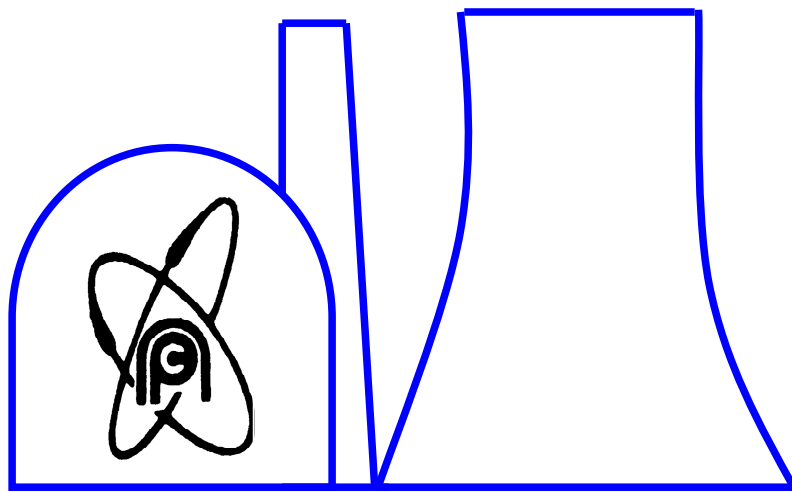




Directorate of Quality Assurance
NDE PROCEDURES



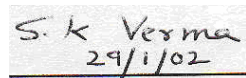

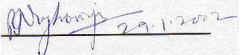
**PROCEDURE FOR EDDY CURRENT TESTING OF
STEAM GENERATORS**

NUCLEAR POWER CORPORATION OF INDIA LIMITED
(A Govt. of India Enterprise)
DIRECTORATE OF QUALITY ASSURANCE

SPECIFICATION NO. PP-P-1963 REV. NO. 2

TITLE	PROCEDURE FOR EDDY CURRENT TESTING OF STEAM GENERATORS
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DATE OF ISSUE (Month/Year)	January 2002	March 2007	January 2013
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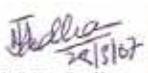
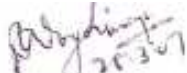
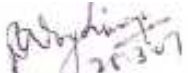


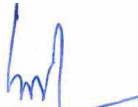
	NAME	SIGNATURE	DATE
PREPARED BY	S.K.Verma		January 2002
REVIEWED BY	M.B.Jadhav		January 2002
APPROVED BY	R. S. Vghasiya		January 2002


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REVISION CONTROL SHEET

SPECIFICATION NO. : PP-E-1963

PROCEDURE FOR EDDY CURRENT TESTING OF STEAM GENERATORS

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1.0 PURPOSE:

This procedure describes the equipment and methods as well as the personnel qualifications essential for the performance of the eddy current examination of Steam Generator Tubes (as a requirement of Pre-Service Inspection (PSI) / In-service Inspection (ISI)) to detect the degradation of the tubes due to service induced conditions like localized corrosion / erosion, fretting, gradual wall thinning. This is in accordance with the requirements of SECTION XI Appendix IV, and SECTION V Article 8 of ASME Code 2010.

2.0 SCOPE:

This procedure is applicable to thin walled tubes of Steam Generators of 220 and 540 MW PHWR's and capable of detecting localized corrosion/erosion, fretting, gradual wall thinning by using multi frequency self-comparison differential mode and external comparison Absolute technique and bobbin probe. This procedure is also capable of detecting deterioration of the tubes at the tube-Support Plate locations by eliminating the signals corresponding to Tube-Support Plates by using an electronic mixer.

3.0 PREREQUISITES:

3.1 Documents:

The following documents are required for the performance of the eddy current inspection programs utilizing the methods described in this procedure.

- a) Tube sheet maps marked to designate the extent of the examination to be performed.
- b) Steam Generator drawings indicating complete details regarding tube material, dia. and wall thickness, straight length, minimum and maximum bending radius of tubes, number of the tube support plates and its location, material, thickness, and ligaments distance, the material of the tube sheet and its thickness and also any other structural members used in contact with tubes.

3.2 PSI:

The tubes must be thoroughly cleaned and ensured that tubes are free from metallic / conductive particles sticking both from inside and outside of tubes.

3.3 ISI:

3.3.1 Plant condition:

The plant must be shut down with Steam Generator isolated, drained and dried from tube side and preferably also from shell side. The Steam Generator shall be opened to access the tube sheet face. Nozzle dams shall be in place. Air movers shall be attached to circulate air through the tubes to dry them and the tube sheet. It should be ensured that the inside surface of all the tubes is free from any foreign particles.

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3.3.2 Radiation protection:

- a) All personnel to be engaged in eddy current inspection programme at operating plants shall have received instructions in and understand the radiation protection rules and guidelines in effect on the plant site.
- b) All personnel to be engaged in the test program shall wear protective clothing and follow instructions regarding radiation protection as recommended by station Health Physics Unit.
- c) All personnel entering a radiation work area will have proven their ability to work using a facemask, airline respirators and other relevant radiation protection equipment.

3.4 Personnel Qualification:

- a) Personnel performing examination in accordance with this procedure shall be certified at least to level I / II in ECT - ISNT /ASNT.
- b) Personnel responsible for data analysis shall be certified to level – II/III in ECT - ISNT /ASNT.

3.5 Equipment:

3.5.1 Eddy Current Tester:

Eddy Current Tester shall have of the following basic capabilities:

- a) EC tester capable of Multi Frequency (at least four frequency) testing (Analog or Digital).
- b) Frequency range from 500 Hz to 1 MHz.
- c) Capability of performing multi channel (at least 4 channels) data acquisition in both differential and absolute mode.
- d) Eddy current data representation in phase amplitude form on X-Y screen with user selectable individual channel and strip chart patterns for at least two charts simultaneously.
- e) Phase angle rotation for signal to be adjustable from 0 to 360 degrees with angle increments of minimum 1 degree.
- f) Signal amplitude magnification to be adjustable through Gain / sensitivity control having a range of around 74 dB in steps of 1 dB increment. (The value of 74 dB is a representative value. The gain should be sufficient to effectively satisfy the equipment calibration requirements as mentioned in point 4.2 below)
- g) Eddy current data to be recorded in real time on non volatile medium e.g. Magnetic tape, computer hard disk or equivalent recording medium.
- h) Replay capability for all channels of recorded data.
- i) Facility to obtain hard copy printout for selected combination of strip chart patterns and / or X-Y patterns.
- j) In case of digital equipment, Data capture rates of at least 600 samples per channel per second with a digital resolution of min 12 bits.
- k) The system shall have capability of performing on-line mixing for cancellation of Tube Support Plate (TSP) signal.
- l) Analysis system to be capable of measuring phase angle in increments of min 1 degree and amplitude measurements upto min 0.1Volts.

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- m) Equipment calibration should be maintained as per ASME Sec V Article 8- II 860 requirements which state that for Analog Instruments the calibration is to be verified for set Frequency within +/- 5% and signal amplification for all channels within +/-5% with each other for identical settings. Digital elements need not be calibrated.

Note:

- I. The above requirements are being satisfied by the following equipment available at site: Zetec MIZ-12, MIZ-17, MIZ-18, MIZ-27, MIZ-40, MIZ-43.
- II. Additionally the following equipment also satisfy the above requirement: ECT MAD 8D, Technofour - INSIS, Situ -PCEAS, Omni Corestar, RDTech, Rohman – ELOTEST. All these equipment and those meeting requirements as laid down by codes can be used provided that they give independent review software with basic analysis features which can be used independently at any remote location viz.NPCIL HQ. The data files should be transferable on standard recording media (Digital / Analog).

3.5.2 Calibration Standard:

The calibration standard shall be manufactured from a defect free length of tubing from the same lot of the tubes for which ISI is to be performed or at least from the identical material, diameter and wall thickness. The following artificial defects are to be created for reference.

- (a) Through-wall drill hole [0.052" (1.3 mm) for 3/4" (19 mm) OD tubing and smaller, and 0.067" (1.7 mm) for larger tubing.
- (b) Flat-bottomed drill hole 5/64" (2.0 mm) dia. 80% through from the outer tube wall surface.
- (c) Flat-bottomed drill hole 7/64" (2.8 mm) dia. 60% through from the outer tube wall surface.
- (d) Flat-bottomed drill hole 3/16" (4.8 mm) dia. 40% through from the outer tube wall surface.
- (e) Four flat-bottomed drill holes spaced 90 degrees apart around the circumference 3/16" (4.8 mm) dia. 20% through from the outer tube wall surface.
- (f) Circumferential groove 10% deep by 1/16" (1.6 mm) wide by 360 degrees on the inside tube wall surface.

Axial distance between artificial defect and distance of defect from end of the tube should be sufficient so as to avoid interference between the signals.

Note: ASME Sec V (2010) Article 8 –II 860 2.2 Calibration Std requirements state the following which is a subset of the above mentioned Cal std . Hence either of them may be used

- g) One or four through-wall holes as follows:
 - (I) One 0.052 in. (1.3 mm) diameter hole for tubing with diameters of 0.75 in. (19 mm) and less, or a 0.067 in. (1.70 mm) hole for tubing with larger diameters.

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- (II) Four holes spaced 90 deg apart in a single plane around the tube circumference, 0.026 in. (0.65 mm) diameter for tubing with diameters of 0.75 in. (19 mm) and less and 0.033 in. (0.83 mm) diameter for tubing with larger diameters.
- h) A flat-bottom hole 0.109 in. (2.7 mm) diameter, 60% through the tube wall from the outer surface.
- i) Four flat-bottom holes 0.187 in. (5 mm) diameter, spaced 90 deg apart in a single plane around the tube circumference, 20% through the tube wall from the outer surface.

[The depth of the artificial discontinuities, at their center, shall be within 20% of the specified depth or 0.003 in. (0.08 mm), whichever is less. All other dimensions shall be within 0.003 in. (0.08 mm).]

Additional Reference standard for wastage is recommended to have the following :
Three grooves of 20mm axial length and 10%, 20 % & 40% depth from OD.

3.5.3 Tube Support Plate:

Ring representing the Tube Support Plate made of similar material and having thickness equal to the thickness of the tube support plate and diameter of hole equal to the hole diameter of the tube support plate. The difference of the OD and ID of ring should be equal to the ligament dimension of the tube support plate.

3.5.4 Probe:

The probe should be bobbin type and having the frequency of operation as per the requirement indicated in 3.5.8

3.5.5 Probe pusher-puller:


Probe pushing and pulling for pre-service / in-service inspection of Tubes shall preferably be accomplished using remotely operated unit - Probe Pusher puller, having constant pulling speed of 300mm per second.

In case of manual pushing and pulling the prober shall be trained for pulling the probe at constant speed of 300mm per second.

(Higher pulling speeds may be used provided the Eddy Current Tester is proven to be capable of faithful data acquisition – probe excitation and data recording; at the higher speed employed)

3.5.6 Communication system:

Two-way audio communications shall be provided between the operational control center and heat exchanger location. Additionally video CCTV system may also be used to effectively monitor the progress of the job.

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3.5.7 Power Supply:

A stabilized and noise free power supply as per the requirement of the equipment used shall be available.

3.5.8 Probes:

Recommended Probe Type:

Sl. No	Heat Exchanger	Tube Material & Size (OD x WT) MM	Frequency KHz (Prime)	Probe Style Number
1	Steam Generator (220MW)	Incolloy 800 16.0 x 1.0	500 (representative value to start with. For actual setting refer pt 4.2 below).	A – 510 – LC, A – 480 F A 520 LC , A-500F
2	Steam Generator (540MW)	Incolloy 800 19.0 x 1.10	400 (representative value to start with. For actual setting refer pt 4.2 below).	A – 610 – LC, A – 580 F

Note : A fill factor of minimum 0.80 should be ensured .

4.0 PERFORMANCE:

4.1 Preparation:

- a) Establish location of control-operation center.
- b) Arrange stabilized voltage and power distribution box at control-operation center.
- c) Laying of cable for eddy current probe and communication system, between control-operation center and heat exchanger to be completed.
- d) Install the two-way communication system and establish communication between control center and heat exchanger.
- e) Install eddy current system (tester, data recorder, mixer, chart recorder etc) as per instrument operating manuals, at control-operation center.
- f) Necessary arrangements at heat exchanger location regarding Eddy Current probe, pusher puller and probe positioner system, if any, are to be completed.

4.2 Equipment Calibration:

The equipment shall be calibrated :

- i. Prior to the commencement of the eddy current examination of the heat exchanger tubes.
- ii. At the end of the Eddy current Examination.

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- iii. After replacement of any component of the test system, ie. Probes, Eddy Current Tester, extension cables, recording instrument or any other part of system hardware.
- iv. Verification of calibration should be done at begin and end of each unit of data storage of the recording media ie. Magnetic tape , cartridge etc.
 - v. At an interval of four hours of continuous operation.
 - vi. At any time that malfunction is suspected.

Instrument operating manual shall be used for setting the instrument parameters.
A S/N ratio of better than 3 should be maintained throughout.

The following steps are to be followed for establishing the ECT for Differential Mode of testing :

I) Differential Bobbin Coil Technique:

- a) Instrument operating procedure shall be used as part of this procedure.
- b) Set the Eddy Current Tester operation for differential mode.
- c) Insert the bobbin coil probe into a section of the calibration standard, which is free of defect and balance the equipment as per requirement.
- d) Set the prime frequency of test on one channel so that the phase angle of a signal from the four 20% flat bottom holes is 50° to 120° rotated clockwise from the signal of the through-the-wall hole. Refer 3.5.8 for the representative value of prime frequency .
- e) The sensitivity should be adjusted to produce a minimum peak-to-peak signal from the four flat bottom holes of a minimum of 30% of the full-scale horizontal presentation. It should be also verified that the signal due to 100% through hole is clearly distinguishable and if necessary, increase the gain or display multiplier.
- f) Adjust the phase or rotation control so that the signal response due to probe motion, or the 10% deep circumferential inside diameter groove, or both, is positioned along the horizontal axis of the display ± 5 degree. Also it shall be verified while pulling the probe, that the trace display for the four 20% flat bottom holes goes down and to the left first, followed by an upward motion to the right, followed by a downward motion to the left returning to the point of origin. A cross check is to verify that the signal due to 100% through hole is close to 40 degrees (measured clockwise from the horizontal) and the signal progresses down and to the right first, followed by an upward motion to the left, followed by a downward motion to the right returning to the point of origin.
- g) Set auxiliary frequency on second channel to a value in the range of Prime frequency divide by 2, thus getting optimum response from tube support plate and suitable to be combined (mixed) with Prime frequency for suppression of tube support plate signal.
- h) The second frequency sensitivity (gain) should be adjusted to get optimum response from tube support plate suitable to be combined (mixed) with Prime frequency signal for suppression of tube support plate signal.
- i) The sensitivity setting should be such that the signal for TSP is not saturated.
- j) Adjust the phase or rotation control for second frequency in an identical manner as mentioned above in point (f) above.

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- k) Perform the mixing of the Prime frequency and second frequency to cancel the TSP signal in defect free area of the tube. Verify that the mix channel shows TSP signal is cancelled to the extent that S/N ratio is better than 3.
- l) Adjust the phase or rotation control for Mix channel in an identical manner as mentioned above in point (f) above.
- m) Similarly set the instrument for third (of Prime frequency multiplied by 2) and fourth (of Prime frequency divide by 4) frequencies for sensitivity and phase as per above mentioned points (e) and (f) above respectively.
- n) Record the calibration data in format as per Annexure II and plot the calibration curve for the prime frequency and other frequencies 2nd, 3rd, 4th and mix channel for the depth of the defect verses the phase angle.

Note: In case the TSP signal is saturated in the Prime Frequency; a suitable gain reduction shall be made and recorded in the report. In this case the evaluation should be done with suitable magnification feature of display.


The following steps are to be followed for establishing the ECT for Absolute Mode of testing :

II) Absolute Bobbin Coil Technique:

- a) Prime frequency chosen in Absolute mode should be verified to generate a signal such that line drawn from origin to tip of signal response of the Thro Wall Hole (TWH) is at 40 deg to the horizontal axis and the angle between line drawn from origin to tip of signal response of the four 20% FBH and the TWH response line is between 50 deg to 120 deg. (In present case the Prime frequency is selected as per 3.5.8)
- b) Sensitivity setting should produce a signal for 20% FBH to have an origin to peak amplitude of minimum 30% of the full scale horizontal presentation. It should be also verified that the signal due to 100% through hole is clearly distinguishable and if necessary, increase the gain or display multiplier.
- c) Phase/ Rotation control should be adjusted so that signal response due to probe motion or 10% ID groove or both is positioned on the horizontal axis +/- 5deg
- d) The response may be rotated to the upper quadrant of the display at the option and convenience of the operator.
- e) The same procedure as mentioned in points (a) to (d) as above should be adopted for 2nd, 3rd and 4th frequencies.

The higher frequency is to be used to verify that any particular signal is confirmed to be due to ID phenomena whereas the lower frequencies are used to confirm that signals observed are due to OD phenomena like presence of conductive deposits on the OD of the tube (mostly near TS or TSP) and for cancellation of TSP signal (Mixing)

An additional calibration tube is recommended for wastage type defects. The calibration standard is to be manufactured from a defect free length of tubing from the same lot of the tubes for which ISI is to be performed or at least from

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the identical material, diameter and wall thickness. This tube may have OD grooves of 20mm axial length and 10%, 20 % & 40% depth from OD. These grooves shall be located at least two inches away from either end of the tube to eliminate end effect. The calibration curve shall be plotted for depth of the defect verses the signal amplitude (in Absolute Channel), in volts .

All Calibration Data Is To Be Recorded In The Standard Format - CALIBRATION RECORDS enclosed as ANNEXURE II

4.3 Tube Inspection:

- a) Eddy Current Inspection activities shall be performed with equipment capable of Differential as well as absolute mode of testing with the settings as per Calibration procedure mentioned in 4.2 above . The Gain and Phase settings are made as per 4.2 mentioned above.
- b) Frequency settings are
 - CH1 = 400 / 500 Khz.(prime frequency) pl see 3.5.8
 - CH2 = (CH1 / 2) Khz
 - CH3 = (CH1 / 4)Khz.
 - CH4 = (CH1 * 2) Khz.


All Equipment Details And Instrument Settings Are To Be Recorded In The Standard Format - EQUIPMENT DETAILS AND INSTRUMENT SETTINGS enclosed as ANNEXURE I

- c) These are representative values to start with and changes shall be made as per requirement of 4.2. The same should be noted in the Annexure I along with all other relevant details.
- d) Tubes in Steam Generator are oriented in Triangular pitch with Row / Col representations and as odd-even , even-odd configuration.
- e) The row and the Column number should identify the tubes as shown in annexure IV .
- f) The row number increasing from bottom to top(partition plate treated as bottom), and the column numbers increasing from left to right (in Hot leg as seen from manhole) The origin 0,0 is **left-bottom** in Hot Leg as seen from the manhole.
- g) The total number of tube support plates should also be noted. The numbering of the tube support plate should start from tube sheet side and proceed in increasing order towards the far end .
- h) Two way audio/ video communication shall be provided between the operational control center and heat exchanger location
- i) The prober in the field location shall have continuous communication, using Two-way communication system, with the Eddy Current equipment operator located at remote control station and both personnel must concur on the tube number being examined.
- j) Insert probe completely through the calibration standard. Record calibration standard while withdrawing probe through calibration tube covering all the

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defects along with the TSP placed in defect free location. Cal Tube recording is preferably named as 999 – 999 for digital recording system.

- k) The system is now ready for operation.
- l) The equipment calibration shall be verified and recorded at the beginning of days work as well as at begin and end of each unit of data storage of the recording media ie. CD / HDD, Magnetic tape , cartridge etc. (as mentioned in 4.2 above)
- m) Verification of calibration shall be checked frequently by observing that the tube support plate signals are at the proper phase angel.
- n) As a minimum, the calibration will be verified at 4 hours intervals and positively after any equipment change or probe change with appropriate noting in Remarks Column in annexure III.
- o) Test one straight leg with straight probe and the other straight leg and the bend region with the flexible probe. An appropriate flexible probe is to be used to test the entire length in one pass if practicable.
- p) Probe positioning and feeding shall be accomplished remotely preferably using Manipulator and Pusher puller mechanism.
- q) Pushing can be done at fastest speed without causing damage to probe. EC data will not be recorded during pushing.
- r) Pulling is to be accomplished at a constant rate of 300 mm per second. In case of advanced EC testers having higher sample rates, higher inspection speeds can be set appropriately after verification of faithful recording of the Calibration tube data at the same probe withdrawal speed.
- s) In case of manual Pushing / Pulling (performed for specific samples, cross verification or confirming tube identification before tube plugging) the person responsible for pushing pulling should be well acquainted with the tube identification scheme as illustrated in Annexure IV
- t) Physical verification of fixture location by using tie rod location (or Peripheral tubes / plugged tubes (if any)) as confirmatory landmarks shall be performed at regular intervals (say after inspection of every fifty tubes) and appropriate entry be made in CD, cartridge (or equivalent recording medium) and also at the beginning of CD container, cartridge (or equivalent recording medium).
- u) If during actual examination the tube identity verification reveals an error has occurred in the recording of probe location, all tubes examined since the previous verification of location shall be re-examined with appropriate noting in Remarks Column in annexure III
- v) The data recording, with proper identification of the tube being examined, shall be made during probe withdrawal . Uniform pull of 300 mm per second should be ensured.
- w) Close monitoring of signals appearing on the Eddy Current Tester, should be carried out while pulling the probe and recording the signals, and any observation shall be recorded on Annexure-III for subsequent detailed analysis.

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5.0 DATA EVALUATION AND DOCUMENTATION:

5.1 Analysis

- a) Calibration curves shall be plotted using the calibration tube data and generating Phase angle vs defect depth curve for each of the inspection frequencies.
- b) The data analyser shall determine that all data collected is properly marked.
- c) All strip chart recordings/ computer charts shall be examined completely.
- d) Basic analysis shall be performed using **Prime frequency** data.
- e) For indications under TSP the mix channel shall be used for analysis. For any anomalies, the second or other frequency shall be used for confirmations.
- f) The strip chart recordings is not considered abnormal unless the excursion in Vertical Channel is at least 3 times larger than the background noise.
- g) Any abnormal signals observed on the strip charts shall be recorded on the data sheets. The CD / HDD, magnetic tape (or equivalent). recording shall be examined for each tube that is recorded as above. In some cases it may be necessary to examine the magnetic tape (or equivalent) completely.
- h) The data analyser shall
 - i. Report tubes whose data is incomplete or which is un-interpretable.
 - ii. Report the tube requiring a re-test at one or more alternate frequencies for tubes that have a signal whose origin is difficult to ascertain.
 - iii. In case of in-service inspection report all defects having wall thinning corresponding to 20% and above. Also report all the dents having amplitude of the order of twice the amplitude of 20% FBH signal.
 - iv. The axial position of the indication with respect to a known structural member like tube sheet or a tube support plate should be reported. The tube support plate should be counted from tube sheet. Always use identical identification followed during pre-service inspection.
 - v. In case of pre-service inspection report all indications observed along with the approximate axial position of the indication with respect to a known structural member like tube sheet or tube support plate. The tube support plate should be numbered from tube sheet side.
 - vi. Preferably the tubes having defect signals should be re-recorded to confirm the presence of the defect indication.


5.2 Report

All analysis data / information shall be recorded on the standard format - EDDY CURRENT TEST EVALUATION REPORT enclosed as Annexure-III.

5.3 Disposition

As per the code the defect corresponding to wall thinning upto 40% from OD is allowable.

All the indication corresponding to wall thinning larger then 40% shall be analyzed by Level III person independently.

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Based on the past experience the defect having the wall thinning greater than 60% and signal amplitude greater than 20% FBH reference holes as well as the tubes having wall thinning indication between 40&60% of the wall thickness and signal amplitude larger than 3 times the signal of 20%FBH reference hole shall be recommended for plugging. Other tubes having indications should be monitored in subsequent ISI.

If the damage could be identified to be growing as compared to previous inspection the tube with the defect indication should be recommended for plugging unless there is an opportunity to inspect the same tube in next outage and the trend indicates that the tube may remain healthy till that time.

However opinion regarding tube plugging is to be concurred by design group / operation group as well as station personnel. These criteria may be reviewed in future with further gain in experience.

5.4 Retention of Records

All the recording media shall be retained, as a minimum, till the next ISI of the same tube is performed.

6.0 REFERENCE DOCUMENTS:

The following documents were referred for this procedure:

- (a) ASME-Boiler & Pressure Vessel Code, Section-XI of 2010.
- (b) ASME-Boiler & Pressure Vessel Code, Section-V of 2010.
- (c) CSA Standard N 285.4-M 2005, Periodic In-service Inspection of CANDU Nuclear Power Plant Components.
- (d) Procedure specification No. PP-E-1609.

Annexure – I

EQUIPMENT DETAILS AND INSTRUMENT SETTINGS

Station: _____ : Unit: _____ Date: _____

Steam Generator No : _____ Leg tested: _____
Tube Material : _____ : Dia : _____ Wall Thick: _____ OD: _____

Straight Length : _____ : Min. Bend Rad : _____ Max. Bend Rad: _____

Tube Sheet Material : _____ Wall Thickness: _____
TSP Material : _____ Thickness: _____ Numbers: _____ Spacing: _____

A) Probe:

- 1) Style Number: _____
- 2) Shaft Length _____ Extension Cable: _Type / Length_____

B) Calibration Standard:

Sl. No. of Tube: _____ Sl. No. of TSP Ring : _____

EQUIPMENT SETTINGS: Eddy Current Tester Make: _____
Model: _____
Calibrated on: _____

		Channel 1	Channel 2	Channel 3	Channel 4
1) Frequency (KHz):					
2) Gain :					
3) Phase:					
Mixer:	Mixer 1	Mixer 2			
Gain					
Phase					

DATA RECORDED BY :	VERIFIED BY:
NAME:	NAME:
NDT Qualification:	NDT Qualification:

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Annexure – II

CALIBRATION TABLE: (to be generated for each frequency and each mode Diff / Abs)

Frequency = _____ KHz Channel No = 1/2/3/4	Mode : Differential / Absolute Samples pre second:	
DEFECT	PHASE ANGLE (degrees)	AMPLITUDE (Volts)
100% Through		
80% FBH		
60% FBH		
40% FBH		
20% FBH		
10% ID Groove		

DATA RECORDED BY :	VERIFIED BY:
NAME:	NAME:
NDT Qualification:	NDT Qualification:

Annexure – III

Station: _____
Unit: _____
Steam Generator No: _____
Leg : Hot / Cold
Date: _____
Sheet : _____ of _____

EDDY CURRENT TEST EVALUATION REPORT:

Sr No	Tube Identification		Observation Type *	Percentage Thinning				Current Amp (V) Pri/Mix	Loc **	Remarks
	Row	Column		Prime / Ch No		Mix				
				Prev	Curr	Prev	Curr			

* Typical Observation types:

TS = Tube Sheet	TSP = Tube Support Plate	PNG = Probe Not Entering
DNT = Dent	PILG = Pilgering Noise	NOISE = Electrical Noise
ID = ID indication	OD = OD indication	DIST = Distorted TSP Signal
M = Severest of Multiple Indications		

** Locations for observations:

Between Top of Tube Sheet (TTS) and Tube Support Plate 1 (TSP1) **OR**
Betn TSP No ___ and TSP No ___ **OR** Betn Grid No ___ and Grid No ___
OR Beyond Grid No ___ **OR** In Bend Region

DATA REPORTED BY	VERIFIED BY:
NAME:	NAME:
NDT Qualification:	NDT Qualification:

Annexure IV

Tube Sheet Map : (for typical 220MW Mushroom type SG)

