



## Fastening the LWCV Actuator Anti-Rotation Bracket

### Issue

The lower well control valve (LWCV) actuator on the 275 ton, 350 ton, 500 ton, and 750 ton top drives is held in place by an anti-rotation bracket. This bracket is fastened to the LWCV actuator guard with capscrews. If these capscrews were sheared during operation, the bracket would fall, potentially causing injury.

### Recommendation

Inspect the capscrews and make sure they are torqued and safety wired properly. (See Figure 1 below and Figure 2 on page 2.) This will ensure that the bracket will be retained in case the capscrews are sheared.



Figure 1: LWCV Anti-Rotation Bracket with Safety Wire in Place

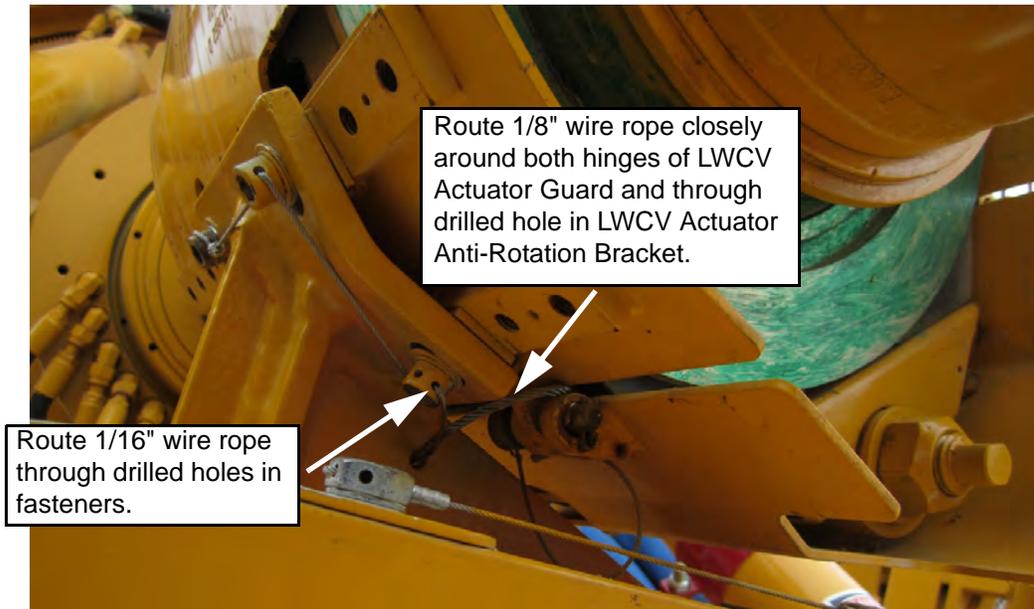


Figure 2: Bracket Safety Wiring Diagram

## Reference Documentation

Refer to the following engineering documents (attached) when performing this procedure:

- ENG701 - Safety Wiring
- ENG725 - Torque Values for Capscrews

## Information

Call the RigLine 24/7™ Support Line if there are any questions about this procedure.

	ENGINEERING SPECIFICATION MANUAL	
	Document: ENG 701	Page 1 of 5
Subject: Safety Wiring		Revision: 2

## 1.0 OBJECTIVE

1.1. This document describes the usage of safety wiring at Canrig.

## 2.0 SCOPE

2.1. This specification applies to all products manufactured by Canrig Drilling Technology.

## 3.0 PROCEDURE

3.1. Where safety wiring is required:

3.1.1. The drawings indicate where safety wiring is required. This is based in part on the following criteria:

3.1.2. Location:

- Any part that is mounted “upside down”
- If the part has the possibility to fall without being contained from a height of greater than 6ft (2m)
- High vibration areas

3.1.3. Some other general guidelines are:

- Only bolts that have holes drilled for safety wire should be used, even if the need to wire is not immediately apparent.
- Loctite® 242 threadlock is not considered a substitute for safety wire.

Effective Date: September 4, 2003	Prepared by: Jason Sloan	Approval: Faisal Yousef
Supersedes: 1		Date: September 4, 2012

This Document is controlled in its electronic format. All hardcopy versions of this document are considered uncontrolled unless a number and recipient is assigned to each issue. Refer to electronic copy on-line prior to each use.

	ENGINEERING SPECIFICATION MANUAL	
	Document: ENG 701	Page 2 of 5
Subject: Safety Wiring		Revision: 2

**3.2. Where safety wiring is NOT required:**

**3.2.1. Where ever Stover nuts are used.**

*Note: The Stover nuts are reusable, but must not be reused more than four (4) times. For complete information regarding Stover nut, see ENG725: Torque value for caps crews.*

**3.2.2. If the bolt is captive such that even when loose, the bolt and the part it retains cannot fall.**

**3.2.3. Where safety wire cannot be applied (i.e. button head, countersink, and/or recessed bolts) Loctite® 242 threadlock (BLUE) must be applied to threads and lock washers (e.g. internal/external teeth lock washer or Nord Lock washer or equivalent) must be used where permissible, as a substitute.**

**3.3. What safety wire to use where:**

**3.3.1. 1/16” diameter wire rope to be used for fasteners. Example: wired/laced bolts prevent loosening. Fall restraint for fasteners such as safety / diaper pins.**

**3.3.2. 1/8” diameter wire rope, with no more than 6 inches slack, to be used as a fall restraint for anything up to 100 lbs.**

**3.3.3. 3/16” diameter wire rope, with no more than 6 inches slack, to be used as a fall restraint up to 500 lbs., unless specified differently on drawings or installation instructions.**

**3.3.4. For components weighting more than 500 lbs., consult with engineering.**

**3.4. Table 1 shows typical safety wire rope and corresponding ferrule part number.**

**3.4.1. Multi-Groove Compression Tool:**

- **M10192**      TOOL, HAND, SWAGE, 1/32 – 1/16
- **M10193**      TOOL, HAND, SWAGE, 1/16 – 3/16
- Both tools listed available from McMaster-Carr or equivalent

Effective Date: September 4, 2003	Prepared by: Jason Sloan	Approval: Faisal Yousef
Supersedes: 1		Date: September 4, 2012

	ENGINEERING SPECIFICATION MANUAL	
	Document: ENG 701	Page 3 of 5
Subject: Safety Wiring		Revision: 2

**Table 1 Safety Wiring Part Number**

Size (inch)	Wire rope P/N Description	Oval Sleeve P/N Description	Oval Stop P/N Description
1/16	<b>M21-2000-010</b> WIRE ROPE, 1/16", 7 X 7, STAINLESS	<b>M19-3006-010</b> FERRULE, 1/16, OVAL, ALUMINUM	<b>M10197</b> FERRULE, 1/16, STOP, ALUMINUM
1/8	<b>M10022</b> WIRE ROPE, 1/8, 7 X 19, STAINLESS	<b>M19-3009-010</b> FERRULE, 1/8, OVAL, ALUMINUM	<b>M10241</b> FERRULE, 1/8, STOP, ALUMINUM
3/16	<b>M21-2001-010</b> WIRE ROPE, 3/16, 7 X 19, STAINLESS	<b>M19-3007-010</b> FERRULE, 3/16, OVAL, ALUMINUM	<b>M10217</b> FERRULE, 3/16, STOP, ALUMINUM

3.5. Table 2 shows number of compressions for aluminum oval and stop swage sleeve.

**Table 2 Type of Swage Sleeve and Number of Compression**

	Type	Number of Compression	
	Aluminum Oval Sleeve	Wire Diameter (inch)	Number of Compression
		1/16	2
		1/8	3
		3/16	4
	Aluminum Stop Sleeve	Wire Diameter (inch)	Number of Compression
		1/16	1
		1/8	2
		3/16	2

Effective Date: September 4, 2003	Prepared by: Jason Sloan	Approval: Faisal Yousef
Supersedes: 1		Date: September 4, 2012

This Document is controlled in its electronic format. All hardcopy versions of this document are considered uncontrolled unless a number and recipient is assigned to each issue. Refer to electronic copy on-line prior to each use.

	ENGINEERING SPECIFICATION MANUAL	
	Document: ENG 701	Page 4 of 5
Subject: Safety Wiring		Revision: 2

3.6. Table 3 shows calculation limit as listed in section 3.3 above.

**Table 3 Safety Wiring Calculation**

Safety Wire	Nominal Breaking Strength (lbs)	Safety Factor of 2:1 <sup>1</sup> (lbs)	Canrig Safety Wiring Specification <sup>2</sup> (lbs)	Maximum Expected Shock Load Values <sup>3</sup> (lbs)
1/8" – 7 X 19 STAINLESS	1,760	880	100	300
3/16" – 7 X 19 STAINLESS	3,700	1,850	500	1,500

NOTES:

<sup>1</sup>Formula is  $\frac{\text{Nominal Breaking Strength}}{2}$

<sup>2</sup>With no more than 6" slack to be used for anything up to stated weight.

<sup>3</sup>Shock load on a wire rope result in an applied load of 3 times the suspended weight of a 6 inch drop.  
Formula is  $3 \times \text{Max Specified Weight}$

#### 4.0 REFERENCE

- 4.1. Bridon America product catalog: Wire rope specification
- 4.2. Nord-lock Inc. product information catalog: Nord-lock washers
- 4.3. Henkel User's Guide: Threadlocking Loctite® 242

#### 5.0 NOTES

- 5.1. The four (4) times limit for Stover nuts was derived from in-house testing.

Effective Date: September 4, 2003	Prepared by: Jason Sloan	Approval: Faisal Yousef
Supersedes: 1		Date: September 4, 2012

This Document is controlled in its electronic format. All hardcopy versions of this document are considered uncontrolled unless a number and recipient is assigned to each issue. Refer to electronic copy on-line prior to each use.

	ENGINEERING SPECIFICATION MANUAL	
	Document: ENG 701	Page 5 of 5
Subject: Safety Wiring		Revision: 2

Revision 2:

- Changed to new format.
- Added reference regarding STOVER nuts reusability.
- Added section 3.3.4 for components greater than 500 lbs.
- Updated multi-groove compression tool P/N and added information regarding number of compression for swage sleeve
- Added Table 1 and Table 2
- Reformatted Calculation Chart into Table 3.
- Deleted “can increase the weight of the load 3 times for” from Table 3 Notes
- Added new section 4 and section 5

Revision 1:

- Revised maximum expected shock load values.

Effective Date: September 4, 2003	Prepared by: Jason Sloan	Approval: Faisal Yousef
Supersedes: 1		Date: September 4, 2012

This Document is controlled in its electronic format. All hardcopy versions of this document are considered uncontrolled unless a number and recipient is assigned to each issue. Refer to electronic copy on-line prior to each use.

	ENGINEERING SPECIFICATION MANUAL	
	Document: ENG 725	Page 1 of 4
Subject: Torque values for cap screws		Revision: 1

## 1.0 OBJECTIVE

1.1. This document describes the torque values for all fasteners used at Canrig.

## 2.0 SCOPE

2.1. This specification applies to all products manufactured by Canrig Drilling Technology.

## 3.0 PROCEDURE

The following guidelines must be followed when installing cap screws, bolts and nuts unless otherwise noted on the engineering drawing or the engineering master:

- 3.1. All cap screws used on Canrig products shall meet or exceed the SAE Grade 8 specifications. They must be torqued to the values shown on Table 1 unless otherwise noted on the assembly drawings or the engineering master (bill of material).
- 3.2. All cap screws permanently installed must be coated with Loctite® 242 threadlock or the equivalent after ensuring that the cap screws threads and mating thread are free of all dirt, oil and grease. This is a medium strength thread locker that prevents rusting of all threads and prevents loosening due to vibration. Loctite® 242 threadlock can be sheared using normal hand tools.
- 3.2.1. Disassembly of Loctite® 242 threadlock: In rare instances where hand tools do not work because of excessive engagement length, apply localized heat to nut or bolt, but do not exceed 250°C (482°F). Disassemble while hot using appropriate PPE to avoid burns.
- 3.2.2. For cleanup: Cured product can be removed with a combination of soaking in a Loctite solvent and mechanical abrasion such as a wire brush.
- 3.3. All cap screws that require periodic loosening to facilitate adjustment of components (e.g. tool joint clamps, link tilt clamps, guide rails, etc.) should be coated with anti-seize thread compound Loctite® Silver Grade 767 or the equivalent.
- 3.4. When using cap screws with locknuts, use only Grade C Stover locknuts or equivalent. Stover nuts are reusable, but must not be reused more than four (4) times.

Effective Date: April 26, 2011	Prepared by: Faisal Yousef	Approval: Beat Kuttel
Supersedes: Rev 0	Page: All	Date: September 4, 2012

This Document is controlled in its electronic format. All hardcopy versions of this document are considered uncontrolled unless a number and recipient is assigned to each issue. Refer to electronic copy on-line prior to each use.

	ENGINEERING SPECIFICATION MANUAL	
	Document: ENG 725	Page 2 of 4
Subject: Torque values for cap screws		Revision: 1

**3.5.** All cap screws requiring the use of Nord-Lock washers or equivalent must be torqued to the same values shown on Table 1.

**3.5.1.** For through hole applications: Turn both fasteners in order to close the cams on both washer pairs before tightening to minimize settlements. Keep the nut secured while tightening the bolt.

**3.6.** For Multi-jackbolt Tensioner (goes by the trade name Superbolt®), the jackbolts must be torqued to the same values shown on Table 1.

**3.7.** When working with a circular pattern, torque cap screws in a crisscross sequence.

#### 4.0 REFERENCE

**4.1.** Canrig engineering drawings

**4.2.** Canrig engineering masters

**4.3.** Henkel User's Guide: Threadlocking Loctite® 242

**4.4.** Nord-lock Inc. product information catalog: Nord-lock washers

#### 5.0 NOTES

**5.1.** The torque values shown above are for compatible materials.

**5.2.** The four (4) times limit for Stover nuts was derived from in-house testing.

**5.3.** Loctite® 243 threadlocker can be used in place of Loctite® 242 for surfaces with slight oil-contamination and inactive surfaces such as stainless steel.

Effective Date: April 26, 2011	Prepared by: Faisal Yousef	Approval: Beat Kuttel
Supersedes: Rev 0	Page: All	Date: September 4, 2012

This Document is controlled in its electronic format. All hardcopy versions of this document are considered uncontrolled unless a number and recipient is assigned to each issue. Refer to electronic copy on-line prior to each use.

	ENGINEERING SPECIFICATION MANUAL	
	Document: ENG 725	Page 3 of 4
Subject: Torque values for cap screws		Revision: 1

Revision 1:

- Fixed typographical error.
- Deleted “the chart below” from section 3.1
- Added section 3.2.1 and 3.2.2 “Loctite 242 disassembly and cleanup”
- Added section 3.5.1 “Through hole application using Nord-Lock washer”
- Added section 3.6 “Multi-Jackbolt Tensioner (MJT)”
- Added section 4.3 and 4.4
- Added section 5.2 and 5.3

Effective Date: April 26, 2011	Prepared by: Faisal Yousef	Approval: Beat Kuttel
Supersedes: Rev 0	Page: All	Date: September 4, 2012

This Document is controlled in its electronic format. All hardcopy versions of this document are considered uncontrolled unless a number and recipient is assigned to each issue. Refer to electronic copy on-line prior to each use.



**Table 1 Cap screw Torque Values**

Grade 8 – UNC Thread							
Size	Hex Head Cap screw Socket Head Cap screw		Plated Bolts or Machined		Flat Head Cap screws Button Head Cap screws		Size
	Torque ft-lb	Torque N-m	Torque ft-lb	Torque N-m	Torque ft-lb	Torque N-m	
<b>1/4</b>	11	15	8	11	8	11	<b><u>1/4</u></b>
<b>5/16</b>	23	31	17	23	16	21	<b><u>5/16</u></b>
<b>3/8</b>	40	54	30	39	26	34	<b><u>3/8</u></b>
<b>7/16</b>	65	88	49	64	42	55	<b><u>7/16</u></b>
<b>1/2</b>	99	134	74	97	63	82	<b><u>1/2</u></b>
<b>9/16</b>	159	216	119	156	101	133	<b><u>9/16</u></b>
<b>5/8</b>	198	268	149	194	126	165	<b><u>5/8</u></b>
<b>3/4</b>	350	475	263	343	230	292	<b><u>3/4</u></b>
<b>7/8</b>	566	767	425	556	360	472	<b><u>7/8</u></b>
<b>1</b>	848	1,150	636	833	540	707	<b><u>1</u></b>
<b>1-1/8</b>	1,245	1,688	934	1,222	792	1,037	<b><u>1-1/8</u></b>
<b>1-1/4</b>	1,750	2,373	1,313	1,718	1,114	1,458	<b><u>1-1/4</u></b>

*Please consult with Engineering Department for bolts larger than 1-1/4 inches. The values shown above were derived with application of Loctite® Silver Grade 767 anti-seize (i.e. K=0.18).*

Effective Date: April 26, 2011	Prepared by: Faisal Yousef	Approval: Beat Kuttel
Supersedes: Rev 0	Page: All	Date: September 4, 2012

This Document is controlled in its electronic format. All hardcopy versions of this document are considered uncontrolled unless a number and recipient is assigned to each issue. Refer to electronic copy on-line prior to each use.