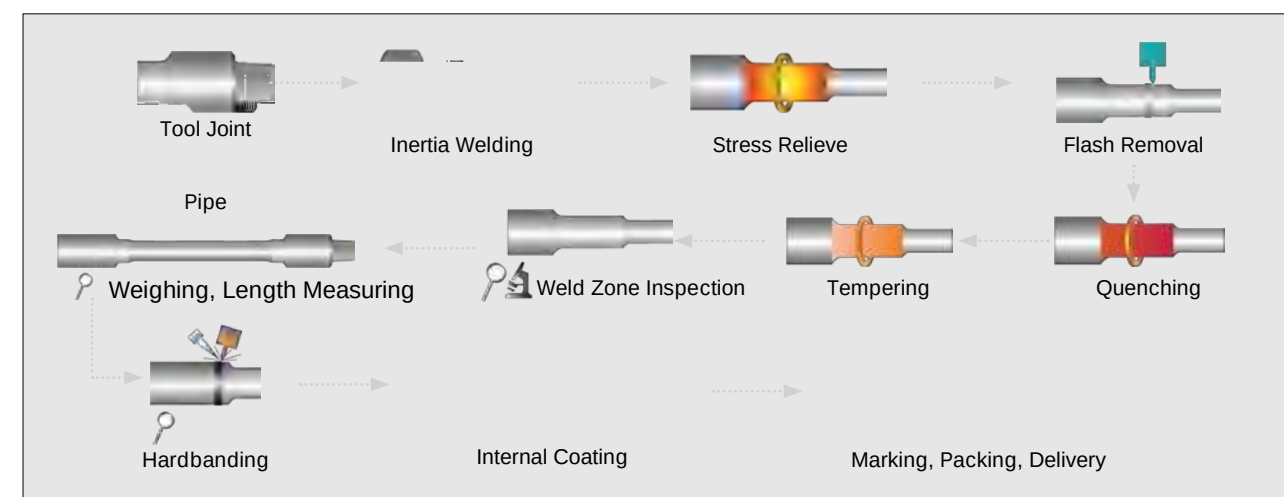
Tool Joint Manufacturing Flow Chart



Drill Pipe Body Manufacturing Flow Chart



Drill Pipe Welding Flow Chart





HWDP					
Tool Joint OD Range	Min. Yield Strength	Min. Tensile Strength	Min. Elongation (%)	Toughness LCVN, Full Size, 21 Min. Avg. / Min. Single	Min. Hardness (BHN)
≤ 6.875"	110 ksi	140 ksi	13	40 / 35 ft-lbf	285
≤174.6 mm	758 Mpa	965 Mpa		54 / 47J	
> 6.875	100 ksi	135 ksi	13	40 / 35 ft-lbf	285
> 174.6 mm	689 Mpa	931 Mpa		54 / 47J	

Drill Collar

Product Introduction

HLIDS[®] is an API compatible high torque double shoulder connection developed by Hilong.

HLMT[®] is a double shoulder connection designed and developed refer to API connection and customer's requirement on site.

HLIDS[®] and HLMT[®] have features as follows:

- The same standard thread profile as API;
- Double shouldered design;
- Smooth transmission on inside diameter;



■ Product Advantage

-

■ Product Advantage

Performance

- High torsional strength. Under the same conditions, the torsional strength of HLST® and HLIST® can be reached or exceeded. This allows for use of streamlined tool joints and improved hydraulic performance.
- Better Fatigue Resistance. We have further improved the fatigue resistance of our products. HLNST® provides better fatigue resistance than HLST® or HLIST connections, which can result in an increased product life.

Ease of Use

- Faster Makeup and breakout. HLNST® has significantly fewer turns from stab to makeup and breakout than comparable HLST® or HLIST® connections. This saves time and reduces the amount of wear on threads.
- Easier to Makeup. The improved guide side angle makes it easier to makeup. Reduce the difficulty of use.

Easier maintenance

Improved tooth profile makes maintenance easier. Reduce maintenance costs.

- Reduced Repair Frequency. Repairs are expensive and time consuming. The field inspection tolerances for HLNST® have been widened without compromising performance, so you do not have to send the pipe in for repairs as often. This reduces downtime and saves you money.
- Less Recut Loss. There is less material loss on recuts, which allows for more recuts before needing to replace the string. The tong gripping distance has also been reduced, allowing more room for recut without adversely impacting performance.

Hilong Premium Connection:

HLDT-GS[®] Series

Product Introduction

HLDT-GS[®] can be used in Drill Stem Testing (DST) operation, hydraulic fracturing, well completion and underbalanced drilling with high metal-to-metal internal seal performance under gas pressure loading. Compared with the traditional single function drill string, using HLDT-GS[®] drill string can save time and reduce cost.

■ Product Advantage

Compared to API connections, HLDT-GS[®] has the following features:

- The use of double shouldered compound sealing structure allows the smooth transition of inner diameter, and smooth metal surface elastic interference fit achieves metal-to-metal seal.
- Seal integrity is not affected by tensile load and multiple drilling trips.

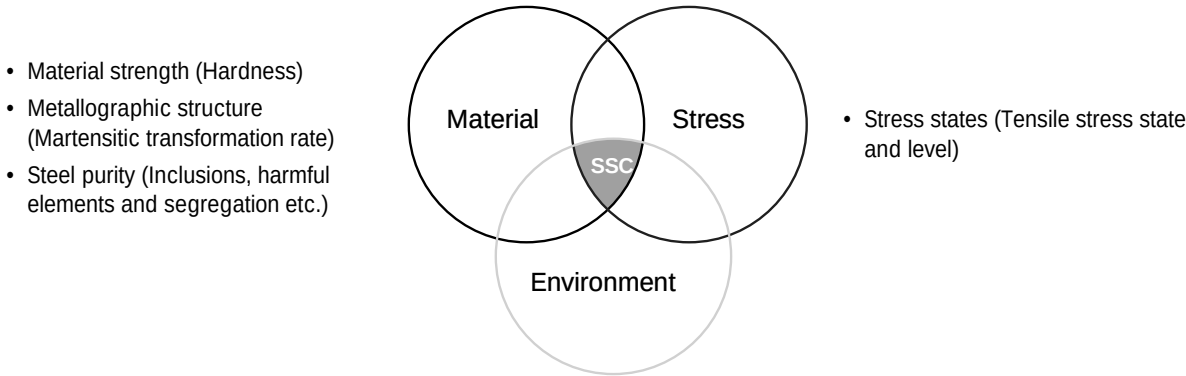
Hilong Sour Service Drill Pipe / Sour Service Heavy Weight Drill Pipe

Brief Introduction

Drilling at H₂S environment with standard drill pipe is highly suspected to Sulfide Stress Cracking (SSC). Considering the sulfide stress cracking is extremely harmful, the developing of sour service drill pipe to meet the requirements of safe drilling in sulfur-containing environments is indeed necessary.

Sulfide stress cracking is extremely harmful, the developing of sour service drill pipe to meet the requirements of safe drilling in sulfur-containing environments is indeed necessary.

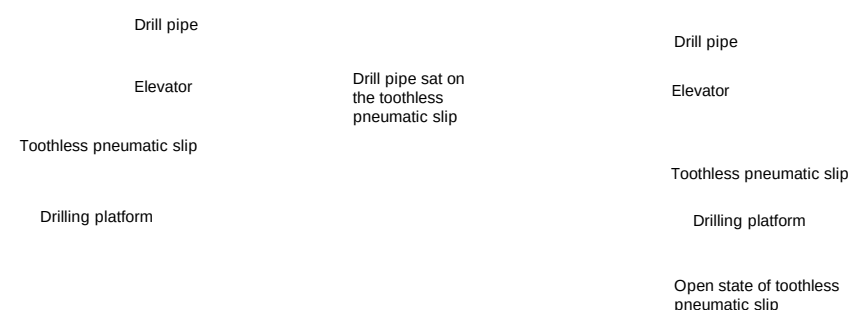
Key Factors to Sulfide Stress Cracking (SSC)



Hilong Non-Slip-Crush Drill Pipe

Product Introduction

Hilong Non-Slip-Crush (NSC) drill pipe is specially designed for solving problems such as the damage to the drill pipe body by the slip, the low operation efficiency of double-elevator, and the high labor intensity in the operation of TIH and TOH. This product adds one more shoulder positioned close to the box end based on normal API standard drill pipe. During the trip operation, drill string is set at the toothless pneumatic slip, and its weight is supported by the bearing slider of the slip along the axial direction. Besides, this product can afford a convenient way for make-up and break-out by raising its position.



(a) Set the slip (b) Tripping into/out of the hole

Product Advantage

Compared to standard drill pipe, Hilong NSC drill pipe has advantages as follows:

- It completely avoids the slip crush on drill pipe body when associated with toothless pneumatic slip, thus extend the drill pipe service life;
- It changes from the traditional double-elevator into single-elevator in the operation of TIH and TOH, which bring the advantage with no need for removing and hanging the elevator frequently. At the same time, a higher box tool joint position design can lead to the make and break more convenient, lower the labor's intensity; and it improves the safety of operation;
- Improving about 15% efficiency of TIH and TOH which compared with double-elevator, reducing non-drilling time, lowering the cost of operation;
- Reducing the sticking risk of drill pipe effectively, lowering the frictional resistance remarkably.

Product Specification

Size Range: 4", 4 1/2", 5", 5 1/2", 5 7/8", 6 5/8" etc.

Steel Grade: G105, S135, HLDT-SH®V150, HLDT-SH®U165.

Well Condition

More suitable for harsh conditions, including deep well, super deep well, offshore well, horizontal well, extended reach well, etc.



Hilong Slip-Protected Drill Pipe

Product Introduction

In order to reduce tripping time in the drilling process to improve drilling efficiency, "one elevator one slip" is the general tripping mode. The pipe body within the range of 600mm-900mm under the box end is always injured by using slip and cause "washouts" in pipe body. The slip transverse and longitudinal loads beared by drill pipe are higher and higher along with drilling depth increasing, complicated geological conditions and offshore drilling. Higher slip crushing capability of the pipe body is required. To solve these problems, Hilong designed and manufactured slip-proof drill pipe, the long, thick-walled upset section is designed on the box end.

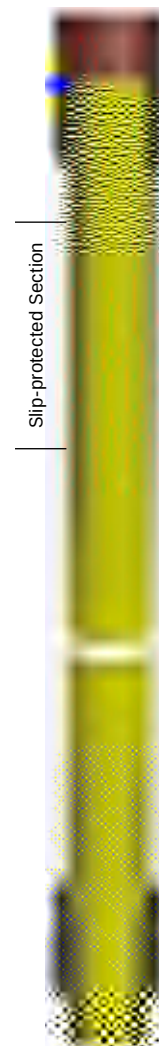
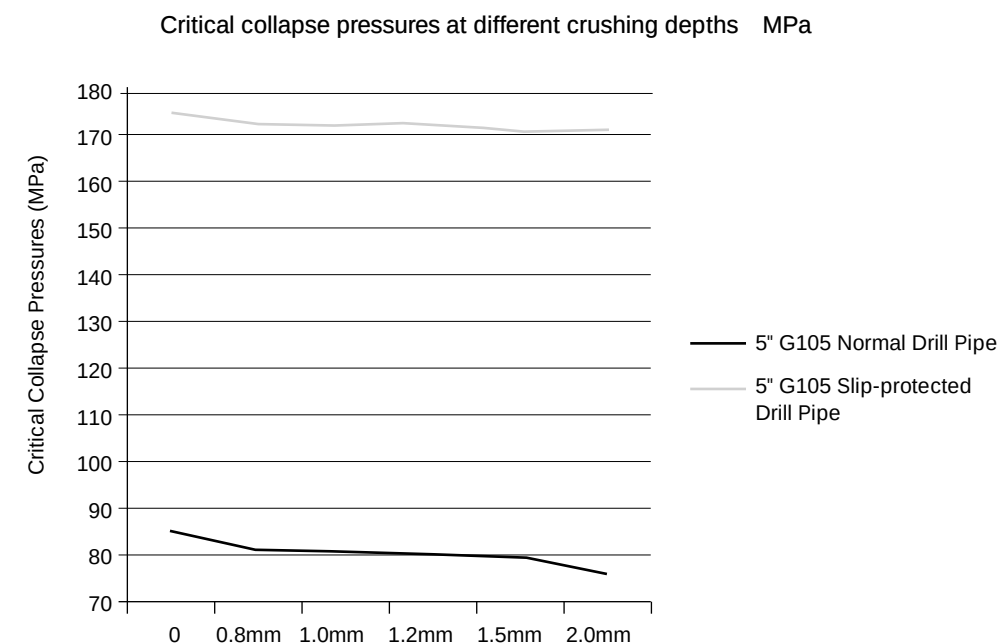
Product Advantage

- Improving drill pipe slip crushing capability. Take 5" 19.50lb/ft G105 for example, the drill pipe crushing capability increased by 140%;
- Fatigue test proved that, because of slip injury, the fatigue life of ordinary drill pipe decreased by 60%. The fatigue life of slip-proof drill pipe (slip crush protest drill pipe) increased more than 5 times in the same slip injury condition.

Product Specification

Size Range: 4", 4-1/2", 5", 5 1/2", 5 7/8", 6 5/8", 7 5/8".

Steel Grade: G105, S135, HLDT-SH®Z140, HLDT-SH®V150.



■ Product Advantage

- Special external upset technics effectively reduce stress concentration on the upset vanishing area, reduce fatigue failure possibility and improve anti-fatigue performance;
- The ID of the tool joint is almost the same as that of the drill pipe body;
- Decreasing annular pressure loss by 20%-50% and improving hydraulic efficiency and drilling speed;
- The flush-hole structure is suitable for continuous coring and wire-line coring.

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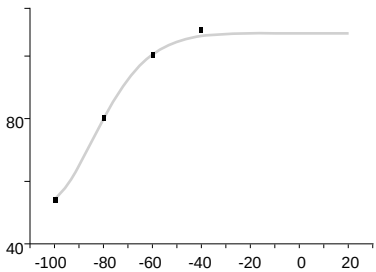


Table 11. Hilong Arctic Service Drill Pipe Performance Data

	Grade	Yield strength	Tensile strength	Charpy impact value (full size -60 or -75 , longitudinal
Pipe body	HLDLT-AS®75	517/724 MPa	≥689 MPa	≥70 J
		75/105ksi	≥100ksi	≥52 ft-lb
	HLDLT-AS®95	655/862 MPa	≥724 MPa	≥70 J
		95/125ksi	≥105ksi	≥52 ft-lb
	HLDLT-AS®105	724/931 MPa	≥793 MPa	≥70 J
		105/135ksi	≥115ksi	≥52 ft-lb
	HLDLT-AS®135	931/1138 MPa	≥1000 MPa	≥70 J
		135/165ksi	≥145ksi	≥52 ft-lb
Tool joint	—	827/1138 MPa	≥965 MPa	≥54 J
		120/165ksi	≥140ksi	≥40 ft-lb
Weld zone	—	10% greater than pipe body, failure must not occur on weld line		≥27 J
				≥26 ft-lb



■ Product Advantages

- Accurate management – Manage the full life cycle process of each drill tool—



■ Product Advantage

- Cleaning efficiency improvement
 - Reduce cuttings bed height at given Flow Rate from 30% to 50%.
 - Improve Erosion Bed rate at given RPM more than 40%.
- Rig time saving
 - Circulating time to recover cuttings can be decreased by more than 50%.
 - Back reaming operations can be reduced or eliminated.
 - Increase rate of penetration.
- Frictional loading improvement
 - Torque & Drag loading can be decreased by 40%.
 - Reduction in Pressure Losses up to 50%.
- Reduce downhole failure risk and eliminate differential sticking.
- Cut down on well bore damage and provide better weight on bit.

HLECDT™ Spiral groove local structure



■ Product Advantages

The tool joint outer diameter of Hilong slim drill pipe is close or equal to the outer diameter of the drill pipe body. It has the characteristics of small tool joint outer diameter and good drill pipe flexibility. It can be used in slim hole

[illegible]

[illegible]

[illegible]

Pipe Body OD (mm)	Nominal Wall Thickness (mm)	Upset Type	Grade	RSC Type	Tool Joint	
					OD (mm)	ID (mm)
101.60	8.38	IU	SS105 / HL110SS	NC40	139.70	61.91
101.60	8.38	IU	SS105 / HL110SS / HL120S / HL125S	HLIDS®38	127.00	65.09
101.60	8.38	IU	SS105 / HL110SS / HL120S / HL125S	HLIDS®40	133.35	68.26
101.60	8.38	IU	SS105 / HL110SS / HL120S / HL125S	HLMT®38	127.00	65.09
101.60	8.38	IU	SS105 / HL110SS / HL120S / HL125S	HLMT®40	133.35	68.26
101.60	8.38	IU	SS105 / HL110SS / HL120S / HL125S	HLST®36	120.65	53.98
101.60	8.38	IU	SS105 / HL110SS / HL120S / HL125S	HLST®39	123.83	65.09
101.60	8.38	IU	SS105 / HL110SS / HL120S / HL125S	HLIST®38	120.65	61.91
101.60	8.38	IU	SS105 / HL110SS / HL120S / HL125S	HLIST®39	123.83	65.09
101.60	9.65	IU	SS105 / HL110SS / HL120S / HL125S	HLIDS®40	133.35	65.09
101.60	9.65	IU	SS105 / HL110SS / HL120S / HL125S	HLMT®40	133.35	65.09
101.60	9.65	IU	SS105 / HL110SS / HL120S / HL125S	HLST®39	123.83	65.09
101.60	9.65	IU	SS105 / HL110SS / HL120S / HL125S	HLST®40	133.35	68.26
101.60	9.65	IU	SS105 / HL110SS / HL120S / HL125S	HLIST®39	123.83	65.09
114.30	8.56	IEU	SS75	NC46	158.75	82.55
114.30	8.56	IEU	SS95 / SS105 / HL110SS	NC46	158.75	76.20
114.30	8.56	IEU	HL120S / HL125S	NC46	158.75	69.85
114.30	8.56	IEU	SS105 / HL110SS / HL120S / HL125S	HLIDS®46	152.40	82.55
114.30	8.56	IEU	SS105 / HL110SS / HL120S / HL125S	HLMT®46	152.40	82.55
114.30	8.56	IEU	SS105 / HL110SS / HL120S / HL125S	HLST®46	152.40	82.55
114.30	8.56	IEU	SS105 / HL110SS / HL120S / HL125S	HLIST®46	152.40	82.55
114.30	8.56	IEU	SS105 / HL110SS / HL120S / HL125S	HLIDS®40	133.35	65.09
114.30	8.56	IEU	SS105 / HL110SS / HL120S / HL125S	HLST®40	133.45	68.26
114.30	10.92	IEU	SS75	NC46	158.75	76.20
114.30	10.92	IEU	SS95	NC46	158.75	69.85
114.30	10.92	IEU	SS105 / HL110SS	NC46	158.75	63.50
114.30	10.92	IEU	HL120S / HL125S	NC46	158.75	57.15
114.30	10.92	IEU	SS105 / HL110SS / HL120S / HL125S	HLIDS®46	152.40	76.20
114.30	10.92	IEU	SS105 / HL110SS / HL120S / HL125S	HLMT®46	152.40	76.20
114.30	10.92	IEU	SS105 / HL110SS / HL120S / HL125S	HLST®46	152.40	76.20
114.30	10.92	IEU	SS105 / HL110SS / HL120S / HL125S	HLIST®46	152.40	76.20
127.00	9.19	IEU	SS75	NC50	168.28	95.25
127.00	9.19	IEU	SS95	NC50	168.28	88.90
127.00	9.19	IEU	SS105 / HL110SS	NC50	168.28	82.55
127.00	9.19	IEU	SS105 / HL110SS / HL120S / HL125S	HLIDS®50	168.28	88.90
127.00	9.19	IEU	SS105 / HL110SS / HL120S / HL125S	HLMT®50	168.28	88.90

Pipe Body OD (mm)	Nominal Wall Thickness (mm)	Upset Type	Grade	RSC Type	Tool Joint	
					OD (mm)	ID (mm)
127.00	9.19	IEU	SS105 / HL110SS / HL120S / HL125S	HLST®46	152.40	82.55
127.00	9.19	IEU	SS75 / SS95 / SS105 / HL110SS	HLST®52	165.10	101.60
127.00	9.19	IEU	HL120S / HL125S	HLST®52	165.10	95.25
127.00	9.19	IEU	SS105 / HL110SS / HL120S / HL125S	HLIST®46	152.40	88.90
127.00	9.19	IEU	SS105 / HL110SS / HL120S / HL125S	HLIST®50	165.10	95.25
127.00	12.70	IEU	SS75	NC50	168.28	88.90
127.00	12.70	IEU	SS95	NC50	168.28	76.20
127.00	12.70	IEU	SS105 / HL110SS	NC50	168.28	69.85
127.00	12.70	IEU	SS105 / HL110SS / HL120S / HL125S	HLIDS®50	168.28	76.20
127.00	12.70	IEU	SS105 / HL110SS / HL120S / HL125S	HLMT®50	168.28	76.20
127.00	12.70	IEU	SS105 / HL110SS / HL120S / HL125S	HLST®46	158.75	69.85
127.00	12.70	IEU	SS105 / HL110SS / HL120S / HL125S	HLST®52	168.28	85.73
127.00	12.70	IEU	SS105 / HL110SS / HL120S / HL125S	HLIST®50	168.28	88.90
139.70	9.17	IEU	SS75	5-1/2FH	177.80	101.60
139.70	9.17	IEU	SS95	5-1/2FH	177.80	95.25
139.70	9.17	IEU	SS105 / HL110SS	5-1/2FH	184.15	88.90
139.70	9.17	IEU	SS105 / HL110SS / HL120S / HL125S	HLIDS®5-1/2FH	177.80	101.60
139.70	9.17	IEU	SS105 / HL110SS / HL120S / HL125S	HLMT®5-1/2FH	177.80	101.60
139.70	9.17	IEU	SS105 / HL110SS / HL120S / HL125S	HLST®52	165.10	95.25
139.70	9.17	IEU	SS105 / HL110SS / HL120S / HL125S	HLST®54	171.45	101.60
139.70	9.17	IEU	SS105 / HL110SS / HL120S / HL125S	HLST®57	177.80	104.78
139.70	9.17	IEU	SS105 / HL110SS / HL120S / HL125S	HLIST®54	168.28	101.60
139.70	9.17	IEU	SS105 / HL110SS / HL120S / HL125S	HLIST®57	177.80	104.78
139.70	10.54	IEU	SS75	5-1/2FH	177.80	101.60
139.70	10.54	IEU	SS95 / SS105 / HL110SS	5-1/2FH	184.15	88.90
139.70	10.54	IEU	SS105 / HL110SS / HL120S / HL125S	HLIDS®5-1/2FH	177.80	101.60
139.70	10.54	IEU	SS105 / HL110SS / HL120S / HL125S	HLMT®5-1/2FH	177.80	101.60
139.70	10.54	IEU	SS105 / HL110SS / HL120S / HL125S	HLST®54	174.63	98.43
139.70	10.54	IEU	SS105 / HL110SS / HL120S / HL125S	HLST®57	177.80	101.60
139.70	10.54	IEU	SS105 / HL110SS / HL120S / HL125S	HLIST®54	171.45	98.43
139.70	10.54	IEU	SS105 / HL110SS / HL120S / HL125S	HLIST®57	177.80	101.60
149.23	9.17	IEU	SS75	5-1/2FH	177.80	101.60
149.23	9.17	IEU	SS95 / SS105 / HL110SS	5-1/2FH	184.15	88.90
149.23	9.17	IEU	HL120S / HL125S	HLIDS®5-1/2FH	177.80	101.60
149.23	9.17	IEU	HL120S / HL125S	HLMT®5-1/2FH	177.80	101.60
149.23	9.17	IEU	HL120S / HL125S	HLST®57	177.80	107.95



Note: Abbreviated steel grade
SS75 - HLD-T-SS[®]75; SS95 - HLD-T-SS[®]95; SS105 - HLD-T-SS[®]105; HL110SS - HLD-T-SS[®]110; HL120S - HLD-T-S[®]120;

Table A.4 Commonly-used Drill Collars Data

Size	OD	Bore	RSC Type	Length	RSC Bevel Dia.	Reference Bending Strength Ratio	Drift
	D	d		L	Df	BSR	
in	mm	mm		m	mm		mm
3 1/8	79.4	31.8	NC23	9.14	76.2	2.57	35.0
3 1/2	88.9	38.1	NC26	9.14	82.9	2.42	41.3
4 1/8	104.8	50.8	NC31	9.14 or 9.45	100.4	2.43	54.0
4 3/4	120.6	50.8	NC35	9.14 or 9.45	114.7	2.58	54.0
5	127.0	57.2	NC38	9.14 or 9.45	121.0	2.38	60.4
6	152.4	57.2	NC44	9.14 or 9.45	144.5	2.49	60.4
6	152.4	71.4	NC44	9.14 or 9.45	144.5	2.84	74.6
6 1/4	158.8	57.2	NC44	9.14 or 9.45	149.2	2.91	60.4
6 1/4	158.8	71.4	NC46	9.14 or 9.45	150.0	2.63	74.6
6 1/2	165.1	57.2	NC46	9.14 or 9.45	154.8	2.76	60.4
6 1/2	165.1	71.4	NC46	9.14 or 9.45	154.8	3.05	74.6
6 3/4	171.4	57.2	NC46	9.14 or 9.45	159.5	3.18	60.4
7	177.8	57.2	NC50	9.14 or 9.45	164.7	2.54	60.4
7	177.8	71.4	NC50	9.14 or 9.45	164.7	2.73	74.6
7 1/4	184.2	71.4	NC50	9.14 or 9.45	169.5	3.12	74.6
7 3/4	196.8	71.4	NC56	9.14 or 9.45	185.3	2.70	74.6
8	203.2	71.4	NC56	9.14 or 9.45	190.1	3.02	74.6
8 1/4	209.6	71.4	6-5/8REG	9.14 or 9.45	195.6	2.93	74.6
9	228.6	71.4	NC61	9.14 or 9.45	212.7	3.17	74.6
9 1/2	241.3	76.2	7-5/8REG	9.14 or 9.45	223.8	2.81	79.4
9 3/4	247.6	76.2	NC70	9.14 or 9.45	232.6	2.57	79.4
10	254.0	76.2	NC70	9.14 or 9.45	237.3	2.81	79.4
11	279.4	76.2	8-5/8REG	9.14 or 9.45	266.7	2.84	79.4

Table A.5 HLIDS® Connection Mechanical Characteristics

RSC Type	Tool Joint OD (mm)	Tool Joint ID (mm)	Torsional Strength (N·m)	Tensile Strength (kN)	Recommended Makeup Torque (N·m)
HLIDS®23	76.20	34.93	8800	1300	5300
HLIDS®26	85.73	44.45	12100	1400	7300
HLIDS®31	111.13	41.28	32600	2800	19500
	104.78	53.98	20700	2000	12400
	104.78	50.80	23900	2200	14400
HLIDS®38	127.00	65.09	36100	2900	21600
	127.00	61.91	40600	3200	24400
	127.00	53.98	50900	3800	30500
	120.65	68.26	30900	2600	18500
	120.65	65.09	34500	2900	20700
HLIDS®40	139.70	50.80	70300	4800	42200
	133.35	71.44	40000	3200	24000
	133.35	68.26	45300	3500	27200
	133.35	65.09	50400	3700	30200
HLIDS®46	133.35	61.91	54600	4000	32800
	152.40	82.55	59700	4000	35800
	152.40	76.20	73300	4700	44000
	152.40	69.85	85700	5300	51400
HLIDS®50	168.28	95.25	66200	4200	39700
	168.28	88.90	83500	4900	50100
	168.28	82.55	99500	5700	59700
	168.28	76.20	114000	6300	68400
	168.28	69.85	127300	6900	76400
	165.10	95.25	65900	4200	39600
HLIDS®5-1/2FH	190.50	82.55	158700	7900	95200
	190.50	76.20	174400	8600	104700
	184.15	95.25	121800	6500	73100
	184.15	92.08	131300	6800	78800
	184.15	88.90	140500	7200	84300
	177.80	101.60	100900	5600	60500
	177.80	98.43	111100	6100	66700
HLIDS®6-5/8FH	209.55	120.65	162300	7500	97400
	209.55	117.48	176500	8000	105900
	203.20	127.00	131800	6500	79100
	203.20	123.83	146800	7000	88100

Note: All data is calculated based on SMYS 827MPa, and Makeup Torques are based on a friction factor of 1.0.



Table A.6 HLMT[®] Connection Mechanical Characteristics

RSC Type	Tool Joint OD (mm)	Tool Joint ID (mm)	Torsional Strength (N·m)	Tensile Strength (kN)	Recommended Makeup Torque (N·m)
HLMT®2-3/8PAC	73.03	34.93	9500	1100	5700
HLMT®2-7/8PAC	79.38	38.10	11600	1200	7000
HLMT®38	127.00	65.09	40100	2900	24100
	127.00	61.91	44700	3200	26800
	127.00	57.15	51100	3500	30700
	123.83	61.91	44500	3200	26700
	120.65	68.26	34900	2600	20900
	120.65	65.09	38500	2900	23100
HLMT®40	139.70	61.91	59400	4000	35700
	133.35	68.26	49000	3500	29400
	133.35	65.09	54100	3700	32500
	133.35	61.91	58400	4000	35000
HLMT®46	152.40	82.55	64000	4000	38400
	152.40	76.20	77700	4700	46600
HLMT®50	168.28	88.90	89700	4900	53800
	168.28	82.55	105700	5700	63400
	168.28	76.20	120400	6300	72200
	165.10	88.90	89400	4900	53600
HLMT®5-1/2FH	177.80	101.60	104700	5600	62800
HLMT®5-1/2FH	177.80	98.43	115000	6100	69000

Note: All data is calculated based on SMYS 827MPa, and Makeup Torques are based on a friction factor of 1.0.

Table A.7 HLST[®] Connection Mechanical Characteristics[illegible]

Note: All data is calculated based on SMYS 827MPa, and Makeup Torques are based on a friction factor of 1.0.



Table A.8 HLIST® Connection Mechanical Characteristics

Note: All data is calculated based on SMYS 827MPa, and Makeup Torques are based on a friction factor of 1.0.

Pipe Body OD (in)	Nominal Weight (lb/ft)	Upset Type	Grade	RSC Type	Tool Joint	
					OD (in)	ID (in)
3 1/2	13.30	IU	S	HLIDS®31	4 1/4	2
3 1/2	13.30	IU	E	HLST®31	4	2 1/4
3 1/2	13.30	IU	X / G / S	HLST®31	4 1/8	2
3 1/2	15.50	EU	E	NC38	5	2 9/16
3 1/2	15.50	EU	X	NC38	5	2 7/16
3 1/2	15.50	EU	G	NC38	5	2 1/8
3 1/2	15.50	EU	S	NC40	5 1/2	2 1/4
3 1/2	15.50	EU	E / X	HLIDS®38	5	2 9/16
3 1/2	15.50	EU	G	HLIDS®38	5	2 7/16
3 1/2	15.50	EU	S / Z / V	HLIDS®38	5	2 1/8
3 1/2	15.50	EU	G	HLMT®38	4 3/4	2 9/16
3 1/2	15.50	EU	S / Z	HLMT®38	4 7/8	2 7/16
3 1/2	15.50	EU	V	HLMT®38	5	2 1/4
3 1/2	15.50	EU	X	HLST®36	4 3/4	2 9/16
3 1/2	15.50	EU	G	HLST®36	4 3/4	2 7/16
3 1/2	15.50	EU	S / Z / V	HLST®36	4 3/4	2 1/8
3 1/2	15.50	EU	G / S	HLST®39	5	2 9/16
3 1/2	15.50	EU	Z / V	HLST®39	5	2 7/16
3 1/2	15.50	EU	G	HLIST®38	4 3/4	2 9/16
3 1/2	15.50	EU	S / Z / V	HLIST®38	4 3/4	2 7/16
3 1/2	15.50	EU	G / S / Z / V	HLIST®39	4 7/8	2 9/16
4	14.00	IU	E	NC40	5 1/4	2 13/16
4	14.00	IU	X	NC40	5 1/4	2 11/16
4	14.00	IU	G	NC40	5 1/2	2 7/16
4	14.00	IU	S	NC40	5 1/2	2
4	14.00	IU	E / X	HLIDS®38	5	2 11/16
4	14.00	IU	G	HLIDS®38	5	2 9/16
4	14.00	IU	S	HLIDS®38	5	2 7/16
4	14.00	IU	E / X	HLIDS®40	5 1/4	2 13/16
4	14.00	IU	G	HLIDS®40	5 1/4	2 11/16
4	14.00	IU	S / Z / V	HLIDS®40	5 1/4	2 9/16
4	14.00	IU	G	HLMT®38	5	2 9/16
4	14.00	IU	S	HLMT®38	5	2 7/16
4	14.00	IU	G	HLMT®40	5 1/4	2 11/16
4	14.00	IU	S / Z / V	HLMT®40	5 1/4	2 9/16
4	14.00	IU	E / X	HLST®36	4 3/4	2 9/16

Pipe Body OD (in)	Nominal Weight (lb/ft)	Upset Type	Grade	RSC Type	Tool Joint	
					OD (in)	ID (in)
4	14.00	IU	G	HLST®36	4 3/4	2 7/16
4	14.00	IU	S	HLST®36	4 3/4	2 1/8
4	14.00	IU	E / X	HLST®39	4 7/8	2 13/16
4	14.00	IU	G	HLST®39	4 7/8	2 11/16
4	14.00	IU	S	HLST®39	4 7/8	2 9/16
4	14.00	IU	Z / V	HLST®39	5	2 9/16
4	14.00	IU	G	HLIST®38	4 3/4	2 9/16
4	14.00	IU	S	HLIST®38	4 3/4	2 7/16
4	14.00	IU	G	HLIST®39	4 7/8	2 11/16
4	14.00	IU	S / Z / V	HLIST®39	4 7/8	2 9/16
4	15.70	IU	E / X	HLIDS®40	5 1/4	2 13/16
4	15.70	IU	G	HLIDS®40	5 1/4	2 11/16
4	15.70	IU	S	HLIDS®40	5 1/4	2 9/16
4	15.70	IU	Z / V	HLIDS®40	5 1/2	2 7/16
4	15.70	IU	G	HLMT®40	5 1/4	2 11/16
4	15.70	IU	S / Z	HLMT®40	5 1/4	2 9/16
4	15.70	IU	V	HLMT®40	5 1/4	2 7/16
4	15.70	IU	G	HLST®39	4 7/8	2 9/16
4	15.70	IU	S / Z / V	HLST®39	5	2 7/16
4	15.70	IU	G / S	HLST®40	5 1/4	2 11/16
4	15.70	IU	Z / V	HLST®40	5 3/8	2 9/16
4	15.70	IU	G	HLIST®39	4 7/8	2 9/16
4	15.70	IU	S / Z / V	HLIST®39	5	2 7/16
4 1/2	16.60	IEU	E	NC46	6 1/4	3 1/4
4 1/2	16.60	IEU	X / G	NC46	6 1/4	3
4 1/2	16.60	IEU	S	NC46	6 1/4	2 3/4
4 1/2	16.60	IEU	E / X / G	HLIDS®46	6	3 1/4
4 1/2	16.60	IEU	S / Z / V	HLIDS®46	6	3
4 1/2	16.60	IEU	G / S / Z / V	HLMT®46	6	3 1/4
4 1/2	16.60	IEU	G / S / Z / V	HLST®46	6	3 1/4
4 1/2	16.60	IEU	G / S / Z / V	HLIST®46	6	3 1/4
4 1/2	16.60	IEU	G	HLIDS®40	5 1/4	2 11/16
4 1/2	16.60	IEU	S	HLIDS®40	5 1/4	2 9/16
4 1/2	16.60	IEU	G / S	HLST®40	5 1/4	2 11/16
4 1/2	20.00	IEU	E	NC46	6 1/4	3
4 1/2	20.00	IEU	X	NC46	6 1/4	2 3/4

[illegible]

[illegible]

[illegible]

Note: Abbreviated steel grade

SS75 - HLDT-SS®75; SS95 - HLDT-SS®95; SS105 - HLDT-SS®105; HL110SS - HLDT-SS®110; HL120S - HLDT-S®120;
HL125S - HLDT-S®125.

Table B.4 Commonly-used Drill Collars Data

Size	OD	Bore	RSC Type	Length	RSC Bevel Dia.	Reference Bending Strength Ratio	Drift
	D	d		L	Df	BSR	
in	in	in		FT	in		in
3 1/8	3 1/8	1 1/4	NC23	30	3.000	2.57	1.375
3 1/2	3 1/2	1 1/2	NC26	30	3.266	2.42	1.625
4 1/8	4 1/8	2	NC31	30 or 31	3.953	2.43	2.125
4 3/4	4 3/4	2	NC35	30 or 31	4.516	2.58	2.125
5	5	2 1/4	NC38	30 or 31	4.766	2.38	2.375
6	6	2 1/4	NC44	30 or 31	5.688	2.49	2.375
6	6	2 13/16	NC44	30 or 31	5.688	2.84	2.938
6 1/4	6 1/4	2 1/4	NC44	30 or 31	5.875	2.91	2.375
6 1/4	6 1/4	2 13/16	NC46	30 or 31	5.906	2.63	2.938
6 1/2	6 1/2	2 1/4	NC46	30 or 31	6.094	2.76	2.375
6 1/2	6 1/2	2 13/16	NC46	30 or 31	6.094	3.05	2.938
6 3/4	6 3/4	2 1/4	NC46	30 or 31	6.281	3.18	2.375
7	7	2 1/4	NC50	30 or 31	6.484	2.54	2.375
7	7	2 13/16	NC50	30 or 31	6.484	2.73	2.938
7 1/4	7 1/4	2 13/16	NC50	30 or 31	6.672	3.12	2.938
7 3/4	7 3/4	2 13/16	NC56	30 or 31	7.297	2.70	2.938
8	8	2 13/16	NC56	30 or 31	7.484	3.02	2.938
8 1/4	8 1/4	2 13/16	6-5/8REG	30 or 31	7.703	2.93	2.938
9	9	2 13/16	NC61	30 or 31	8.375	3.17	2.938
9 1/2	9 1/2	3	7-5/8REG	30 or 31	8.813	2.81	3.125
9 3/4	9 3/4	3	NC70	30 or 31	9.156	2.57	3.125
10	10	3	NC70	30 or 31	9.344	2.81	3.125
11	11	3	8-5/8REG	30 or 31	10.500	2.84	3.125

Table B.5 HLIDS® Connection Mechanical Characteristics

RSC Type	Tool Joint OD (in)	Tool Joint ID (in)	Torsional Strength (ft-lb)	Tensile Strength (lb)	Recommended Makeup Torque (ft-lb)
HLIDS®23	3.000	1.375	6500	284200	3900
HLIDS®26	3.375	1.750	8900	313700	5300
HLIDS®31	4.375	1.625	24000	623800	14400
	4.125	2.125	15300	447100	9200
	4.125	2.000	17700	495700	10600
HLIDS®38	5.000	2.563	26600	649200	16000
	5.000	2.438	30000	708100	18000
	5.000	2.125	37500	842400	22500
	4.750	2.688	22800	587300	13700
	4.750	2.563	25400	649200	15300
HLIDS®40	5.500	2.000	51800	1080100	31100
	5.250	2.813	29500	711600	17700
	5.250	2.688	33400	776400	20100
	5.250	2.563	37200	838300	22300
	5.250	2.438	40300	897200	24200
HLIDS®46	6.000	3.250	44000	901200	26400
	6.000	3.000	54100	1048400	32500
	6.000	2.750	63200	1183900	37900
HLIDS®50	6.625	3.750	48800	939100	29300
	6.625	3.500	61600	1109900	37000
	6.625	3.250	73400	1269000	44000
	6.625	3.000	84100	1416200	50500
	6.625	2.750	93900	1551700	56300
	6.500	3.750	48600	939100	29200
HLIDS®5-1/2FH	7.500	3.250	117000	1778300	70200
	7.500	3.000	128700	1925500	77200
	7.250	3.750	89800	1448400	53900
	7.250	3.625	96900	1535300	58100
	7.250	3.500	103600	1619200	62200
	7.000	4.000	74400	1265800	44700
	7.000	3.875	82000	1358600	49200
HLIDS®6-5/8FH	8.250	4.750	119700	1678100	71800
	8.250	4.625	130200	1788600	78100
	8.000	5.000	97200	1448400	58300
	8.000	4.875	108300	1564800	65000

Note: All data is calculated based on SMYS 120ksi, and Makeup Torques are based on a friction factor of 1.0.

Table B. 6 HLMT[®] Connection Mechanical Characteristics

Note: All data is calculated based on SMYS 120ksi, and Makeup Torques are based on a friction factor of 1.0.

Appendix C

Table C.1 Hilong Drilling Tools Request for Quotation Template

Note: All data is calculated based on SMYS 120ksi, and Makeup Torques are based on a friction factor of 1.0.

 Grey cells indicate feature does not apply.



