

# RECALL NOTICE – 130809

## PLEASE READ THIS IMPORTANT INFORMATION



Issued 08/09/2013

**TO:** All customers who purchased Swivel Joints (SJ), Hose Loops (HL) and/or Long Radius Ells (LRL), all figures and sizes, containing any of the heat codes (lots) affected. You are receiving this notice because our records indicate your location or overall account received one or more of the Products affected.

**ISSUE:** Kemper Valve & Fittings Corp. (KVF) has determined through extensive 3<sup>rd</sup>-party testing that certain certifications provided to KVF were inaccurate. Consequently, certain SJ, HL and LRL body components (Products) may not meet our specifications. Although various characteristics are affected, lower Charpy impact energy values are the primary non-conforming characteristic. **NO MATERIAL-CAUSED FIELD FAILURES HAVE BEEN REPORTED TO OR ARE KNOWN TO KVF. SUPPORTED BY A LONG, SUCCESSFUL SERVICE HISTORY AND INDEPENDENT EXPERT COMMENTARY, KVF'S CONCLUSION IS THAT NO ONE IS IN IMMINENT DANGER DUE TO THESE PRODUCT NON-CONFORMITIES WHEN USED UNDER NORMAL OPERATING CONDITIONS AND IN INTENDED APPLICATIONS (see "EXPERT COMMENTS"). KVF RECOMMENDS THAT YOU CONTINUE TO UTILIZE YOUR AFFECTED PRODUCTS DURING THE REPLACEMENT PERIOD.**

(see "RESOLUTION" section)

KVF has been manufacturing these products for over 15 years with production totaling hundreds of thousands of units with long, successful service histories. The preservation of the established confidence in KVF and its support of its products and the safety of KVF's customers and their employees are our highest priorities. It is with these priorities in mind that we are providing this notice and opportunity for replacement.

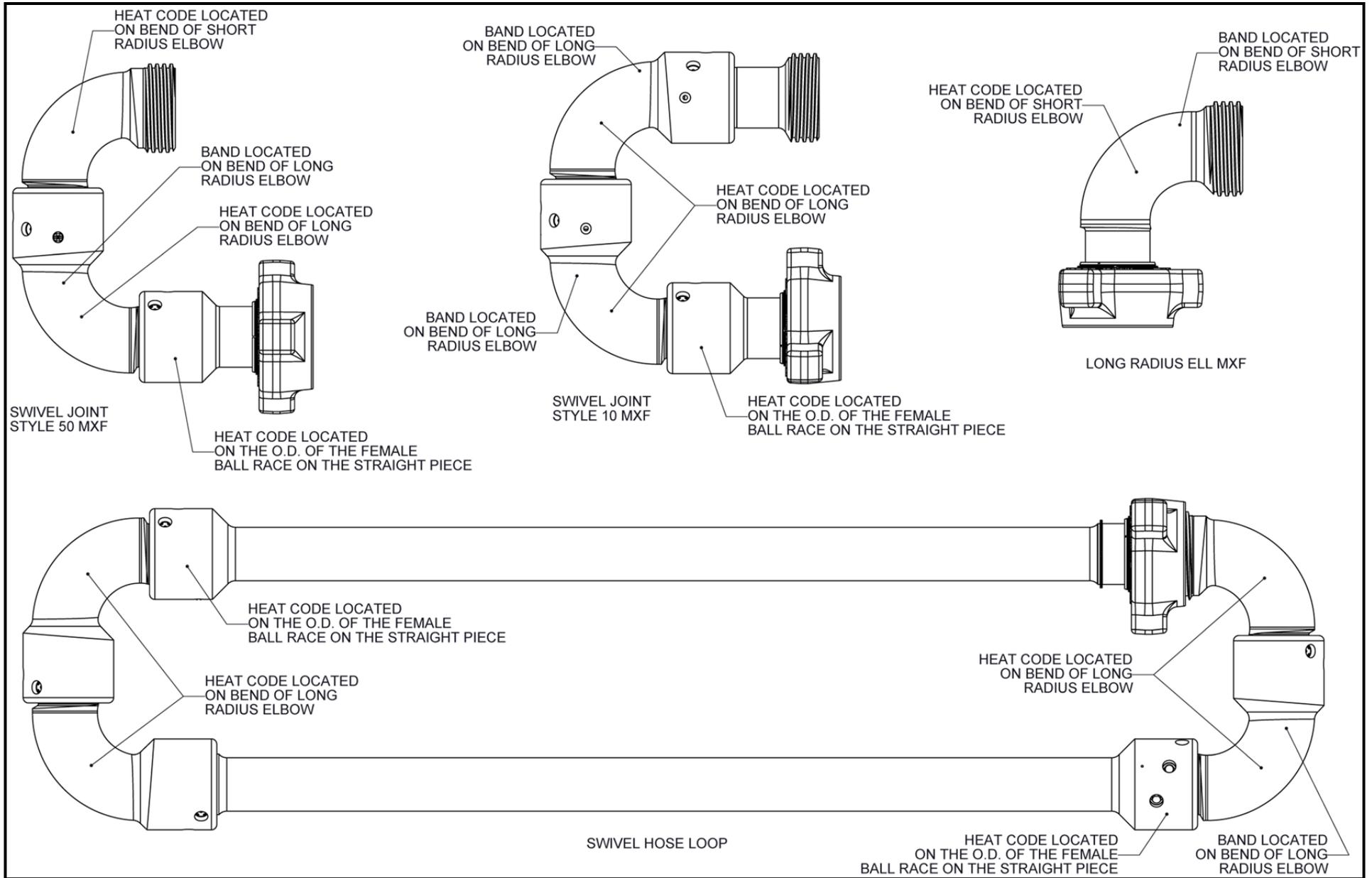
**HOW TO IDENTIFY:** Included with this notice is a list of affected serial numbers and heat codes specific to your location or overall account. If you do not have this list, contact your KVF Sales Representative (SR) to obtain it.

Use the OEM certification band for physical identification, which contains the original product serial number, to match the list up to your Products.

If you cannot locate the OEM serial number, you can additionally determine by inspection if product is affected. Refer to the heat code stamp on each component. Lightly sand or wire brush to clean off any debris from these areas to ensure greater visibility of the stamp.

To locate the stamp location on each component, see the “Serial No. and Heat Code Reference Chart” on the next page.

# SERIAL NO. AND HEAT CODE REFERENCE CHART



**RESOLUTION:** KVF is currently manufacturing conforming, 3<sup>rd</sup>-party verified and significantly enhanced product. **KVF IS COMMITTED TO SUPPORTING ITS PRODUCTS AND THUS WILL REPLACE ALL IN-SERVICE OR INVENTORIED PRODUCTS AFFECTED WITH CONFORMING PRODUCTS.**

KVF will develop customized programs with each customer to replace their affected Products with minimizing impact to your operations as the goal. Depending on your volume and types of affected Products, your replacement program may be up to one year in length.

The affected Products must be presented to Kemper to be eligible for replacement.

**ACTION(S) :**

1. If you have not already received it, contact your SR to obtain a list of affected serial numbers and heat codes specific to your location or overall account.
2. Work with your SR to formulate your customized replacement plan including lead-times, time-tables, order of items and quantities. KVF intends to remain in close contact with you to establish, support and execute this plan.
3. Identify the population of affected Products (see “HOW TO IDENTIFY” section) in your inventory and formulate your replacement plan with your SR. Obtain a Return Material Authorization (RMA) as needed from your SR to track your material through the process and execute the replacement plan.
4. If you have any questions regarding this notice that you would like to address directly to KVF Engineering, Management and Sales, please contact [recall@kempervalve.com](mailto:recall@kempervalve.com). Include a brief description of your

question(s), as well as your contact information. An appropriate KVF representative will then follow-up with you shortly to address your communication.

**REFERENCE INFORMATION:**

**DBTT** – KVF has created a Ductile-to-Brittle transition graph for both affected alloys (AISI 8620 and AISI 4715). Testing was conducted on actual, finished components of randomly selected, distinct heat codes with an average of 5 different heat codes per temperature. This testing was completed to illustrate actual EXISTING PRODUCT performance in terms of Charpy impact energy. Our intention is to provide you with a means of additional understanding for the primary non-conforming characteristic and to provide insight into the utilization of these alloys over a range of operating temperatures. Charpy impact energy performance (ft. lbs. absorbed) is temperature dependent. Various points of interest are also indicated on the graph.

The confidence interval (CI) dashed lines illustrate the lower boundary at which we can statistically state that we are 95% confident that 99% of the Charpy Impact Energy values are at or above X ft. lbs. across the provided temperature range. The intersection points (red and blue dots) illustrate at what temperature these bounds cross the specification Charpy impact energy absorbed of 30 ft. lbs.

The testing was performed by Sherry Laboratories, a lab with an A2LA ISO 17025 certification, NADCAP (National Aerospace and Defense Contractors Accreditation Program) Accreditation with Merit and Notable Prime Aerospace Approvals.

The statistical analysis was performed by Dr. Wayne Taylor, a statistics expert who specializes in sampling and destructive testing programs.

### **Dr. Wayne Taylor**

- B.S. Mathematics – Purdue University
- M.S. Statistics – Purdue University
- Ph.D. Statistics – Purdue University
- Fellow, American Society for Quality (ASQ)
- Fellow, Royal Statistical Society
- American Statistical Association (ASA) Member
- Accredited Professional Statistician with a Ph.D. in Statistics
- Former Director of Quality Technologies at Baxter Healthcare Corporation

### **Statistical Analysis Points of Note:**

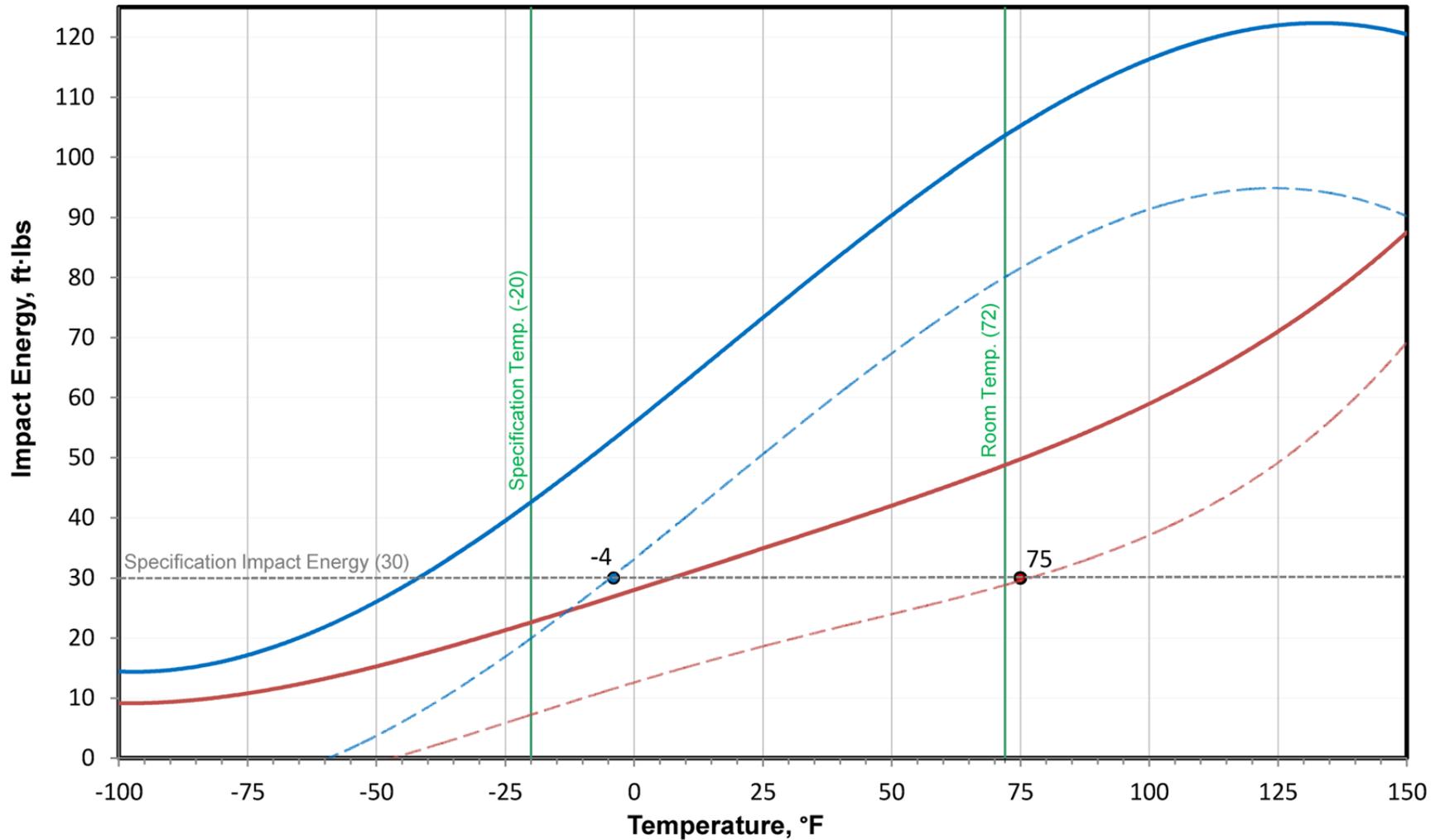
- We can assert that we are 95% confident that 99% of the AISI **4715** absorbs **20 ft. lbs.** of energy at - **20° F** (- 29° C).
- We can assert that we are 95% confident that 99% of the AISI **4715** absorbs **30 ft. lbs.** of energy at - **4° F** (- 20° C).
  
- We can assert that we are 95% confident that 99% of the AISI **8620** absorbs **7 ft. lbs.** of energy at - **20° F** (- 29° C).
- We can assert that we are 95% confident that 99% of the AISI **8620** absorbs **30 ft. lbs.** of energy at **75° F** (24° C).

(refer to the graph on the next page)

# KVF SJ/HL/LRL - Ductile-to-Brittle Transition Temp. (DBTT)

AISI 4715 & AISI 8620 (Historical), 5 (15 Specimens) Charpy Impact Tests per Temperature

● AISI 4715 In-Spec. Temp. ● AISI 8620 In-Spec. Temp. — AISI 4715 Impact Energy Poly with 99% Lower CI — AISI 8620 Impact Energy Poly with 99% Lower CI



Testing by Sherry Laboratories (A2LA ISO 17025, NAPCAP Accreditation with Merit, Notable Prime Aerospace Approvals)

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**EXPERT COMMENTS:**

KVF has consulted with some of the Nation's leading authorities on Metallurgy, Material Science and Failure Analysis and KVF offers some perspectives and comments below from one of those experts regarding the Charpy impact energy characteristic of these steel alloys and their application.

**David Duquette, Ph.D.**

*Metallurgy, Material Selection, Component Corrosion Failure, Fatigue Failure and Engineering Expert Consultant*

- B.S. – U.S. Coast Guard Academy
- Ph.D. – Massachusetts Institute of Technology (MIT)
- Fellow, American Society for Metals (ASM)
- Fellow, National Association of Corrosion Engineers (NACE)
- Fellow, the Electrochemical Society

Note a particular specialty of Dr. Duquette's: "*mechanical properties of metals and alloys including the notch toughness or impact behavior of a variety of materials including high strength martensitic steels*".

Dr. Duquette's responses to various inquiries by KVF regarding Charpy impact energy in the application are as follows:

*"...the comfortable level for a Charpy impact energy will depend on the application. Steels with lower shelf impact energies as low as 3 have been successfully used in many applications. Higher impact energies are insurance policies that are intended to provide some forgiveness against possible low ductility behavior at specific temperatures."*

*"The energy measured in a Charpy test is a combination of the energy required to propagate a crack and the energy absorbed by the plastic deformation of the material. The energy to propagate a crack in a brittle materials is low so the*

*Charpy impact energy will be low. Increases in the Charpy impact energy are almost totally attributed to the energy absorbed in plastic deformation.*

*Accordingly one could look at high impact energies as a kind of ‘forgiveness factor’. It basically is a number that must be exceeded by a rapid strain rate force (blow) to an engineering structure. The test applies a more severe constraint on the results by constraining the energy absorption in a very localized region (the notch root) rather than allowing the force to be distributed over the entire structure. In simple terms it would take twice the amount of force to drive a crack in a steel with an impact energy of 10 Ft.-Lb. vs. one that has an impact energy of 5 ft. lb.”*

*“A Charpy impact value of 7 is not a linear measure of resistance to brittle failure compared to a Charpy measurement of 30, but there is no question that a Charpy impact value will resist impact loads, so yes, this difference is likely only to be observed in an ‘overload’ condition such as overpressurization, sledgehammer impact (blunt instrument, no notch like Charpy), etc. (vs. standard operating conditions). Even an overload condition would not necessarily compromise a swivel joint unless it is applied very rapidly (a burst or knock of some type). In most fluid containing systems loads are transmitted over some finite period of time rather than being a sudden burst. However, I must admit to not knowing the critical process parameters in fracking operations.”*

*“I have ... expressed my opinion that Charpy impact values can be of limited usefulness in real engineering applications since they primarily predict a temperature where alloys, particularly steels, lose their intrinsic toughness and exhibit brittle fracture under impact loading. Further, they imply that a sharp notch will be present in an engineering component.”*

*“Thus, even at the -20°F temperature, the possibility of catastrophic failure is virtually non-existent. Catastrophic failure would require the presence of sharp notches (sharper than the threads in the swivel joints), and impact loading. It is*

*my impression that while there is a possibility of using the swivel joints at temperatures as low as -20°F, that is not the normal operating condition. Thus a catastrophic failure would require a ‘perfect storm’ of conditions involving an impact load applied to a swivel joint that contained a sharp notch (perhaps a fatigue crack) at a temperature lower than -20°F.”*

*“A semi-quantitative examination of Charpy impact energies on the fatigue behavior of medium to high strength steel indicates that even for very low values of impact energy, fatigue resistance is not an issue.*

*In considering the effect of a low impact energy on the fatigue limit, which primarily measures the resistance to fatigue crack initiation, an empirical study of a number of steels indicates that there is no measurable effect of a low Charpy impact energy on the fatigue limit. These analyses are in accordance with the general observation that temperatures from ~-50 F to ~+150 F have little effect on the fatigue resistance of medium to high strength steels.*

*Even if a fatigue crack has initiated, there is no correlation between the stable growth of the initiated crack and the Charpy impact energy value. However, there is a small (and probably not measurable) effect on the critical crack length for unstable crack growth at a given applied stress. Essentially a ductile material will support slightly larger cracks than a brittle material. However, for medium to high strength steels the effects of low Charpy impact values on the transition from stable to unstable crack growth for engineering structures are negligible.*

*To conclude, there is no significant correlation between Charpy impact energy values and fatigue resistance for medium to high strength steels. Wide ranges in operating temperatures, including temperatures below the nominal DBTT, will have no measurable effect on the performance of engineering structures, including swivel joints, under cyclic loading conditions.”*