Application Guidelines
Table of Contents

Driveline Sizing
  Specifying a Spicer Driveline ..................................... 2
  Application Definitions ........................................ 2
  Calculating Maximum Driveshaft Torque
    Domestic Applications ...................................... 3
    Export Applications ......................................... 5
  Application Guidelines ...................................... 6
    10-Series Graph........................................... 6
    SPL Graph.................................................. 7
    SPL Interaxle Graph.................................... 8

Critical Speed
  Critical Speed .................................................. 9
  Standard Equation ........................................... 9
  Simplified Equations ....................................... 9
  Adjusted Critical Speed .................................... 10
  Spicer Diamond Series Critical Speed.................. 10
  Maximum Driveshaft Length .................................. 11
  Spicer Standard Tube Sizes .................................. 12

Center Bearing Mounting
  Center Bearing Mounting ..................................... 13

Driveline Analysis
  Driveline Analysis .......................................... 14
  Design Criteria ............................................. 14
  Torsional and Inertial Excitation ......................... 14
  Center Bearing Loading ..................................... 18
  Joint Life vs. Joint Angles ................................ 20

Appendix
  Application Form ............................................ 21
  End Yoke Dimensions................................. 22
  Attaching Hardware and Torque Specs .................. 28
Specifying a Spicer Driveline

Application Definitions

- Domestic applications - restricted to the continental United States, Canada, Australia and New Zealand.
  - On-highway - operation on well-maintained, concrete and asphalt roadways including turnpikes, interstates, and state routes with not more than 10% off-highway operation.
  - Off-highway - operation on unimproved dirt or gravel roads, as well as, poorly maintained paved roads, more than 10% of the time.
  - Line haul - operation on well maintained concrete and asphalt roadways including turnpikes, interstates, and state routes 100% of the time with a maximum 80,000 lb. GCW.

- Export applications - outside of the continental United States, Canada, Australia and New Zealand.
  Driveline sizing for export applications is based on Maximum Driveshaft Torque **only**. (see "Calculating Maximum Driveshaft Torque (Export Applications)" on page 5)
Calculating Maximum Low Gear Torque

Step 1 - Low Gear Torque Calculation
LGT = T x TLGR x TE x SR x TCR x C

LGT = Maximum Driveshaft Low Gear Torque
T = Net Engine Torque or 95% of the Gross Engine Torque
TLGR = Transmission Low Gear Ratio (forward)*
TE = Transmission Efficiency (automatic = 0.8; manual = 0.85)
SR = Torque Converter Stall Ratio (if applicable)
TCR = Transfer Case or Auxiliary Transmission Ratio (if applicable)
C = Transfer Case Efficiency (if applicable, 0.95)

* Some applications require deep reduction transmissions for speed-controlled operations such as paving and pouring. In these applications it may be more appropriate to use the second lowest forward transmission ratio to calculate the Maximum Low Gear Torque. To use the second lowest forward gear ratio to calculate LGT, all three of the following conditions must be met:
1. Lowest forward gear ratio numerically greater than 16:1.
2. Split between the lowest forward gear ratio and the second lowest forward gear ratio is greater than 50%.
3. Startability Index must be greater than 25 (see below calculation).

Startability Index Calculation
SI = (T x TR x AR x TCR x 942.4) / (RR x GCW)

SI = Startability Index
T = Engine Clutch Engagement Torque at 800 RPM
TR = Transmission Second Lowest Forward Gear Ratio
AR = Axle Ratio
TCR = Transfer Case or Auxiliary Transmission Ratio (if applicable)
RR = Tire Rolling Radius (in)
GCW = Maximum Gross Combination Weight (lbs)

Step 2 - Wheel Slip Calculation
WST = (.71 x W x RR) / (11.4 x AR)

WST = Wheel Slip Torque Applied to the Driveshaft
W = Axle Capacity (lbs)
RR = Tire Rolling Radius (in)
AR = Axle Ratio
Step 3 - Gradeability Calculation
Calculate the torque required for 25% gradeability.

Note: For Linehaul applications with 3.10 axle ratio or numerically larger only.

\[ GT = \frac{0.265 \times RR \times GVW}{11.4 \times AR} \]

- \( GT \) = Net Driveline Torque at 25% Gradeability
- \( RR \) = Tire Rolling Radius (in)
- \( GVW \) = Gross Vehicle Weight (lbs)
- \( AR \) = Axle Ratio

Step 4 - Overall Low Gear Ratio Calculation
\[ OLGR = TLGR \times SR \times TCR \]

- \( OLGR \) = Overall Low Gear Ratio
- \( TLGR \) = Transmission Low Gear Ratio
- \( SR \) = Torque Converter Stall Ratio (if applicable)
- \( TCR \) = Transfer Case or Auxiliary Transmission Ratio (if applicable)

Step 5 - Driveline Series Selection
To select a driveline series:
1. Plot the torque values determined from Steps 1, 2, and 3 with the overall low gear ratio (OLGR) from Step 4 on the appropriate graph for Ten Series or SPL Series in the Applications Guidelines section on pages 6 & 7.
2. To determine the appropriate driveline series for SPL or 10 Series using the Application Guidelines graphs on pages 6 & 7, use the smallest series for the main driveline as determined from Steps 1, 2, and 3.

Note: The selected driveline series can not be more than one series smaller than the series selected from Step 1 (LGT).

Step 6 - Specifying the Interaxle Driveline (if applicable)
To specify the interaxle driveline, use:
1. 60% of the Driveline Series Selection torque from Step 5 and the OLGR from Step 4.
2. Find the appropriate interaxle driveline series for SPL using the Driveline Sizing graph under "Application Guidelines" on page 8, and for Ten Series using the Driveline Sizing graph under "Application Guidelines" on page 6.

Note: High angle (45°) interaxle driveshafts are available in SPL170, SPL250 and 1710 Series only.
Calculating Maximum Driveshaft Torque for Export Applications

Step 1 - Low Gear Torque Calculation
\[ \text{LGT} = T \times \text{TLGR} \times \text{TE} \times \text{SR} \times \text{TCR} \times \text{C} \]

- \( \text{LGT} \) = Maximum Driveshaft Low Gear Torque
- \( T \) = Net Engine Torque or 95% of the Gross Engine Torque
- \( \text{TLGR} \) = Transmission Low Gear Ratio (forward)
- \( \text{TE} \) = Transmission Efficiency (automatic = 0.8; manual = 0.85)
- \( \text{SR} \) = Torque Converter Stall Ratio (if applicable)
- \( \text{TCR} \) = Transfer Case or Auxiliary Transmission Ratio (if applicable)
- \( \text{C} \) = Transfer Case Efficiency (if applicable, 0.95)

Step 2 - Overall Low Gear Ratio Calculation
\[ \text{OLGR} = \text{TLGR} \times \text{SR} \times \text{TCR} \]

- \( \text{OLGR} \) = Overall Low Gear Ratio
- \( \text{TLGR} \) = Transmission Low Gear Ratio
- \( \text{SR} \) = Torque Converter Stall Ratio (if applicable)
- \( \text{TCR} \) = Transfer Case or Auxiliary Transmission Ratio (if applicable)

Step 3 - Driveline Series Selection
To select a driveline series:

1. Plot the torque value determined from Step 1 with the overall low gear ratio (OLGR) from Step 2 on the appropriate graph for 10 Series or SPL Series in the "Applications Guidelines" section on pages 6 & 7.

Step 4 - Specifying the Interaxle Driveline (if applicable)
To specify the interaxle driveline, use:

1. 60% of the Driveline Series Selection torque from Step 1 and the OLGR from Step 2.
2. Find the appropriate interaxle driveline series for SPL using the Driveline Sizing graph, under "Application Guidelines" on page 8, and for 10 Series using the Driveline Sizing graph, under "Application Guidelines" on page 6.

Note: High angle (45°) interaxle driveshafts are available in SPL170, SPL250 and 1710 Series only.
Application Graphs

10 Series Graph
SPL Series Graph

SPL SERIES
MAIN DRIVE APPLICATION GUIDELINES

MAX. NET DRIVESHAFT TORQUE

LOW GEAR RATIO
SPL Interaxle Series Graph

SPL SERIES
INTERAXLE APPLICATION GUIDELINES

\[\text{Max. Net Driveshaft Torque}\]

\[
\begin{array}{c|c|c}
\text{Low Gear Ratio} & 4 & 5 \\
\hline
\text{N\textdegree m} & 2,000 & 1,475 \\
\text{LB. FT.} & 1,475 & \\
\hline
\text{N\textdegree m} & 10,000 & 7,375 \\
\text{LB. FT.} & 7,375 & \\
\hline
\text{N\textdegree m} & 20,000 & 14,750 \\
\text{LB. FT.} & 14,750 & \\
\hline
\text{N\textdegree m} & 30,000 & 22,125 \\
\text{LB. FT.} & 22,125 & \\
\hline
\text{N\textdegree m} & 40,000 & 29,500 \\
\text{LB. FT.} & 29,500 & \\
\hline
\end{array}
\]

- SPL250
  - 21,000 Lb. Ft. 15,490 N\textdegree m
- SPL170
  - 15,000 Lb. Ft. 11,064 N\textdegree m
Critical Speed

Critical speed is defined as: The speed at which the rotational speed of the driveshaft coincides with the natural frequency of the shaft.

Standard Equation

\[ CS = 30 \pi \sqrt{\frac{E \times 386.4 (O^2 + I^2)}{P \times L^4 \times 16}} \]

- \( CS \) = Critical Speed
- \( E \) = Modulus of tubing material (psi)
- \( O^* \) = Outside Diameter of Tubing (in)
- \( I^* \) = Inside Diameter of Tubing (in)
- \( P \) = Density of Tubing Material (lbs/in³)
- \( L \) = Distance Between Journal Cross Centers (in)

* Refer to "Spicer Standard Tube Sizes" on page 11 for tube dimensions.

Material Properties

<table>
<thead>
<tr>
<th>Material</th>
<th>Modulus</th>
<th>Density</th>
<th>( \frac{E}{P} \times 386.4 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>( 30.00 \times 10^6 )</td>
<td>0.2830</td>
<td>( 41.0 \times 10^9 )</td>
</tr>
<tr>
<td>Aluminum</td>
<td>( 10.30 \times 10^6 )</td>
<td>0.0980</td>
<td>( 39.4 \times 10^9 )</td>
</tr>
</tbody>
</table>

Simplified Equations

**Steel:**

\[ CS = \frac{4.769 \times 10^6}{L^2} \sqrt{O^2 + I^2} \]

**Aluminum:**

\[ CS = \frac{4.748 \times 10^6}{L^2} \sqrt{O^2 + I^2} \]

- \( CS \) = Critical Speed
- \( L \) = Distance Between Journal Cross Centers (in)
- \( O \) = Outside Diameter of Tubing (in)
- \( I \) = Inside Diameter of Tubing (in)
Critical Speed

Adjusted Critical Speed (Maximum Safe Operating Speed)

\[ ACS = TC \times CF \times SF \]

\( ACS = \) Adjusted Critical Speed
\( TC = \) Theoretical Critical
\( CF = \) Correction Factor
\( SF = \) Safety Factor

Suggested factors for Adjusted Critical Speed:
- Safety Factor = 0.75
- Correction Factor
  - Outboard Slip = 0.92
  - Inboard Slip = 0.75

**Note:** The value for ACS (Maximum Safe Operating Speed) must be greater that the maximum driveshaft speed of the vehicle.

**Spicer Diamond Series™ Adjusted Critical Speed**

The Spicer Diamond Series driveshaft combines a light weight aluminum tube with traditional steel end components. The Spicer Diamond Series is available in two tube sizes for driveline installed lengths of 80 in. to 130 in. The following formulas can be used to calculate the Maximum Safe Operating Speed (ACS) for each tube design.

**Spicer Diamond Series 7 inch straight tube:**

\[ ACS = \left( \frac{L}{7816} \right)^{-1.8457} \]

**Note:** The maximum installed length for the 7 inch straight design is 106 in.

**Spicer Diamond Series 8.5 inch hydroformed tube:**

\[ ACS = \left( \frac{L}{6440} \right)^{-1.967} \]

**Note:** The maximum installed length for the 8.5 inch hydroformed design is 130 in.
**Maximum Driveshaft Length**

Refer to the chart at the bottom of this page for maximum driveshaft length vs. RPM guidelines. This information can also be found in TMC Recommended Practice RP610A Chart 3.

The general length limitations are as follows:

<table>
<thead>
<tr>
<th>Tube O.D.</th>
<th>Maximum Length *</th>
<th>Driveline Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0 in.</td>
<td>60 in.</td>
<td>SPL32, SPL36</td>
</tr>
<tr>
<td>3.5 in.</td>
<td>65 in.</td>
<td>SPL55, SPL70</td>
</tr>
<tr>
<td>4.0 in.</td>
<td>70 in.</td>
<td>1710, 1760, SPL100</td>
</tr>
<tr>
<td>4.2 in.</td>
<td>72 in.</td>
<td>SPL140</td>
</tr>
<tr>
<td>4.3 in.</td>
<td>73 in.</td>
<td>SPL140HD</td>
</tr>
<tr>
<td>4.5 in.</td>
<td>75 in.</td>
<td>1710, 1810</td>
</tr>
<tr>
<td>5.0 in.</td>
<td>80 in.</td>
<td>SPL170, SPL250</td>
</tr>
<tr>
<td>5.5 in.</td>
<td>83 in.</td>
<td>SPL350</td>
</tr>
</tbody>
</table>

* Installed length u-joint center to u-joint center.
## Spicer Standard Tube Sizes

<table>
<thead>
<tr>
<th>Series</th>
<th>Tube Size (in)</th>
<th>Dana Part Number</th>
<th>Torque Rating (lbs. ft.)</th>
<th>Tube JAEL (lbs. ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1610</td>
<td>4.00 x .134</td>
<td>32-30-52</td>
<td>5,700</td>
<td>8,600</td>
</tr>
<tr>
<td>1710</td>
<td>4.00 x .134</td>
<td>32-30-52</td>
<td>7,700</td>
<td>8,600</td>
</tr>
<tr>
<td>1710 HD</td>
<td>4.09 x .180</td>
<td>32-30-72</td>
<td>10,200</td>
<td>13,925</td>
</tr>
<tr>
<td>1760</td>
<td>4.00 x .134</td>
<td>32-30-92</td>
<td>10,200</td>
<td>10,435</td>
</tr>
<tr>
<td>1760 HD</td>
<td>4.09 x .180</td>
<td>32-30-72</td>
<td>12,200</td>
<td>13,925</td>
</tr>
<tr>
<td>1810</td>
<td>4.50 x .134</td>
<td>36-30-62</td>
<td>12,200</td>
<td>13,065</td>
</tr>
<tr>
<td>1810 HD</td>
<td>4.59 x .180</td>
<td>36-30-102</td>
<td>16,500</td>
<td>17,935</td>
</tr>
<tr>
<td>SPL 90</td>
<td>4.00 x .095</td>
<td>32-30-12</td>
<td>4,900</td>
<td>6,300</td>
</tr>
<tr>
<td>SPL 100</td>
<td>4.00 x .095</td>
<td>32-30-12</td>
<td>5,700</td>
<td>6,300</td>
</tr>
<tr>
<td>SPL 140</td>
<td>4.21 x .138</td>
<td>100-30-3</td>
<td>7,744</td>
<td>11,010</td>
</tr>
<tr>
<td>SPL 140 HD</td>
<td>4.33 x .197</td>
<td>100-30-5</td>
<td>10,325</td>
<td>16,519</td>
</tr>
<tr>
<td>SPL 170</td>
<td>4.96 x .118</td>
<td>120-30-3</td>
<td>12,539</td>
<td>13,185</td>
</tr>
<tr>
<td>SPL 170 HD</td>
<td>5.06 x .167</td>
<td>120-30-4</td>
<td>12,539</td>
<td>19,617</td>
</tr>
<tr>
<td>SPL 170 I/A</td>
<td>4.59 x .180</td>
<td>36-30-102</td>
<td>11,063</td>
<td>17,935</td>
</tr>
<tr>
<td>SPL 250 I/A</td>
<td>5.06 x .167</td>
<td>120-30-4</td>
<td>15,489</td>
<td>19,617</td>
</tr>
<tr>
<td>SPL 250</td>
<td>5.06 x .167</td>
<td>120-30-4</td>
<td>16,595</td>
<td>19,617</td>
</tr>
<tr>
<td>SPL250 HD</td>
<td>5.12 x .197</td>
<td>120-30-5</td>
<td>18,439</td>
<td>23,555</td>
</tr>
<tr>
<td>SPL350</td>
<td>5.45 x .167</td>
<td>130-30-21720</td>
<td>22,127</td>
<td>24,180</td>
</tr>
<tr>
<td>SPL350 HD</td>
<td>5.51 x .197</td>
<td>130-30-21718</td>
<td>25,815</td>
<td>28,731</td>
</tr>
</tbody>
</table>
Center Bearing Mounting

Spicer heavy duty center bearings must be mounted within 3° of perpendicular to the coupling shaft centerline as shown in Figure 1 below and the center bearing assembly must not operate with a linear offset greater than 1/8 inch as shown in Figure 2.

Note: The Spicer "XC" self aligning center bearing may be mounted up to +/- 10° of perpendicular to the coupling shaft centerline as shown in the side view of Figure 1. The rubber isolator must remain perpendicular to the coupling shaft centerline within 3° as shown in Figure 1.

Figure 1

Figure 2
Driveline Analysis

Design Criteria

- Torsional Vibration
- Inertial Vibration
- Center Bearing Loading

Torsional and Inertial Excitation

Calculate Joint Angles

To find the true joint angle of each joint, first find the top-view and side-view angles of each joint. The top-view angle of Joint A is equal to 0.67 - 0.00 = 0.67 and the side-view joint angle of Joint A is equal to (-4.0) - (-1.3) = -2.70. By putting the top-view angle (0.67) to the X-axis and the side-view angle (-2.70) to the Y-axis, the true joint angle of Joint A is equal to 2.78 @ 284.1 degrees.

Note: The true joint angle is a vector: the 2.78 degrees is the magnitude and the 284.1 degree is the argument. The true joint angles of joints A, B, and C are shown in the following chart.
Driveline Analysis

Calculate Torsional and Inertia Excitation

Calculate the torsional effect:

\[ \Theta_{rots} = \sqrt{((\Theta_1 - \phi_1)^2 + (\Theta_2 - (90^\circ - \delta_1))^2 + (\Theta_3 - (\phi_2 - 90^\circ))^2} \]

(1) When \( d_1 = 0 \) deg, \( d_2 = 0 \) deg.

\[
\begin{align*}
\Theta_{rots} &= \sqrt{(2.78 - 284.1)^2 + (1.26 - (276.01 - 90)^0)^2 + (2.58 - 108.29)^2} \\
&= \sqrt{(7.7284 - 151.8^0) + (1.5876 - 12.02^0) + (6.6564 - 143.42)} \\
&= \sqrt{(12.8667 - 145.4^0)} \\
&= 3.587^0 - 72.75^0 \\
3.3405 \times 10^6 \times (2368\text{rpm})^2 \times (3.5870^0)^2 &= 241.0154 \text{ rad} \text{ sec}^{-2}
\end{align*}
\]

(2) When \( d_1 = 0 \) deg, \( d_2 = 90 \) deg.

\[
\begin{align*}
\Theta_{rots} &= \sqrt{(2.78 - 284.1)^2 + (1.26 - (276.01 - 90)^0)^2 + (2.58 - (108.29 - 90)^0)^2} \\
&= \sqrt{(7.7284 - 151.8^0) + (1.5876 - 12.02^0) + (6.6564 - 36.58)} \\
&= \sqrt{(0.65124)^2} \\
&= 0.80699^0 \text{ - 41.162^0} \\
3.3405 \times 10^6 \times (2368\text{rpm})^2 \times (0.80699^0)^2 &= 12.1988 \text{ rad} \text{ sec}^{-2}
\end{align*}
\]

(3) When \( d_1 = 90 \) deg, \( d_2 = 90 \) deg.

\[
\begin{align*}
\Theta_{rots} &= \sqrt{(2.78 - 284.1)^2 + (1.26 - (276.01 - 90 - 90)^0)^2 + (2.58 - (108.29 - 90 - 90)^0)^2} \\
&= \sqrt{(7.7284 - 151.8^0) + (1.5876 - 167.98^0) + (6.6564 - 143.42)} \\
&= \sqrt{(15.847236 - 149.89^0)} \\
&= 3.98085^0 \text{ - 74.94^0} \\
3.3405 \times 10^6 \times (2368\text{rpm})^2 \times (3.98085^0)^2 &= 296.84 \text{ rad} \text{ sec}^{-2}
\end{align*}
\]
Driveline Analysis

(4) When \( d_1 = 90 \) deg, \( d_2 = 0 \) deg.

\[
\begin{align*}
&= \sqrt{(2.78 - 284.1')^2 + (1.26 - (276.01 - 90)')^2 + (2.58 - (108.29 - 90)')^2} \\
&= \sqrt{(7.7284 - 151.8') + (1.5876 - 167.98') + (6.6564 - 36.58')} \\
&= \sqrt{(3.018639 - 179.699')} = 1.737423' - 89.84'
\end{align*}
\]

\[
3.3405 \times 10^4 (2368rpm)^2 (1.737423'^2) = 56.54 \text{ rad}^2 \text{sec}^{-2}
\]

Calculate the inertia drive effects:

\[
\Theta_d = \sqrt{2(\Theta_1 - \phi_1)^2 + (\Theta_2 - (\phi_2 - 90^\circ - \delta_0))^2}
\]

(1) When \( d_1 = 0 \) deg, \( d_2 = 0 \) deg or \( d_1 = 0 \) deg, \( d_2 = 90 \) deg.

\[
\begin{align*}
&= \sqrt{(2.78 - 284.1')^2 + (1.26 - (276.01 - 90)')^2} \\
&= \sqrt{(15.4568 - 151.8') + (1.5876 - 12.02')} \\
&= \sqrt{(13.939105 - 149.98')} = 3.733511'^2 - 74.99'
\end{align*}
\]

\[
3.3405 \times 10^4 (2368rpm)^2 (3.733511'^2) = 261.10 \text{ rad}^2 \text{sec}^{-2}
\]

(2) When \( d_1 = 90 \) deg, \( d_2 = 90 \) deg or \( d_1 = 90 \) deg, \( d_2 = 0 \) deg.

\[
\begin{align*}
&= \sqrt{(2.58 - 108.29')^2 + (1.26 - (276.01 + 90)')^2} \\
&= \sqrt{(13.3128 - 143.42') + (1.5876 + 143.42')} \\
&= \sqrt{(16.987278 - 153.29')} = 4.12156'^2 - 76.64'
\end{align*}
\]

\[
3.3405 \times 10^4 (2368rpm)^2 (4.12156'^2) = 318.19 \text{ rad}^2 \text{sec}^{-2}
\]

Calculate the inertia coast effects:

\[
\Theta_c = \sqrt{2(\Theta_1 - \phi_1)^2 + (\Theta_2 + (\phi_2 + 90^\circ + \delta_0))^2}
\]

(1) When \( d_1 = 0 \) deg, \( d_2 = 0 \) deg or \( d_1 = 90 \) deg, \( d_2 = 0 \) deg.

\[
\begin{align*}
&= \sqrt{(2.58 - 108.29')^2 + (1.26 - (276.01 + 90)')^2} \\
&= \sqrt{(13.3128 - 143.42') + (1.5876 + 143.42')} \\
&= \sqrt{(11.887165 - 140.24')} = 3.447777'^2 - 70.11'
\end{align*}
\]

\[
3.3405 \times 10^4 (2368rpm)^2 (3.447777'^2) = 222.66 \text{ rad}^2 \text{sec}^{-2}
\]
When \( d_1 = 0 \) deg, \( d_2 = 90 \) deg or \( d_1 = 90 \) deg, \( d_2 = 90 \) deg.

\[
\begin{align*}
\sqrt{2(2.58 \cdot 10^8)^2 + (1.26 \cdot 276.01 + 90 + 90)^2} &= \sqrt{(13.3128 \cdot 143.42) + (1.5876 \cdot 167.98)} \\
&= \sqrt{(14.77151 \cdot 145.98)} \\
&= 3.84337 \cdot 72.99^\circ \\
3.3405 \times 10^6 (2368 \text{rpm})^2 (3.84337^\circ)^2 &= 276.69 \text{ rad}^2/	ext{sec}^4
\end{align*}
\]

Note: The maximum torsional excitation level is 300 rad/sec². The maximum inertia excitation level is 1000 rad/sec².

Calculate the torque fluctuations:

The mass moment of inertia of the following items are approximately equal to:

<table>
<thead>
<tr>
<th>Item</th>
<th>lbf-in-sec²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission</td>
<td>2.33</td>
</tr>
<tr>
<td>Axle</td>
<td>2.53</td>
</tr>
<tr>
<td>1760 Driveshaft</td>
<td>1.3</td>
</tr>
</tbody>
</table>

(1) The torque fluctuation at the axle end is:

\[
T_{\text{axle}} = T_{\text{torsional, axle}} + T_{\text{inertia, drive}} \\
= J_{\text{axle torsional}} + J_{\text{driveshaft drive}} \\
= (2.53)(241.01) + (1.3)(261.10) \\
= 949.18 \text{ in-lb} \\
= 79.1 \text{ ft-lb}
\]

(2) The torque fluctuation at the transmission end is:

\[
T_{\text{transmission}} = T_{\text{torsional, transmission}} + T_{\text{inertia, coast}} \\
= J_{\text{transmission torsional}} + J_{\text{driveshaft coast}} \\
= (2.33)(241.01) + (1.3)(222.66) \\
= 851.01 \text{ in-lb} \\
= 70.92 \text{ ft-lb}
\]
Center Bearing Loading

Calculate Static / Dynamic Center Bearing Load

Static

\[
\frac{1}{2} \frac{T}{\text{AB} - \text{DB}} \left\{ \sin a^\circ \left( \Phi_a + 90^\circ \right) + \left( \tan b^\circ \cdot \frac{\text{AB}}{\text{BC}} \sin b^\circ \right) \left( \Phi_b + 90^\circ \right) + \frac{\text{AB}}{\text{BC}} \tan c^\circ \left( \Phi_c - 90^\circ \right) \right\}
\]

\[
= \frac{1}{2} \frac{12214 \times 12}{(40.62)} \left\{ \sin 2.78^\circ \left( 284.1 + 90^\circ \right) + \left( \tan 1.26^\circ \cdot \frac{40.44.34}{40.44.34} \sin 1.26^\circ \right) \left( 276.01 + 90^\circ \right) + \frac{40.44.34}{44.34} \tan 2.58^\circ \left( 108.29 - 90^\circ \right) \right\}
\]

\[
= 2168.1657 \left\{ (0.0485 - 194.1^\circ) + (0.0022 - 366.01^\circ) + (0.0406 - 18.29^\circ) \right\}
\]

\[
= 2168.1657 \times (0.0912 - 15.77^\circ)
\]

\[
= 197.7738 \text{ lbs} \left( 15.77^\circ \right)
\]

Dynamic

\[
\frac{1}{2} \frac{T}{\text{AB} - \text{DB}} \left\{ \sin a^\circ \left( 90 - \Phi_a \right) + \left( \tan b^\circ + \frac{\text{AB}}{\text{BC}} \sin b^\circ \right) \left( 90 - \Phi_b + 2 \delta \right) + \frac{\text{AB}}{\text{BC}} \tan c^\circ \left( 90 - \Phi_c + 2 \delta \right) \right\}
\]

(1) When \( d_1 = 0 \text{ deg}, d_2 = 0 \text{ deg} \).

\[
= \frac{1}{2} \frac{12214 \times 12}{(40.62)} \left\{ \sin 2.78^\circ \left( 90 - 284.1^\circ \right) + \left( \tan 1.26^\circ + \frac{40.44.34}{40.44.34} \sin 1.26^\circ \right) \left( 90 - 276.01^\circ \right) + \frac{40.44.34}{44.34} \tan 2.58^\circ \left( 90 - 108.29^\circ \right) \right\}
\]

\[
= 2168.1657 \left\{ (0.0485 - 194.1^\circ) + (0.0418 - 186.01^\circ) + (0.0406 - 18.29^\circ) \right\}
\]

\[
= 2168.1657 \times (0.0502 - 176.0^\circ)
\]

\[
= 108.7635 \text{ lbs} \left( 176.0^\circ \right)
\]
(2) When $d_1 = 0$ deg, $d_2 = 90$ deg.

\[
\begin{align*}
&= \frac{1}{2} \frac{12214 \times 12}{(40 - 6.2)} \left( \sin 2.78^\circ (90 - 284.1)^\circ \right) \\
&\quad + (\tan 1.26^\circ + \frac{40}{44.34} \sin 1.26^\circ) (90 - 276.01)^\circ \\
&\quad + \frac{40}{44.34} \tan 2.58^\circ (90 - 108.29 + 2 \times 90)^\circ \\
&= 2168.1657 \{(0.0485 - 194.1^\circ) + (0.0418 - 186.01^\circ) + (0.0406 - 161.71^\circ)\} \\
&= 2168.1657(0.1305 - 167.18^\circ) \\
&= 282.9240 \text{lbs} - 167.18^\circ
\end{align*}
\]

(3) When $d_1 = 90$ deg, $d_2 = 90$ deg.

\[
\begin{align*}
&= \frac{1}{2} \frac{12214 \times 12}{(40 - 6.2)} \left( \sin 2.78^\circ (90 - 284.1)^\circ \right) \\
&\quad + (\tan 1.26^\circ + \frac{40}{44.34} \sin 1.26^\circ) (90 - 276.01 + 2 \times 90)^\circ \\
&\quad + \frac{40}{44.34} \tan 2.58^\circ (90 - 108.29)^\circ \\
&= 2168.1657 \{(0.0485 - 194.1^\circ) + (0.0418 - 186.01^\circ) + (0.0406 - 18.29^\circ)\} \\
&= 2168.1657(0.0336 - 9.11^\circ) \\
&= 72.8115 \text{lbs} - 9.11^\circ
\end{align*}
\]

(4) When $d_1 = 90$ deg, $d_2 = 0$ deg.

\[
\begin{align*}
&= \frac{1}{2} \frac{12214 \times 12}{(40 - 6.2)} \left( \sin 2.78^\circ (90 - 284.1)^\circ \right) \\
&\quad + (\tan 1.26^\circ + \frac{40}{44.34} \sin 1.26^\circ) (90 - 276.01 + 2 \times 90)^\circ \\
&\quad + \frac{40}{44.34} \tan 2.58^\circ (90 - 108.29 + 2 \times 90)^\circ \\
&= 2168.1657 \{(0.0485 - 194.1^\circ) + (0.0418 - 6.01^\circ) + (0.0406 - 18.29^\circ)\} \\
&= 2168.1657(0.0484 - 155.36^\circ) \\
&= 105.03326 \text{lbs} - 155.36^\circ
\end{align*}
\]

**Maximum Center Bearing Loads**

<table>
<thead>
<tr>
<th>Design</th>
<th>Static Load</th>
<th>Dynamic Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Rubber</td>
<td>500 lbs.</td>
<td>500 lbs.</td>
</tr>
<tr>
<td>Semi-Slotted Rubber</td>
<td>250 lbs.</td>
<td>250 lbs.</td>
</tr>
<tr>
<td>Slotted Rubber</td>
<td>100 lbs.</td>
<td>100 lbs.</td>
</tr>
</tbody>
</table>
Joint Life vs. Joint Angle

% of Expected Joint Life

Angle (degrees)
Application Form

Heavy / Medium-Duty Applications

Company: ___________________________________  Contact: ___________________________________

Email: _____________________________________  Date: _____________________________________

Phone: _____________________________________  Fax: ______________________________________

Vocation: ___________________________  Vehicle Make: ___________________________  Vehicle Model: ___________________________

Weight - Empty: ___________________________  GVW Total: ___________________________

  GVW (Front): ________________  GVW (Rear): ________________  GCW: ___________________________

Tires - Size: ________________  Make: ___________________________  Rolling Radius: ___________________________

Engine - Make: ___________________________  Model: ___________________________  Displacement: ___________________________

  Net Torque: ________________  At Speed: ________________  Net H.P.: ________________  At Speed: ________________

  Gross Torque: ________________  At Speed: ________________  Gross H.P.: ________________  At Speed: ________________

Maximum Operating Speed (including engine over speed): ___________________________

Trans - Make: ___________________________  Model: ___________________________

  Ratios - Forward (including overdrive): ________________  Reverse: ___________________________

Torque Converter - Make: ___________________________  Model: ___________________________  Stall Ratio: ___________________________

Auxiliary - Make: ___________________________  Model: ___________________________  Ratios: ___________________________

Transfer Case - Make: ___________________________  Model: ___________________________  Ratios: ___________________________

  Torque Split Ratio - Front: ___________________________  Rear: ___________________________

Axle Make - Front: ___________________________  Model: ___________________________  Ratios: ___________________________

  Make - Front: ___________________________  Model: ___________________________  Ratios: ___________________________

B₁₀ Life Expectancy: ___________________________

Vehicle Duty Cycle: ___________________________

Description of Vehicle Function: _____________________________________________________________

_______________________________________________________________________________________

_______________________________________________________________________________________

Signed: ___________________________________

Title: ___________________________________

Spicer Engineer: ___________________________  Phone: ___________________________________

Email: _____________________________________  Fax: ______________________________________
## APPLICATION PROPOSAL

<table>
<thead>
<tr>
<th>Vehicle Position</th>
<th>Series</th>
<th>Dana Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission to Rear Axle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission to Auxiliary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auxiliary to Rear Axle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission to Mid Bearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid Bearing to Rear Axle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaxle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheel Drive</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Vehicle Application Sketch

#### Plan View

#### Side View

---

Proposed By: ____________________________

Signed: ____________________________

Title: ____________________________
## Yoke Dimensions

### Snap Ring Cross Holes

<table>
<thead>
<tr>
<th>Type</th>
<th>Series</th>
<th>A (mm / in)</th>
<th>B (mm / in)</th>
<th>C* (mm / in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snap Ring</td>
<td>1210</td>
<td>65.0 / 2.56</td>
<td>26.9 / 1.06</td>
<td>79.2 / 3.12</td>
</tr>
<tr>
<td>Construction</td>
<td>1280 / 1310</td>
<td>84.8 / 3.34</td>
<td>26.9 / 1.06</td>
<td>96.8 / 3.81</td>
</tr>
<tr>
<td></td>
<td>1330</td>
<td>95.0 / 3.74</td>
<td>26.9 / 1.06</td>
<td>106.4 / 4.19</td>
</tr>
<tr>
<td></td>
<td>1350</td>
<td>95.0 / 3.74</td>
<td>30.2 / 1.19</td>
<td>108.0 / 4.25</td>
</tr>
<tr>
<td></td>
<td>1410</td>
<td>109.2 / 4.30</td>
<td>30.2 / 1.19</td>
<td>124.0 / 4.88</td>
</tr>
<tr>
<td></td>
<td>1480 / SPL 55</td>
<td>109.2 / 4.30</td>
<td>34.8 / 1.37</td>
<td>124.0 / 4.88</td>
</tr>
<tr>
<td></td>
<td>1550 / SPL 70</td>
<td>129.0 / 5.08</td>
<td>34.8 / 1.37</td>
<td>144.5 / 5.69</td>
</tr>
<tr>
<td></td>
<td>SPL 90 / SPL 100</td>
<td>130.6 / 5.14</td>
<td>41.1 / 1.62</td>
<td>149.4 / 5.88</td>
</tr>
<tr>
<td></td>
<td>1650</td>
<td>146.8 / 5.78</td>
<td>41.1 / 1.62</td>
<td>165.1 / 6.50</td>
</tr>
<tr>
<td></td>
<td>SPL350</td>
<td>177.0 / 6.97</td>
<td>65.0 / 2.56</td>
<td>206.0 / 8.11</td>
</tr>
</tbody>
</table>

* Swing diameter clears yoke by 1.5 mm / 0.06 in.
### 10 Series Half Round Cross Holes

<table>
<thead>
<tr>
<th>Type</th>
<th>Series</th>
<th>A (mm / in)</th>
<th>B (mm / in)</th>
<th>C (mm / in)</th>
<th>D (mm / in)</th>
<th>E (mm / in)</th>
<th>F* (mm / in)</th>
<th>G (mm / in)</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-bolt</td>
<td>1210</td>
<td>62.0 / 2.44</td>
<td>26.9 / 1.06</td>
<td>56.4 / 2.22</td>
<td>35.8 / 1.41</td>
<td>0.8 / 0.03</td>
<td>87.4 / 3.44</td>
<td>8.4 / 0.33</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1280/1310</td>
<td>81.8 / 3.22</td>
<td>26.9 / 1.06</td>
<td>73.9 / 2.91</td>
<td>35.8 / 1.41</td>
<td>0.8 / 0.03</td>
<td>101.6 / 4.00</td>
<td>8.4 / 0.33</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1330</td>
<td>91.9 / 3.62</td>
<td>26.9 / 1.06</td>
<td>84.1 / 3.31</td>
<td>35.8 / 1.41</td>
<td>0.8 / 0.03</td>
<td>115.8 / 4.56</td>
<td>8.4 / 0.33</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1350</td>
<td>91.9 / 3.62</td>
<td>30.2 / 1.19</td>
<td>81.0 / 3.19</td>
<td>42.2 / 1.66</td>
<td>0.8 / 0.03</td>
<td>115.8 / 4.56</td>
<td>9.9 / 0.39</td>
<td>-</td>
</tr>
<tr>
<td>Design</td>
<td>1410</td>
<td>106.4 / 4.19</td>
<td>30.2 / 1.19</td>
<td>95.2 / 3.75</td>
<td>42.2 / 1.66</td>
<td>0.8 / 0.03</td>
<td>125.5 / 4.94</td>
<td>9.9 / 0.39</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1480</td>
<td>106.4 / 4.19</td>
<td>35.1 / 1.38</td>
<td>93.7 / 3.69</td>
<td>48.5 / 1.91</td>
<td>0.8 / 0.03</td>
<td>134.9 / 5.31</td>
<td>11.7 / 0.46</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1550</td>
<td>126.2 / 4.97</td>
<td>35.1 / 1.38</td>
<td>113.5 / 4.47</td>
<td>48.5 / 1.91</td>
<td>0.8 / 0.03</td>
<td>152.4 / 6.00</td>
<td>11.7 / 0.46</td>
<td>-</td>
</tr>
<tr>
<td>Bearing</td>
<td>1210</td>
<td>62.0 / 2.44</td>
<td>26.9 / 1.06</td>
<td>53.8 / 2.12</td>
<td>40.1 / 1.58</td>
<td>0.8 / 0.03</td>
<td>87.4 / 3.44</td>
<td>-</td>
<td>0.25 - 28</td>
</tr>
<tr>
<td></td>
<td>1280/1310</td>
<td>81.8 / 3.22</td>
<td>26.9 / 1.06</td>
<td>73.9 / 2.91</td>
<td>40.1 / 1.58</td>
<td>0.8 / 0.03</td>
<td>101.6 / 4.00</td>
<td>-</td>
<td>0.25 - 28</td>
</tr>
<tr>
<td></td>
<td>1330</td>
<td>91.9 / 3.62</td>
<td>26.9 / 1.06</td>
<td>84.1 / 3.31</td>
<td>40.1 / 1.58</td>
<td>0.8 / 0.03</td>
<td>115.8 / 4.56</td>
<td>-</td>
<td>0.25 - 28</td>
</tr>
<tr>
<td></td>
<td>1350</td>
<td>91.9 / 3.62</td>
<td>30.2 / 1.19</td>
<td>81.0 / 3.19</td>
<td>45.7 / 1.80</td>
<td>0.8 / 0.03</td>
<td>115.8 / 4.56</td>
<td>-</td>
<td>0.312 - 24</td>
</tr>
<tr>
<td>Strap</td>
<td>1410</td>
<td>106.4 / 4.19</td>
<td>30.2 / 1.19</td>
<td>95.2 / 3.75</td>
<td>45.7 / 1.80</td>
<td>0.8 / 0.03</td>
<td>125.5 / 4.94</td>
<td>-</td>
<td>0.312 - 24</td>
</tr>
<tr>
<td></td>
<td>1480</td>
<td>106.4 / 4.19</td>
<td>35.1 / 1.38</td>
<td>93.7 / 3.69</td>
<td>53.8 / 2.12</td>
<td>0.8 / 0.03</td>
<td>134.9 / 5.31</td>
<td>-</td>
<td>0.375 - 24</td>
</tr>
<tr>
<td></td>
<td>1550</td>
<td>126.2 / 4.97</td>
<td>35.1 / 1.38</td>
<td>113.5 / 4.47</td>
<td>53.8 / 2.12</td>
<td>0.8 / 0.03</td>
<td>152.4 / 6.00</td>
<td>-</td>
<td>0.375 - 24</td>
</tr>
<tr>
<td>Tapped Hole</td>
<td>1610</td>
<td>134.9 / 5.31</td>
<td>47.8 / 1.88</td>
<td>122.2 / 4.81</td>
<td>63.5 / 2.50</td>
<td>9.7 / 0.38</td>
<td>171.4 / 6.75</td>
<td>-</td>
<td>0.375 - 24</td>
</tr>
<tr>
<td></td>
<td>1710</td>
<td>157.2 / 6.19</td>
<td>49.3 / 1.94</td>
<td>142.0 / 5.59</td>
<td>71.4 / 2.81</td>
<td>7.9 / 0.31</td>
<td>190.5 / 7.50</td>
<td>-</td>
<td>0.50 - 20</td>
</tr>
<tr>
<td></td>
<td>1760</td>
<td>180.1 / 7.09</td>
<td>49.3 / 1.94</td>
<td>165.1 / 6.50</td>
<td>71.4 / 2.81</td>
<td>7.9 / 0.31</td>
<td>212.9 / 8.38</td>
<td>-</td>
<td>0.50 - 20</td>
</tr>
<tr>
<td></td>
<td>1810</td>
<td>194.1 / 7.64</td>
<td>49.3 / 1.94</td>
<td>179.1 / 7.05</td>
<td>71.4 / 2.81</td>
<td>7.9 / 0.31</td>
<td>228.6 / 9.00</td>
<td>-</td>
<td>0.50 - 20</td>
</tr>
<tr>
<td>Bearing</td>
<td>1410</td>
<td>106.4 / 4.19</td>
<td>30.2 / 1.19</td>
<td>95.2 / 3.75</td>
<td>45.7 / 1.80</td>
<td>0.8 / 0.03</td>
<td>125.5 / 4.94</td>
<td>8.4 / 0.33</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1480</td>
<td>106.4 / 4.19</td>
<td>35.1 / 1.38</td>
<td>93.7 / 3.69</td>
<td>53.8 / 2.12</td>
<td>0.8 / 0.03</td>
<td>134.9 / 5.31</td>
<td>9.9 / 0.39</td>
<td>-</td>
</tr>
<tr>
<td>Thru-Hole</td>
<td>1550</td>
<td>126.2 / 4.97</td>
<td>35.1 / 1.38</td>
<td>113.5 / 4.47</td>
<td>53.8 / 2.12</td>
<td>0.8 / 0.03</td>
<td>152.4 / 6.00</td>
<td>9.9 / 0.39</td>
<td>-</td>
</tr>
</tbody>
</table>

* Swing diameter clears yoke by 1.5 mm / 0.06 in.
### SPL Full Round Cross Holes

* Swing diameter clears yoke by 1.5 mm.

<table>
<thead>
<tr>
<th>Type</th>
<th>Series</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>D * (mm)</th>
<th>E (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPL</td>
<td>SPL 140</td>
<td>128</td>
<td>49</td>
<td>32</td>
<td>160</td>
<td>M8 x 1.00</td>
</tr>
<tr>
<td>Full</td>
<td>SPL 170</td>
<td>153</td>
<td>55</td>
<td>32</td>
<td>185</td>
<td>M8 x 1.00</td>
</tr>
<tr>
<td>Round</td>
<td>SPL 250</td>
<td>152</td>
<td>60</td>
<td>32</td>
<td>184</td>
<td>M8 x 1.00</td>
</tr>
</tbody>
</table>
## SPL Half Round Cross Holes

<table>
<thead>
<tr>
<th>Type</th>
<th>Series</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>D (mm)</th>
<th>E (mm)</th>
<th>F * (mm)</th>
<th>G (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing</td>
<td>SPL 55</td>
<td>106.4</td>
<td>35.1</td>
<td>93.7</td>
<td>53.8</td>
<td>0.8</td>
<td>134.9</td>
<td>0.375 x 24 UNF</td>
</tr>
<tr>
<td></td>
<td>SPL 70</td>
<td>126.2</td>
<td>35.1</td>
<td>113.5</td>
<td>53.8</td>
<td>0.8</td>
<td>152.4</td>
<td>0.375 x 24 UNF</td>
</tr>
<tr>
<td></td>
<td>SPL 100</td>
<td>126</td>
<td>41</td>
<td>115</td>
<td>59</td>
<td>6</td>
<td>154</td>
<td>0.375 x 24 UNF</td>
</tr>
<tr>
<td>Tapped</td>
<td>SPL 140</td>
<td>139</td>
<td>49</td>
<td>113</td>
<td>76</td>
<td>8</td>
<td>174</td>
<td>12 x 1.25</td>
</tr>
<tr>
<td></td>
<td>SPL 170</td>
<td>164</td>
<td>55</td>
<td>140</td>
<td>82</td>
<td>8</td>
<td>193</td>
<td>12 x 1.25</td>
</tr>
<tr>
<td></td>
<td>SPL 250</td>
<td>163</td>
<td>60</td>
<td>135</td>
<td>88</td>
<td>10</td>
<td>193</td>
<td>12 x 1.25</td>
</tr>
<tr>
<td></td>
<td>SPL 350</td>
<td>171.8</td>
<td>65</td>
<td>142</td>
<td>100</td>
<td>0</td>
<td>219</td>
<td>14 x 1.25</td>
</tr>
</tbody>
</table>
BP Cross Holes

<table>
<thead>
<tr>
<th>Type</th>
<th>Series</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>D* (mm)</th>
<th>E (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing</td>
<td>1610</td>
<td>134.9/5.31</td>
<td>47.8/1.88</td>
<td>58.7/2.31</td>
<td>180.8/7.12</td>
<td>0.312-24</td>
</tr>
<tr>
<td>Plate</td>
<td>1710</td>
<td>1.54.7/6.09</td>
<td>49.3/1.94</td>
<td>62.0/2.44</td>
<td>200.2/7.88</td>
<td>0.375-24</td>
</tr>
<tr>
<td>Full</td>
<td>1760</td>
<td>177.8/7.00</td>
<td>49.3/1.94</td>
<td>62.0/2.44</td>
<td>220.5/8.68</td>
<td>0.375-24</td>
</tr>
<tr>
<td>Round</td>
<td>1810</td>
<td>191.8/7.55</td>
<td>49.3/1.94</td>
<td>62.0/2.44</td>
<td>235.0/9.25</td>
<td>0.375-24</td>
</tr>
<tr>
<td></td>
<td>1880</td>
<td>205.5/8.09</td>
<td>55.6/2.19</td>
<td>71.4/2.81</td>
<td>250.9/9.88</td>
<td>0.438-20</td>
</tr>
</tbody>
</table>

*Swing Diameter Clears Yoke by 1.5/0.06 mm/in.
Joint Kit Attaching Hardware and Torque Specifications

U-bolts

<table>
<thead>
<tr>
<th>Series</th>
<th>Spicer U-Joint Kit No</th>
<th>U-Bolt Kit</th>
<th>Recommended Nut Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1210</td>
<td>5-443X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1310, SPL22</td>
<td>5-1310X, 5-1310-1X</td>
<td>2-94-28X</td>
<td>14-17 lbs. ft.</td>
</tr>
<tr>
<td>1330, SPL25</td>
<td>5-1330X, 5-1330-1X</td>
<td>2-94-28X</td>
<td>14-17 lbs. ft.</td>
</tr>
<tr>
<td>1350, SPL30</td>
<td>5-1350X, 1350-1X</td>
<td>3-94-18X</td>
<td>20-24 lbs. ft.</td>
</tr>
<tr>
<td>1410, SPL36</td>
<td>5-1410X, 5-1410-1X</td>
<td>3-94-18X</td>
<td>20-24 lbs. ft.</td>
</tr>
<tr>
<td>1480, SPL55</td>
<td>SPL55X, SPL55-1X</td>
<td>3-94-28X</td>
<td>32-37 lbs. ft.</td>
</tr>
<tr>
<td>1550, SPL70</td>
<td>SPL70X, SPL70-1X</td>
<td>3-94-28X</td>
<td>32-37 lbs. ft.</td>
</tr>
<tr>
<td>3R</td>
<td>5-3147X, 5-795X</td>
<td>2-94-58X</td>
<td>17-24 lbs. ft.</td>
</tr>
</tbody>
</table>

Bearing Strap

WARNING: Bearing strap retaining bolts should not be reused.
<table>
<thead>
<tr>
<th>Series</th>
<th>Spicer U-Joint Kit No</th>
<th>Strap and Bolt Kit</th>
<th>Recommended Bolt Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPL90</td>
<td>SPL90X</td>
<td>90-70-28X</td>
<td>45-60 lb. ft.</td>
</tr>
<tr>
<td>SPL100</td>
<td>SPL100X</td>
<td>90-70-28X</td>
<td>45-60 lb. ft.</td>
</tr>
<tr>
<td>1210</td>
<td>5-443X</td>
<td>2-70-18X</td>
<td>13-18 lb. ft.</td>
</tr>
<tr>
<td>1310, SPL22</td>
<td>5-1310X, 5-1310-1X</td>
<td>2-70-18X</td>
<td>13-18 lb. ft.</td>
</tr>
<tr>
<td>1330, SPL25</td>
<td>5-1330X, 5-1330-1X</td>
<td>2-70-18X</td>
<td>13-18 lb. ft.</td>
</tr>
<tr>
<td>1350, SPL30</td>
<td>5-1350X, 5-1350-1X</td>
<td>3-70-28X</td>
<td>30-35 lb. ft.</td>
</tr>
<tr>
<td>1410, SPL36</td>
<td>5-1410X, 5-1410-1X</td>
<td>3-70-28X</td>
<td>30-35 lb. ft.</td>
</tr>
<tr>
<td>1480, SPL55</td>
<td>SPL55X, SPL55-1X</td>
<td>3-70-38X</td>
<td>45-60 lb. ft.</td>
</tr>
<tr>
<td>1550, SPL70</td>
<td>SPL70X, SPL70-1X</td>
<td>3-70-38X</td>
<td>45-60 lb. ft.</td>
</tr>
<tr>
<td>1610</td>
<td>5-674X</td>
<td>5-70-28X</td>
<td>45-60 lb. ft.</td>
</tr>
<tr>
<td>1710</td>
<td>5-675X</td>
<td>6.5-70-18X</td>
<td>115-135 lb. ft.</td>
</tr>
<tr>
<td>1760</td>
<td>5-677X</td>
<td>6.5-70-18X</td>
<td>115-135 lb. ft.</td>
</tr>
<tr>
<td>1810</td>
<td>5-676X</td>
<td>6.5-70-18X</td>
<td>115-135 lb. ft.</td>
</tr>
<tr>
<td>3R</td>
<td>5-3147X, 5-795X</td>
<td>2-70-48X</td>
<td>30-35 lb. ft.</td>
</tr>
<tr>
<td>7260</td>
<td>5-1306X, 5-789X</td>
<td>2-70-38X</td>
<td>13-18 lb. ft.</td>
</tr>
</tbody>
</table>
**Cap and Bolts**

(*) Discontinued

<table>
<thead>
<tr>
<th>Series</th>
<th>Spicer Kit No</th>
<th>Cap and Bolt Kit</th>
<th>Recommended Bolt Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1650</td>
<td>5-165X</td>
<td>5-70-18X</td>
<td>77-103 lb. ft.</td>
</tr>
<tr>
<td>1850</td>
<td>5-185X</td>
<td>8-70-18X</td>
<td>110-147 lb. ft.</td>
</tr>
<tr>
<td>2050</td>
<td>5-340X</td>
<td>9-70-28X</td>
<td>744-844 lb. ft.</td>
</tr>
</tbody>
</table>

**Bearing Plate**

**WARNING:** Self locking bolts should not be reused.

### Serrated Bolts with Lock Patch / No Lock Strap (Models after Spring 1994)

<table>
<thead>
<tr>
<th>Series</th>
<th>Bolt Part No</th>
<th>Thread Size</th>
<th>Recommended Bolt Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1610</td>
<td>5-73-709</td>
<td>.312-24</td>
<td>26-35 lb. ft.</td>
</tr>
<tr>
<td>1760</td>
<td>6-73-209</td>
<td>.375-24</td>
<td>38-48 lb. ft.</td>
</tr>
<tr>
<td>1880</td>
<td>7-73-315</td>
<td>.438-20</td>
<td>60-70 lb. ft.</td>
</tr>
</tbody>
</table>

### Bolt with Lock Strap (Pre-Spring 1994 Models)

<table>
<thead>
<tr>
<th>Series</th>
<th>Bolt Part No</th>
<th>Thread Size</th>
<th>Recommended Bolt Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1880</td>
<td>7-73-115</td>
<td>.438-20</td>
<td>60-70 lb. ft.</td>
</tr>
</tbody>
</table>

### Quick Disconnect (Half Round)

<table>
<thead>
<tr>
<th>Series</th>
<th>Bolt Part No</th>
<th>Thread Size</th>
<th>Recommended Bolt Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPL90</td>
<td>6-73-412</td>
<td>.375-24</td>
<td>45-60 lb. ft.</td>
</tr>
<tr>
<td>1610</td>
<td>6-73-412</td>
<td>.375-24</td>
<td>45-60 lb. ft.</td>
</tr>
<tr>
<td>1710</td>
<td>8-73-316</td>
<td>.500-20</td>
<td>115-135 lb. ft.</td>
</tr>
<tr>
<td>1760</td>
<td>8-73-316</td>
<td>.500-20</td>
<td>115-135 lb. ft.</td>
</tr>
<tr>
<td>1810</td>
<td>8-73-316</td>
<td>.500-20</td>
<td>115-135 lb. ft.</td>
</tr>
</tbody>
</table>
### Bearing Retainer

<table>
<thead>
<tr>
<th>Series</th>
<th>U-Joint Kit No</th>
<th>Retainer Kit No</th>
<th>Bolt Part No</th>
<th>Recommended Bolt Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPL140</td>
<td>SPL140X</td>
<td>140-70-18X</td>
<td>5007417</td>
<td>115-125 lb. ft.</td>
</tr>
<tr>
<td>SPL170</td>
<td>SPL170-4X</td>
<td>170-70-18X</td>
<td>5007417</td>
<td>115-125 lb. ft.</td>
</tr>
<tr>
<td>SPL250</td>
<td>SPL250-3X</td>
<td>250-70-18X</td>
<td>5007417</td>
<td>115-125 lb. ft.</td>
</tr>
<tr>
<td>SPL350</td>
<td>SPL350X</td>
<td>350-70-18X</td>
<td>5019836</td>
<td>177-199 lb. ft.</td>
</tr>
</tbody>
</table>

### Spring Tab

<table>
<thead>
<tr>
<th>Series</th>
<th>U-Joint Kit No</th>
<th>Spring Tab Kit No</th>
<th>Bolt Part No</th>
<th>Recommended Bolt Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPL140</td>
<td>SPL140X</td>
<td>211941X</td>
<td>8-73-114M</td>
<td>25-30 lb. ft.</td>
</tr>
<tr>
<td>SPL170</td>
<td>SPL170X</td>
<td>211941X</td>
<td>8-73-114M</td>
<td>25-30 lb. ft.</td>
</tr>
<tr>
<td>SPL250</td>
<td>SPL250X</td>
<td>211941X</td>
<td>8-73-114M</td>
<td>25-30 lb. ft.</td>
</tr>
</tbody>
</table>