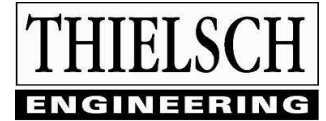


TECHNICAL BULLETIN



SUBJECT: Pipe Support Integrity as Applicable to Piping System Safety and Performance

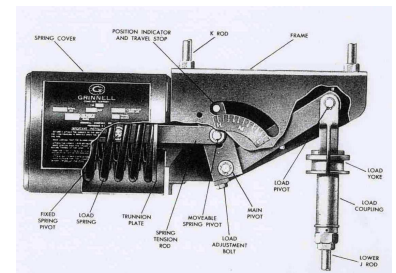
Main Steam, Hot Reheat, and Cold Reheat piping represent critical systems which can be subject to catastrophic failures. These lines transport steam to and from the boiler and turbine. The pipe leads range up to several hundred feet in length and may be as much as over 5" thick. The loads on some hangers can be as large as 150,000 pounds. Thermal movements of as much as 12" are common. These lines and supports must receive the necessary attention and service to insure the safety of the critical high pressure piping systems.

In the past, the conditions of the pipe supports were largely ignored. Being engineered products, hangers are designed to withstand many loads and abnormal operating conditions. Standard practice is to design for twice the rated load, and in some cases, five times. As a result, the supports rarely reflect problems by breaking or falling down. Usually, only through periodic inspections or surveillance can most problems be identified and steps taken to correct or solve them.

On many power plant installations where the critical piping systems have been walked along their entire length and the pipe supports have been inspected, the pipe supports were noted to have been frozen in a topped or bottomed out position. In many supports, failures had occurred in the springs, clamps, hanger rods, and other related hanger components.

The following is a brief outline of a program that should be implemented at all generating stations. Further implementation details will be provided upon request.

The supports should all be inspected annually, first hot, prior to an outage, and again cold, during the shutdown. While inspecting the supports, name plate data and any obvious discrepancies or required repairs should be noted. Readings should be recorded on a permanent form or log for future comparative inspections or reference (Procedure TEA-27). The program should also include preparation of detailed isometric sketches of each system, showing the hanger mark numbers assigned to the pipe supports and their approximate locations.

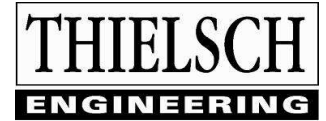


While obtaining support readings, the following other items are checked and noted, if present.

- Damage to, or cracking in, branch and drain lines
- Interferences at safety valve discharge piping
- Inoperable or corroded springs and snubbers
- Fluid levels in snubber reservoirs and the piston settings
- Bound snubbers (mechanical or hydraulic)
- Damaged support steel
- Bent hanger rods, snubbers or struts
- Topped or bottomed springs
- Evidence of absence of movement in constant support hangers



TECHNICAL BULLETIN



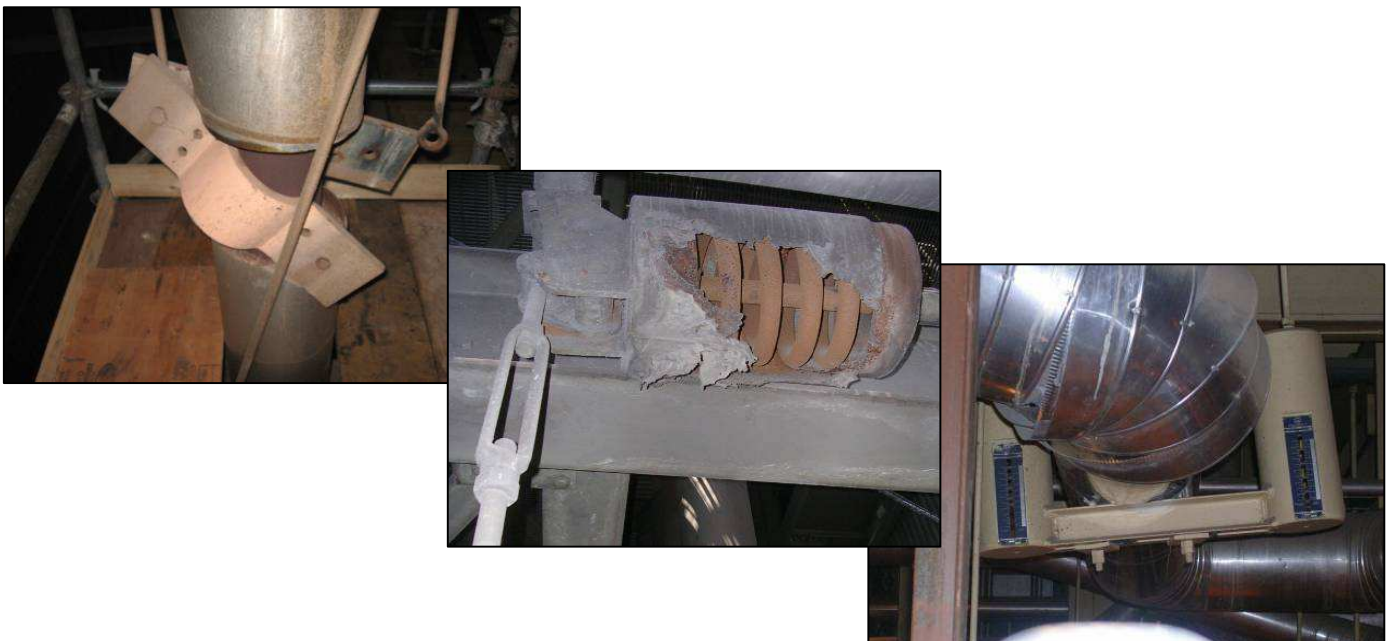
The benefit of hanger surveillance, in addition to the maintenance of the supports themselves, is that harmful stresses in the piping system can sometimes be detected. With proper treatment, maintenance, and adjustment, these problems can be addressed, and the possibility of sudden failures, that could cost millions or affect the safety of personnel, avoided.

The following are examples of problems that have been identified and resolved from piping system walkdowns:

- Auxiliary and main steam lines sagging up to 10"
- Headers sagging 12" or more
- Under supported and over stressed hot reheat and main steam leads and equalizing lines
- Cracked and damaged pipe lugs and welded pipe attachment
- Distortion and/or cracking at branch connections
- Cracks in valve bonnets
- Cracks in attemperator pipe sections
- High-cycle fatigue failures in piping and supports, particularly in Cold Reheat piping.
- Inadequately supported, or too rigidly supported branch steam piping to boiler feed pump turbines, auxiliary systems, start-up systems, etc.

While the above only addresses critical piping systems, it can easily be performed on any piping system. This is usually left up to the plant operator who may have a history of trouble or problems with a particular system in the unit. However, in some instances, we recommend an expansion based upon cursory checks, or experiences with different boilers, turbines, or pumps.

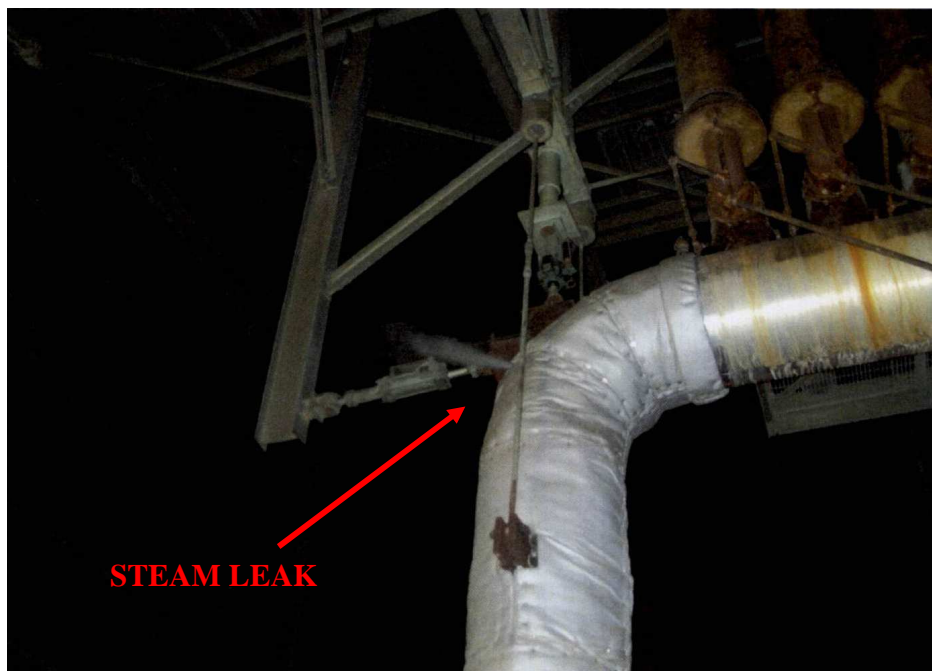
The final reports issued will normally involve integrity analyses with detailed photographs, sketches, and other illustrations to provide a complete record of all critical systems and components. Such records are thus suitable for meaningful comparisons with the results of future inspections and integrity analyses.



TECHNICAL BULLETIN



THRU WALL CRACKING AT SNUBBER ATTACHMENT



STEAM LEAK



TECHNICAL BULLETIN



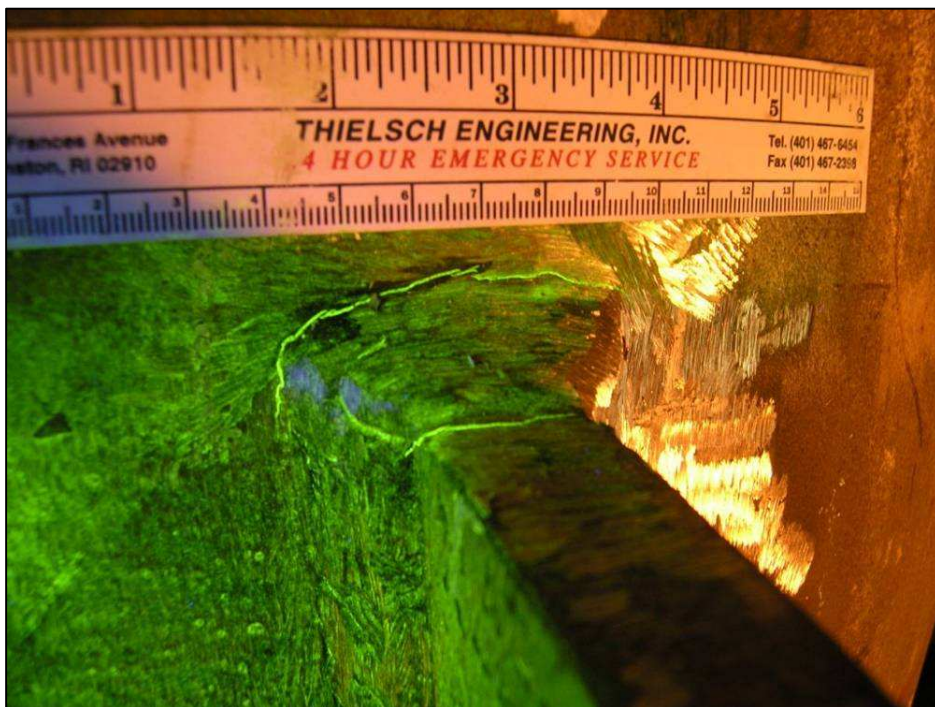
HANGER SHEAR LUG CRACKS AND REPAIRS



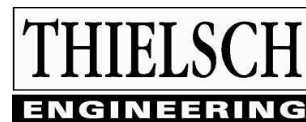
TECHNICAL BULLETIN



SERVICE RELATED CRACKING



TECHNICAL BULLETIN



SAFETY VALVE DISCHARGE EVENT



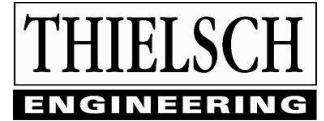
TECHNICAL BULLETIN



WATER HAMMER EVENT



TECHNICAL BULLETIN



If you would like more information on failures associated with Hanger Supports or would like Thielsch Engineering develop a scope of work for an engineering inspection and evaluation, please feel free to call 401-467-6454 or you can e-mail me at Pkenefick@thielsch.com.

Very truly yours,

THIELSCH ENGINEERING, INC.

A handwritten signature in blue ink, appearing to read "P. Kenefick", with a stylized flourish at the end.

Peter R. Kenefick, Vice President
Field Engineering Services

PK/kf