APPENDIX J—REVIEWING AUDIOGRAMS

Compare the most recent audiogram with the baseline audiogram. If a Standard Threshold Shift (STS) is observed, review data for intervening years to determine when the STS occurred. The baseline audiogram is usually, but not always, the first audiogram. If a later audiogram shows lower hearing thresholds, that would be the baseline. If a persistent STS is identified, the audiogram after the STS is identified would be adopted as the revised baseline for future comparisons.

Evaluate data for each ear separately. A threshold shift can occur in one ear and not the other. Use threshold data only for the three required frequencies, which are 2,000, 3,000, and 4,000 Hz. For each audiogram, compare to the baseline and take the average of the difference in threshold at the three required frequencies. If the average is less than 10 dB, no STS has occurred. If the average is greater than or equal to 10 dB, the age correction values must be applied to determine whether an STS has occurred.

To apply the age correction values, subtract the age correction value for the worker's age at the time of the baseline audiogram from their age at the time of the suspected threshold shift. Subtract the difference in the age correction values from the difference between the current and baseline audiograms. Take the average of the age-corrected threshold shifts at the three required frequencies; if the average is greater than or equal to 10 dB, an STS has occurred.

Example #1: A 45-year-old male worker has the following audiogram information:

	Test Frequency, Left Ear (Hz)					*Test Frequency, Right Ear (Hz)*				
Test year	*1,000*	*2,000*	*3,000*	*4,000*	*6,000*	*1,000*	*2,000*	*3,000*	*4,000*	*6,000*
Baseline (1990)	*3*	*5*	*4*	*0*	*2*	*1*	*3*	*5*	*1*	*4*
Current year (2008)	*14*	*14*	*12*	*9*	*13*	*12*	*14*	*18*	*12*	*9*

The data for the left ear show that the threshold shifted by less than 10 dB at all required frequencies. Thus, an STS could not have occurred in the left ear because the average change at the required frequencies is less than 10 dB. Data for 1,000 Hz and 6,000 Hz are not included in the determination of whether an STS has occurred. For the right ear, a shift of at least 10 dB occurred at each of the required frequencies, so the average will be greater than 10 dB. (The difference in hearing thresholds between the current and baseline audiograms is 11, 13, and 11 dB at 2,000, 3,000, and 4000 Hz, respectively.) It is now necessary to apply the age correction values from Table F-1 in Appendix F of 1910.95.

Age Correction Values for Males (from Table F-1 in Appendix F of 1910.95)			
	2,000 Hz	*3,000 Hz*	*4,000 Hz*
Age 27 (1990)	*4*	*6*	*7*
Age 45 (2008)	*7*	*13*	*18*
Difference in age correction values	**3**	**7**	**9**

Age-Corrected Threshold Shift (Right Ear)			
	2,000 Hz	*3,000 Hz*	*4,000 Hz*
Threshold shifts from baseline	*11*	*13*	*11*
Difference in age correction values	*3*	*7*	*9*
Age-corrected threshold shift	**8**	**6**	**2**

Since all age-corrected changes in hearing threshold are less than 10, the average will be less than 10. No STS has occurred.

<u>Example #2</u>: A 50-year-old female worker with 10 years of service has the following audiometric data:

	Test Frequency, Left Ear (Hz)					*Test Frequency, Right Ear (Hz)*				
Test year	*1,000*	**2,000**	**3,000**	**4,000**	*6,000*	*1,000*	**2,000**	**3,000**	**4,000**	*6,000*
Baseline	*10*	**7**	**8**	**8**	*15*	*11*	**8**	**9**	**9**	*13*
Current year	*12*	**17**	**18**	**16**	*17*	*13*	**17**	**21**	**25**	*17*

The average threshold shift for the left ear is (10+10+8)/3=9.33. Since the average for the left ear is less than 10, no STS has occurred.

The average threshold shift for the right ear is (9+12+16)/3=12.33; the age correction values must be applied to determine whether an STS has occurred.

Age Correction Values for Females (from Table F-1 in Appendix F of 1910.95)			
	2,000 Hz	*3,000 Hz*	*4,000 Hz*
Age 50 (current year)	*10*	*11*	*12*
Age 40 (baseline)	*7*	*8*	*8*
Difference in age correction values	**3**	**3**	**4**

Age-Corrected Threshold Shift (current year, age 50)			
	Test Frequency, Left Ear (Hz)		
	2,000	*3,000*	*4,000*
Threshold shifts from baseline	*9*	*12*	*16*
Difference in age correction values	*3*	*3*	*4*
Age-corrected threshold shift	**6**	**9**	**8**

The age-corrected average is (6+9+8)/3=7.66. Since this is less than 10, no STS has occurred.

<u>Example #3</u>: Selected audiometric test data for a 35-year-old female worker with 10 years of service:

	Test Frequency, Left Ear (Hz)					*Test Frequency, Right Ear (Hz)*				
Test year	*1,000*	**2,000**	**3,000**	**4,000**	*6,000*	*1,000*	**2,000**	**3,000**	**4,000**	*6,000*
Baseline	*8*	**9**	**13**	**14**	*18*	*12*	**15**	**15**	**11**	*15*
Current year	*18*	**19**	**22**	**23**	*25*	*20*	**24**	**27**	**30**	*35*

For the left ear, the shifts at the required frequencies are 10 dB, 9 dB, and 9 dB, respectively. No STS can occur because the average is less than 10 dB. For the right ear, the values are 9 dB, 12 dB, and 19 dB; (9+12+19)/3=13.33. Since the average is greater than or equal to 10 dB, the age correction values need to be applied.

Age Correction Values for Females (from Table F-1 in Appendix F of 1910.95)			
	2,000 Hz	*3,000 Hz*	*4,000 Hz*
Age 35 (current year)	*6*	*7*	*7*
Age 25 (baseline)	*5*	*4*	*4*
Difference in age correction values	**1**	**3**	**3**

Age-Corrected Threshold Shift: Current Year, Age 35, Right Ear			
	Test Frequency, Left Ear (Hz)		
	2,000	*3,000*	*4,000*
Threshold shifts from baseline	*9*	*12*	*19*
Difference in age correction values	*1*	*3*	*3*
Age-corrected threshold shift	**8**	**9**	**16**

The average threshold shift is (8+9+16)/3=11. Since the average shift is greater than or equal to 10 dB, an STS has occurred, even though two of the values are less than 10. Also, note that the worker's current average hearing threshold for the right ear is (24+27+30)/3=27. Since this exceeds 25, both conditions are met (an STS has occurred and the hearing threshold for the right ear is greater than or equal to 25 dB); therefore, the case is recordable. Review the OSHA 300 Log to determine whether the case was recorded.

<u>Example #4:</u> Selected audiometric test data for a 40-year-old male worker:

	Test Frequency, Left Ear (Hz)					*Test Frequency, Right Ear (Hz)*				
Test Year	*1,000*	**2,000**	**3,000**	**4,000**	*6,000*	*1,000*	**2,000**	**3,000**	**4,000**	*6,000*
Age 20	*5*	**4**	**6**	**8**	*8*	*5*	**3**	**4**	**5**	*8*
Age 25	*5*	**3**	**5**	**7**	*9*	*6*	**6**	**7**	**7**	*9*
Age 30	*12*	**9**	**11**	**10**	*15*	*8*	**12**	**14**	**13**	*17*
Age 35	*17*	**15**	**19**	**18**	*20*	*16*	**18**	**17**	**21**	*23*
Age 40 (current year)	*21*	**25**	**30**	**33**	*36*	*18*	**22**	**25**	**25**	*27*

Review the data and observe that the lowest thresholds for the left ear occur in the second audiogram (at 2,000, 3,000, and 4,000 Hz). Use age 25 as the baseline for the left ear. For the right ear, use the first audiogram as the baseline because it has the lowest thresholds.

Next, compare the current year audiogram with the baseline. Observe that for each ear, at the required frequencies, all changes in threshold exceed 10 dB, so the averages will exceed 10 dB for each ear. The age correction factors must now be applied to determine whether an STS occurred.

Age Correction Values (from Table F-1 in Appendix F of 1910.95)			
	2,000 Hz	*3,000 Hz*	*4,000 Hz*
Age 20 (use for right ear)	*3*	*4*	*5*
Age 25 (use for left ear)	*3*	*5*	*7*
Age 40	*6*	*10*	*14*
Difference in age correction values, left ear	*3*	*5*	*7*
Difference in age correction values, right ear	*3*	*6*	*9*

Age-Corrected Threshold Shift (current year, age 40)						
	Test Frequency, Left Ear (Hz)			*Test Frequency, Right Ear (Hz)*		
	2,000	*3,000*	*4,000*	*2,000*	*3,000*	*4,000*
Threshold shifts from baseline	*22*	*25*	*26*	*19*	*21*	*20*
Difference in age correction values	*3*	*5*	*7*	*3*	*6*	*9*
Age-corrected threshold shift	**19**	**20**	**19**	**16**	**15**	**11**

In scanning the data for the left ear, the average threshold shift will exceed 10 dB but not 25 dB. An STS has occurred but not an OSHA-recordable case. The average STS is: (19+20+19)/3=19.33 dB. Likewise, for the right ear, the average shift will be greater than 10 dB but less than 25 dB. An STS has occurred for the right ear but not an OSHA-recordable case. The average is (16+15+11)/3=14.

Since the STS is much larger than 10 dB for both ears, it is prudent to examine data from the intervening years to determine when the STS occurred. In scanning the data for age 30 for the left ear, none of the shifts exceed 10 dB before age correction, so the STS did not occur at that interval. In scanning the data for age 35, the shifts were 12 dB, 14 dB, and 11 dB. The age correction values will need to be applied.

Age Correction Values (from Table F-1 in Appendix F of 1910.95)			
	2,000 Hz	*3,000 Hz*	*4,000 Hz*
Age 25	*3*	*5*	*7*
Age 35	*5*	*8*	*11*
Difference in age correction values, left ear	**2**	**3**	**4**

Age-Corrected Threshold Shift (age 35, left ear)			
	Test Frequency, Left Ear (Hz)		
	2,000	*3,000*	*4,000*
Threshold shifts from baseline	*12*	*14*	*11*
Difference in age correction values	*2*	*3*	*4*
Age-corrected threshold shift	**10**	**11**	**7**

The average age-corrected threshold shift at age 35 for the left ear was (10+11+7)/3 =9.33. No STS occurred in that interval. There is no need to adopt a revised baseline for that interval.

For the right ear, review data for the intervening years to determine when the STS occurred. For age 25, all shifts were less than 10 dB. For age 30, the shifts were 9 dB, 10 dB, and 8 dB. Since the average is less than 10 dB, no STS occurred. For age 35, all shifts were well above 10 dB, so the age correction values will need to be applied.

Age Correction Values (from Table F-1 in Appendix F of 1910.95)			
	2,000 Hz	*3,000 Hz*	*4,000 Hz*
Age 20	*3*	*4*	*5*
Age 35	*5*	*8*	*11*
Difference in age correction values, right ear	**2**	**4**	**6**

Age-Corrected Threshold Shift (age 35, right ear)			
	Test Frequency, Right Ear (Hz)		
	2,000	*3,000*	*4,000*
Threshold shifts from baseline	*15*	*13*	*16*
Difference in age correction values	*2*	*4*	*6*
Age-corrected threshold shift	**13**	**9**	**10**

The age-corrected standard threshold shift for the right ear is (13+9+10)/3=10.66. The STS occurred at age 35. The audiogram for age 35 should be adopted as the revised baseline.