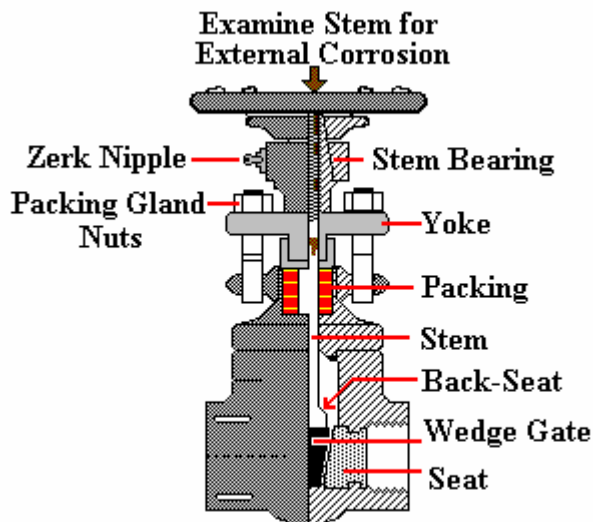


Chapter 15

Gate Valve Maintenance

The gate valve is an old proven design. Many of the smaller, simpler gate valves require stem seal maintenance only. Some of the more elaborate and larger diameter gate valves in high-pressure and / or sour service have provisions for seat sealant injection.

The simplest design is the typical forged steel gate valve as illustrated below.



Typical Forged Steel Gate Valve

Periodic maintenance consists of inspecting the stem for leakage and tightening the gland nut as required. Keep the threaded stem oiled to prevent rusting and clean up any dirt or sand which adheres to the stem. Cycle the valve (if possible) to keep the valve from seizing in one position. Keep paint away from the stem threads, as it can build-up and increase torque and may keep the valve from seating properly.

Forged and cast steel gate valves are generally simple and inexpensive. Most styles are designed so that the gate and seats can be easily replaced. This style of valve does not have any provision for seat sealant injection. Stem packing can be made from braided rope packing or soft plastic type packing such as: Sealweld® Slick Sticks or Pak-King compound.

Should stem leaks develop after the packing gland has been fully compressed it is possible to have professional leak sealers come in and effect repairs. It is done simply by hot tapping into the packing chamber and injecting Sealweld® Pak-King compounds.

Wellhead Gate Valves

The W-K-M® POW-R-SEAL gate valve illustrated below is the most copied gate valve in industry today. At last count there were over (25) twenty-five copy-cat manufacturers of varying quality. The working principles are all identical; the seat rings are fixed to the body and the gate is split and held together with a strong spring.

Maintenance on this style of valve consists of adding more plastic stem packing putty sticks as stem leaks develop. **Be careful** while removing the bolt or stinger of the packing injector. Occasionally the ball check in the body of the packing injector will not seat properly and gas or liquid can escape under high pressure. Remove the bolt **slowly**, it should unscrew by hand after one or two turns if there is no pressure behind it. There is a small vent hole near the top of the packing injector body which should vent leakage as the bolt is unscrewed if the ball check has failed. Exercise **extreme caution** while injecting stem packing. The fine threads on the bolt portion of the packing injector can generate up to 30,000 PSI without much effort with a short wrench. Turn the screw in slowly until the leakage stops.

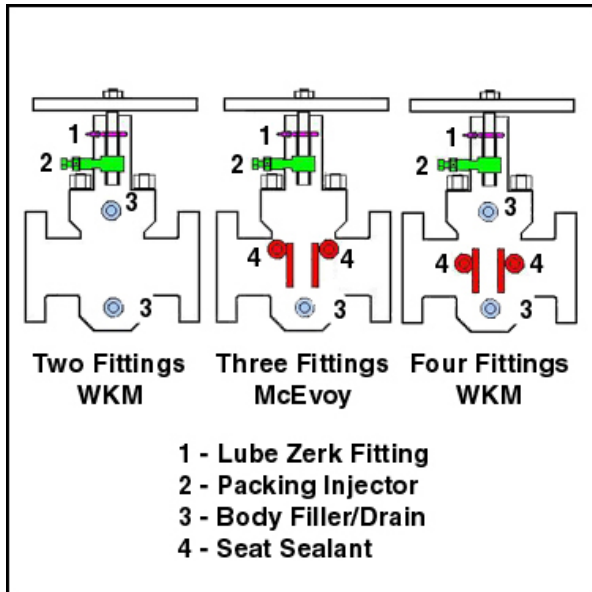
NOTE: DO NOT OVER-TIGHTEN or the valve may become difficult to operate.

The body cavity is often filled with body filler grease to lubricate the gate and seats, prevent internal corrosion and keep hydrates from collecting in the valve body. **Always** consult the proper W-K-M® (or other manufacturers) manual for advice on body filling instructions before starting. Quantities required to fill the body are approximately (1) one pound of grease per inch of valve size, a two (2") inch gate valve requires about (2 lbs.) two pounds of body filler grease. For best results select a grease which is insoluble in the solution flowing through the valve. **Extreme care** must be taken, **DO NOT** exceed the maximum working pressure of the valve being serviced when filling the body cavity. Attach the SO-BV Tool to one of the (2) two body grease fittings to vent leakage and to prevent over-pressuring the body cavity while filling.

The stem bearing should be lubricated periodically with a high quality water resistant bearing compound such as Sealweld® Eterna-Lube 1000. Care should be taken not to over-lubricate the stem bearings.

Types of API Gate Valves



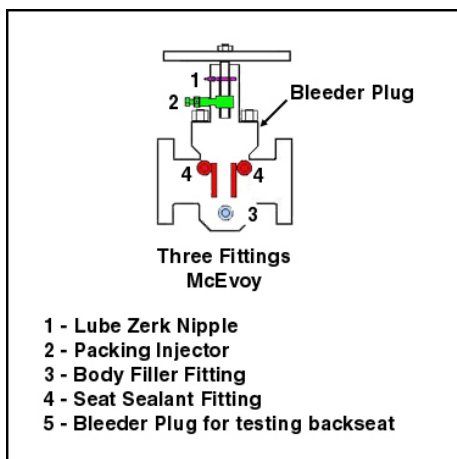


In order to get this style of gate valve to seal properly, it may be necessary to operate the valve several times. Use of heavy sealing compound is generally **NOT recommended** due to the large quantities which must be injected. The seat design does not have provision for seat sealant injection; however, in an emergency, filling the body cavity with an insoluble seat sealant may achieve the desired results.

McEvoy® Gate Valves

The McEvoy® gate valve is considered by many to be the Cadillac of wellhead gate valves. It is designed for many years of rugged reliable service. It has many design features which make it ideal for severe service such as high-pressure and corrosive conditions. Because it is a more expensive valve, **extra care** should be taken to ensure many years of reliable service.

The main advantage of the McEvoy® design is the provision for automatic seat sealant injection. Every time the valve is operated, the sealant reservoir discharges a small amount of sealant into each seat ring. There is sufficient quantity of sealant for approximately (100) one hundred operations. The sealant reservoir is refilled through the (2) two capped fittings adjacent to each seat ring. Because the valve seats feed from a reservoir, use of valve cleaner is generally **not recommended** except in an emergency. There is no assurance that the valve cleaner can be completely displaced from the reservoir unless the reservoir is emptied by operating the valve over (100) one hundred times.



McEvoy® Three Fitting Style

The smaller capped fitting located near the bottom of the valve body is used for the injection of a body filler grease. As with other wellhead gate valves, the body filler grease will lower operating torque, prevent corrosion and prevent hydrates from collecting in the valve body.

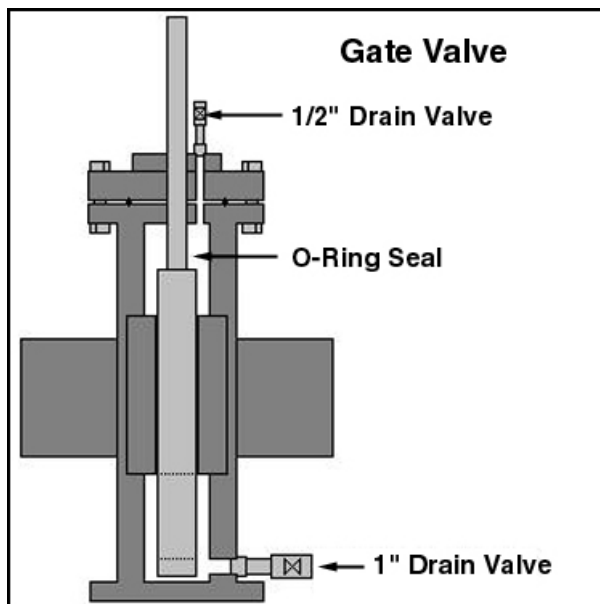
Stem packing consists of a series of chevron packing rings in the bonnet assembly. The packing and stem bearing can be replaced with the valve under pressure by following the instructions as detailed in the owners manual. The bleeder plug can be removed to check if the stem back-seating was successful.

The stem bearing should be lubricated periodically with a high quality water proof lubricant such as Sealweld® Eterna-Lube 1000.

As with any valve, the valve should be cycled at least once or twice a year to keep from seizing in one position.

Pipeline Gate Valves

Pipeline gate valves are designed so that the gate is in a fixed position and the seats are spring loaded and allowed to float. The seat sealing principles are very similar to pipeline ball valves. Gate valves in liquids service are usually equipped with a body relief valve. The relief valve will prevent the body from rupturing as a result of liquids expansion with the valve in the closed position.

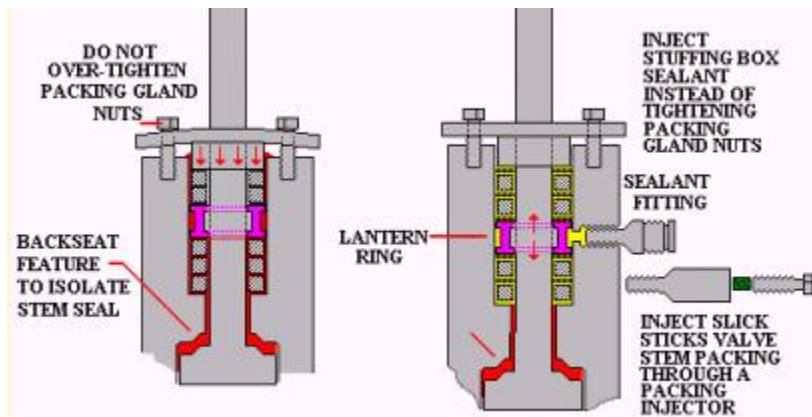


Typical Through Conduit Pipeline Gate Valve

There are many different manufacturers of pipeline gate valves. The working principles are all generally the same. Where they differ is in the seat sealing and stem packing areas. See the illustrations of the most common stem packing designs. Some valves use different combinations of these designs. Each style has its advantages depending on the service conditions.

Because of the long travel of the valve stem, pipeline gate valves are prone to stem leakage.

In the case of O-ring seals, the O-rings will roll as the stem rises which can lead to pinching and tearing of the O-ring. Valves with O-ring type stem seals generally use a buttonhead fitting to allow for the injection of valve sealant such as Sealweld® # 5050 if leakage develops. Care should be taken when injecting sealants into a valve stem. Because it is an enclosed chamber there is no where for excess sealant to go. Continued high-pressure injection may extrude the O-ring stem seals out of their recess and make the leakage worse. Usually (1 - 2) one or two strokes of the gun handle is sufficient to put a small amount of pressure (2,000 PSI to 3,000 PSI) into the stem gland in order to charge the seals. Valve cleaner should **never** be injected into a buttonhead fitting on a valve stem with O-ring type seals because there is no way to displace the cleaner.



Gate Valve Stem Packing

In the case of plastic putty type packing, the long travel of the stem shaft has a tendency to pull some of the packing out as well. This means additional packing must be added on a regular basis to replace the lost packing.

Chevron ring type packings are available in a wide variety of exotic grades for valves in extreme services such as hard to hold liquids and gasses. When chevron packing fails, it may require a system shut-down to replace the packing safely. Valves equipped with chevron rings with an emergency sealant backup (either buttonhead or packing injector) are generally more reliable. With the dual system, most leakage can at least be slowed considerably if not stopped completely.

Stem bearings and weather seals are generally lubricated with a light-weight water resistant grease such as Sealweld® Eterna-Lube 1000. The grease provides a protective coating over metal parts which would otherwise rust and corrode. **Be careful** not to over-lubricate or build excess pressure with the grease gun as this could pop the weather seals. Some valve manufacturers use a Zerk fitting with a relief slot to ensure excess pressure can not be built up. Oil seeping from the stem or gearbox may indicate that the stem seal has failed and that the lubricating grease has broken down back into its oil base. If this occurs, tag the valve for stem seal or gearbox seal replacement during the next shut-down. Make sure all the old grease residue is removed before replacing with fresh grease. Eterna-Lube 1000 is effective in this application because of its resistance to breakdown as a result of temperature fluctuations. Weather seals can often be replaced safely with the valve under pressure.

***ALWAYS** consult the owners manual before attempting any repair procedure.*

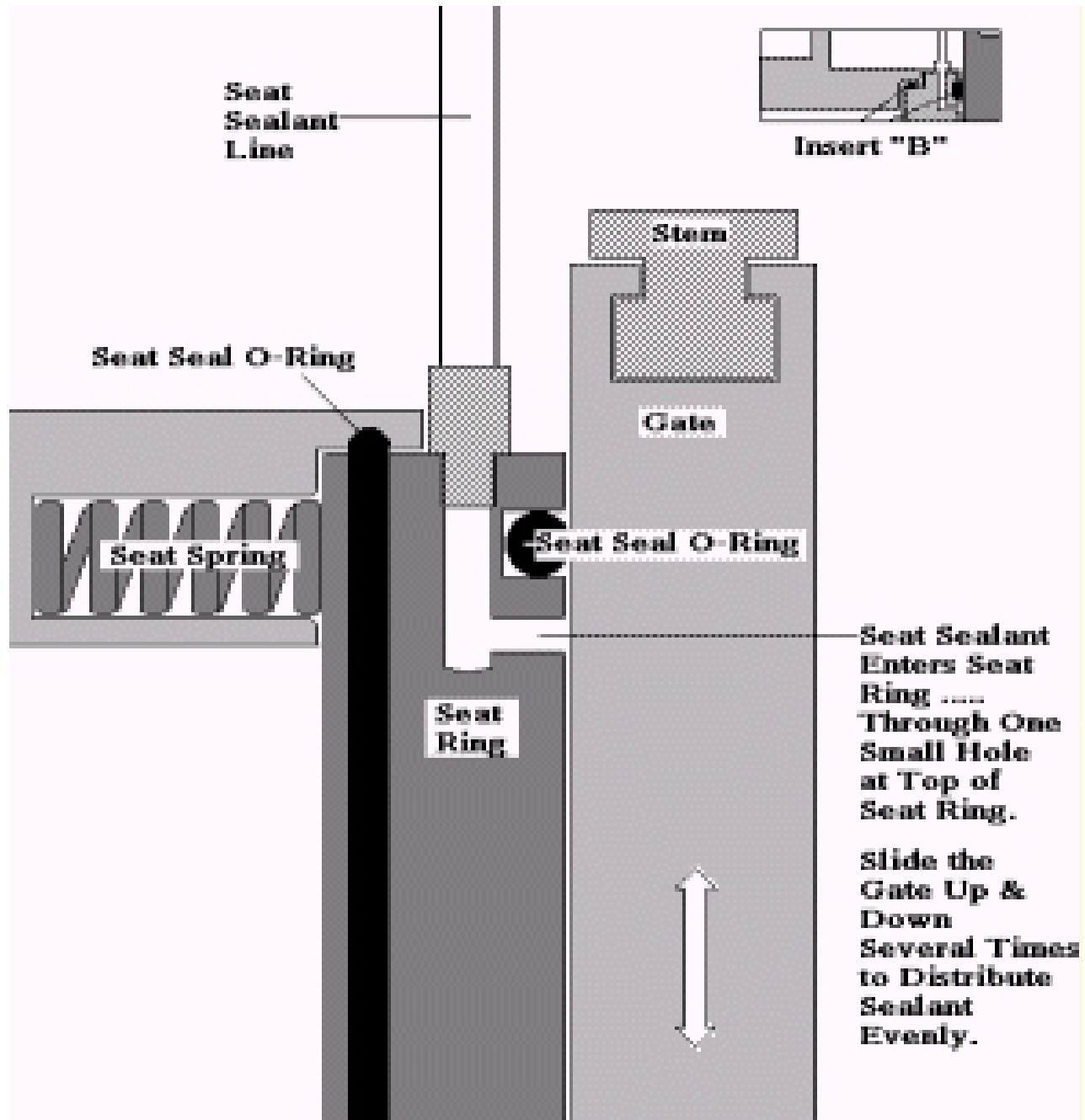
The body cavity should be drained periodically to get rid of contaminants which may have collected in the bottom of the valve. Many pipeline valves are designed with seat seals that will allow for body draining with the line under pressure and the valve in the open or closed position. Block and Bleed is described as closing the valve and draining the body cavity. Double Block and Bleed is described as being able to drain the body cavity with the valve in the full open or full closed position. If the valve does not operate properly, it may be as a result of contaminants which have collected in the bottom of the valve.

Seat sealing systems vary from one manufacturer to another. In principle they are very similar to a typical pipeline ball valve. The sealant does not generally travel the circumference of the seat ring like most ball valves. Rather, it enters through only (1 – 2) one or two small holes near the seal face area. It is essential to operate the valve several times to ensure complete coverage of the valve cleaner or lubricant / sealant being injected. Quantities of lubricant / sealant required to fill the seat sealant system are 25% to 50% less than similarly sized ball valves. Use approximately 0.50 ounces to 0.75 ounces per inch of valve size into each seat ring. A ten (10") inch gate valve will require five to seven (5 – 7 ozs.) ounces to completely fill the seat sealant system. Quantities required to top-up the seat sealant system will be considerably less as well.

Valves with double block and bleed provisions should have their seat seals tested as part of maintenance routines.

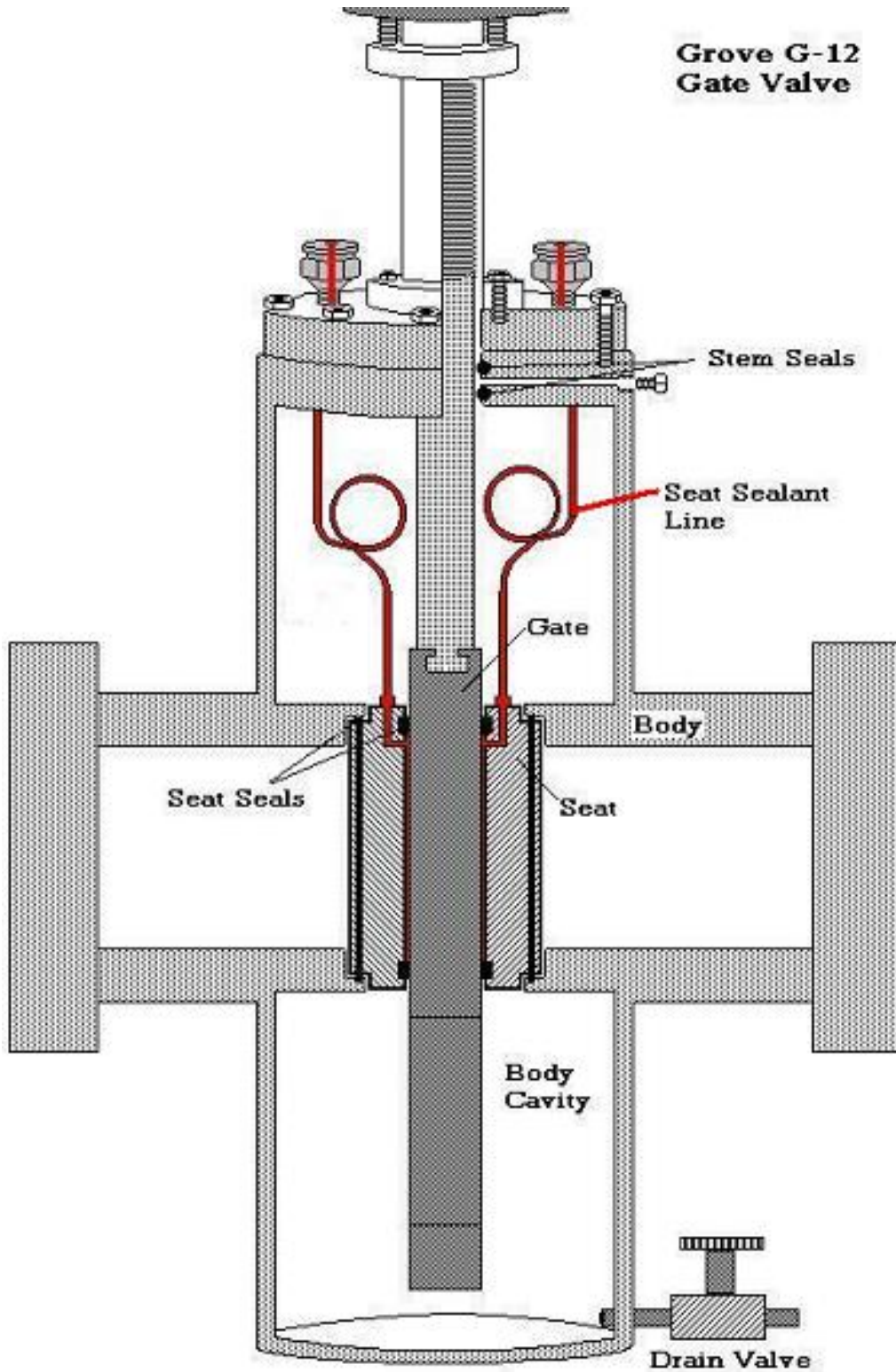
ALWAYS cycle the valve several times before switching to heavier sealants.

Grove® G-12 Gate Valve Sealing Principles



Grove® G-12 Gate Valve Sealing Principles

Grove® G-12 Gate Valve Cut-Away View



Grove® G-12 Gate Valve Cut-Away View

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