KEG SAFETY

Below are some basic safety cautions to keep in mind when handling kegs:

INSPECTION

1. **Keg Exterior** - Sharp edges from cracked drain-holes or split hand-holes or split chimbs can cut and injure an operator when handling the keg. That's why it is important to make sure that kegs are inspected regularly and in case of such an unsafe condition, they should be either professionally repaired or alternatively scrapped.
2. **Chimbs** - Make sure that both the top and bottom chimbs are in good working condition, so the full keg stands firm on the ground. If either top or bottom chimbs are deformed making the keg unstable, send it out for chimb straightening.
3. **Keg Valves** - (most commonly D-Valves on American kegs) are the only barrier between the harsh and sometimes unsanitary environment and your beer, and if the CO2 valve is not sealing anymore because either the EPDM seal has cracks or defects, or the stainless steel ball has micro-scratches, or if the inner or outer valve spring were over-stroked too many times, then it is time to pull the valve and either replace it or send it out for refurbishment. A leaking valve can cause the beer to go bad and then you have all of a sudden customer complaints and full kegs coming back to the brewery.

HANDLING

1. A filled Half-Barrel keg weighs about 160 pounds, which is too much weight for one person to lift or carry safely. Always make sure correct lifting support tools are used or two people are assigned to handle full kegs.
2. It is advisable to **wear steel-toe shoes** when moving full kegs around, as there is a high risk of injury should a keg drop onto someone's foot when rolling kegs into position, loading, unloading or moving kegs from the delivery truck into the walk-in cooler at the customer site.
3. Find more information on safe keg handling here: OSHA Ergonomic Solutions: Beverage Delivery eTool - Beer Kegs. U.S. Department of Labor | Occupational Safety & Health Administration www.osha.gov/SLTC/etools/beverage/beer_kegs.html

CLEANING

1. All drop-in D-valves are secured with a Stainless Steel lock ring, which prevents the valve from being ejected out through the neck of the keg in case it is under 30 PSI or more pressure. When servicing a keg, it is imperative that prior to removal of the SS lock ring, the pressure is released, to prevent the D-valve from becoming a projectile and seriously hurting or even killing an operator. ALWAYS first depressurize the keg by pushing down on the valve ball with a suitable tool, to prevent damage to the D-valve. It is recommended to place a towel over the valve, so when releasing pressure the operator does not get splashed by liquid.
2. **The inside of a stainless steel beer keg is a food zone**, so the surface has to be smooth and easy to clean, and it cannot have any deep or sharp crevices which could harbor bacteria or other organisms. If the pressure vessel has been damaged to a point where there are areas inside the keg

that cannot be cleaned using CIP (Cleaning in Place) chemicals through the valve down-tube, then the keg becomes unsanitary and either has to be repaired or scrapped.

3. **Chemical cleaning** of kegs can be tricky and dangerous as well, as there are some pretty strong caustic and sometimes also strong acids are used. Some of the most common chemicals used for keg cleaning are:
   - **Sodium Hydroxide solution** – highly caustic; cleaning of organic matter inside and outside of the keg
   - **Potassium Hydroxide solution** – highly caustic; cleaning of organic matter inside and outside of the keg
   - **Sodium Hypochlorite solution** – used for heavily soiled kegs; will create toxic chlorine gas when in contact with acid;
   - **Nitric Acid solution** – pickling and passivation and beer-stone cleaning
   - **Phosphoric Acid solution** – beer-stone cleaning (if Nitric acid is too strong)
   - **Citric Acid solution** – sanitization of inside of keg

4. Some of these chemicals will create some unwanted reactions if the user is not careful, so always read the MSDS sheets as well as any other product literature and always wear the appropriate Personal Protective Equipment (PPE) before you start manually cleaning kegs with these chemicals. Also make sure that when Acid is used, neutralize with caustic and not just rinse with water, as this just dilutes the acid, and later when the liquid slowly evaporates, the acid becomes stronger again and attacks the stainless steel passivation layer.

REPAIR

1. **Leave Manual Weld Repair to the Pro's** - Manual weld repairs on a pressure vessel should only be performed by a professional capable of performing sanitary welding with interpass temperatures of below 300 Degrees F. The primary reason for this is that the yield and the ultimate tensile strength of weld metal are both functions of the interpass temperature. Furthermore if the weld is too hot, there is a build-up of "weld-sugar" on the inside of the keg, which is very hard to be removed and which will most likely leave some rough area, not complying with the food zone specifications. After the welding is performed on the pressure vessel, it is necessary to pickle and passivate the inside of the keg to remove the weld scale (oxidation layer) as well as the free iron. Free iron is the enemy of beer, as it will make the beer taste bitter. The acceptable free iron content should not be more than 1.5mg per 15.5 gallons of liquid, but a good pickling line will be able to drop this down to 0.35mg per 15.5 gallons of liquid.
2. **Frozen kegs** - When full kegs are exposed to below freezing temperatures during the winter months or because the walk-in thermostat is set too low, the beer will start freezing from the outside towards the center of the keg. Since the ice is expanding the volume by 9%, it creates hydraulic pressure on the keg, and depending on the size and type of keg the following will happen:
   - Half Barrel kegs and squat quarter kegs (Pony kegs): frozen kegs show that both bottom and top dome are pushed out, which irreversibly deforms the keg and moves the neck out of position, so it cannot run through the automatic fill-lines.
   - Slim Quarter and Sixth Barrel kegs: frozen kegs show three vertical cuts spaced 120 degree apart on the cylindrical walls, where the metal gave way due to the hydraulic pressure.
3. If a keg was frozen, never attempt to mechanically push the top dome back down using a shop press or other mechanical press, as this will seriously weaken the stainless steel construction of the keg. If the neck is too high to run down your racking line, take the valve out and scrap your keg.
4. **Overheated kegs** - When full kegs are exposed to fire or excessive heat, the liquid will boil and overheated steam will pressurize the keg to the point where either the EPDM CO_2 valve might

disintegrate, at which point the keg becomes a torpedo, or the ball valve being ejected like a bullet from the keg, or the metal structure will be destroyed by tearing or rupturing. There are a lot of different failure modes possible, but the point is to prevent that from happening by not throwing full kegs into a fire just for fun.

5. **Burst Pressure** - Stainless steel kegs are rated for an internal pressure of at least 60 to 90 PSI without deformation, with a burst pressure of at least 300 PSI. The safety factors for burst pressure is usually about three to four, so the new keg does not actually rupture until it is exposed to 1000 PSI internal pressure or more. A lot of the new kegs can be purchased with a special pressure relief-valve in the form of a burst disc, which is a small circle stamp on the bottom dome of the keg, which is designed to break out at a certain design pressure to prevent the valve from becoming the weakest point of the pressure vessel. Never intentionally pressurize the keg to more than the design pressure using compressed air, to prevent damage to the keg or worse injuring yourself or innocent bystanders. The reason for this is that while liquid is incompressible, air can be compressed to the point of becoming very dangerous, like a rocket or a torpedo. When de-denting kegs to remove volume impacting dents, it has to be done using liquid and not air, and this procedure should only be done by professional keg service companies.

More notes specific to this facility: