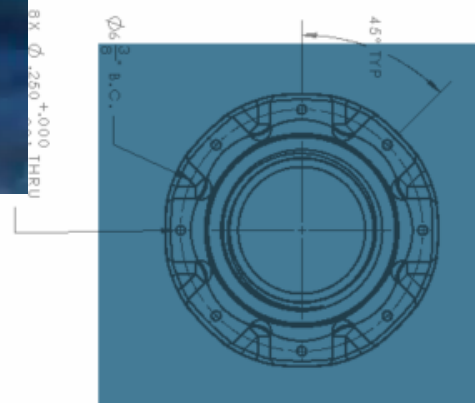
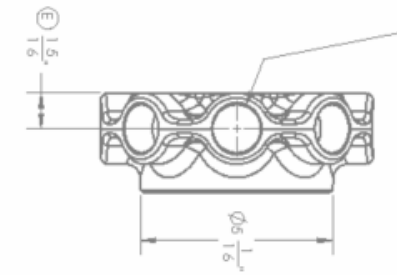
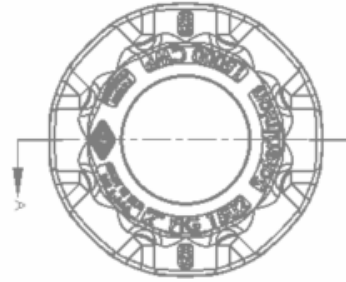
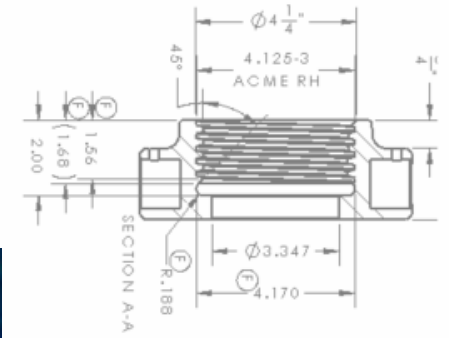




Safely Remove a Hammer
From the Equation



Conventional Hammer Union



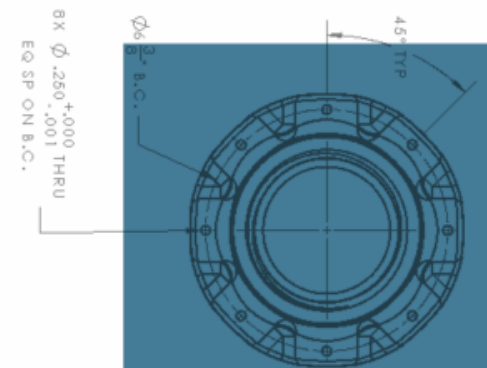
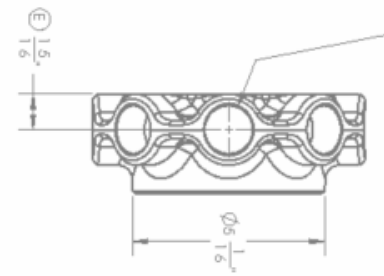
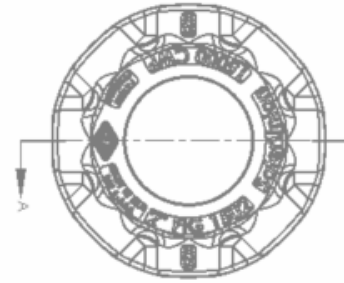
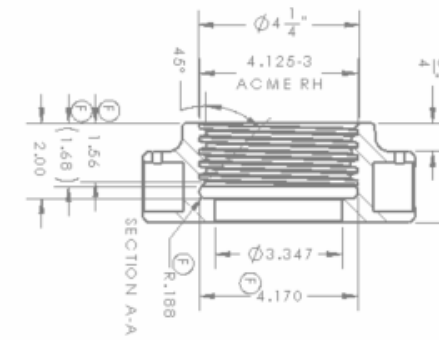


Problems associated with Hammer Unions

Staff injuries

- ◆ A typical job site contains 20-80 connections requiring to be struck 4-8 times on average presenting personnel with as many as **600 opportunities for injury**¹
- ◆ **6+ hammer-related injuries per month that result in lost-work time** for well stimulation operations in the United States.
- ◆ May cause sparks leading to fire or explosions

¹The data adapted from Bull and Neal “Eliminating hammer injuries in the oil field” 2007 SPE E&P Environmental and Safety Conference Galveston, TX 5-7 March 2007



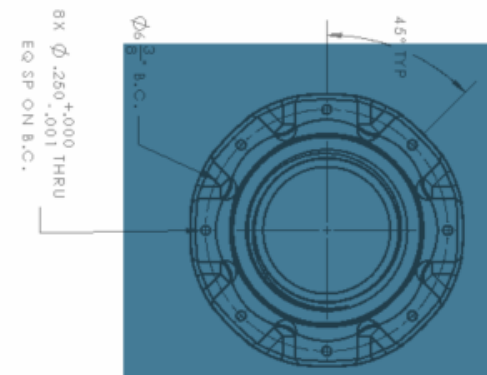
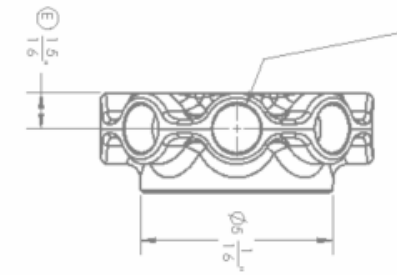
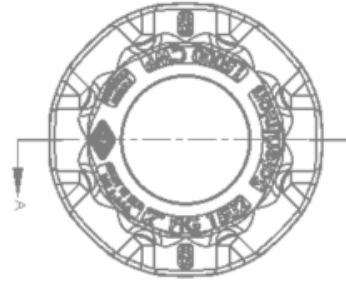
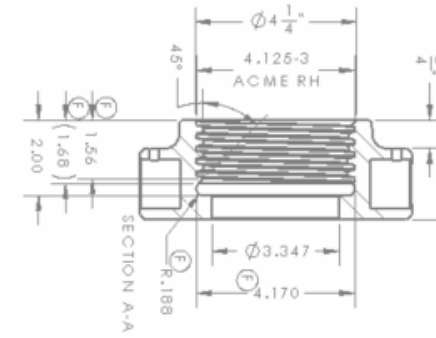


Problems associated with Hammer Unions

Halliburton
January - July, 2016

# of Injuries	Cause of injury
21 ¹	Personnel strike themselves with hammer
6	Personnel strike other people with hammer
9	Injuries resulting from strain of swinging a hammer
2	Injuries resulting from projectiles from a hammer blow

¹The data adapted from Bull and Neal “Eliminating hammer injuries in the oil field” 2007 SPE E&P Environmental and Safety Conference Galveston, TX 5-7 March 2007

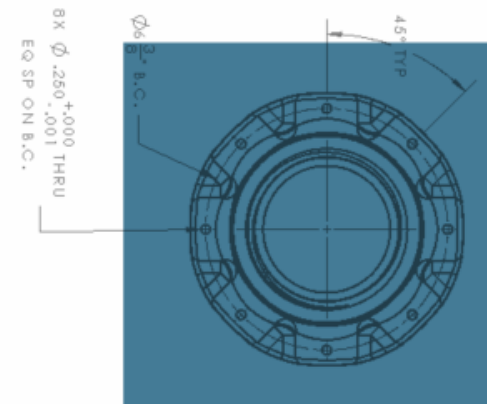
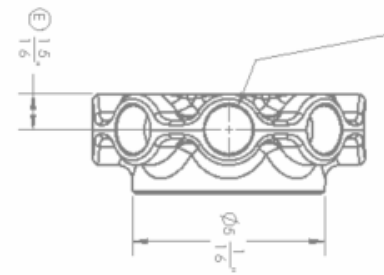
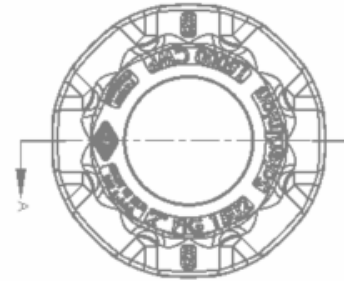
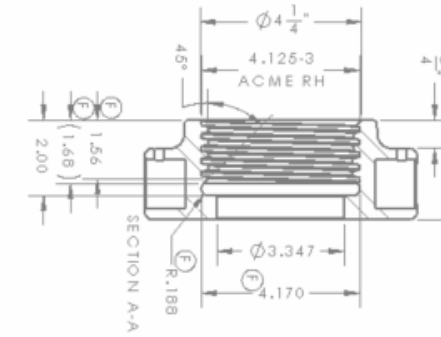
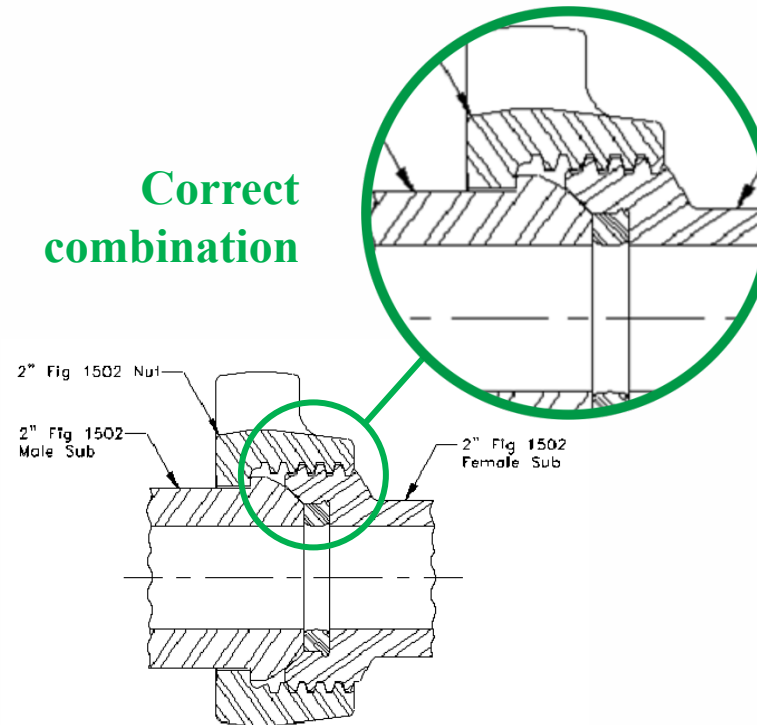
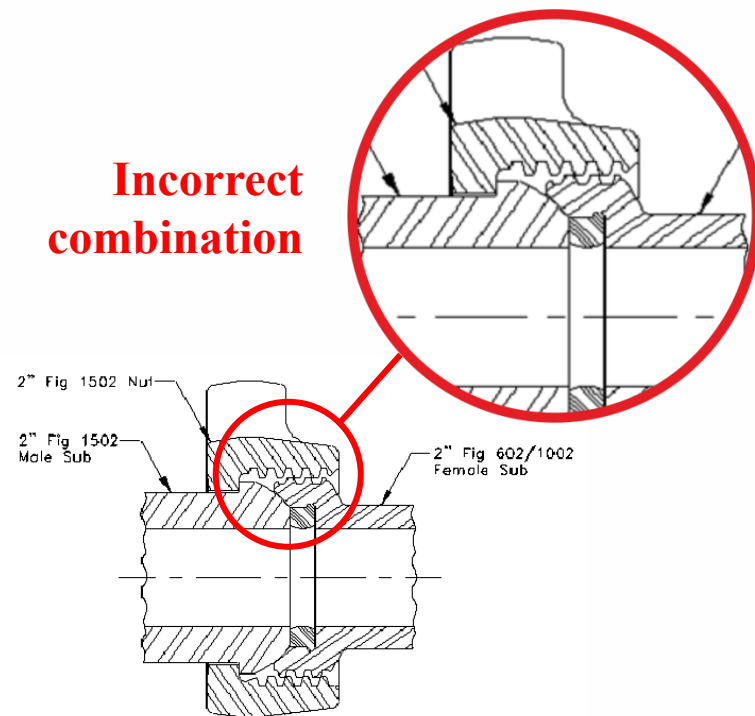




Problems associated with Hammer Unions

Mismatching parts

potential dangers associated with 2" Figure 602 equipment being connected to equipment of higher pressure rating, such as 2" Figure 1502

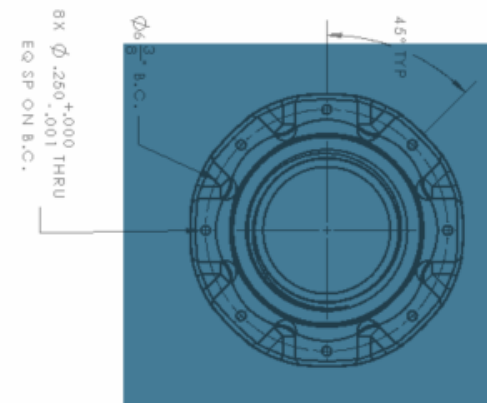
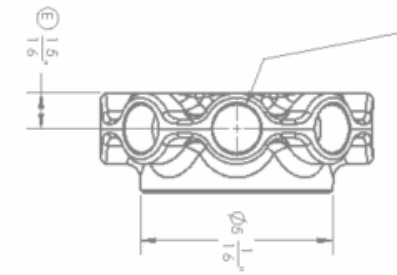
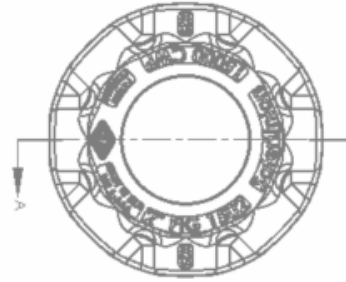
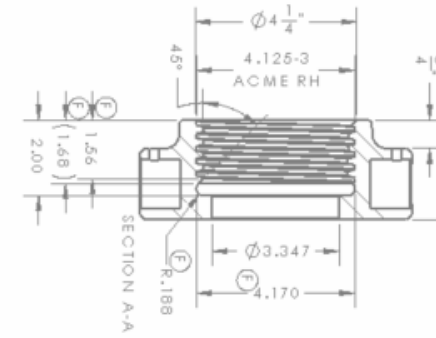




Problems associated with Hammer Unions

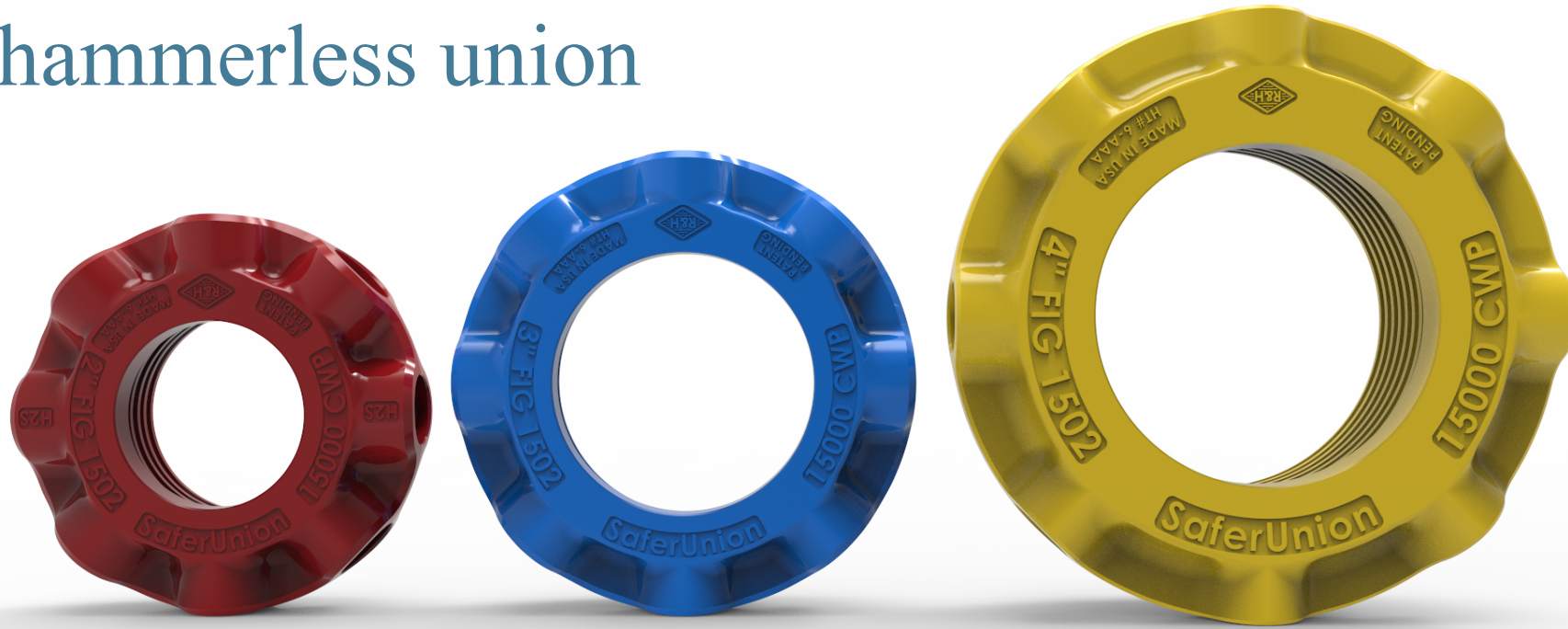
Cost

- ◆ Striking hammer unions can offset the calibration of pressure gauges causing misreading. Service or replacement will be needed.
- ◆ \$3,000 per interrupted service (Baker Hughes)
- ◆ Higher insurance premiums, hiring new people, and potential lawsuits
- ◆ Repeated hammer strikes wear down the union's lugs leading to necessary to replace the nut

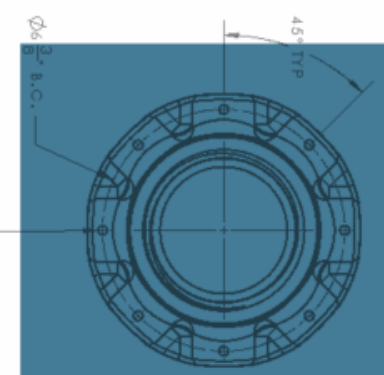
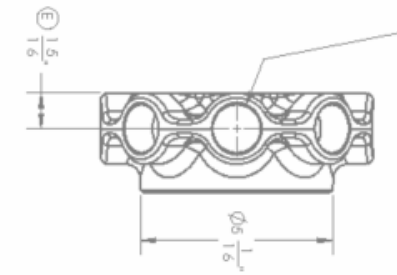
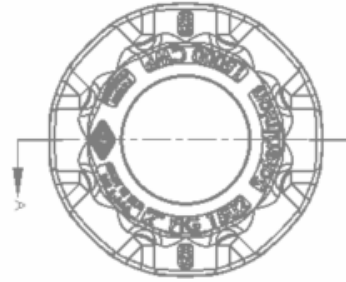
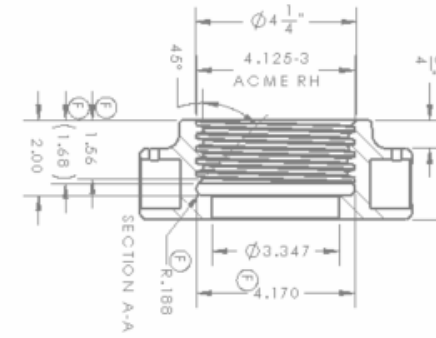




SaferUnion™ hammerless union

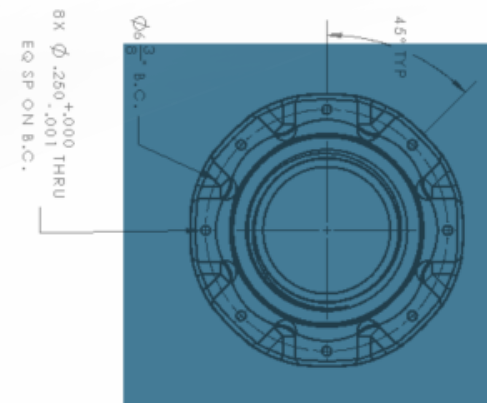
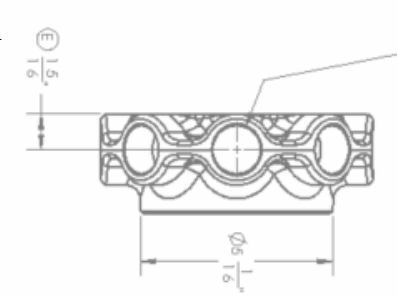
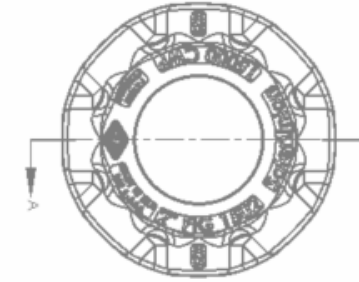
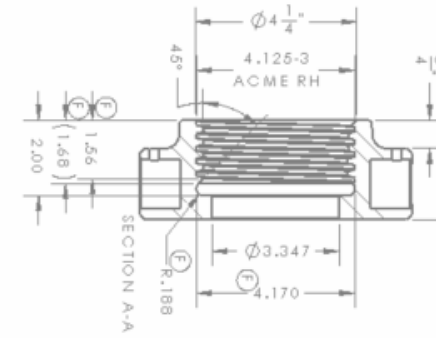
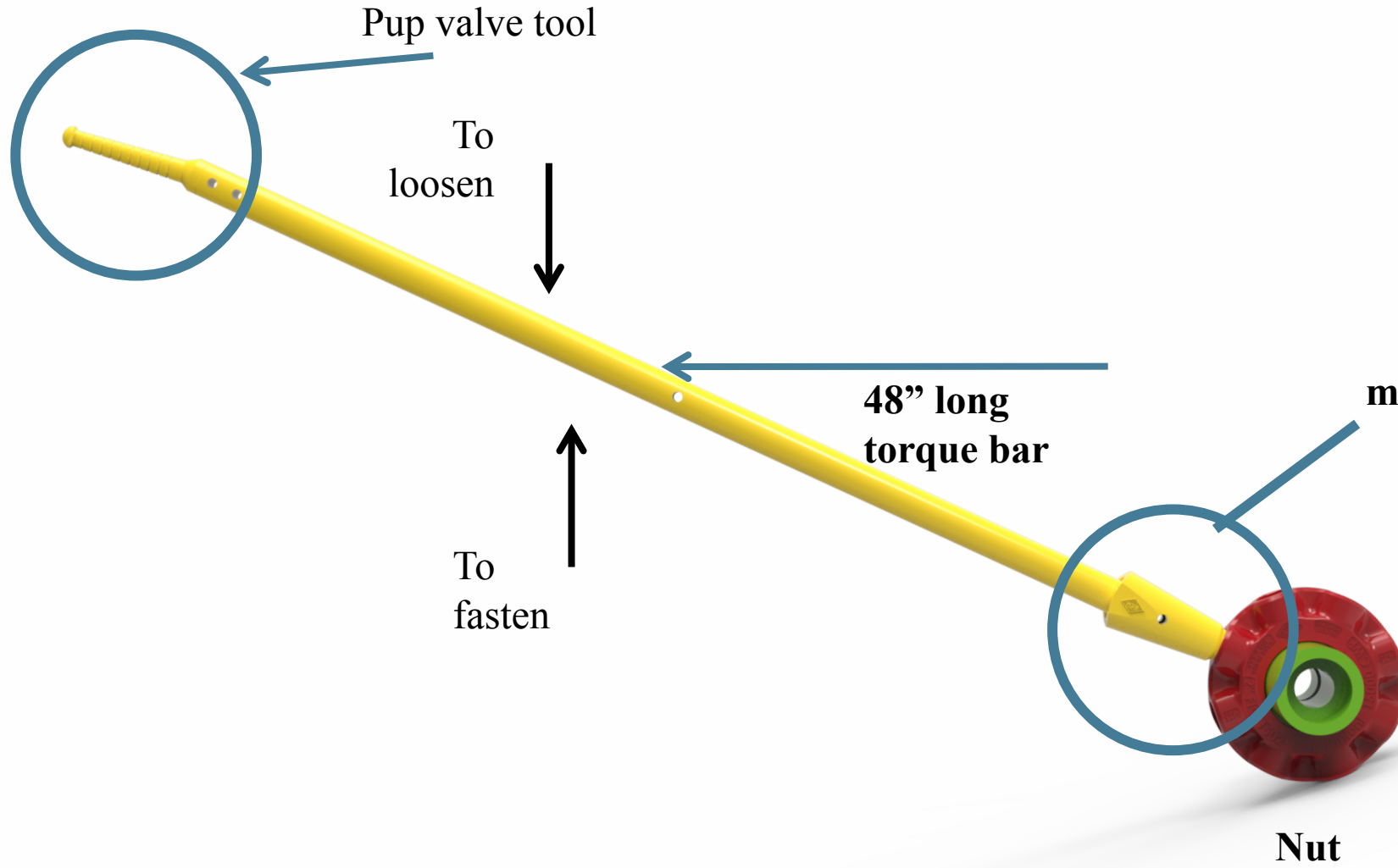


The SaferUnion™ is a superior alternative to the conventional hammer unions that provides greater safety in dangerous working environments. It requires the use of less energy. Instead of hitting a union with a sledgehammer to tighten the connection, the new design uses a bar with a long moment arm, that is capable of providing sufficient torque on the nut to either tighten or loosen the connection.





SaferUnion™ bar

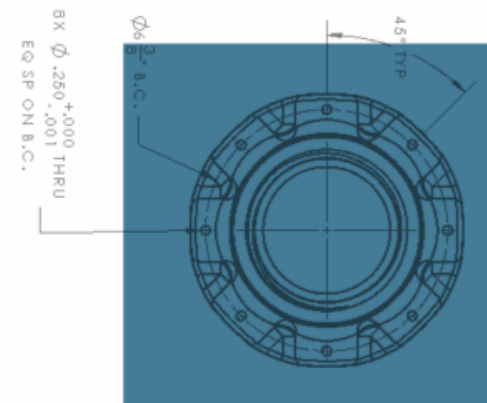
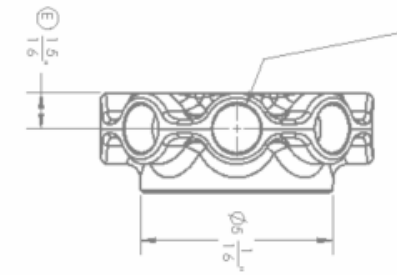
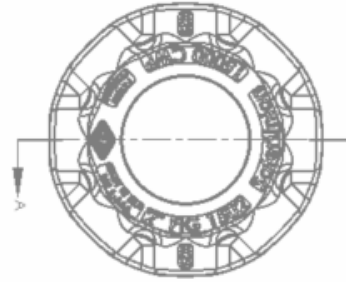
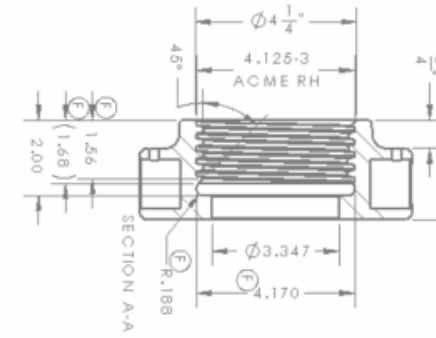




SaferUnion™ bar

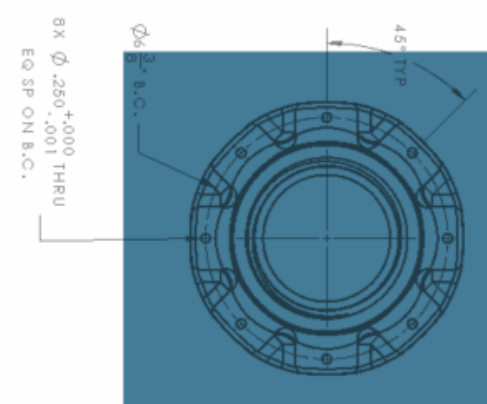
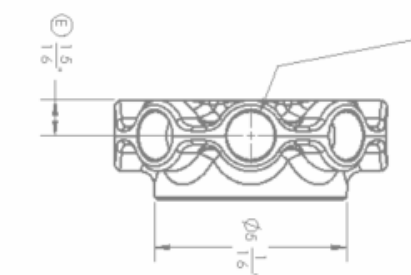
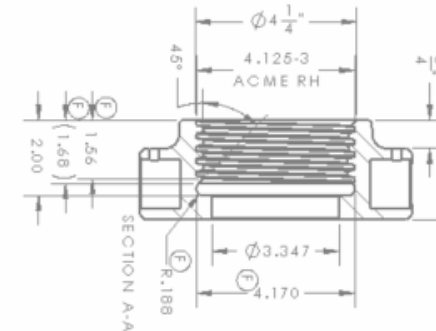
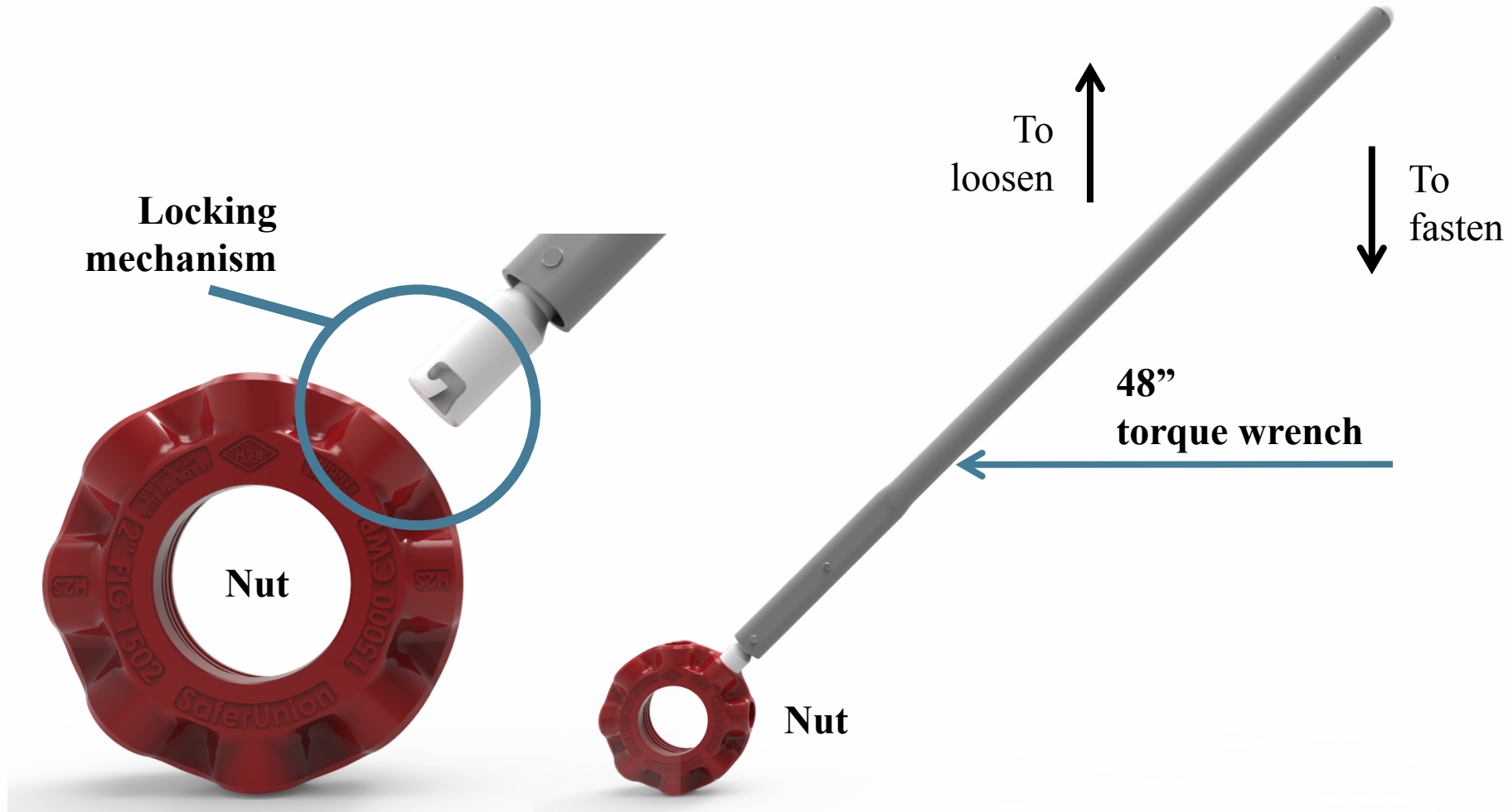
Benefits of the Bar

- ◆ The slot lock on the handle engages with the nut pins securing the bar in place preventing it from accidental detachment
- ◆ One tool fits all sizes 2, 3, 4 SaferUnion™ Nut
- ◆ Pup valve tool on the other end
- ◆ Available size 48” and 24”





SaferUnion™ torque wrench

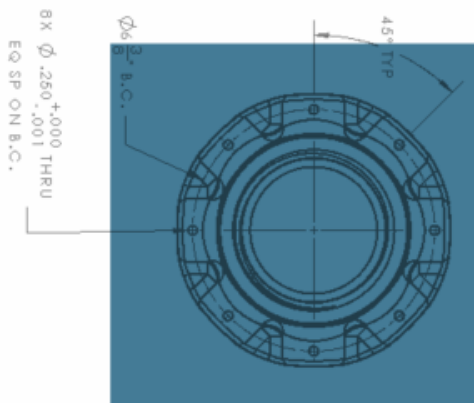
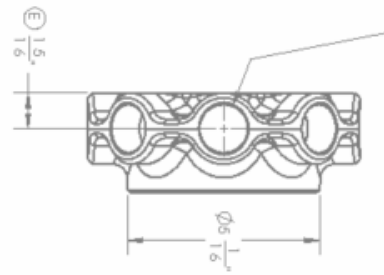
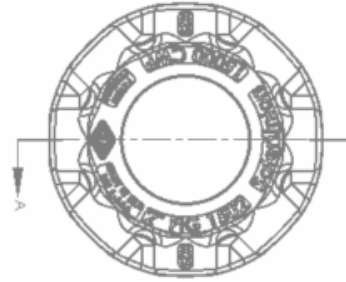
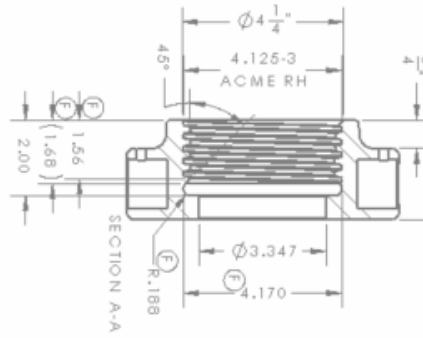




SaferUnion™ torque wrench

Benefits of the Torque Wrench

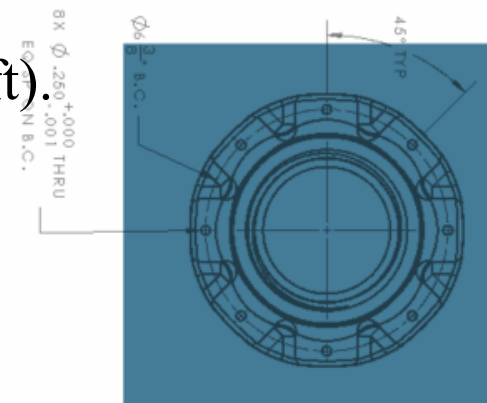
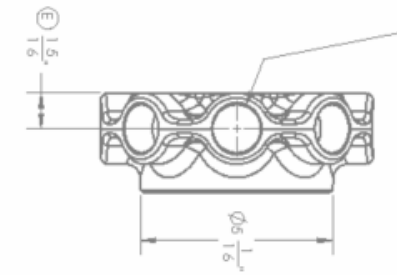
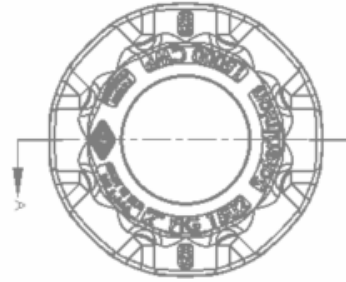
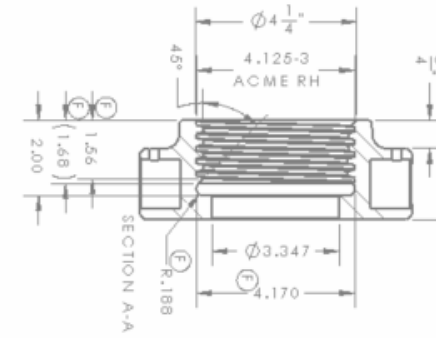
- Can provide SaferUnion™ assemblies with a predefined torque value
- Can apply torque up to 2,000 lb-ft
- The surface of the bar is knurled to provide an exceptional grip
- Comes with a setting tool
- Slot-lock prevents accidental detachment of the bar





Advantages of the SaferUnion™

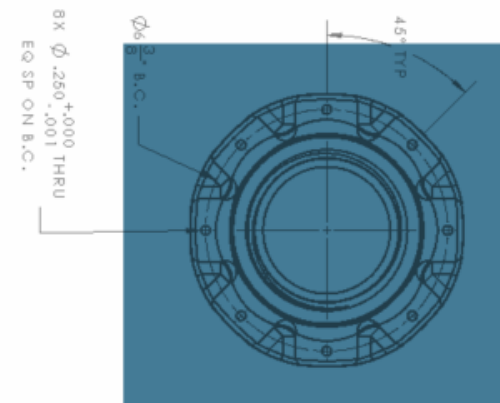
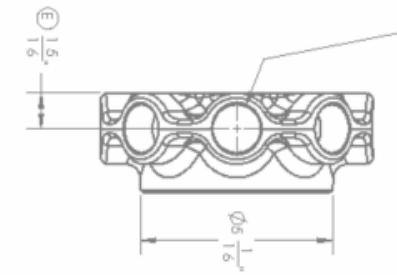
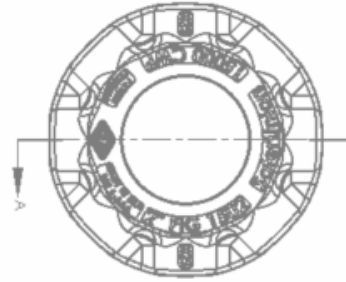
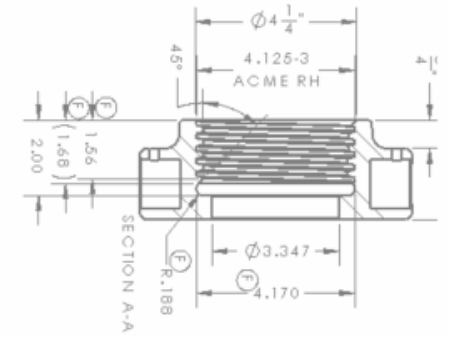
- ◆ No hammer hitting is needed thus avoiding generation of sparks which can cause accidents in explosive environments.
- ◆ No bodily injuries from missing hammer strikes, flying metal chips or due to hammer slipping out of worker's hands.
- ◆ Only one person is required to operate it.
- ◆ SaferUnion™ can, on average, be supplied with 18% more torque compared to the conventional hammer unions (1240 lbs–ft vs.1052 lbs–ft).





SaferUnion™'s Technical Advantages

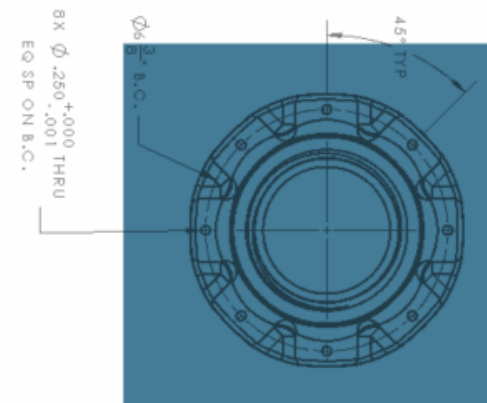
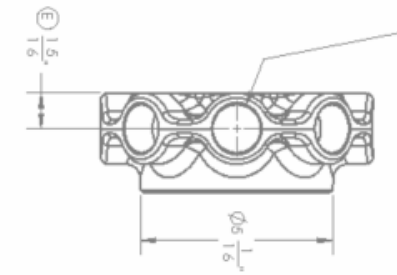
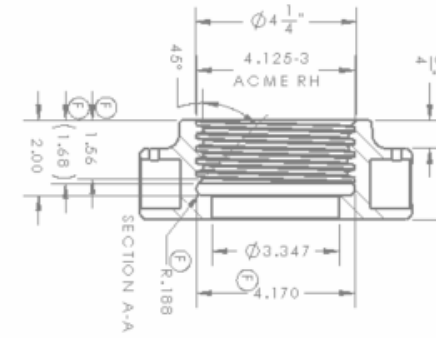
- ◆ Increased accessibility, with 8 points located every 45° due to its unique design and can be handled by a single crew member
- ◆ Secure connection with torque tools due to the slot locks
- ◆ Faster union installation
- ◆ Less human effort needed
- ◆ Minimum Safety Factor of 3
- ◆ Exceeds pressure rating requirements





Investment vs Savings

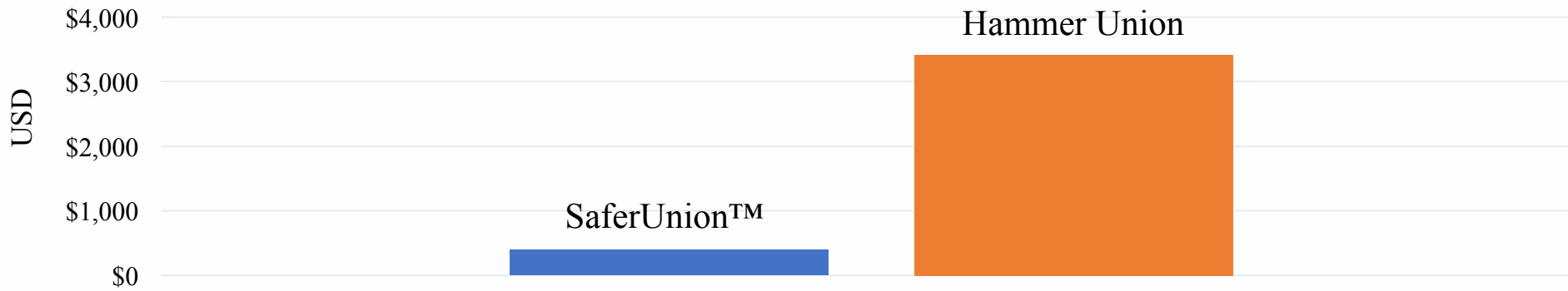
- ◆ Since a hammer strike is not used, the cracking of the nut due to fatigue is greatly reduced.
- ◆ Saves time during the rig up/rig down processes.
- ◆ It allows one person installation and removal, saving up to 50% of pipe servicing crew expenses in contrast to other hammer union alternatives.
- ◆ Eliminates the impact of hitting unions on pressure gauges.



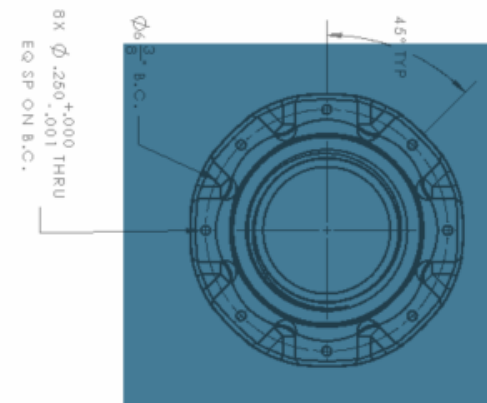
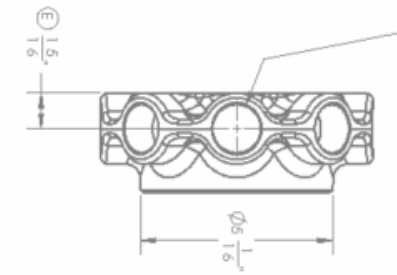
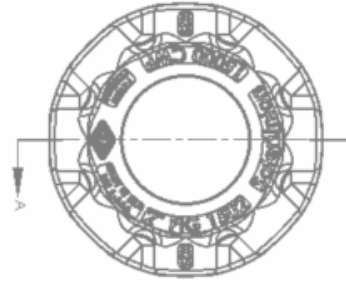
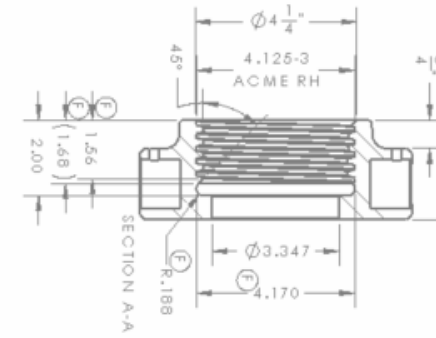
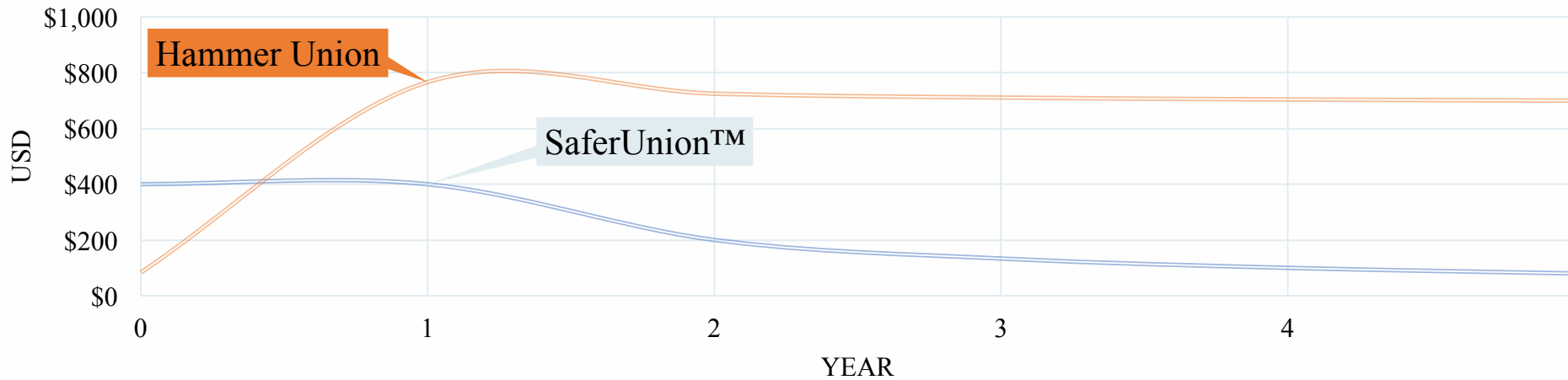


Investment vs Savings

Average 5-year Investment per Union Connection



Average Annual Investment per Pipe Connection

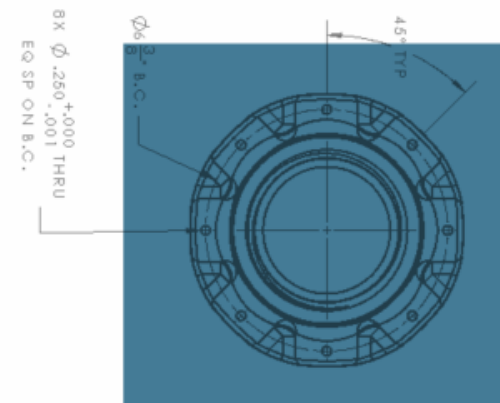
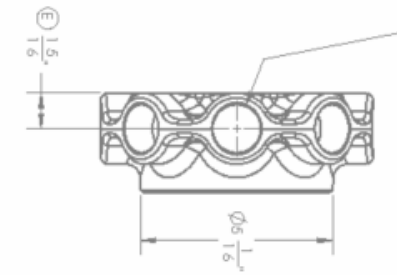
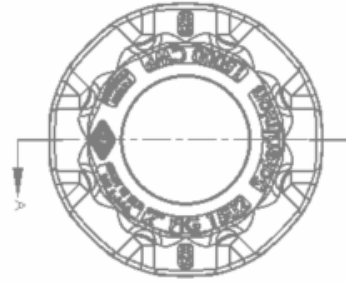
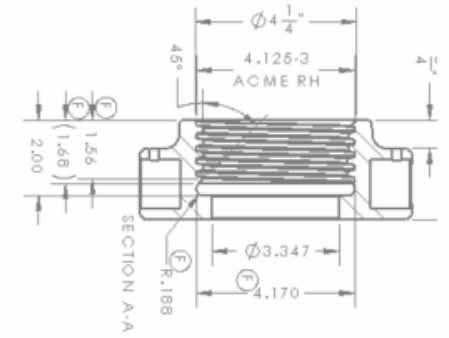




Application



- Offshore rig
- Onshore rig
- Refinery plant
- Custody metering
- Well testing
- Fracking equipment





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