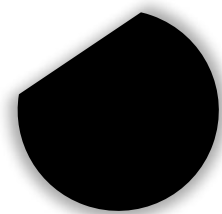


**Hilong Group**

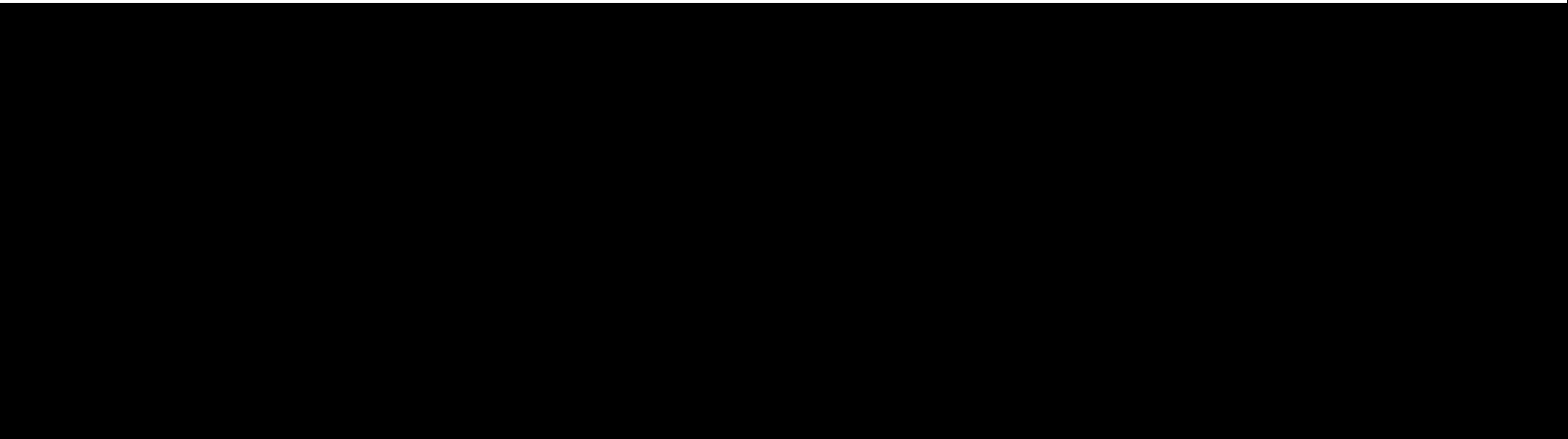


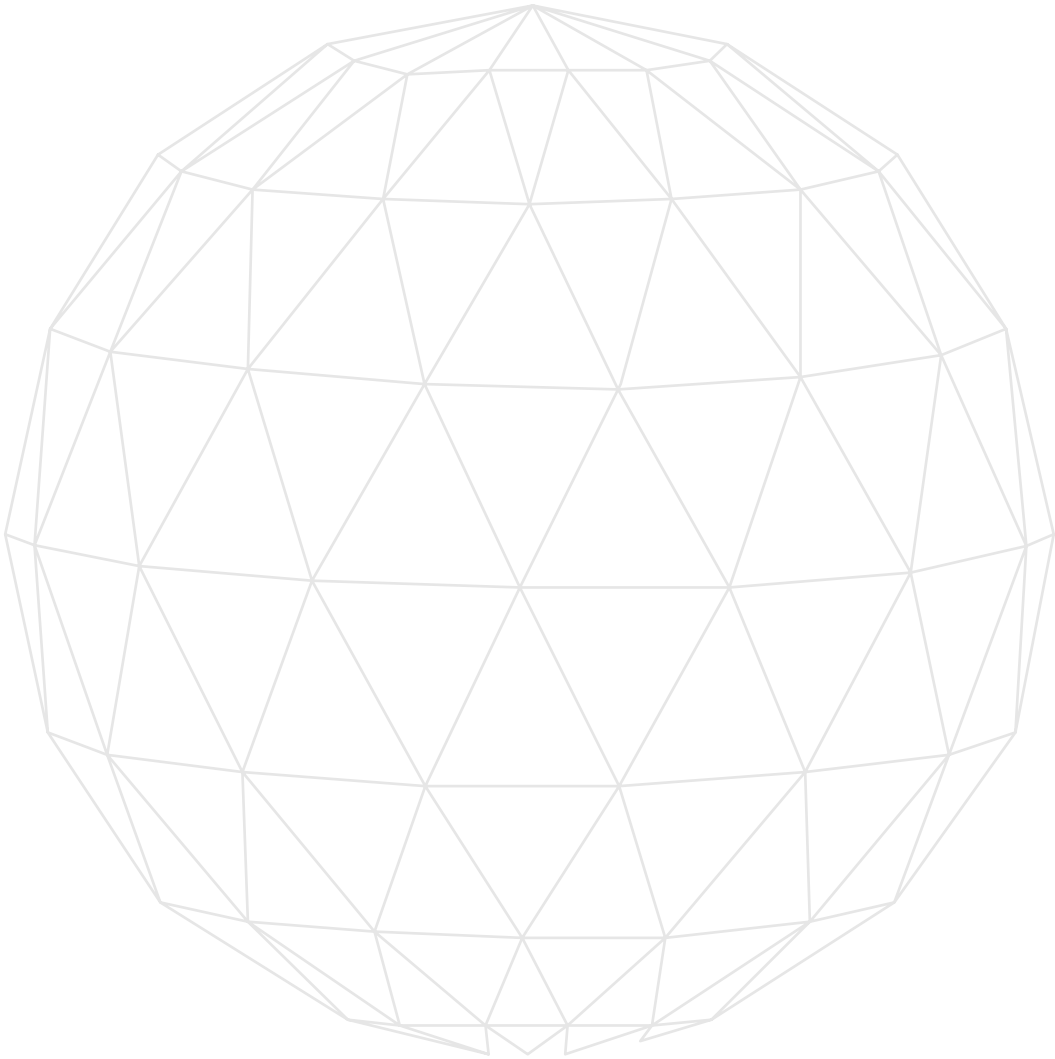
**LS**



[www.hilonggroup.com](http://www.hilonggroup.com)

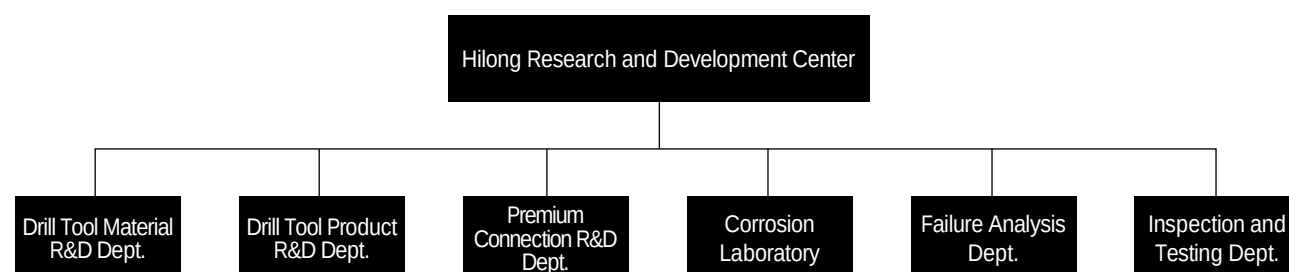
**HILONG GROUP OF COMPANIES**





**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.

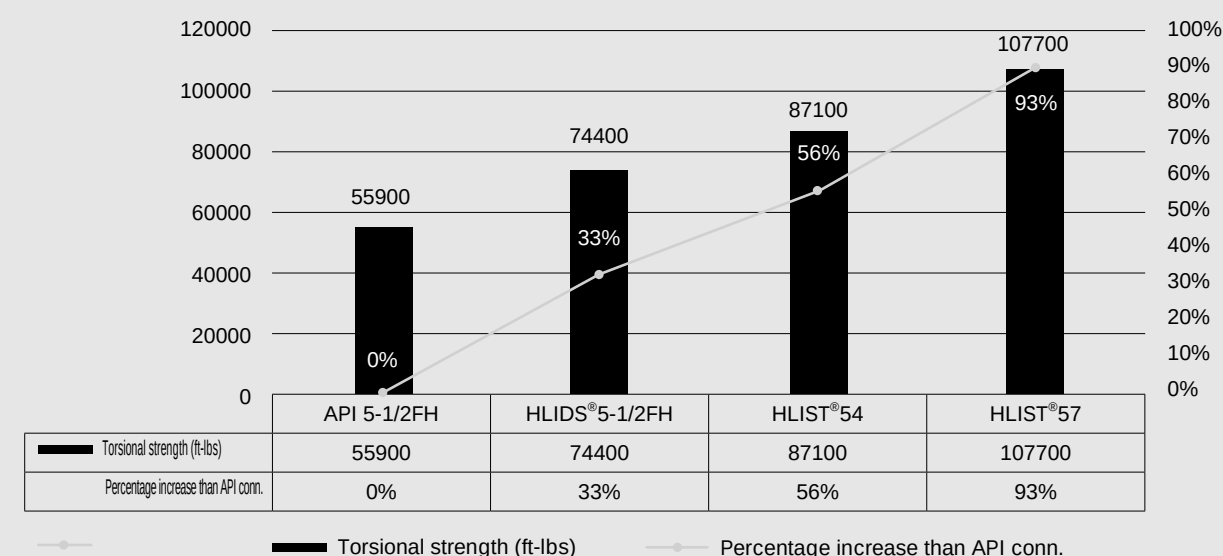
With industry development and technological innovation, there is an essential need in the industry for a drilling tool solution that performs better than standard API drilling tools, to meet the needs of deeper wells and more complex well conditions, while being more efficient and economical.

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







# 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

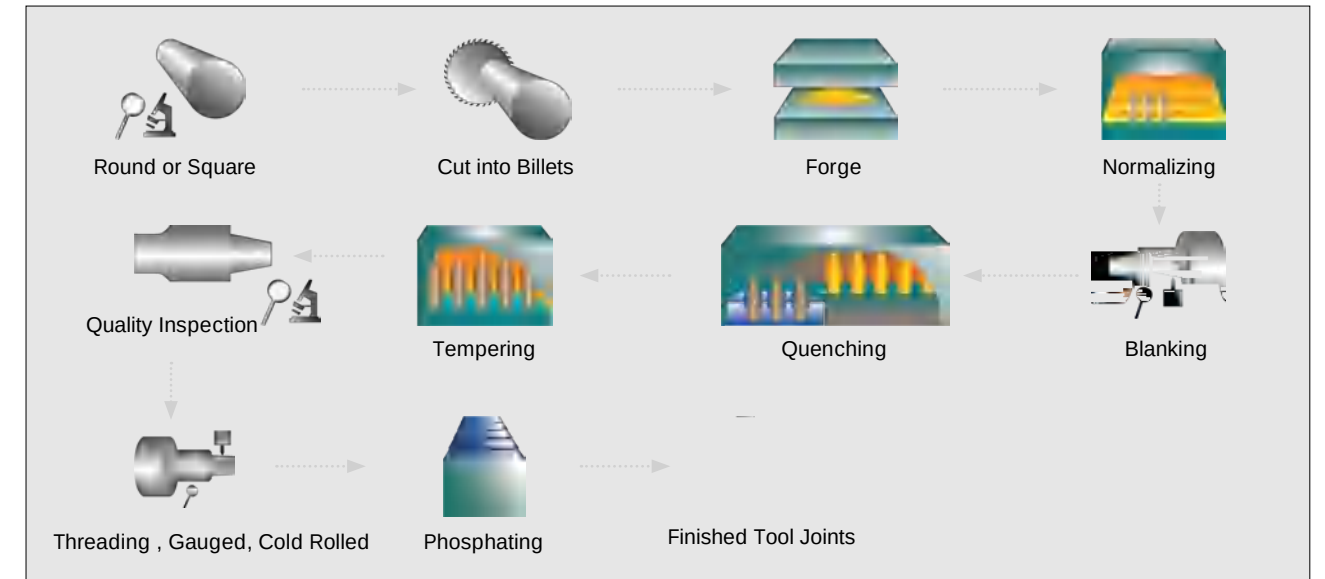
- Hilong sour service drill pipe grade

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

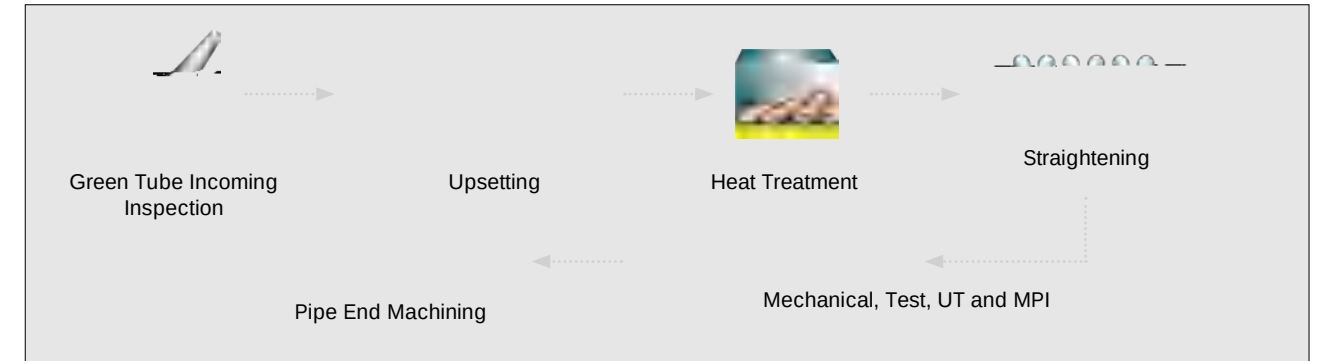
Steel grade: HLD-T-SS®75, HLD-T-SS®95, HLD-T-SS®105, HLD-T-SS®110, HLD-T-S®

## Drill Pipe Manufacturing Flow Chart

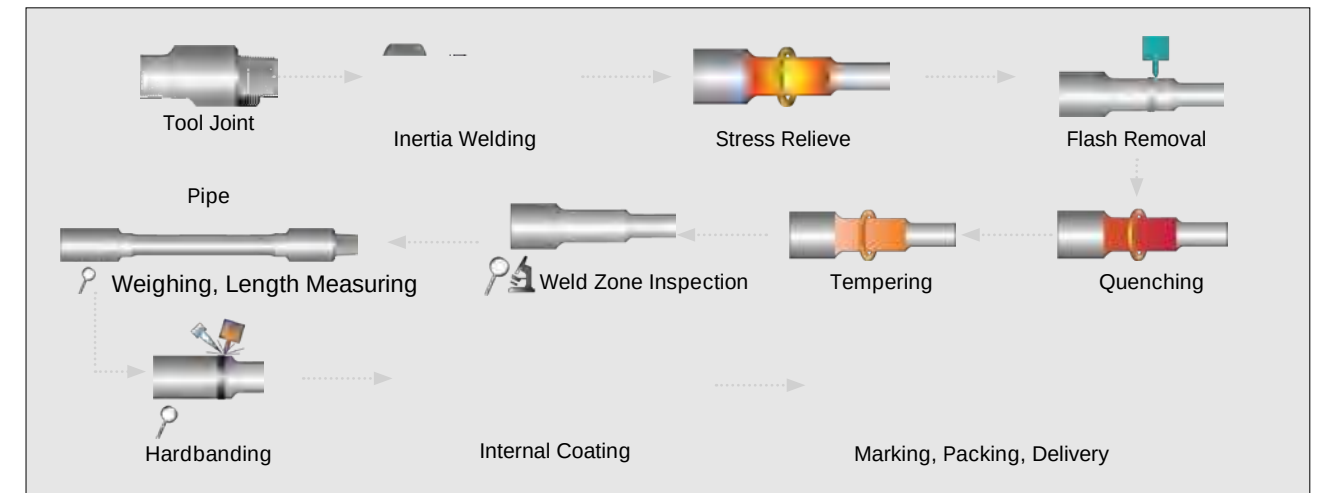
**Tool Joint Manufacturing Flow Chart**



**Drill Pipe Body Manufacturing Flow Chart**



**Drill Pipe Welding Flow Chart**





| HWDP                   |                        |                          |                           |                                                             |                        |
|------------------------|------------------------|--------------------------|---------------------------|-------------------------------------------------------------|------------------------|
| Tool Joint<br>OD Range | Min. Yield<br>Strength | Min. Tensile<br>Strength | Min.<br>Elongation<br>(%) | Toughness<br>LCVN, Full Size, 21<br>Min. Avg. / Min. Single | Min. Hardness<br>(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<sup>®</sup> is an API compatible high torque double shoulder connection developed by Hilong.

HLMT<sup>®</sup> is a double shoulder connection designed and developed refer to API connection and customer's requirement on site.

HLIDS<sup>®</sup> and HLMT<sup>®</sup> 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<sup>®</sup> Series

### Product Introduction

HLDT-GS<sup>®</sup> 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<sup>®</sup> drill string can save time and reduce cost.

### ■ Product Advantage

Compared to API connections, HLDT-GS<sup>®</sup> 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.

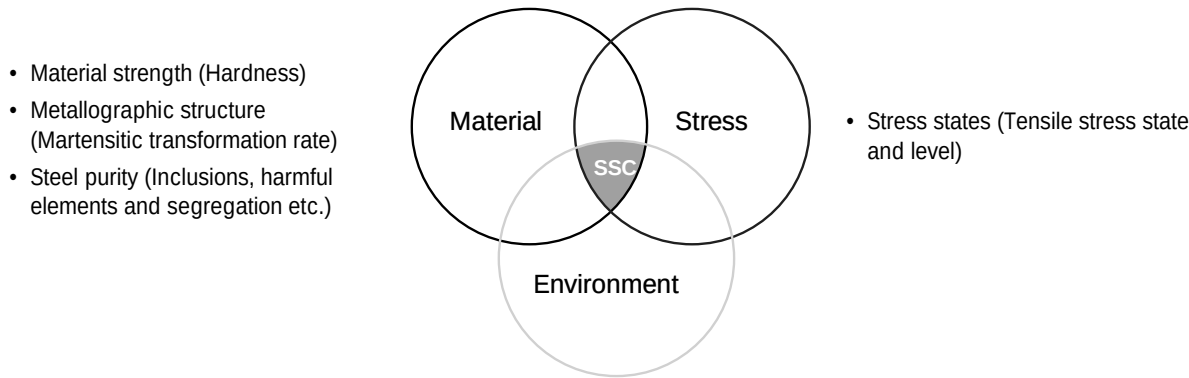
Hilong Sour Service Drill Pipe / Sour Service Heavy Weight Drill Pipe

Brief Introduction

Drilling at H<sub>2</sub>S 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 to the safety of the well.

Key Factors to Sulfide Stress Cracking (SSC)

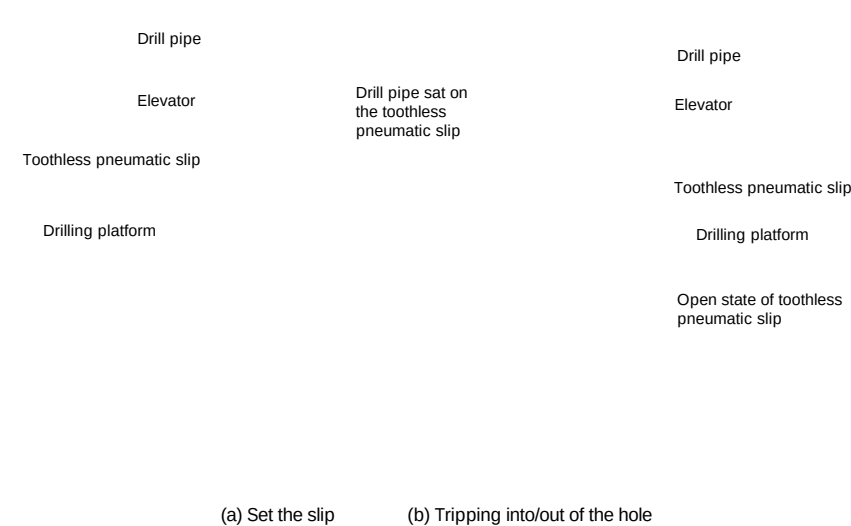


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## Hilong Non-Slip-Crush Drill Pipe

### 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.



### 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, HLD-T-SH<sup>®</sup>V150, HLD-T-SH<sup>®</sup>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.

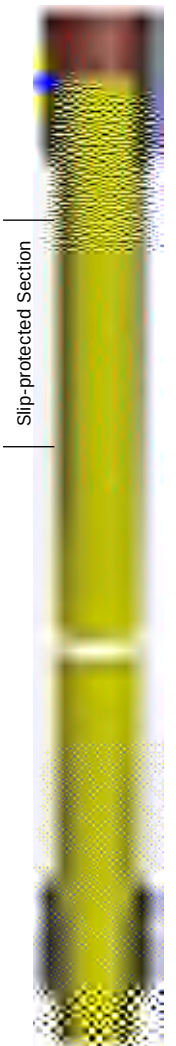
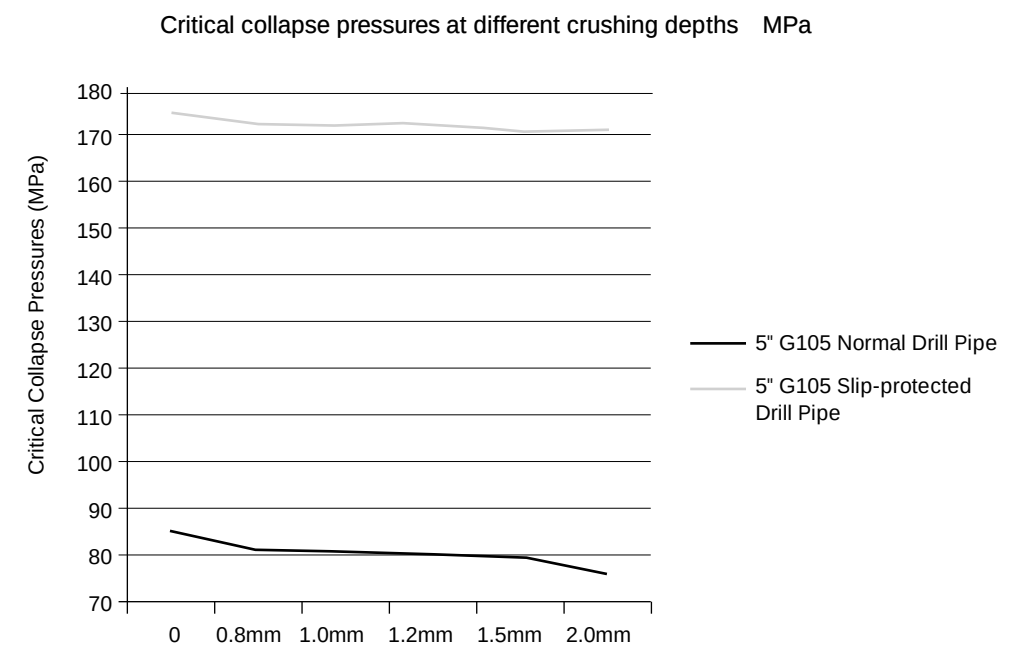
### Product Advantage

- 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, HLD-T-SH<sup>®</sup>Z140, HLD-T-SH<sup>®</sup>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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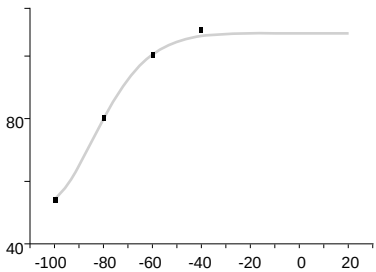


Table 11. Hilong Arctic Service Drill Pipe Performance Data

|              | Grade        | Yield strength                                                     | Tensile strength | Charpy impact value<br>(full size -60 or -75 , longitudinal |
|--------------|--------------|--------------------------------------------------------------------|------------------|-------------------------------------------------------------|
| Pipe<br>body | HLD-T-AS®75  | 517/724 MPa                                                        | ≥689 MPa         | ≥70 J                                                       |
|              |              | 75/105ksi                                                          | ≥100ksi          | ≥52 ft-lb                                                   |
|              | HLD-T-AS®95  | 655/862 MPa                                                        | ≥724 MPa         | ≥70 J                                                       |
|              |              | 95/125ksi                                                          | ≥105ksi          | ≥52 ft-lb                                                   |
|              | HLD-T-AS®105 | 724/931 MPa                                                        | ≥793 MPa         | ≥70 J                                                       |
|              |              | 105/135ksi                                                         | ≥115ksi          | ≥52 ft-lb                                                   |
|              | HLD-T-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<br>zone | —            | 10% greater than pipe body, failure must not occur<br>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



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#### ■ 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<br>OD<br>(mm) | Nominal Wall<br>Thickness<br>(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<br>OD<br>(mm) | Nominal Wall<br>Thickness<br>(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<sup>®</sup>75; SS95 - HLD-T-SS<sup>®</sup>95; SS105 - HLD-T-SS<sup>®</sup>105; HL110SS - HLD-T-SS<sup>®</sup>110; HL120S - HLD-T-S<sup>®</sup>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                           |
| HLIDS®50      | 152.40             | 69.85              | 85700                    | 5300                  | 51400                           |
|               | 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                           |
| HLIDS®5-1/2FH | 165.10             | 95.25              | 65900                    | 4200                  | 39600                           |
|               | 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                           |
| HLIDS®6-5/8FH | 177.80             | 98.43              | 111100                   | 6100                  | 66700                           |
|               | 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<br>(in) | Nominal Weight<br>(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<br>(in) | Nominal Weight<br>(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.





