MS-15® Mudline Suspension Systems
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**DRIL-QUIP: LEADER IN TECHNOLOGY AND QUALITY**

Recognized worldwide for cutting-edge exploration, drilling and production technology, DRIL-QUIP’s state-of-the-art equipment, support and service give unique advantages to operators in today’s tough environments.

DRIL-QUIP provides consistent high quality products in accordance with industry standards, employing the most advanced equipment and techniques available to ensure dimensional accuracy and performance reliability.

Our engineering staff brings their proven skills and experience to bear on the complex challenges encountered in the field, helping operators find viable product solutions for industry applications.
**MS-15 Mudline Suspension System**

*Dril-Quip’s unique MS-15 Mudline Suspension System is a series of casing hangers that support the weight of each casing string at or near the mudline. Designed for use with bottom-supported drilling vessels and platforms, the system allows disconnect from and reconnect to the well at the mudline.*

**System Features**

- High pressure capacity; system rated for 15,000 psi working pressure
- High load capacity at each hanger interface
- Easy handling, trouble-free operation
- Hangers have left-hand running threads, right-hand tie-back threads
- Metal-to-metal seals on running and tie-back tools with resilient backup seals
- Automatic centralization ensures concentricity
- Stack-down system for washout efficiency and easy access to tie-back thread profile
- Designed for temporary abandonment
- Designed with large flow-by areas
- Subsea completion possible with Dril-Quip’s Mudline Conversion System
- Critical service configurations available
- Extra metal-to-metal sealing for higher pressure and critical service
- Extra centralization for high-angle drilling
- Heavier wall for greater load and pressure capacity
- Fully tested
- Field-proven technology
- Torque tool option available for running tools
MS-15 System Components

**Drilling Phase**
- 20” Shoulder Hanger
- 13 ¾” Shoulder Hanger
- Butt weld Sub
- 9 ¾” Split Ring Hanger
- 7” Split Ring Hanger
- Running Tools

**Temporary Abandonment Phase**
- 30” Corrosion Cap
- 30” Quick-Jay™ Connector
- Temporary Abandonment Caps
There are two types of Casing Hangers utilized in the MS-15 Suspension System: Shoulder Hangers and Split Ring Hangers. Shoulder Hangers are generally required with larger-size casing strings and are used when enough annular space exists to allow a single load shoulder to hang the casing load and still pass the drill bit needed for the casing string. The Shoulder Hanger features either a single or multiple load shoulder profile in the ID, depending on the casing program.

**Features**
- High pressure, high load capacity
- Easy installation; weight-set hanger
- Field-interchangeable landing rings accommodate changes in casing programs
- Large flow-by areas for running and cementing
- Full 360-degree load-bearing area on landing ring for maximum load-carrying capacity
- Unique, two-step landing ring provides automatic centralization when landed
- Independent metal-to-metal sealing surfaces; one for running tools, one for tie-back tools

The Shoulder Hanger will use a multiple load shoulder profile in the hanger’s ID to transition to the Split Ring Hanger for running casing string with higher load-carrying requirements.
When casing loads exceed a single load shoulder’s ability to support the weight of the casing string, the MS-15 system uses a unique Split Ring Hanger with a multiple load shoulder profile. The system’s patented split ring and detent ring accommodate high loads while allowing passage of required drill bit sizes.

**Features**

- High pressure, high load capacity
- Large flow-by areas during running and cementing
- Unique design ensures full engagement of each split ring load shoulder with mating profile
- Positive backup of split ring when landed
- Detent ring allows hanger resetting while eliminating shear pins and tensile coupons
- Dual metal-to-metal seals; one for running tools, one for tie-back tools

**Split Ring Setting Sequence**

1. **Running Position**
   - **Hanger Body**
   - **Load Ring**
   - **Split Ring** — multiple load shoulders on split ring protected from casing ID while running
   - **Detent Ring** — eliminates premature vertical movement of split ring

2. **Landed/Not Detented**
   - **Hanger Body** — provides full centralization with load ring above split ring and retainer ring below split ring
   - **Split Ring** — energy in split ring forces multiple load shoulders into mating profile of outer hanger ID

3. **Detented Position**
   - **Load Ring** — maintains large flow-by area and provides high load capacity at interface of split ring and hanger
   - **Hanger Body** — backup shoulder provides full backup behind top of split ring
   - **Detent Ring** — activated by casing weight and centralizes split ring, provides full backup behind bottom of split ring
The MS-15 Mudline Hanger Running Tool allows the casing string to be run and landed in the previous mudline hanger. The running tool incorporates tangentially bored washports for cleaning the annulus between casing strings. The tool’s left-hand threads allow the use of right-hand rotation to remove the running string or open the washports.

**Features**

- High pressure, high load capacity
- Low torque make-up
- Self-aligning profile allows full alignment with hanger prior to thread engagement
- Slots for direct make-up of running tool with torque tool are optional
- Optional stab-in running tools for mudline hangers 16” and larger eliminate left-hand rotation
- Dual O-rings above washports
- Seal below washport never exposed during wash operations
- One-way seal on nose of pin prevents pressure lock during make-up
- Field-proven performance

Right-hand rotation of approximately six turns opens washports for washout of casing. After washout, running tool is made up with six turns to the left.

Right-hand rotation of approximately six turns with weight picked up opens washports for washout of casing. After washout, weight is slacked off and running tool is made up.
Run on drill pipe, the MS-15 Profile Cleanout Tool is used to verify the distance to the multiple load shoulder profile and prepares the mudline hanger ID for the split ring hanger. The profile cleanout tool is rotated to clean out the multiple load shoulder ID. Wash fluid can be pumped through the drill pipe during this operation.

- Notched split ring for thorough cleaning of multiple load shoulder profile in ID of previously-run hanger body
- Jet ports for washing out multiple load shoulder profile
- Indicator ring verifies full cleanout of multiple load shoulder profile
- Used to verify the distance to the multiple load shoulder profile
The MS-15 Mudline Suspension System offers Temporary Abandonment (TA) Caps that protect each mudline hanger’s tie-back profile from debris during abandonment and while the well is in suspension. Temporary Abandonment Caps make up in the hanger running tool threaded profile and supply resilient seals between the TA Cap and the mudline hanger.

The MS-15 system also offers a simple, weight-set, rotation-lock stab-in TA Cap. When angular misalignment is a problem, this cap allows temporary abandonment of the mudline hanger. The cap’s threaded split lock ring engages the running threads in the mudline hanger.

**Temporary Abandonment Caps**

**Features**

- Simple installation
- Caps make up into left-hand running threads, protecting tie-back threads
- Full alignment prior to make-up
- Available vented or with back-pressure valve
- Low torque make-up
- Optional stab-in TA cap allows weight-set make-up

**Temporary Abandonment Cap Running and Retrieving Tool**

An overshot type tool with three J-slot profiles, the MS-15 TA Cap Running and Retrieving Tool runs on drill pipe and lands on the TA cap mandrel with running and retrieving J-lugs.

**Features**

- Removable back-pressure valve stinger available
- Seals and locks to top of TA cap mandrel
- Porting for pressure control of well
**Tie-Back Profile Cleanout Tool**

Dril-Quip’s Tie-Back Profile Cleanout Tool runs on drill pipe. It is used to wash out the tie-back thread profile and the sealing surface between the tie-back tool and the mudline hanger ID.

**Temporary Abandonment Cap Mill and Flush Tool**

This component of the MS-15 Mudline Suspension System cleans off the running and retrieving mandrel located on the TA cap. This prepares the TA cap retrieval J-lugs for easy access with the TA cap running and retrieving tool.

**Features**

**Tie-Back Profile Cleanout Tool**
- Runs on drill pipe
- Available for any size Dril-Quip TA cap
- Mills large debris from around TA cap mandrel
- Jetting nozzles wash debris from around TA cap mandrel

**Temporary Abandonment Cap Mill and Flush Tool**
- Uses top of hanger as reference point for positioning washout holes at tie-back threads and tie-back sealing surface
- Available for any size Dril-Quip mudline hanger
The stack-down configuration and unique design features of the MS-15 Mudline Suspension System make it an excellent choice for production wells.

Centralizing shoulders on each hanger body help establish concentricity around the centerline of the well. Centralized tie-back tools incorporate an alignment profile that forces full alignment between the tool and the hanger body prior to any thread engagement. Special stab-in tie-back tools are available to solve problems with angular misalignment and platform-to-well misalignment.

**System Features**

- System stacks down to fully expose tie-back threads
- Reliable metal-to-metal sealing
- Tie-back threads and sealing areas are unused and protected during drilling
- Hangers have left-hand running threads, right-hand tie-back threads
- All strings tie back using right-hand rotation

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**Tie-Back Phase**

<table>
<thead>
<tr>
<th>Tie-Back</th>
<th>Stab-In</th>
</tr>
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<tbody>
<tr>
<td>20&quot; Shoulder Hanger</td>
<td>20&quot; Shoulder Hanger</td>
</tr>
<tr>
<td>13 3/8&quot; Shoulder Hanger</td>
<td>13 3/8&quot; Shoulder Hanger</td>
</tr>
<tr>
<td>30&quot; Butt weld Sub</td>
<td>30&quot; Butt weld Sub</td>
</tr>
<tr>
<td>9 5/8&quot; Split-Ring Hanger</td>
<td>9 5/8&quot; Split-Ring Hanger</td>
</tr>
<tr>
<td>7&quot; Split-Ring Hanger</td>
<td>7&quot; Split-Ring Hanger</td>
</tr>
<tr>
<td>Split Ring</td>
<td>Split Ring</td>
</tr>
<tr>
<td>Detent Ring</td>
<td>Detent Ring</td>
</tr>
<tr>
<td>Stab-In Tie-Back Tools</td>
<td>Stab-In Tie-Back Tools</td>
</tr>
<tr>
<td>Threaded Tie-Back Tools</td>
<td>Threaded Tie-Back Tools</td>
</tr>
</tbody>
</table>
Tie-Back Tools

Dril-Quip’s MS-15 Tie-Back Tools reconnect the mudline hanger to the surface for completion. For subsea completion, the tools tie the well back to a tubing head.

The Stab-In Tie-Back Tool offers a simple, weight-set design that provides an easy way to tie back to the well when platform misalignment is a problem. It includes a threaded split lock ring that engages the tie-back threads in the top of each mudline hanger.

Features

- Fully aligned prior to make-up
- High pressure containment provided by metal-to-metal primary seal and resilient backup seals
- Sized to match each Dril-Quip mudline hanger
- Threaded tie-back tool makes up with just six right-hand turns for metal-to-metal seal with resilient backup
- Stab-in tie-back tool’s resilient seals are weight set; metal-to-metal seals energize with ½ to 1 right-hand rotations

Run on drill pipe, Dril-Quip’s Tie-Back Torque Tool is used to apply high direct torque to the Stab-In Tie-Back Tool.

Features

- Spring-loaded torque keys for easy torque slot engagement
- Sized to match each Dril-Quip tie-back tool
- Can be used to apply torque to mudline hanger running tools equipped with torque slots
Subsea completions on mudline-suspended wells are possible with Dril-Quip’s Mudline Conversion System. This system of adapters provides an efficient way to convert a mudline suspension system for subsea completion.

**SYSTEM FEATURES**

- Subsea tubing hanger installs through BOP stack and riser for safe rig operations
- Metal-to-metal sealing profile optional in tubing hanger ID
- Diver-friendly make-up adapter ring on tubing head provides centralization, maximum height adjustment and rigid support
- Tubing head provides internal lockdown profile for annulus metal-to-metal sealing and positive lockdown of tubing hanger
- Field-proven tubing hanger systems available
The Dril-Thru Mudline Completion System is a unique mudline suspension system designed to accept subsea tubing hangers and subsea completion trees without the use of adapters. This system simplifies operations when it is known in advance that the well will be completed with a subsea tree.

**System Features**

- Drilling and completion work possible through conventional BOP equipment
- Wellhead hanger housing can accommodate several casing hangers and a tubing hanger
- Internal lockdown profile for positive lockdown of tubing hanger
- Metal-to-metal sealing throughout
- Diver or diverless tree make-up
- Field-proven performance
**CS-10™ CASING SUPPORT SYSTEM**

The CS-10 Casing Support System is used primarily in platform applications to decrease load on the platform by hanging casing off at the mudline.

**Specialty Casing Connectors**

- Multi-Thread™ Connectors
- Quik-Thread® Connectors
- Quik-Stab® Connectors
- Quik-Jay™ Connectors

**Dril-Quip** fabricates complete casing joints for both drilling and driving applications. **Dril-Quip** offers a variety of connectors that are ideal for use with mudline suspension equipment.

**Critical Service System**

Dril-Quip offers a high pressure, high temperature mudline suspension system for use in critical-service applications. These critical-service systems incorporate all of the field-proven features of the MS-15 and include additional metal-to-metal sealing and centralization.
Dril-Quip offers traditional and unitized surface wellheads for use in with its mudline suspension product line for jacket and platform applications. The company’s surface wellhead equipment is offered in a variety of sizes, configurations and service ratings. Dril-Quip’s unitized surface wellheads feature metal-to-metal sealing technology and simplified operational procedure to reduce installation time.

Dril-Quip’s surface completion trees have been designed to incorporate metal-to-metal sealing technology and safe, effective production solutions for onshore and offshore well developments. The Company’s trees include API-monogrammed gate valve components that are designed to comply with all applicable API specifications and Dril-Quip’s ISO 9000, 9001 Quality System. Dril-Quip utilizes a variety of tests to verify the performance of its trees and valves to ensure the highest possible standards.

Dril-Quip template systems provide the operator with the ability to arrange production wells in a pattern. This eliminates the possibility of intersecting wells or well misalignment by forcing direct centerline-to-centerline well spacing. All Dril-Quip template systems come with the required alignment and concentricity accessories to facilitate vertical installation of equipment during the drilling phase. Dril-Quip template systems supply alignment features to the jacket installation and also provide trouble-free operations during the tie-back phase.
**MS-15 STRENGTHS AND DIMENSIONS**

Dril-Quip manufactures and stocks a wide variety of mudline suspension systems to match most casing programs. The following charts are for typical casing programs.

*Contact a Dril-Quip representative to obtain strength-and-dimension charts for specific casing programs.*

### 30' x 20' x 13 3/8' x 9 7/8' x 7' Casing Program

<table>
<thead>
<tr>
<th>SIZE (inches)</th>
<th>TYPE</th>
<th>INTERNAL YIELD PRESSURE (psi)</th>
<th>TENSION YIELD PRESSURE (x 1,000 lbs)</th>
<th>MIN. RETURN AREA (sq in)</th>
<th>MAX. OD (inches)</th>
<th>HANGER WILL RUN THROUGH</th>
<th>MIN. ID (inches)</th>
<th>MAX. BIT SIZE (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>—</td>
<td>—</td>
<td>3,800</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>26.250</td>
<td>26</td>
</tr>
<tr>
<td>30 x 20</td>
<td>SH</td>
<td>5,000</td>
<td>3,800</td>
<td>48</td>
<td>27.250</td>
<td>30 x 1&quot; Wall Pipe</td>
<td>17.553</td>
<td>17 1/2</td>
</tr>
<tr>
<td>20 x 13 3/8&quot;</td>
<td>SH</td>
<td>10,000</td>
<td>2,400</td>
<td>13</td>
<td>18.510</td>
<td>20&quot; x 1 133 lb/ft. Csg.</td>
<td>12.490</td>
<td>12 1/4</td>
</tr>
<tr>
<td>13 3/8 x 9 7/8</td>
<td>SP</td>
<td>16,500</td>
<td>2,000</td>
<td>10</td>
<td>12.188</td>
<td>13 7/8&quot; x 72 lb/ft. Csg.</td>
<td>8.803</td>
<td>8 1/4</td>
</tr>
<tr>
<td>9 7/8 x 7 (32-38 lb)</td>
<td>SP</td>
<td>17,500</td>
<td>700</td>
<td>5</td>
<td>8.375</td>
<td>9 7/8&quot; x 53.5 lb/ft. Csg.</td>
<td>5.905</td>
<td>5 7/8</td>
</tr>
</tbody>
</table>

SH Indicates shoulder type hanger  
SP Indicates split ring type hanger

### 30' x 16' x 10 3/4' x 7 3/8' (or 7') Casing Program

<table>
<thead>
<tr>
<th>SIZE (inches)</th>
<th>TYPE</th>
<th>INTERNAL YIELD PRESSURE (psi)</th>
<th>TENSION YIELD PRESSURE (x 1,000 lbs)</th>
<th>MIN. RETURN AREA (sq in)</th>
<th>MAX. OD (inches)</th>
<th>HANGER WILL RUN THROUGH</th>
<th>MIN. ID (inches)</th>
<th>MAX. BIT SIZE (inches)</th>
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<tr>
<td>30</td>
<td>—</td>
<td>—</td>
<td>3,800</td>
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<td>26.470</td>
<td>26</td>
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<tr>
<td>30 x 16</td>
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<td>3,300</td>
<td>48</td>
<td>27.530</td>
<td>30&quot; x 1&quot; Wall Pipe</td>
<td>14.990</td>
<td>14 3/4</td>
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<tr>
<td>16 x 10 3/4&quot;</td>
<td>SP</td>
<td>12,000</td>
<td>1,700</td>
<td>12</td>
<td>14.500</td>
<td>16&quot; x 109 lb/ft. Csg.</td>
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<td>10 3/4 x 7 3/8&quot;</td>
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<td>1,200</td>
<td>6</td>
<td>9.500</td>
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<td>6.802</td>
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SH Indicates shoulder type hanger  
SP Indicates split ring type hanger

### 30" x 13 3/8" x 9 7/8" x 7" Casing Program (21 1/4" BOP)

<table>
<thead>
<tr>
<th>SIZE (inches)</th>
<th>TYPE</th>
<th>INTERNAL YIELD PRESSURE (psi)</th>
<th>TENSION YIELD PRESSURE (x 1,000 lbs)</th>
<th>MIN. RETURN AREA (sq in)</th>
<th>MAX. OD (inches)</th>
<th>HANGER WILL RUN THROUGH</th>
<th>MIN. ID (inches)</th>
<th>MAX. BIT SIZE (inches)</th>
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<tr>
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<td>—</td>
<td>—</td>
<td>2,900</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>20.125</td>
<td>20</td>
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<tr>
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<td>SH</td>
<td>9,700</td>
<td>2,900</td>
<td>28</td>
<td>21.125</td>
<td>21 1/4&quot; BOP</td>
<td>12.490</td>
<td>12 1/4</td>
</tr>
<tr>
<td>13 3/8 x 9 7/8</td>
<td>SP</td>
<td>16,500</td>
<td>2,000</td>
<td>10</td>
<td>12.188</td>
<td>13 7/8&quot; x 72 lb/ft. Csg.</td>
<td>8.803</td>
<td>8 3/4</td>
</tr>
<tr>
<td>9 7/8 x 7 (32-38 lb)</td>
<td>SP</td>
<td>17,500</td>
<td>900</td>
<td>5</td>
<td>8.375</td>
<td>9 7/8&quot; x 53.5 lb/ft. Csg.</td>
<td>5.905</td>
<td>5 7/8</td>
</tr>
</tbody>
</table>

SH Indicates shoulder type hanger  
SP Indicates split ring type hanger
### 36" x 26" x 20" x 13\(\frac{3}{8}\)" x 9\(\frac{7}{8}\)" x 7" Casing Program

<table>
<thead>
<tr>
<th>SIZE (inches)</th>
<th>TYPE HANGER</th>
<th>INTERNAL YIELD PRESSURE (psi)</th>
<th>TENSION YIELD PRESSURE (x 1,000 lbs)</th>
<th>MIN. RETURN AREA (sq in)</th>
<th>MAX. OD (inches)</th>
<th>HANGER WILL RUN THROUGH</th>
<th>MIN. ID (inches)</th>
<th>MAX. BIT SIZE (inches)</th>
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<td>26 x 20</td>
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<td>26 x 20</td>
<td>SP</td>
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<td>3,700</td>
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<td>24.125</td>
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<tr>
<td>20 x 13(\frac{3}{8})&quot;</td>
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<td>10,000</td>
<td>3,000</td>
<td>13</td>
<td>17.446</td>
<td>20&quot; x 1.00&quot; Wall Pipe</td>
<td>12.490</td>
<td>12(\frac{1}{4})</td>
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<tr>
<td>13(\frac{3}{8}) x 9(\frac{7}{8})&quot;</td>
<td>SP</td>
<td>16,500</td>
<td>2,250</td>
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<td>12.188</td>
<td>13(\frac{3}{8})&quot; x 72 lb/ft. Csg.</td>
<td>8.803</td>
<td>8(\frac{1}{4})</td>
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<tr>
<td>9(\frac{5}{8}) x 7 (32-38 lb)</td>
<td>SP</td>
<td>17,500</td>
<td>910</td>
<td>5</td>
<td>8.375</td>
<td>9(\frac{7}{8})&quot; x 53.5 lb/ft. Csg.</td>
<td>5.905</td>
<td>5(\frac{7}{8})</td>
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</tbody>
</table>

SH Indicates shoulder type hanger  
SP Indicates split ring type hanger

### 36" x 24" x 18\(\frac{5}{8}\)" x 13\(\frac{3}{8}\)" x 9\(\frac{7}{8}\)" x 7" Casing Program

<table>
<thead>
<tr>
<th>SIZE (inches)</th>
<th>TYPE HANGER</th>
<th>INTERNAL YIELD PRESSURE (psi)</th>
<th>TENSION YIELD PRESSURE (x 1,000 lbs)</th>
<th>MIN. RETURN AREA (sq in)</th>
<th>MAX. OD (inches)</th>
<th>HANGER WILL RUN THROUGH</th>
<th>MIN. ID (inches)</th>
<th>MAX. BIT SIZE (inches)</th>
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<tr>
<td>36</td>
<td>SH</td>
<td>5,000</td>
<td>5,000</td>
<td>48</td>
<td>29.250</td>
<td>29(\frac{1}{2})&quot; BOP</td>
<td>28.250</td>
<td>28</td>
</tr>
<tr>
<td>36 x 24</td>
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<td>5,000</td>
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<td>22</td>
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<td>4,500</td>
<td>15</td>
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<td>24(\frac{3}{4})&quot; Wall Pipe</td>
<td>17.553</td>
<td>17(\frac{1}{2})</td>
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<td>3,000</td>
<td>12</td>
<td>17.000</td>
<td>18(\frac{5}{8}) x 136 lb/ft. Csg.</td>
<td>12.490</td>
<td>12(\frac{1}{4})</td>
</tr>
<tr>
<td>13(\frac{3}{8}) x 9(\frac{7}{8})&quot;</td>
<td>SP</td>
<td>16,500</td>
<td>2,000</td>
<td>10</td>
<td>12.188</td>
<td>13(\frac{3}{8})&quot; x 72 lb/ft. Csg.</td>
<td>8.803</td>
<td>8(\frac{1}{4})</td>
</tr>
<tr>
<td>9(\frac{5}{8}) x 7 (32-38 lb)</td>
<td>SP</td>
<td>17,500</td>
<td>710</td>
<td>5</td>
<td>8.375</td>
<td>9(\frac{7}{8})&quot; x 53.5 lb/ft. Csg.</td>
<td>5.905</td>
<td>5(\frac{7}{8})</td>
</tr>
</tbody>
</table>

SH Indicates shoulder type hanger  
SP Indicates split ring type hanger