CEN-629-P Revision 2, "Repair of Westinghouse Series 44 and 51 Steam Generator Tubes Using Leak Tight Sleeves";

CEN-632-P Revision 0, "Repair of Kewaunee Steam Generator Tubes Using a Resleeving Technique"; or

WCAP-13088, Revision 3, "Westinghouse Series 44 and 51 Steam Generator Generic Sleeving Report".

b. Any Westinghouse mechanical hybrid expansion joint (HEJ) sleeve which, upon inspection, exhibits wall degradation of 24% or more shall be plugged or repaired prior to returning the steam generator to service. Figure TS 4.2-1 depicts a Westinghouse HEJ sleeve.

c. For disposition of parent tube indications in the upper joint of Westinghouse HEJ sleeved tubes,* as depicted in Figure TS 4.2-1, the following requirements will apply:

1. HEJ sleeved tubes shall be inspected with a non-destructive examination technique capable of locating the bottom of the hardroll upper transition. HEJ sleeved tubes with circumferential parent tube indications located ≥ 0.92 inch (plus an allowance for NDE uncertainty) below the bottom of the hardroll upper transition, as measured on the inside of the sleeve, may remain in service.

2. HEJ sleeved tubes with circumferential parent tube indications located < 0.92 inch (plus an allowance for NDE uncertainty) from the bottom of the hardroll upper transition, as measured on the inside of the sleeve, shall be plugged or repaired prior to returning the steam generator to service.

3. HEJ sleeved tubes with axial parent tube indications located in the parent tube pressure boundary, as depicted in Figure TS 4.2-1, shall be plugged or repaired prior to returning the steam generator to service.

d. Any Combustion Engineering leak tight sleeve which, upon inspection, exhibits wall degradation shall be plugged prior to returning the steam generator to service. This plugging limit applies to the sleeve up to and including the weld region.

e. Any Westinghouse laser welded sleeve which, upon inspection, exhibits wall degradation of 25% or more, shall be plugged prior to returning the steam generator to service. This plugging limit applies to the sleeve up to and including the weld.

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*TS 4.2.b.4.c is applicable for operating cycle 23 only.



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The pressure boundary for HEJ sleeves is shown on Figure TS 4.2-1. The pressure boundary used to disposition parent tube indications (PTIs) detected in the upper joint of HEJ sleeved tubes is discussed in WCAP-15050.[5]* The pressure boundary described in the WCAP will allow PTIs located in the upper joint to remain in service if there is a minimum non-degraded (i.e., no detectable degradation in the parent tube) hardroll length of 0.92 inch (plus an allowance for NDE uncertainty) as measured from the bottom of the hardroll upper transition. The minimum hardroll engagement length is derived from structural and leakage testing. During field application, the PTI is located in reference to the bottom of the hardroll upper transition to ensure the minimum length of non-degraded hardroll exits. The inspection is performed using eddy current techniques capable of profiling and flaw detection as described in "NDE Technique to Determine Length Measurements in HEJ Sleeved Tubes with Parent Tube Indications."[6] The NDE uncertainty for this criterion is a function of the eddy current probe and technique used. The uncertainty has been calculated to be 0.023 inch. However, for field application, an eddy current uncertainty of 0.03 inch will be applied to the minimum hardroll engagement length of 0.92 inch.

Leakage testing performed for the HEJ pressure boundary showed that leak rates for normal operating and steam line break (SLB) are comparable. However, statistical analysis shows that for a 99 percent confidence level the ratio of leak rate at SLB to normal operating is 9.3.[5] To bound SLB leak rate, the assumption is made that SLB leak rate is one order of magnitude greater than normal operating leak rate. The normal operating primary-to-secondary leakage limit is 0.104 gpm (150 gpd per TS 3.1.d.2). Therefore, the maximum primary-to-secondary leak rate during a SLB is assumed to be approximately 1 gpm (9.3 x 0.104 gpm). The 1 gpm will be the assigned leakage encompassing the HEJs left in service using the length criterion described in the paragraph above. Steam line break leakage in the faulted loop from all sources must be calculated to be less than or equal to the maximum allowable leakage described in the Basis for TS 3.4.d. Maintenance of the maximum allowable leak rate limit ensures off-site doses will remain within a small fraction of the 10 CFR Part 100 guidelines and ensures control room doses will not exceed GDC-19 during a SLB.

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[5]WCAP-15050, "HEJ Sleeved Tube Length Based Degradation Acceptance Criterion," May 1998.

*The pressure boundary described by WCAP-15050 is applicable for operating cycle 23 only.

[6]"NDE Technique to Determine Length Measurements in HEJ Sleeved Tubes with Parent Tube Indications," Attachment 5 to Letter to Document Control Desk from C.R. Steinhardt dated May 14, 1998.