

**Industrial Hygiene Report
For Noise Exposure Monitoring Surveys
Conducted at Three Manufacturing Plants
In Quebec, Canada
(June 2003-January 2004)**

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Executive Summary

From June 2003 to January 2004 noise researchers from the U.S. National Institute for Occupational Safety and Health conducted full shift time-weighted average (TWA) noise exposure monitoring at three different manufacturing facilities in Quebec, Canada. The noise measurement surveys were conducted as part of a research project to compare task-based methods of measuring full shift noise exposures to the traditional noise dosimetry method; and to evaluate the risk of hearing loss for workers exposed to both continuous noise and impact noise. Personal dosimetry monitoring of workers was conducted three separate times for the workers participating in the study. During noise surveys, noise researchers also measured the noise levels of work tasks, noted time at task, and observed hearing protector usage. The following table briefly describes each plant and summarizes the number of participating workers, number of different job titles represented, and number of TWA noise dosimeter measurements collected during the study.

Plant	Description of Manufacturing	Number of Workers	Number of Jobs	Number of TWA Dosimeter Measurements
A	Manufacture oriented polystyrene food containers for agricultural produce, bakery products, catered foods, fast-food restaurants.	69	13	229
B	Manufacture aluminum cans and bottle caps for the beverage industry	49	13	162
C	Repair heavy equipment for the construction, agriculture, and mining industries	30	12	110

Notable results of the noise monitoring surveys at each plant included the following:

Plant A:

- The average full-shift noise exposure of grinder operators exceeded the Quebec noise exposure limit of 90 dBA. The main source of their noise exposure was the scrap grinders and compressed air use. The full-shift noise exposure of slitter operators and maintenance mechanics sometimes exceeded 90 dBA.
- Employees in almost all of the monitored jobs, except electrician and building maintenance, had TWA noise exposures in excess of the NIOSH Recommended Exposure Limit (REL) of 85 dBA.
- The average noise level measured during the tasks start-up extruder, load grinder, compressed air, emergency scrap removal (extruder), unload pelletizer, hand tool use, monitor machine (extruder), and activities in pelletizer area, exceeded 90 dBA. The maximum sound level in several other tasks exceeded 90 dBA.
- Most employees wore hearing protection. Fifty-two of the 68 observed employees wore hearing protection for more than 90% of the work shift and 29 of these employees wore hearing protection for the entire work shift. Six employees wore hearing protection for less than half the shift.

Plant B:

- Employees in all the monitored job titles had TWA noise exposures exceeding the Quebec noise exposure limit and NIOSH REL. The main source of high noise exposure was production equipment in the canning, assembly, and lithography departments.
- Full-shift noise exposures for all of the assembly department jobs monitored and for the canning department jobs stretcher operator, stretcher mechanic, and decorator were greater than 95 dBA.
- The average noise level measured during most of the tasks, such as repair/maintenance or monitoring, conducted near operating equipment in the canning and assembly departments exceeded 95 dBA. Several of the tasks had maximum noise levels over 100 dBA. Overall, approximately 75% of the tasks observed during the study had noise levels exceeding 90 dBA.

- Employees consistently wore hearing protection when necessary. Forty-six of the 50 observed employees wore hearing protection for more than 90% of the work shift and 35 of these employees wore hearing protection for the entire work shift.

Plant C:

- Only employees in the welder job title had TWA noise exposures exceeding the Quebec noise exposure limit. The main source of their noise exposure was from welding, cutting torches, and pneumatic tools.
- Some employees in nearly all of the monitored job titles had TWA noise exposures in excess of the NIOSH REL for noise.
- The average noise level measured during the tasks compressed air, hammer, power hand tools, spray with high pressure washer, test engines, test hydraulic pump, and welding, exceeded 90 dBA. The maximum sound level in all of these tasks, except test hydraulic pump, exceeded 100 dBA. The maximum sound level in several other tasks exceeded 90 dBA.
- Hearing protector usage varied greatly. Nearly all of the monitored employees wore hearing protection for less than half of their work shift.

Based on the noise exposure monitoring results, NIOSH made the following recommendations to reduce the risk of hearing loss:

- These companies must continue to include employees in job titles with the potential for TWA noise exposures to exceed Quebec noise exposure limit in a hearing loss prevention program, based on Quebec noise regulations. Some employees, who were not overexposed to noise during the surveys, could be overexposed sometimes based on the amount of time spent in high noise tasks.
- Although the NIOSH REL of 85 dBA is not a regulatory noise exposure limit, it is considered more protective in the prevention of hearing loss. Therefore, all employees in jobs which have the potential for TWA noise exposures to exceed the NIOSH REL should be included in a hearing loss prevention program.
- Continue to require the use of hearing protection. Quebec regulations require employees to wear hearing protection when noise levels are 90 dBA or greater. NIOSH recommends the mandatory use of hearing protection when noise levels are greater than 85 dBA.
- Although proper and consistent use of hearing protection can help reduce noise exposure risk, as a long term hearing loss prevention strategy, these companies should implement noise reduction controls at equipment or in work areas where noise levels exceed 90 dBA. Knowledgeable noise control engineers should be consulted about possible noise reduction options.

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1. INTRODUCTION

Researchers from the National Institute for Occupational Safety and Health (NIOSH), Cincinnati, Ohio, conducted a noise research study at three different manufacturing plants in Quebec, Canada, from June 2003 through January 2004. This NIOSH project was funded under the National Occupational Research Agenda (NORA) funding initiative. NORA was developed by NIOSH along with industry and research community partners in 1996 as a framework to guide future occupational safety and health research. Hearing loss research was identified as one of the top 21 research priorities during the NORA process.

The overall objective of the NIOSH study was to create an exposure-response model, corrected for measurement error, to evaluate the synergistic effects of impulsive noise and continuous noise in predicting hearing loss. The study will also compare the two main approaches to noise exposure monitoring: task-based assessment and dosimetry. The specific aims of the study were to:

- (1) Evaluate the exposure-response relationship for noise and hearing loss, incorporating exposure metrics for impulse noise;
- (2) Evaluate the measurement errors present in daily time weighted average (TWA) noise exposure assessments by conducting paired (side-by-side) evaluations of dosimetry and task-based sampling (TBS). Repeated noise samples for individual workers will be conducted to measure the imprecision of the exposure estimates and how this affects exposure-response relationships.

During analysis of the research data, noise exposure metrics will be developed using daily time-weighted average exposures, including current, annual, and cumulative noise exposure estimates for workers at each study site and this will be supplemented with measures of impulsive noise characteristics for jobs with sound level peaks of over 120 dB. To better control for the effect of hearing protection device (HPD) use, additional information on hearing protector use and fit among study subjects was collected over the course of the study (i.e., HPD usage estimates by workers and direct observation of HPD use and fit by field data collection technicians). Using the additional noise and HPD data collected, the study will explore ways to identify and refine noise exposure metrics for impulsive noise characteristics that best predict hearing hazard using direct measures of noise exposure, statistical modeling and biologically-based models of the ear. Various exposure parameters will be developed for use in exposure-response models to evaluate the importance of impulsive noise on hearing loss. The impact of measurement reliability (bias and imprecision in the task-based measurement method) and measurement imprecision (due to day-to-day variability in exposure) on the exposure-response relationship for noise and hearing loss will be further evaluated using task-based and dosimetry data collected for Specific Aim 2.

For Specific Aim 2, the study will examine the predictive value of three methods of measuring time-in-task for TBS (direct one-on-one worker observation by trained technicians, supervisor assessment of "typical workday," and worker assessment of actual time-at-task on the day of sampling) compared to full-shift noise dosimetry. Dosimetry data and tasks based samples were collected on multiple jobs at each facility (7 workers/job) which will permit an evaluation of the validity of each sampling method based on different job characteristics and an estimate the reliability and bias in the exposure metric for correcting the exposure-response analysis. Two additional repeated measures (within six months) were also collected on employees in some of the selected jobs to estimate the variability in exposures across jobs, persons and days. This information will be used to estimate the imprecision in the exposure assessment for use in the exposure-response analysis and to evaluate the relative contribution of variability in time-at-task and variability in noise level of task to the overall variability in exposures within a job.

The purpose of this report is to provide a comprehensive and detailed description of the noise study and field data collection process. Full-shift employee noise exposures measurement results and preliminary analysis of time-at-task and task sound levels are also included. Additional analysis of noise study data is ongoing and will be published in peer-reviewed research literature upon completion.

2. PLANT DESCRIPTIONS

2.1 Plant A

Plant A is one of largest producers of oriented polystyrene (OPS) packaging material in Canada. Because OPS is lightweight, tough, flexible, easily fabricated or thermoformed, low-cost, and transparent it has many applications in packaging. The plant produces a wide variety of OPS food containers used for agricultural produce, bakery products, catered foods, fast-food restaurants, and groceries. Container production includes melting plastic pellets, extruding plastic sheeting, molding container forms, thermoforming final product containers, and recycling scrap plastic material. There are six operational departments: Molding, Extrusion, Thermoforming, Lamination, Maintenance, and Shipping. Approximately 180 hourly workers are employed at the plant. The facility operates seven days per week, 24 hours per day, utilizing two 12-hour work shifts or three eight-hour work shifts. Thermoforming department employees work 12-hour shifts and the rest of the employees work eight-hour shifts. Employees have two 15-minute breaks and a 30-minute lunch during their shift. Thermoforming employees also have a 30-minute dinner break. In some departments (such as Thermoforming and Extrusion) employees are cross-trained and can work at various positions as necessary to fill in for other employees who are on leave. Background noise levels in most of the facility were variable, generally ranging from 80 dBA to 90 dBA. However, noise levels sometimes exceeded 90 dBA in the Thermoforming and Extrusion departments and were generally in excess of 95 dBA in the scrap plastic grinding rooms. Impact noise was also present in some areas of the plant. Impact noise can be broadly defined as a noise which is characterized by a sharp rise and rapid decay in sound level that is less than one second in duration.

Workers in the Mold department work at machining equipment to create, modify, and repair the mold templates used for container production in the Thermoforming department. Some of the equipment used by employees in this area includes a CNC machine, lathes, milling machines, drill presses, bench grinders, and vertical band saws. Employees may also use hammers, drills, pneumatic polishers, and compressed air. The noises in this area are intermittent, and could include impact noise created by hammering, drilling and using compressed air to clean parts. These impulses are typically random in level, frequency of occurrence, duration, and character.

Manufacturing processes in the Extrusion department involve pelletizing plastic, melting plastic pellets, extrusion of the molten plastic into a wide thin sheet, trimming the edges of the plastic sheet, and rolling the extruded plastic sheet onto long metal spools (approximately three meters width). During the trimming process each edge is continuously cut to produce the final edge and width of the sheet. The edge material that has been cut away is vacuum transported via ducts, generating high background noise with possible intermittent impulse noises when pieces of plastic snap and strike each other while being pulled into the ducts. Impulse noises are also generated when wooden pallets are dropped to the ground prior to placing spools on the pallets.

In the Thermoforming department smaller spools of plastic (less than one meter width) are unrolled and automatically fed into the thermoforming machines. The plastic is heated and formed in vacuum molds inside the machine - creating plastic containers, which are moved via conveyors to the machine

operator who boxes the containers by hand. Impulse noise may be generated by the vacuum-forming process of the thermoforming machines. The thermoforming operators usually work several feet from where vacuum-forming occurs. Thermoforming mechanics working near the vacuum-forming section of the thermoforming machine could be exposed to impulse noise, if present. In some cases these mechanics may work less than ½ meter distance from the vacuum forming process.

There are two rooms housing plastic scrap grinders. One room is near the main thermoforming area and the other room is near the extrusion area. In both of these rooms, grinder operators manually load scrap plastic into the grinders. During grinding the operators typically work from one-half to two meters from the grinder. Noise generated by the grinders is high-level, and could occasionally generate impulse noise when a new load of plastic scrap is introduced.

Maintenance workers are exposed to variable background noise. Noise levels could be high (> 90 dBA) when repairs are required near operating production equipment. However, noise levels are typically low (< 80 dBA) in non-production areas such as the maintenance shop and warehouses.

2.2 Plant B

Plant B produces approximately 10.5 million bottle caps and 2.3 million aluminum beverage cans during a typical work day. Rolls and sheets of aluminum are cut, pressed, extruded, painted, cleaned, and formed into bottle caps or beverage cans during processing. There are seven operational departments: Canning, Assembly, Lithography, Maintenance, Quality Control, Plastic Mix, and Shipping & Receiving. The facility operates seven days per week, 24 hours per day, utilizing three work shifts. The plant employs approximately 120 hourly workers. Canning Department employees work 12-hour shifts while most other employees work eight-hour shifts. Employees in the lithography department work 7.5-hour shifts. Most employees have a 10 to 15-minute break each hour. In some departments (particularly Canning, Assembly and Lithography), employees are cross-trained and work at various positions as necessary to fill in for other employees who are on leave. Because of the type of processes, equipment, and high production rate, there is high-level background noise (greater than 95 decibels) across much of the canning and assembly departments, as well as the potential for impact noise, in some areas of the plant. Impact noise can be broadly defined as a noise which is characterized by a sharp rise and rapid decay in sound level that is less than one second in duration.

The first step in the production of beverage cans from rolls of aluminum occurs in the canning department. Aluminum is unrolled and fed into an automated stamping machine where blanks, in the form of small cups, are produced. The operating speed of the stamping machine is computer controlled, based on production supply needs. The machine generates a continuous string of impulses, the repetition rate of which changes based on demand. The blanks are automatically transported to the extrusion machines, where they are extruded and stretched into the shape of standard beverage cans. When this machine is operating properly, workers might observe the operation from work desks located approximately five meters from the production line. During set-up, maintenance, and quality control checks operators are commonly within one to two feet of the machine.

Can label artwork is applied as the cans proceed through decorator machines. Decorator machines are large, specialized wheel-mounted printing presses that allow the outside of each can to be printed on as it passes through the decorator. Decorator machines generate high-level continuous and impact-like noise. During changes in the machine set-up operators often work within one meter of the decorator. When equipment is operating normally, workers usually monitor the machines from a distance of a few meters and would occasionally leave the work area.

In the finishing area of the canning department approximately 1800 cans per minute pass through finishing equipment. The sprayer (coater) machine applies a clear coating to each can. The necker machine and flanger machine add final contours to the top (i.e. "neck") of the cans. All three machines are usually operated by one worker, who is stationed centrally between them where he is exposed to the cumulative noise from all three processes. Relative to the rest of the plant, some of the highest continuous noise levels occur in the finishing area.

For production of bottle caps, rolls of aluminum are first cut into sheets by a metal shearer. Aluminum sheets are then printed with the manufacturers' bottle cap designs in a multi-step process at the coater press and printing press. Completed printed sheets are stamped by cap presses in the assembly department which stamp circular disks and form them into a partially crimped bottle cap shape. After stamping, the caps are processed by rotary machines in which a liner is inserted into the caps. The caps then proceed through automated quality control screening, are counted, and dropped one-by-one into cardboard boxes. The cap presses and rotary machines in the assembly department generate substantial noise (continuous and impact) even though several of the cap presses have been partially enclosed by noise-dampening blankets. Operators in this area move around the area, but also spend time moving hoppers of caps and making adjustments in close proximity to the area where the cap and rotary presses are located.

Fork truck operators and maintenance workers are exposed to a wide variety of background noises. The noise exposure of the maintenance workers can be quite high when a large number of repairs are required near production equipment, while their noise exposures might be low in other circumstances. Likewise, fork truck drivers have low noise exposure in some areas, such as the warehouses, but also can have high noise exposure in the assembly and canning departments.

2.3 Plant C

Plant C, headquartered in Pointe-Claire, Quebec, Canada, sells, rents, and services heavy equipment, diesel engines, and lift trucks used primarily in construction, mining, forestry, agriculture and transportation. The company is organized into four major operational divisions employing approximately 950 people: Material Handling, Energy, Truck Engine, and Heavy Equipment. The Heavy Equipment Division is broken down into several subdivisions which serve specific industry segments, such as new equipment, used equipment, and rental equipment.

The equipment repaired at the Pointe-Claire facility includes a variety of tractors, earthmovers, skid-steer loaders, forklifts, backhoes, trenching machinery, paving equipment, hydraulic excavators, generators, and ore-carrying trucks. Repairs range from maintenance and replacement of worn parts to complete rebuilding of engines, transmissions, wheel tracks, buckets, and blades. In 2003, there were approximately 100 hourly workers, mostly mechanics and machinists, in the primary in-house repair areas of the facility. Nearly all of these employees worked 8.5 hour work shifts (including lunch) during the day, typically from 7:00 AM to 3:30 PM. There were a few mechanics who worked in the evening, as needed, to complete repair orders. Other employees in the facility were mostly involved with sales, outside repairs, and general office work.

The work tasks conducted by employees in this facility depend on the nature of repair work required for individual equipment or components of equipment. The workers do not always have the same repair assignments one day to the next or repair the exact same equipment every day. However workers do perform some similar tasks, such as using pneumatic wrenches to disassemble or reassemble parts.

Much of the noise exposure in the facility is a result of exposure to impact noise. Impact noise can be broadly defined as a noise which is characterized by a sharp rise and rapid decay in sound level that is less than one second in duration. Impact noise is generated primarily in the equipment repair areas. In these areas technicians disassemble, repair, reassemble, and test equipment requiring anything from routine maintenance to major repairs and rebuilds. Many different types of high-level sounds are produced during these repair processes. Equipment repairs are made using a variety of power tools, impact wrenches, hammers, and special tools. Welding equipment and cutting torches are commonly used as well. Impact noises generated in the repair areas of the facility tend to be random and unpredictable because the specific nature of repairs required on a piece of equipment are unknown until the work order is given to the technician prior to starting the repair process. In addition to the direct noise exposure each mechanic receives while performing repairs, there is also exposure to random background impulses as large tools are dropped, and as nearby workers perform repairs. Based on equipment repair orders workers at this facility could be exposed to high sound levels for several days in succession. Alternatively, on some days a worker may not be exposed to any substantially high sound levels.

3. NOISE STUDY DATA COLLECTION PROCEDURES

3.1 Study Instrumentation

3.1.1 Background and Instrument Specifications

During planning for the NIOSH noise project integrating noise dosimeters from several different manufacturers, including Quest, Larson Davis, Bruel & Kjaer, Metrosonics, CEL, were evaluated to determine adequacy for field data collection. Although type 1 noise monitoring instruments have better accuracy across a broader frequency spectrum, type 2 instruments were selected for this study for the following reasons:

- **Applicability:** Real-world TWA dosimetry monitoring is most commonly conducted using type 2 instruments. OSHA also minimally requires the use of type 2 dosimeters or sound level meters for noise assessments.
- **Availability:** There are very few models of type-1 dosimeters available.
- **Cost:** Type-1 models are more expensive than type-2 models.
- **Microphone Durability:** Type-1 microphones are too fragile for field work, whereas microphones on type-2 models have been widely and successfully used in the field for noise exposure monitoring.

Because the full-shift TWA noise exposure measurements collected by the employee-worn dosimeters will be compared to TWA exposure calculations based on short duration integrated sound levels measured separately during employee work tasks, it was essential that the instruments had commensurate dynamic response characteristics and performance capabilities and also allowed for simultaneous collection of the necessary noise data. Although some integrating, logging sound level meters can collect all of the necessary noise data, they cannot collect all the data simultaneously. Additionally, sound level meters and noise dosimeters, because of different ANSI specifications, may have different noise response dynamics depending on the frequency characteristics of the noise measured.

After review of data collection needs and consultation with known experts in noise instrumentation, two different models of Larson Davis Company (Salt Lake City, Utah) Spark Series Type-2 noise dosimeters were selected for use in the study: Spark™ Series Model 705P and Model 706RC. The model 705P was used for personal noise dosimetry while the model 706RC was used as a sound level meter for short duration noise measurements during representative work tasks. The Model 705P dosimeter was completely sealed in an extruded metal housing without any external control switches or buttons. This increased the durability of the dosimeter and prevented the risk of employees altering the instrument settings while wearing the dosimeters. The Model 706RC dosimeter was equipped with a three-inch solid boom pre-amplifier/microphone (Model MPR002) rather than the wire microphone to make positioning of the microphone in an employee's hearing zone easier during task-based noise measurements. Both instruments had identical dynamic response and performance characteristics, which minimized instrument differences as a potential error source when comparing results. The microphones of both instruments have resonances near 7.5 kHz and roll the instrument response off above 10 kHz.

Both models of dosimeters had interactive communication features which allowed them to be programmed in advance of field use using a laptop computer equipped with an infrared reader (Extended Systems XTNDAccess IrDA PC adapter). Noise measurement data were able to be downloaded directly to the computer using the infrared communication port. Larson Davis Blaze™ Program analysis software (version 3.00 and 4.01) was used for dosimeter set-up, calibration, downloading, and data export. A Larson Davis Model CAL200 calibrator was used for instrument calibration. Table 1 provides detailed specifications for the Larson Davis Spark™ Model 705P and 706RC noise dosimeters.

Table 1. Larson Davis Spark™ dosimeter instrument specifications

Instrument Specifications	
Measurement Range	40 to 143 dB (RMS) 80 to 146 dB (peak) typical
Maximum Peak Level	146 dB Sound Pressure Level
Detectors	Slow, Fast, Peak
Frequency Weighting	A, C, Unweighted (Peak)
Microphone	3/8 inch, detachable prepolarized electrolet (model MPR001 or model MPR002)
Amplitude Response Error	Less than +/- 0.3 dB from 65 to 140 dB
Frequency Response Error	Less than +/- 0.3 dB from 80 Hz to 20,000 Hz
Memory	1 megabyte; non-volatile (705P); 4 megabyte; non-volatile (706RC)
Clock/Calendar	Month, Day, Year; hh:mm:ss; 98 event timers
Power Supply	Internal: one AA battery ~ 35 hours operation (705P); Internal: two size AA battery ~ 100 hours operation (706RC)
Dimensions	3.9"L x 2.9"W x 0.78"D (705P); 5.5"L x 2.5"W x 1.25"D (706RC)
Weight	198 grams (705P); 238 grams (706RC)
Standards	ANSI S1.4 -1983 ANSI S1.25 - 1991 IEC 60651 – 1993 IEC 60804 – 1993 IEC 61252 – 1993
Intrinsic Safety Standards	ANSI/UL 913 ANSI/UL 2279 Part 11 CSA-157 CSA-E70-11 IEC 60079-11 EN 50020

The rise and fall times for the slow and fast detector setting of the Larson Davis dosimeters were also investigated prior to use of the instruments. Craig Smith, Engineer, Larson Davis Company, conducted laboratory testing of a representative Model 706 dosimeter and provided the following results:

***Laboratory Testing of Rise and Fall Times for Fast and Slow Detectors of Larson Davis Spark Model 706 Noise Dosimeters
(Testing Conducted by Craig Smith, Engineer, Larson Davis Company, August 2001)***

Fall Time

Slow Detector = 4.4 dB/sec

Fast Detector = 39.5 dB/sec

Model 706 dosimeter (SN# 654) was electrically tested using an ADP046 adapter. A signal near overload (134.6 dBuV) was injected into the instrument (1000 Hz, A weighting). The signal was then removed. The time history and the LN table were examined to determine the rate of decay. In two separate tests, both the time history and the LN table results showed a decay of 4.386 dB/sec for the SLOW detector.

Because of the fast rate of decay only the LN table data could be used for determining the FAST detector decay. Two separate tests showed the decay to be 39.47 dB/sec. For both the time history and the LN table, the decay was calculated from the linear portion of the decay only. The decay was linear from at least 132.0 to 65.0 dBuV.

Rise Time

Slow Detector = 1.86 sec

Fast Detector = 200 ms

The standards do not specify how to quantify the rise time; therefore, I used the standard definition of "the time required for the signal to change from 10% to 90% of its final value."

Model 706 dosimeter (SN# 654) was electrically tested using an ADP046 adapter. Four separate tests were conducted with the FAST detector. The LN table data was used to measure the time required for the output to change from 10% of its final value to 90% of its final value. The first two tests began with a 1000Hz input (A weighting) at 55.0 dBuV. The signal was then instantly stepped to 135.0 dBuV (5.623V). The time for the output to move from 115.0 dBuV (562.3 mV or 10% of 5.623V) to 134.1 dBuV (5.061V or 90% of 5.623V) was 200ms. The second two tests started at a level of 44.8.0 dBuV. The level was stepped to 124.8 dBuV (1.741V). The time was measured from 10% (104.8 dBuV or 174.1 mV) to 90% (123.9 dBuV or 1.567V). The time measured was again 200ms.

The SLOW detector was also tested twice with the signal changing from 44.8 dBuV to 124.8 dBuV. The measured time from 10% to 90% of final voltage was 1.86 sec. The test was repeated with the signal changing from 84.8 dBuV to 124.8 dBuV. The measured time from 10% to 90% of final voltage was 1.84 sec.

3.1.2 Noise Dosimeter Settings

For data collection both the Model 705P and Model 706 RC Larson Davis Spark™ Dosimeters were programmed with the following instrument settings:

Table 2: Dosimeter instrument settings used for noise survey data collection

Instrument Settings	<i>Dose 1</i>	<i>Dose 2</i>	<i>Dose 3</i>	<i>Dose 4</i>
Exchange Rate (dBA)	5	5	3	3
Threshold (dBA)	80	0	80	0
Criterion Level (dBA)	85	85	85	85
Criterion Duration (hours)	8	8	8	8
RMS Weighting	A weighting	A weighting	A weighting	A weighting
Peak Weighting	Unweighted	Unweighted	Unweighted	Unweighted
Detector Setting	Slow	Slow	Slow	Slow
Data Accumulation Averaging Rate (sec.)	1	1	1	1
Gain Setting (dBA)	0	0	0	0

These instrument settings were chosen to allow for analysis of the monitoring results based on both OSHA noise measurement criteria (Dose 1 Setting), established for the Hearing Conservation Amendment of the OSHA Noise Standard [OSHA 1983], and NIOSH noise measurement criteria (Dose 3 Setting), [NIOSH 1998]. These dosimeter settings allowed for the following comparisons of noise measurement results:

- OSHA noise measurement criteria (Dose 1 Setting) versus NIOSH noise measurement criteria (Dose 3 Setting)
- The use of a 5-dB (Dose 1 and 2 Settings) versus 3-dB exchange rate (Dose 3 and 4 Settings)
- The use of 80 dBA threshold (Dose 1 and 3 Settings) versus 0 dBA threshold (Dose 2 and 4 Settings)

3.2 Selection of Jobs for Noise Exposure Monitoring

3.2.1 Background

There were two primary objectives guiding the selection of employees for this study:

- (1) potential exposure to noise levels which exceeded 85 dBA, and
- (2) the ability to identify similar noise exposure groups by selecting multiple groups of seven workers at each facility in which each group of seven workers had essentially the same job functions and set of work tasks (therefore similar noise exposures), even if the workers within a group may have actually had different job titles.

The initial plan presented in the research protocol was that the seven workers comprising each similar exposure group would have the same job title, because it was assumed that workers with the same job title would also have the same job functions, same set of work tasks, and similar noise exposures. In practice, however, this “a priori” concept of job title was not always correct. For the companies participating in this study NIOSH found that the definition of what constitutes a “job title” varies and different companies use different criteria to delineate workers’ job titles. For example, some companies might use very broad definitions for employees’ job titles and include several jobs with

very different job functions and work tasks under the same job title. Alternatively, some companies might use very narrow definitions for job titles and therefore might have a number of jobs with very similar job functions and work tasks, but with different job titles. Therefore, establishment of similar exposure groups could not be based solely on job title. For this study, a similar exposure group consisted of either workers who all had the same job title or groupings of workers from several different job titles who had been determined to have similar job functions, work tasks, job mobility characteristics, noise exposure sources, and therefore likely to have similar noise exposures.

3.2.2 Rationale for Selection of Seven Workers in each Similar Exposure Group

Specific Aim #2 of this study, as presented in the study protocol, was to “evaluate the measurement errors present in daily time weighted average (TWA) noise exposure assessments by conducting paired (side-by-side) evaluations of dosimetry and task-based sampling (TBS). Repeated noise measurements collected on a subset of individual workers from the study population will be analyzed to measure the imprecision of the exposure estimates and how this affects exposure-response relationships.” In order to achieve the objective of this specific aim with an acceptable statistical power, it was necessary to determine and select a sample size with an adequate number of workers.

When variability in between-worker tasks, time-at-tasks, and noise levels is high, a larger sample size is required to accurately estimate the noise mean and variance for the job and also be representative of the job. If the between-worker distribution of exposures is unknown, 10-20 workers are recommended for sampling in order to estimate means and variances and to determine distributional fit [Rappaport, 1995]. To balance cost and study design efficiency, the study attempted to include 24 different jobs distributed across the three plants participating in the study in order to obtain sufficient sample size to allow for selection of jobs with differing levels of worker mobility, task number, noise levels, and impulse/non-impulse noise characteristics. From among these jobs, seven workers per job group were selected because of the potentially high task variability from worker to worker within the same jobs or homogeneous job groups. Sample size calculations (based on currently available task-based sampling data) indicate that given the current sample plan of selecting seven workers in each of the jobs, a difference of 3dB or more is detectable with 80% power for jobs with variability of 3dB or less.

An analysis of the statistical power and sample size necessary for this study was prepared by Misty Hein, NIOSH Statistician, during development of the study protocol. This analysis is provided in Appendix A. Note: This analysis was prepared based on the expectation that data might be collected at two automotive manufacturing plants. However, this sample size analysis criterion was followed for data collection at the three study plants actually recruited for participation in the study.

3.2.3 Identification of Similar Exposure Groups at the Study Plants

After initial contact with the company, company representatives such as a plant manager, plant engineer, or health and safety coordinator provided preliminary data which identified work departments, number of employees, and a subjective estimation regarding whether various work areas were “noisy” or “not noisy.” To help identify work areas and jobs in the plant with noise levels potentially exceeding 85 dBA a walkthrough of the production areas of the facility was conducted by members of the NIOSH study team and company representatives. During the walkthrough, preliminary noise measurements were taken in work areas and near selected noise-generating equipment using a hand-held Larson Davis company Model 824S Type-1 integrating sound level meter. Based on observations and noise measurements taken during the facility walkthrough, the study team was able to identify specific work areas and jobs for potential inclusion in the study.

Once the work areas for noise monitoring were identified, the next step was a determination of which jobs in those work areas had enough workers to compose similar exposure groups with at least seven

workers in the group. This was done in conjunction with personnel at the company, such as the safety and health coordinator and plant supervisors, who were able to provide important information regarding job titles, job functions, and work activities of employees working in the high noise areas of the plant. Ideally, the study team wanted to identify job titles with at least seven workers in each job title. However it was not always possible to find job titles in the high noise areas that had seven or more workers, due to a limited number of available employees in some jobs or some employees choosing not to participate. When this occurred the study team sought to identify different job titles with similar job functions, job tasks, mobility characteristics, and noise exposure sources which could be feasibly grouped together as a similar exposure group.

It should be noted that the names of the job titles or plant departments used by NIOSH researchers may have differed from the actual job titles or department names used by the plants. This was partially because job titles or departments in French didn't always easily translate directly into English. Different job titles grouped into a similar exposure group were usually given a single descriptive job title name by NIOSH researchers for ease of understanding. The department, job title, or job group names developed and used by NIOSH researchers were based on the type of work conducted by the employees.

The jobs selected for noise monitoring at each plant, and NIOSH-assigned job codes, are identified in Tables 3a, 3b, and 3c. A brief description of the jobs included in the study from each plant is provided in Tables 4a, 4b, and 4c. A layout of the primary work locations at each plant is shown in Figures 1a, 1b, and 1c.

Table 3a: Jobs at Plant A selected for noise monitoring

Department	Job Titles [Job Codes]				
Extrusion	Extrusion Operator [A2A]	Slitter Operator [A2B]	Weigh Station Operator [A2C]	Grinder Operator [A2D]	Pelletizer [A2E]
Thermoforming	Thermoforming Operator [A1A]	Thermoforming General Aid [A1B]	Thermoforming Mechanic [A1C]		
Maintenance*	Maintenance Mechanic* [A4A]	Maintenance Electrician* [A4B]	Building Maintenance* [A4C]		
Mold	Mold Machinist [A3A]				
Expedition	Fork Lift Driver [A5A]				

* The three maintenance department jobs were grouped together as a similar exposure group for the study. However, monitoring results are provided separately in this survey report.

Table 3b: Jobs at Plant B selected for noise monitoring

Department	Job Titles [Job Codes]		
Canning	Decorator [B1A]		
Canning	Stretcher Operator [B1B]	Stretcher Mechanic [B1C]	
Canning	General Mechanic [B1D]	Mechanic – Rear Section [B1E]	
Canning	Department Aid [B1F]	Packaging Operator [B1G]	
Assembly	Counting Operator [B2A]		
Assembly	Press Operator 26 mm [B2B]		
Assembly	Rotary Operator [B2C]		
Lithography	Printing Press Operator [B3A]	Varnisher (Coater) [B3B]	Measurer [B3C]

Note: each row in this table represents a similar exposure group

Table 3c: Jobs at Plant C selected for noise monitoring

Department or Work Areas (Name of Similar Exposure Group)	Job Titles [Job Codes]				
Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas (Rebuilding Mechanics)	Motor Rebuilding Technician (Mechanic) [C2A]	Transmission Rebuilding Technician (Mechanic) [C2B]	Cylinder Head Rebuilding Technician (Mechanic) [C2C]	Hydraulic Pump Rebuilding Technician (Mechanic) [C2D]	Fuel Injector Rebuilding Technician (Mechanic) [C2E]
Machining Areas (Machinists)	Machinist - Operations Section [C3A]	Machinist - Welding Section [C3B]	Machinist (Hydraulic Cylinder Repair – Bay 56/58) [C3C]		
Track (Track Repair Mechanics)	Track Repair [C5A]	Painter [C5B]			
Welding (Welders)	Welder [C4A]				
New, Used, and Rental Equipment Repair Sections (Heavy Equipment Repair Mechanics)	Heavy Equipment Repair Technician (Mechanic) [C1A]				

Table 4a: Job Titles and Job Description for each Job Monitored during Study (Plant A)

Job Title [Job Code]	Job Description
Thermoforming Operator [A1A]	Unload and inspect plastic containers from thermoforming machine production line. Defective product is placed in recycling bin. Also assembles shipping boxes, cleans work area, and prepares paperwork. May assist with thermoforming machine set-up and minor repairs such as rewinding thermoforming machine if break in plastic sheet occurs.
Thermoforming General Aid [A1B]	Helps prepare thermoforming machine for production, makes adjustments during operation, and conducts minor repairs. Additionally, assembles shipping boxes, moves and stacks full boxes, empties scrap containers, clean floor around thermoforming machines, operates pallet wrap machines, and conducts miscellaneous activities.
Thermoforming Mechanic [A1C]	Primarily conducts repairs of thermoforming machines, prepares machines for production (set-up and changing container molds), and makes adjustments during container production. Also conducts some of the same work activities as General Aid when repairs and adjustments are not needed.
Extrusion Operator [A2A]	Work around extruder machine monitoring operation by observing the computer monitors and control panel, makes adjustments when necessary, uses compressed air, changes filter, and sweeps floor. Sets up the extruder for operation, makes minor repairs, and removes plastic from extruder when break in sheeting occurs. Also works in the control booth completing paperwork, monitoring operation via computer display screens, and conducting quality control tests on OPS sheets.
Slitter Operator [A2B]	Prepare slitter for production, move master roll from extruder to slitter, install metal rod with core cylinders, monitor slitter during operation, make adjustments as needed, prepare paperwork at slitter work table, go to control booth for brief time periods (< 1 minute) to deliver/receive paperwork and speak with extrusion operator, remove completed plastic rolls and place on roller conveyor for the weigh station operators. Sometimes assist extruder operators or weigh station operators. Occasionally work in grinder room or drive fork lift.
Weigh Station Operator [A2C]	Move rolls of plastic sheet from slitter to weigh station area, weigh plastic rolls, use overhead hoist to move plastic rolls to pallets, wrap plastic rolls with shrink wrap, and secure rolls to pallets with metal banding. Sometimes conduct slitter operator activities or assist extrusion operators. Occasionally work in grinder room or drive fork lift.
Grinder Operator [A2D]	Load plastic scrap material into grinder, moving full or empty plastic scrap bins with pallet jack, cut plastic scrap rolls, inspect quality of ground plastic, clean scrap material off floor, and sweep floor.
Pelletizer [A2E]	Load plastic flake into pelletizer, prepare outfeed box and moves full box with pallet jack, check for proper machine operation, make adjustments, drive forklift, and clean using vacuum, compressed air, and broom.
Mold Machinist [A3A]	Help build container molds using machining equipment (lathe, milling machine, drill press, CNC machine), electric or pneumatic powered tools (polisher, band saw, wrench, grinder, drill), and non-powered hand tools (hammer, wrench, screwdriver). Also spends time measuring, preparing mold drawings, calibrating equipment, and cleaning.
Maintenance Mechanic [A4A]	Conduct maintenance and repair on production equipment using powered and non-powered tools. Also conduct welding, machining, and miscellaneous repair work in maintenance shop.
Maintenance Electrician [A4B]	Investigate electrical problems and conduct electrical repairs or maintenance activities.
Building Maintenance [A4C]	Conduct maintenance activities related to the building such as general cleaning; painting; repairing doors, windows, walls; and landscape work (mowing, trimming bushes, snow removal).
Fork Lift Driver [A5A]	Drive fork lift. Conduct maintenance and repair of fork lift.

Table 4b: Job Titles and Job Description for each Job Monitored during Study (Plant B)

Job Title	Job Description
Stretcher Operator	Load aluminum sheet metal rolls onto production line, set-up press, and feed aluminum into press. Work near stretcher machines, watch production, verify stretchers working properly, inspect production quality, make adjustments when necessary, change tooling, undo jams, clean-up rejected cans, conduct stretcher machine repairs. Also work at tool bench, located approximately 5 meters from stretcher machines, and in mechanic shop, tool room, and quality control office.
Stretcher Mechanic	
Decorator	Monitor operation of decorator machines. Check quality, add inks, and make adjustments during print runs. Set-up decorator machines which includes washing press rollers and changing printing plates.
General Mechanic	Conduct maintenance and repairs on production equipment including decorator, washer, coater, necker, flanger, waxer, palletizer, wrapper, conveyor, cyclone, and recycler. Work in mechanic shop using tools such as hammer, grinder, drill, saw; and using machining equipment such as lathe, drill press, sander, band saw, and shear press.
Mechanic – Rear Section	
Department Aid	Work in pallet area: place separators between layers of cans, strap pallets by hand, stack and move pallets of cans. Occasionally work at palletizer station or finishing station. Drive fork lift to move full pallets.
Packaging Operator	
Press Operator 26mm	Monitor cap presses during operation and make adjustments to ensure proper bottle cap quality. Repair and un-jam presses. Replace printed aluminum sheets at infeed. Move full bins of bottle caps away from press and replace with empty bins.
Rotary Operator	Monitor rotary machines during operation and make adjustments to ensure proper bottle cap quality. Clean spilled bottle caps from floor around rotary machines. Move bottle cap bins.
Counting Operator	Monitor counting machines during operation and make adjustments to ensure proper bottle cap quality. Conduct minor repairs of counting machine. Prepare and place empty boxes under feeder, close full boxes, move full boxes to nearby pallet. Clean spilled bottle caps from floor around counting machines.
Printing Press Operator	Set-up printing press or coater/varnisher for production. Set-up activities include installing printing plate; washing rollers, printing plates, or other parts with solvents and cleaners; filling ink or varnish tanks; and making adjustments. Monitor operation and make adjustments during production run. Periodically, pull completed metal sheets off the line and stand at nearby work bench to check quality. Mix inks, varnish, or other chemicals at the chemical storage area.
Varnisher (Coater)	
Measurer	

Table 4c: Job Titles and Job Description for each Job Monitored during the Study (Plant C)

Job Title	Locations	Job Description
Heavy Equipment Repair Technician (Mechanic)	Bays 60, 62, 63, 64, 65, 66, 67, 68, 69	Repaired construction, mining, and agricultural equipment. Conducted inspections and electronic diagnosis of equipment to identify problems. Removed and reinstalled engines, transmissions, wheels, tracks, buckets, scoops, and other parts of large construction, mining, and agricultural equipment. Much of the time employees used their hands or hand tools (wrenches) during repairs. Powered tools, both hand-held and stationary, cutting torches, and hammers were also used for short durations, but were some of the main contributors to noise exposures.
Motor Rebuilding Technician (Mechanic)	Bays 53, 54	Repaired engines after removal from heavy equipment. Much of the time employees used their hands or hand tools (wrenches) during repairs. Powered tools, both hand-held and stationary, and hammers were also used for short durations, but were some of the main contributors to noise exposures. Sometimes had noise exposure from the engine test area at the back of Bay 54.
Transmission Rebuilding Technician (Mechanic)	Bay 52	Repaired transmissions after removal from heavy equipment. Much of the time employees used their hands or hand tools (wrenches) during repairs. Powered tools, both hand-held and stationary, and hammers were also used for short durations, but were some of the main contributors to noise exposures. Sometimes had noise exposure from the transmission and hydraulic pump test area at the back of Bay 52.
Cylinder Head Rebuilding Technician (Mechanic)	Bay 51	Repaired cylinder heads after removal from heavy equipment engines. Much of the time employees used their hands or hand tools (wrenches) during repairs. Powered tools, both hand-held and stationary, and hammers were used for short durations, but were some of the main contributors to noise exposures.
Hydraulic Pump Rebuilding Technician (Mechanic)	Room near Bay 50	Repaired the hydraulic pumps after removal from heavy equipment engines. Much of the time employees used their hands or hand tools (wrenches) during repairs. Powered tools, both hand-held and stationary, and hammers were used for short durations, but were some of the main contributors to noise exposures. This job was conducted primarily in a room that was separated from the rest of the rebuilding repair jobs.
Fuel Injector Rebuilding Technician (Mechanic)	Room near Bay 50	Repaired fuel injectors after removal from heavy equipment engines. Much of the time employees used their hands or hand tools (wrenches) during repairs. Powered tools, both hand-held and stationary, and hammers were used for short durations, but were some of the main contributors to noise exposures. This job was conducted primarily in a room that was separated from the rest of the rebuilding repair jobs.
Machinist - Operations Section	Bay 50	Primarily used lathes and a few other large stationary machines. These are the only machinist jobs which conduct metalizing. Metalizing is a process by which thin layers of metal are added to parts as the part rotates in a lathe. Metal powder is blown onto the part and then the metal is melted by a blow torch as the part rotates. Compressed air and some hand-held power tools are also used.
Machinist - Welding Section	Bays 73	Used large stationary equipment machining equipment in Bay 73. Compressed air and some hand-held power tools are also used. Sometimes have noise exposure from welding area across the aisle when the welders are conducting high noise tasks, such as metal grinding.
Machinist – Hydraulic Cylinder Repair	Bays 56, 58	Machinist in hydraulic cylinder repair area. This job is conducted near the motor rebuilding areas and probably has a bit more task overlap with the rebuilding technician jobs than the other machinist jobs (primarily from the use of hand tools). However, there are also several pieces of stationary machining equipment that the employees use a lot. There was some consideration regarding whether this job was more similar to rebuilding mechanics than machinist, but machinist grouping chosen because of the many stationary machines in the area that are often used.
Welder	Bays 74, 75	Performed typical welding activities. Used GMA and other types of welding equipment. Sometimes conducted grinding using hand-held grinder. Noise exposure during grinding can be substantial and will also contribute somewhat to exposure of nearby employees.
Painter	Bays 70, 72; Bay 74	Conducted spray painting using pneumatic-powered paint gun in area behind track repair. Some noise exposure from adjacent track repair area. May be overlap of job duties with track repair mechanic job.
Track Repair	Bays 70, 72	Repaired metal tracks from heavy equipment. Often worked at a track repair machine removing or installing metal pins into track. Other stationary machines are also used. Employees use hand-held power tools. Some noise exposure from dropping metal onto concrete floor. May also conduct spray painting.

Figure 1b: Plant B Layout

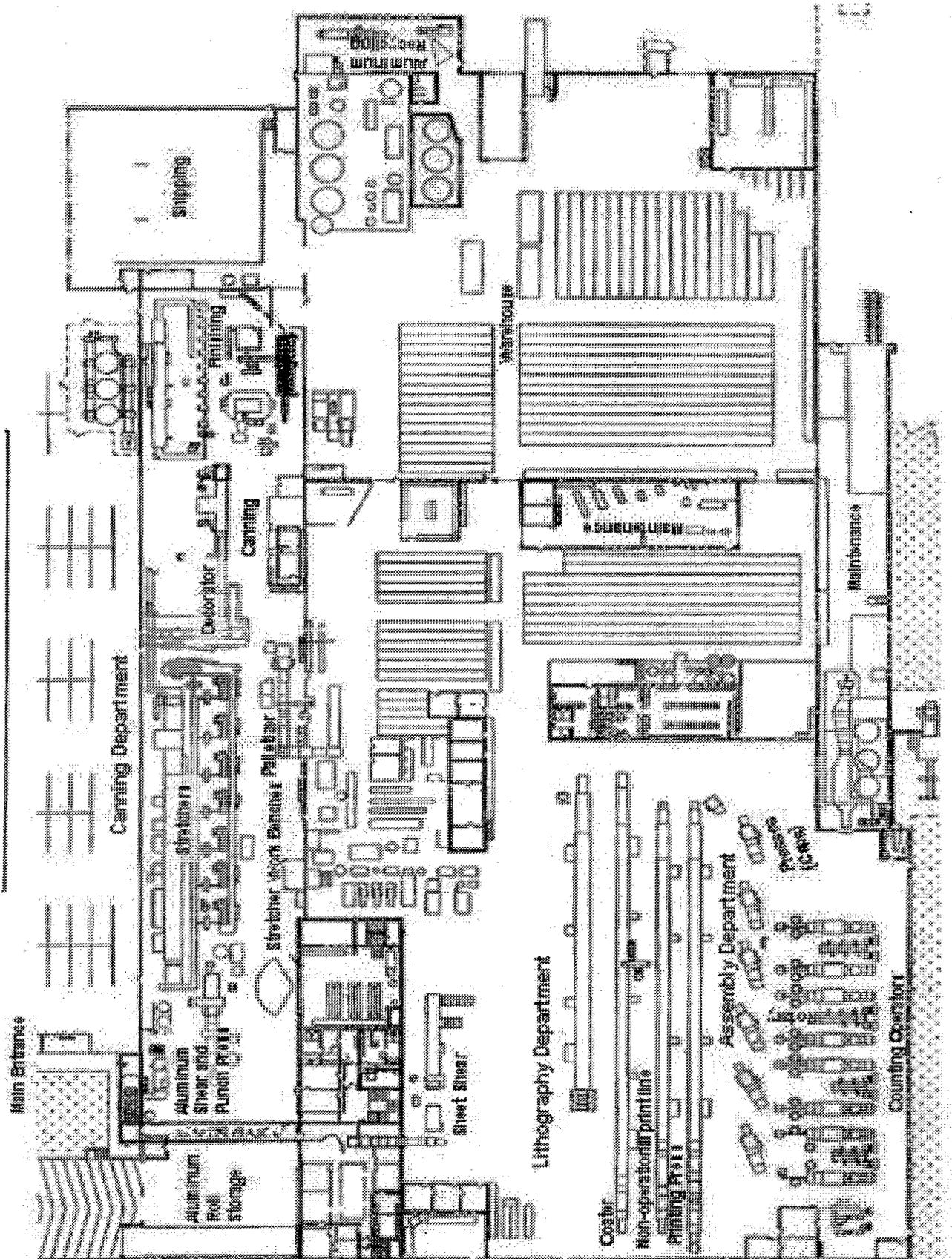
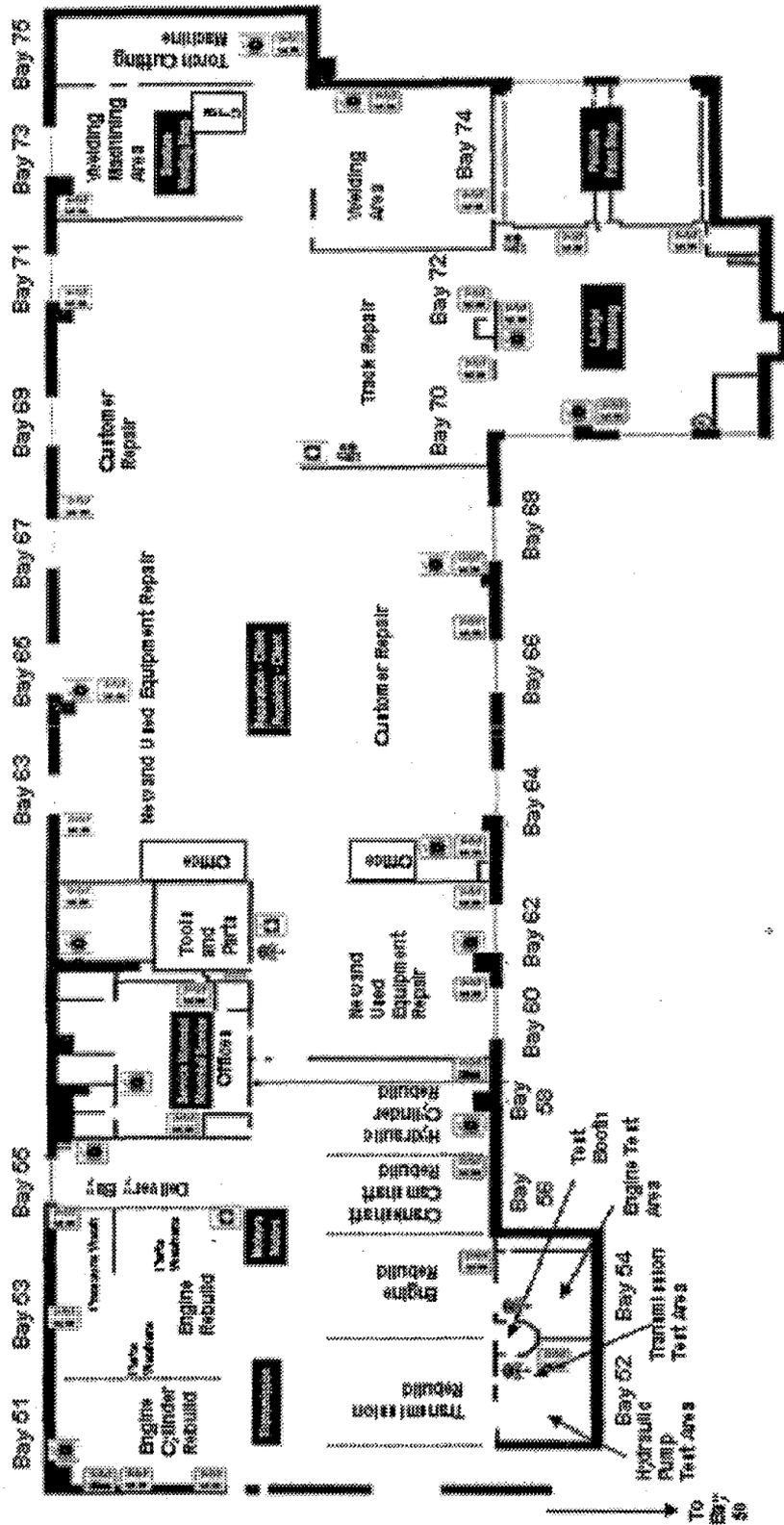


Figure 1c: Plant C Layout



3.2.4 Additional Notes and Observations Regarding Job Groupings

One of the lessons learned during this research, particularly at Plant C, was that creating similar exposure groups was not always a simple process. While grouping employees with the job title such as welder was very straightforward, attempting to establish exposure groups based primarily on job title or similarity of work tasks was not a feasible approach in other cases. At Plant C nearly all employees conducting repair work had the job title “repair technician (mechanic),” regardless of which type of equipment they were repairing. Additionally, the universe of job tasks for these employees was very similar. Although the tasks and tools used across these jobs were similar, the study team felt that the type of equipment repaired (heavy equipment vs. components of heavy equipment) and location of repair work could also be factors influencing noise exposures. Therefore, jobs such as heavy equipment repair mechanics were grouped separately from rebuilding mechanics.

After completion of noise exposure monitoring and reflection by researchers about job functions, work tasks, work locations, and other job related details it appears that some job titles that had been initially grouped together into a similar exposure group could be too dissimilar to actually be considered as part of the original similar exposure grouping. For example, consider the rebuilding mechanic jobs from the Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas. These jobs were grouped together because employees in all of these jobs conducted repairs on various components of heavy equipment (engines, transmissions, cylinder heads, fuel injectors, and hydraulic pumps), used similar hand tools, and had many of the same tasks. However, employees in the hydraulic pump repair job and fuel injector repair job might be sufficiently different such that they should not be grouped with the other “rebuilding mechanic” jobs as a similar exposure group. One of the primary differences is that these two jobs are located and conducted in separate rooms and therefore these employees are rather isolated from open work areas of the plant and do not have noise exposure from adjacent workers and noise sources, which the other employees in the rebuilding mechanic job group have. From the perspective of representative noise exposure monitoring, exposure measurements from these jobs may not be representative of noise exposures in the other jobs within the rebuilding mechanic group and vice versa.

3.3 Process of Determining of Task

One of the key aims of this research was to compare the standard dosimetry method of measuring full-shift noise exposure to three-different task based methods of determining full-shift noise exposure. Therefore, a critical component of the project was to identify and define tasks for the jobs that were selected for study.

3.3.1 Defining Task for the Study

The concept of “task” can have different interpretations depending on the reason for studying work “tasks.” For example, ergonomists break down jobs into task components based partially on specific body movements to allow them the ability to identify musculoskeletal stressors and biomechanical disadvantage, whereas industrial hygienists are more concerned about tasks from the perspective of air contaminant or noise exposures. NIOSH researchers determined tasks for this study through observation of employees work activities and discussions with plant management, supervisors and employees. For this study the following were considerations related to defining work tasks:

- Usually, a task was a single step in the production, repair, or maintenance process. For example the steps of loading or unloading could each be considered a separate task in a production job. For repair work, tasks were separated based on the specific steps within the repair process that employees conducted. For example, repair work using the hands might be given the task name

“repair”; repair work using a hand held power tool was given the task name “power tool use”; using a self standing machine for repair of a part was called “stationary machine use”; using machining equipment was called “machining;” and activities in the mechanic shop such as using hand tools, measuring, drawing, paperwork, general cleaning, discussion with other employees was called “machine shop activities.” Likewise, different steps in the maintenance process such as sweeping versus painting would be considered different tasks.

- Initially the study team thought that sound level or anticipated sound level should not be a consideration for defining tasks. However, since one of the primary objectives of a task based noise monitoring approach is to obtain a representative time-weighted average noise exposure estimate, it is necessary to consider sound level generated by different work activities for delineating tasks. For example, conducting repairs using powered hand tools and conducting repairs using non-powered hand tools are essentially the same type of repair activity. While each of these are very similar activities and part of the overall repair process, the fact that using a powered hand tool generates substantially different sound levels than conducting repairs with non-powered hand tools resulted in the separation of these into two different tasks. Similarly, the same task conducted in different work areas might be separated into two different tasks because the sound level differences between the work areas. For example consider a maintenance or housekeeping task such as “sweeping” the floor. For part of the day an employee sweeps the floor in a warehouse area of the facility where the sound level is very low and for some of the day the employee sweeps the floor in a production area of the facility in which the sound levels are very high. In this scenario, the employee’s work activity, “sweeping the floor” is clearly the same in both location, however, the noise levels vary considerably depending on the whether sweeping occurred in the warehouse or production area. The best estimate of task based noise exposure would need to be able to capture the time spent sweeping in both work areas. Based on that rationale, a task such as sweeping might be separated into separate tasks, “sweeping in warehouse” and “sweeping in production” when there were substantial differences in the noise levels in the different work areas.
- Most tasks took longer than a minute to perform. However, there were some jobs in which an employee might perform several very short duration tasks (less than 10 to 20 seconds at a time) in random order for extended periods of time. For example, stacking a box, unloading a box from a process line, and throwing scrap away. Although each of these could be considered separate tasks, time-at-task in this study was recorded with one minute resolution. Therefore, it was logistically impractical to capture these activities separately and they were grouped together for the purposes of task monitoring and given a general task name such as “activities near machine.”

3.3.2. Steps in Determining Tasks at Study Plants

The general process of determining tasks for the jobs in this study was a sequential process involving the following steps.

3.3.2.1 Step 1: Review of information provided by the plants

Some of the plants in the study were able to provide job description or job duty information. The focus of this type of information was usually on production steps and related tasks, but did not necessarily divide daily work activities into components which would be typically considered for task based sampling. For example a job duty might be "repair," however from a task-based sampling perspective "repair" could be broken down into separate tasks such as "using power hand tools," "using stationary machines," and "hammering." In some cases several steps in the company's job description might be combined together as a task for this study. For example, job steps such as, "reading repair manuals," "using the work area computer," and "discussing repairs with co-workers" might be combined for task-based monitoring into the task "planning work." Overall, job description information provided by the company was quite useful in helping to understand what tasks employees were expected to do. The more detailed the information the company was able to provide the easier it usually was for the study team to understand work tasks. Detailed job description information could also help focus in-plant observations of work activities and help during the process of interviewing employees and supervisors.

3.3.2.2 Step 2: Observation of work activities in the plant

Once a list of jobs for possible inclusion in the study was developed (based on the first walkthrough at the plant), the study team (consisting of 2 or 3 CIH's and an epidemiologist) returned to the facility to observe employees at their jobs. The study team was typically accompanied by plant personnel such as the health and safety manager, human resource manager, supervisor, and/or other personnel. These observations allowed NIOSH to become more familiar with the layout of the facility, work areas, equipment, products, and typical work activities. During the walkthrough the study team had the opportunity to ask specific questions about jobs, equipment, and work activities. Additionally, NIOSH was able to identify and map some of the equipment, particularly equipment likely to generate substantial noise, used by employees in various work areas.

3.3.2.3 Step 3: Development of preliminary task lists

Following the walkthrough, the NIOSH study team reviewed walkthrough notes, job information, and sound level measurement data, if available. Additional discussion with plant personnel also occurred when necessary to answer questions about operations, jobs, and work activities. The team discussed relevant information from the walkthrough to help clearly determine which jobs to include in the study and start the process of preparing a task list for each job. Based on the walkthrough information and job descriptions, refinement of the jobs selected for noise monitoring were made. Additionally rough draft preliminary task lists were prepared for each job group in the study based on the job description information, results of discussions with plant personnel, and initial walkthrough observations by the study team.

3.3.2.4 Step 4: Detailed job observation and development of field-use task list

After a preliminary task list had been prepared, the primary NIOSH industrial hygienist returned to the facility for more careful and deliberate observations of the workers in the jobs that had been selected for study. Employees in these jobs were typically observed for a period of 30 to 60 minutes,

depending on the complexity of the job (i.e. the number of apparently different tasks and equipment in the work area). The primary purpose of this more extensive observation was to further refine the preliminary task lists and note tools and equipment used. Following this more comprehensive job observation, the NIOSH industrial hygienist met with the study team to further review and continue refining tasks.

Field-use draft task lists were then prepared for each job for use in Phase I of the study. These task lists were reviewed with the data collection technicians to help explain task terminology and provide a description of the tasks. Part of the initial challenge in the study was language-related. Although each of the data collection technicians hired for the study spoke English, their primary language was French, therefore it was necessary to explain some of the task terminology. The names and terminology related to some of the equipment used by employees also had to be explained to the data collection technicians. (Note: none of the data collection technicians had previous experience working in manufacturing plants and were not familiar in many cases with the names of equipment or tools. During the course of data collection, employees were very willing to provide the name of tools or equipment to the study team and data collection technicians, when necessary.

3.3.2.5 Step 5: Further refinement of task lists during data collection

During data collection the task lists were further evaluated and refined at two additional points of time.

- During the first two weeks of data collection the data collection technicians used the field-use task lists. However, they were instructed that if an employee was conducting a task that did not appear to be on the task list, the new task should be added to the task list and a written description of the new task provided. Additionally, the primary NIOSH industrial hygienist continued to observe the workers and work activities of the jobs selected for the study. An ongoing master task list was prepared and utilized for each job as a method of noting new tasks and refining tasks already on the list. After the initial use of the field-use task lists the NIOSH study team industrial hygienists reviewed the task lists for each job and revised, added, or collapsed tasks and then provided the revised field-use task lists to the data collection technicians as necessary.
- At the completion of Phase I of the study the tasks reported on the data collection forms were reviewed by the NIOSH study team and further refined, if necessary. However very little change in the task lists occurred at this stage. Updated tasks were provided to the data collection technicians prior to the start of the Phase II.

3.3.2.6 Step 6: Preparation of final task list and machine list used for data analysis

After completion of data collection for the study, the primary NIOSH IH and statistician reviewed all the tasks reported on the direct observation data collection forms and cross referenced the tasks reported on the forms with the tasks on the field-used task list. The goals of this review were to identify new tasks that had been observed by the field technicians during data collection and to also identify variations of task names. If a new task was identified during this review, the new task was added to the master task list. Task name variations for tasks that were already on the field-use task list were also documented on the master task list. The NIOSH IH and statistician made the determination regarding whether a task was new or a task name variation based on notes provided on the data collection forms and the knowledge about the jobs and work activities in each plant.

During the review of the tasks reported on the field data collection form, the NIOSH IH and statistician also prepared a master list of the tools and machines (along with machine and tool name

variations) that had been noted on the field data collection forms. A copy of the master lists of tasks and machine/tools for each job is provided in Appendix B and Appendix C, respectively.

3.3.3 List of tasks and task descriptions

Tables 5a, 5b, and 5c list for Plant A, Plant B, and Plant C, respectively, each unique task that was observed during data collection, a description of each task, and the job codes representing the jobs in which each task was conducted during data collection. Note: these tables show only the tasks that were actually observed during noise study data collection; employees in each facility most likely conduct additional tasks that were not observed during the study.

Table 5a: Observed Job Tasks During Noise Study (Plant A)		
Task	Task Description	Job Codes Conducting Task *
Activities Outside Mold Department	Miscellaneous activities by mold machinist conducted outside the mold department. Includes trips to office, warehouse, lamination department, or mechanic department.	A3A
Activities Outside Shipping Department	Fork lift operator in not on forklift and performing miscellaneous activities outside of the shipping department such as paperwork or work-related discussion with other employees.	A5A
Activities in Extrusion Department	Miscellaneous activities conducted in the extrusion department, but not at the extruder machine or in the control booth. Examples include using a pallet truck to move boxes, carry scrap to recycle bins, operate plastic wrap machine, paperwork, or work-related discussions.	A1B, A2A, A2C, A2E, A4A
Activities in Lamination	Miscellaneous activities in the lamination department, but not at the laminator machine.	A1C, A2C, A4A
Activities in Mechanic Department	Repair work in mechanic department using non-powered tools. Also conducting miscellaneous activities such as getting tools and parts or preparing for repairs.	A1C
Activities in Mold Department	Miscellaneous activities in the mold department such as minor repairs or modifications of thermoforming machine container molds, preparation of new molds, or discussion with mold machinists.	A1C
Activities in Pelletizer Area	Work in the pelletizer area of the facility. Includes checking production of plastic material and assisting pelletizer operator.	A2A, A2B
Activities in Shipping	Miscellaneous activities in the shipping area.	A2E, A5A
Activities in Shop	Work in mold shop preparing container mold for thermoforming machines.	A1C
Activities in Thermoforming Department	Miscellaneous activities in the thermoforming department such as operating the plastic wrap machine, preparing paperwork, or discussion with other employees.	A1A, A1B, A1C, A2E, A3A
Activities in Warehouse	Miscellaneous activities in the warehouse area.	A2E, A5A
Break	Work breaks usually taken in the in-plant break room near extrusion department, 2 nd floor lunch room, or outside the plant.	All job codes.
Calibration	Mold machinist conducting precision measurements on molds to ensure that they meet proper design specifications.	A3A
Cleaning	General cleaning floors or other surfaces using a broom, cloth, or paper towel.	A1A, A2B, A2C, A2E, A3A, A4C
Compressed Air	Using compressed air usually to clean machine surfaces.	A1A, A2D, A2E, A3A
Compressor Room	Work in air compressor room. Primarily to check or adjust the plant compressed air system.	A1C
Control Booth	Work in control booth conducting paperwork, monitoring the extruder on the computer displays, performing quality measurement and tests of plastic film, or discussing production needs. May briefly walk out to slitter area to deliver paperwork, discuss with slitter operator, or look at computer monitors in those areas (typically these short trips are 20 seconds in duration).	A2A, A2B, A2C, A2D, A2E
Cut Tube	Work in core cutter area cutting cardboard tube to proper length for slitter.	A2B, A2C
Drive Electric Pallet Roll Jack	Using electric-powered pallet jack to move rolls of plastic sheet.	A2B
Drive Fork Lift	Operating fork lift.	A1B, A1C, A2B, A2C, A2D, A2E, A3A, A4A, A4C, A5A
Emergency Scrap Removal	Removing plastic from machine after a break of plastic occurs.	A2A, A2B, A2C
Empty Garbage	Disposing of waste at the garbage compactor located adjacent to the thermoforming department	A2C
Garbage Disposal Activities	Disposing of waste at the garbage compactor located adjacent to the thermoforming department.	A2E

Table 5a: Observed Job Tasks During Noise Study (Plant A)		
Task	Task Description	Job Codes Conducting Task *
Grinder Room	Work in the grinder room doing activities other than loading the grinder. Activities include: moving bins with a pallet jack, checking ground product, sweeping the floor, cutting plastic rolls, picking scrap off the floor, waiting for the next bin of scrap, paperwork.	A2B, A2C, A2D
Hand Tool Use	Using a non-powered hand tools such as wrench or screwdriver.	A3A
Load Grinder	Loading plastic scrap material into in-feed of the grinder.	A2D, A2E
Load Pelletizer	Dump large box of plastic flake into the pelletizer. Operator usually stands on a platform while the flake is dumped.	A2E
Load/Unload Winder	Carry by hand and install a long metal cylinder on the outfeed of the extruder for the plastic master roll. Use overhead hoist to move large plastic master roll from winder to slitter.	A2B, A2C
Lunch	Lunch usually taken in the in-plant break room near extrusion department, 2 nd floor lunch room, or outside the plant.	All job codes.
Machine Downtime	Thermoforming machine is not operating and employee is in the work area doing miscellaneous activities while waiting for a mechanic to fix or adjust the machine.	A1A
Machine Shop Activities	Non-specific work activities in the maintenance shop or mold department such as measuring, drawing, paperwork, and searching for tools.	A3A, A4A, A4B
Machining	Using machining equipment such as lathe, drill press, milling machine, CNC machine, or others.	A3A
Mold Shop	Work in mold shop (tool room) adjacent in thermoforming department preparing mold for thermoforming machines.	A1B, A1C, A3A
Monitor Machine	For extrusion operator: work around extruder machine monitoring operation by observing the computer monitors and control panel, making adjustments to the machine, and changing filter. For pelletizer operator: work around pelletizer monitoring operation, check computer display, make adjustments, complete paperwork at desk next to machine, tape leaks in outfeed bag, prepares box for outfeed, and may do some sweeping with a broom or cleaning with a cloth.	A2A, A2E
Office Work	Meetings, paperwork, or other activities in an office.	A1A, A1B, A1C, A2A, A2B, A2C, A2D, A2E, A3A, A4B, A5A
Outside Grinder Room	Activities that occur outside the grinder room such as moving full or empty bins with a pallet jack, cleaning scrap material off the floor, move metal rollers, short duration activities in pelletizer area.	A2C, A2D
Package Plastic Rolls	Wrap plastic rolls with shrink wrap or use metal banding to secure to pallet and then move to walkway area for pick-up by forklift.	A2B, A2C
Power Tool Use	Using tools powered by air (pneumatic) or electricity, such as pneumatic wrench, grinder, drill, or using a hammer.	A3A, A4A
Repair Fork Lift	Conducting repairs or maintenance on fork lift.	A2E
Repair/Maintenance	Maintenance mechanics repairing machines or equipment in production or non-production areas using their hands or non-powered hand tools such as screw drivers and wrenches.	A4A, A4B
Set-Up/Repair	Preparing or helping to prepare a machine (thermoforming machine or extruder) for operation. Conducting minor repair of a problem with machine, such as rewinding machine if a break in plastic occurs. Employee could also be helping the mechanic fix a problem at the machine.	A1A, A1B, A1C, A2A
Slitter Activities	Prepare slitter for production, install the metal rod with core cylinders (thick cardboard tubes), work at the slitter while the machine is operating, make adjustments, and complete paperwork at work table located near slitter. May also go to the control booth for brief time periods (< 1 minute) to deliver/receive paperwork, or speak with extrusion operator. Remove completed rolls of material and place on roller conveyor for the weigh station operators	A2A, A2B, A2C
Start-Up Extruder Line 1	Set-up extruder for operation.	A2C

Table 5a: Observed Job Tasks During Noise Study (Plant A)		
Task	Task Description	Job Codes Conducting Task *
Storage Room	Mechanic obtaining part or tool from storage area.	A4A, A4B
Unload Pelletizer	Use pallet jack to move full box of pelletized plastic for pick up by fork lift.	A2E
Unload/Inspect/Package	During operation of thermoforming machine employee unloads container from the production line and places it in shipping box. Also QC inspection of containers, disposal of defective container into plastic recycle bin, move (push) the full box away, and assemble new boxes.	A1A, A1B
Use Pallet Truck	Move full boxes, plastic rolls, or other objects with pallet truck.	A1B, A1C
Using Vacuum	Use vacuum to clean in pelletizer area.	A2E
Using Vacuum Forming Machine	Working at vacuum former machine in mold department testing prototype container molds.	A3A
Warehouse Activities	Miscellaneous work in warehouse area of plant.	A1B
Weigh Station Activities	At weigh station, place pallet on the floor which the plastic roll will be placed on after weighing, move plastic rolls to weigh station, weigh plastic, move to pallet.	A2B, A2C
Welding	Using welder (primarily in mold department).	A3A
Work Near Machine	Assembling boxes, stacking or moving full boxes, emptying scrap, cleaning within 10 feet of thermoforming machines.	A1A, A1B, A1C

* Key for job codes in Table 5a

Job Code	Job Name	Job Code	Job Name	Job Code	Job Name
[A1A]	Thermoforming Operator	[A2C]	Weigh Station Operator	[A4A]	Maintenance Mechanic
[A1B]	Thermoforming General Aid	[A2D]	Grinder Operator	[A4B]	Maintenance Electrician
[A1C]	Thermoforming Mechanic	[A2E]	Pelletizer	[A4C]	Building Maintenance
[A2A]	Extrusion Operator	[A3A]	Mold Machinist	[A5A]	Fork Lift Driver
[A2B]	Slitter Operator				

Table 5b: Observed Job Tasks During Noise Study (Plant B)		
Task	Task Description	Job Codes Conducting Task *
Adjust Machine	Operator makes adjustments to press or counting machine during operation.	B2A, B2B
Aluminum Recycling Area	Working in area where aluminum recycling machine is located.	B1B, B1C
Break	Breaks were usually taken outside the plant or in the cafeteria.	B1A, B1B, B1C, B1D, B1E, B2B, B2C, B3A, B3B, B3C
Change Aluminum Roll	Load aluminum roll onto production line, feed aluminum sheet metal into punch press, set-up press for operation (also called coil change-over)	B1B, B1C
Change Decorations	Moving decorator printing press off the can production line and moving a different decorator with new print set-up into position on the line. Occurs when there is a change of print jobs.	B1A
Choosing Ink	Selecting ink from the ink storage area for the decorator.	B1A
Clean Tools with Degreaser	Using degreasing agent to clean stretcher machine parts.	B1D
Cleaning	Cleaning the floor around the counting machine or box stand with a broom or using the magnet rod to pick-up bottle caps from the floor. Empty the defective cap containers into a large metal bin.	B2A
Cleaning of Garbage Waste	Cleaning garbage from work area.	B1F
Closing (Shut Down)	Activities related to shutting down the varnisher or printing press at the end of a shift.	B3A, B3B
Counter Operation	Miscellaneous activities near the counter machines.	B2C
Drive Fork Lift	Driving a lift truck in the assembly, canning, recycling, shipping, or warehouse areas.	B1B, B1E, B1F, B1G, B2B
Filling Chemicals	Pouring chemicals into container.	B1F
Film Preparation	Preparing film for can images.	B1E
Finishing Station	Working at the finishing station when the regular operator is taking a break.	B1F
Lunch	Employees commonly ate lunch in the 2 nd floor cafeteria or outside the production building.	B1A, B1B, B1C, B1D, B1E, B1F, B1G, B2A, B2B, B2C, B3A, B3B, B3C
Machine Downtime	Machine is "off" and operator is waiting in work area for it to re-start.	B1A, B2A
Machine Shop Activities	Non-specific work activities in the mechanic shop (machine shop) such as using hand tools, measuring, drawing, paperwork, general cleaning, discussion with other employees.	B1B, B1C, B1D, B1E
Machining	Using machining equipment such as milling machine, lathe, drill press, large grinder or sander, band saw, shear press.	B1D, B1E
Maintenance (feeder)	Infeed feeder of the printing press or coater/varnisher is off and employee is conducting maintenance or making adjustments.	B3C
Maintenance (press)	Printing press or coater/varnisher is off and employee is conducting maintenance or making adjustments along the main part of the printing press or coater/varnisher.	B3A, B3C
Mixing Products	Mixing inks, varnish, or other chemicals at the chemical storage area.	B3A, B3B, B3C
Monitor Machine	Working around the 26 mm presses or rotary machines to observe and verify proper operation. Move empty or full bottle cap bins when necessary.	B2B, B2C
Monitor Operation (Inspection)	Monitoring operation of the decorator machines from the decorator platform. Includes adding ink when necessary and making adjustments. Set up other decorators for operation which includes preparing and installing the printing plates and washing the print rollers.	B1A
Monitor Press (along press)	Monitoring printing press during operation and making adjustments when needed. During production runs employee periodically pulls completed metal sheets off the printing line and stands at work bench to check quality. Monitoring conducted at the central part of the printing press or coater/varnisher.	B3A, B3B, B3C
Monitor Press (infeed)	Monitoring and making adjustment to the printing press or coater/varnisher during operation. Moving pallets of sheet metal to the infeed. Monitoring conducted at the infeed area of printing press or coater/varnisher.	B3A, B3B, B3C
Monitor Production (close)	Working near the feeder portion of the counting machine where bottle caps fall into boxes. Activities include watching operation, preparing and placing empty boxes under the feeder, closing full boxes and moving them by hand or with a vacuum lift device to a nearby pallet, and preparing paperwork.	B2A
Monitor Production (distance)	Monitoring the counting machines from a distance of 4 meters or more.	B2A
Monitor Spray Machine	Monitor proper operation of the spray machine in the finishing area.	B1F
Office Work	Working in an office area.	B1A, B1C, B1D, B1E, B1F, B1G, B3B, B3C
Pallet Area	Working in the pallet area stacking and moving pallets, placing separators between layers of cans, and strapping pallets by hand.	B1F, B1G
Palletizer Area	Working at the palletizer station when the regular operator is taking a break.	B1F, B1G
Planning Work	Employee in work area discussing work needs with other employees, reading manuals, using computer, walking around, planning work activities.	B1G, B1F
Power Tool Use	Using hand-held electric or pneumatic powered tools such as a grinder, drill, or saw. Also includes using hammers.	B1D, B1E

Task	Task Description	Job Codes Conducting Task *
Printer Area Activities	Miscellaneous work in the lithography department.	B1C
Quality Control	Pulling cans or bottle caps from production line to check quality. Sometimes quality control is conducted in work area and sometimes quality is checked in a quality control office.	B1A, B1B, B1C, B1D, B1E, B2B, B2C
Repair/Maintenance	Conducting repairs or maintenance of production equipment. Includes making adjustments and fixing jams. For mechanics the task was subdivided, based on the machine or equipment under repair.	B1B, B1C, B1D, B1E, B2A, B2B, B2C
Replace Aluminum Sheet	Placing aluminum sheets with bottle cap images at infeed of cap press.	B2B
Set-Up	Setting up equipment or machines for production. Includes cleaning, making adjustments, installing parts, or making minor repairs.	B1B, B1C, B1D, B2A, B2C, B3A, B3B, B3C
Tool Room	Working in the parts storage room.	B1B, B1C, B1D, B1E
Warehouse Activities	Preparing aluminum rolls (unwrapping) in the canning department warehouse.	B1B, B1C
Welding	Conducting welding on equipment or parts either in the mechanic shop or in the production area.	B1C
Work Bench	Work conducted at tool bench located approximately 5 meters from the stretcher machine platform - repair and clean used tools.	B1B, B1C
Working at computer	Conducting work at lithography department computer.	B3A

* Key for job codes in Table 5b

Job Code	Job Name	Job Code	Job Name	Job Code	Job Name
B1A	Decorator	B1F	Department Aid	B3A	Printing Press Operator
B1B	Stretcher Operator	B1G	Packaging Operator	B3B	Varnisher (Coater)
B1C	Stretcher Mechanic	B2A	Counting Operator	B3C	Measurer
B1D	General Mechanic	B2B	Press Operator 26 mm		
B1E	Mechanic – Rear Section	B2C	Rotary Operator		

Table 5c: Observed Job Tasks During Noise Study (Plant C)		
Task	Task Description	Job Codes Conducting Task *
Bearing Heating	Assumed to be slight heating of bearing sleeve with a torch.	C1A
Break	Plant wide breaks generally occurred twice per day. Employees typically took breaks in the cafeteria, 2 nd floor room near Bay 55, outside picnic tables, at table in Bay 73 (welding machinists), or sometimes in the work area.	C1A, C2A, C2B, C2C, C2D, C2E, C3A, C3B, C3C, C4A, C5A, C5B
Chemical Dip Tank	Using a chemical dip tank (similar to chemical plating tank), primarily to clean parts. Small parts were placed in basket and lowered by hoist into chemical cleaning bath for short time interval (generally < 5 min.). Large parts were lowered directly with hoist.	C2A, C2B, C2C
Cleaning	Sweeping the floor with a broom, hand cleaning with rags, picking up items off floor, or using a vacuum (less common than others).	C1A, C2A, C2B, C2C, C2D, C3A, C3B, C3C, C4A, C5A, C5B
Compressed Air	Using compressed air with hand-held nozzle.	C1A, C2A, C2B, C2C, C2D, C2E, C3A, C3B, C3C, C4A, C5A, C5B
Control Booth	Employees in control room (behind bays 52 and 54) while engine, hydraulic pump, or transmission tests are conducted. Employees usually observing tests or controlling tests using desktop computer.	C2A
Cutting Torch (acetylene)	Using acetylene fueled torch to cut metal.	C1A, C2A, C2B, C3A, C3B, C3C, C4A, C5A
Drive Fork Lift	Driving electric or propane powered fork lift.	C1A, C2A, C3A, C3B, C3C, C4A, C5A
Driving Service Car	Driving a small electric or propane powered vehicle (slightly longer than golf cart with bed for carrying items) in plant.	C3A
Hammer	Using a hammer. Usually the hammer had a steel head (rarely -composite mallet head) and hammering was usually done on metal parts.	C1A, C2A, C2B, C2C, C2D, C2E, C3A, C3B, C3C, C4A, C5A
Hand Truck	Using a manual powered hand truck to move objects. Hand trucks had metal wheels.	C1A, C2A, C2C, C3A, C3B, C4A, C5A
Lunch	Lunch was usually at the same time across repair areas. Employees typically had lunch in the cafeteria, 2 nd floor room near Bay 55, outside picnic tables, at table in Bay 73 (welding machinists), or sometimes in the work area.	C1A, C2A, C2B, C2C, C2D, C2E, C3A, C3B, C3C, C4A, C5A, C5B
Metalizing	At a lathe, employee spraying metal powder onto rotating part with a spray gun (looks similar to a paint spray gun), followed by heating the part with torch to harden the metal powder. (Bay 50)	C3A
Office Work	Employee in office (commonly one of the offices in the repair areas) discussing repair work with supervisor or looking up part-related information on computer.	C1A, C2A, C2B, C2C, C2D, C2E, C3A, C3B, C3C, C4A, C5A, C5B
Open and Close Bay Door	Automated opening or closing the large bay doors in the repair area.	C1A
Operate Heavy Equipment	Moving heavy equipment into or out of the building, or sitting in the equipment while the engine is running.	C1A
Overhead Hoist/Pulley	Using the electric powered overhead hoist to move heavy objects.	C1A, C2A, C2B, C2C, C2D, C2E, C3A, C3B, C3C, C4A, C5A
Paint Storage Room	Working in the paint storage room.	C5B
Painting Activities	Preparing surfaces for painting (cleaning, hand sanding, scraping with razor, taping) and post-painting touch up and tape removal	C5B
Parts Washers	Using manual solvent-based parts washer to remove grease and dirt from parts. Includes use of large automated parts washer (Typhoon Washer – Bay 51/53) which cleans using detergents and high pressure water in enclosed wash container.	C1A, C2A, C2B, C2C, C2D, C2E, C3A, C3B

Table 5c: Observed Job Tasks During Noise Study (Plant C)		
Task	Task Description	Job Codes Conducting Task *
Planning Work	Employee in work area discussing repairs with other employees, reading manuals, using computer, walking around, planning repairs.	C1A, C2A, C2B, C2C, C2D, C2E, C3A, C3B, C3C, C4A, C5A, C5B
Power Hand Tools (pneumatic or electric)	Using power hand tools (pneumatic or electric) during repair process. Examples of power hand tools include pneumatic wrench, grinder, and sander.	C1A, C2A, C2B, C2C, C2D, C2E, C3A, C3B, C3C, C4A, C5A, C5B
Pumping Fluids	Pumping motor oil or transmission fluid into or out of equipment using pneumatic powered pump.	C1A, C2A, C2B, C2D
Repair	Repairing heavy equipment and parts using the hands or non-powered hand tools such as wrenches. Includes visual inspection of equipment or parts during the repair process. Power hand tools, compressed air, and hammer were often used during repair process (the task time for these was captured separately.)	C1A, C2A, C2B, C2C, C2D, C2E, C3A, C3B, C3C, C4A, C5A
Spray Painting	Spray painting with a compressed air powered paint gun.	C5B
Spray with high pressure washer	Using hand held high pressure washer to clean parts. Located in Bay 53.	C1A, C2A, C2B, C2C, C2D, C2E, C5A
Stationary Machine Use	Using stationary machines, primarily in Bays 50, 56, 70, 73. Examples include Magnaflux, surface grinder, machine drill, milling machine, lathe, polisher/sander, boring machine, hydraulic press, honing machine, metal enlarger, track roller, Centurion idler welder, MLB roller rebuild, roller press, idler press, spring and rod press, and boring machine.	C2A, C3A, C3B, C3C, C4A, C5A, C5B
Stationary Power Tools	Using stationary power tools associated with mechanic jobs. Examples include sandblast box, stationary grinder, stationary saw, drill press, and buffing machine.	C1A, C2A, C2B, C2C, C2D, C2E, C3A, C3B, C3C, C4A, C5A
Test Engines	Working in engine test area (behind Bay 54) while engine tested.	C2A
Test Fuel Injection Pump	Testing operation of fuel injection pump in the fuel injection room (Room in bay 50 near machining area)	C2A, C2E
Test Fuel Injector	Testing operation of fuel injector in the fuel injection room (Room in bay 50 near machining area)	C2E
Test Hydraulic Pump	Testing hydraulic pump in the hydraulic pump test area (behind bay 52).	C2D
Tool Room	Working in tool storage room.	C2A
Use Press	Assumed to be related to device for testing hydraulic pump.	C2D
Welding	Conducting one of following types of welding: arc-air, MIG, TIG, arc cutting, ARM machine (Hobart Weldtest), and torch cutting machine in Bay 75. Most welding conducted in Bay 74.	C1A, C3B, C4A

* Key for job codes in Table 5c

Job Code	Job Name	Job Code	Job Name
C1A	Heavy Equipment Repair Technician (Mechanic)	C3A	Machinist - Operations Section
C2A	Motor Rebuilding Technician (Mechanic)	C3B	Machinist - Welding Section
C2B	Transmission Rebuilding Technician (Mechanic)	C3C	Machinist - Hydraulic Cylinder Repair, Bay 56/58
C2C	Cylinder Head Rebuilding Technician (Mechanic)	C4A	Welder
C2D	Hydraulic Pump Rebuilding Technician (Mechanic)	C5A	Track Repair
C2E	Fuel Injector Rebuilding Technician (Mechanic)	C5B	Painter

3.3.4 Additional notes and observations about task identification

Job description, job duties, and task data provided by the companies prior to and during the initial site visit were very useful in helping the NIOSH study team develop a general understanding of work activities. In this study, and for conducting task-based noise monitoring in general, one of the most important ways of obtaining the information necessary to delineate and define tasks was observation of workers during their work shift. Several hours of observation per job are most beneficial and the more time spent observing workers and work activities the better. In addition to the observation of workers, it is imperative to ask supervisors and workers questions about their jobs and work activities, if possible, during the process of job observation (without excessive distraction of the worker) or at the end of the work shift following observation. The following are examples of the types of questions that are helpful for identifying tasks and other important job information:

What do you do in your job?

How many other people do this job?

Do you normally do the same job every day? If not, what other jobs do you do and how often?

What are the routine and non-routine tasks in your job(s)?

Is the job stationary or mobile?

If the job is stationary, where do you sit/stand and how close to the operation are you?

If the job is mobile, what areas of the plant do you go and how long do you spend in each area?

Is there a specific job rotation schedule? If so, what is the rotation schedule?

Do all the equipment and processes operate every shift or do they operate more on some shifts?

Does the rate of production stay the same or does it change daily, weekly, seasonally, randomly?

Are there operations or equipment which only run periodically? If so, what are they and when do they run?

What are the greatest contributors to noise exposure in this job?

Where do the high noise levels occur?

What tasks do you do in which the task itself generates most of your noise exposure?

What do you call this work activity or task?

Is this a task that is normally done?

Is this the way this task is always done?

How long does this task usually take to complete?

How often is this task conducted?

Is this where the task is normally conducted?

Where else in the facility might you do this?

How many people and/or how many jobs conduct this task?

What tools or machines are used?

Are there other tools or machines that are used sometimes?

Are there other tasks that are always done together with this task?

Are there some tasks that you only do occasionally?

What are the occasional tasks?

Does it seem like the occasional tasks are noisy?

How often are these occasional tasks done?

Where are these occasional tasks done?

How many people do the occasional tasks?

What tools or other equipment might be used for occasional tasks?

How long are the tools used during occasional tasks?

3.4. Recruitment and Consent Process for Workers

3.4.1 Recruitment

Once the NIOSH team had identified the jobs at each facility meeting study requirements for inclusion in the study, the primary contact person(s) at each facility were informed about the jobs from which NIOSH intended to recruit workers. During field studies NIOSH researchers commonly recruit workers directly for study participation, however, in this study, because French was the primary language for nearly all the workers and the only language spoken by many of the workers at the study sites, it was essential that the workers be contacted by French speaking personnel. Therefore the contractor hired in Montreal (Bertrand Johnson Acoustique, Inc.) to assist with this study was tasked to help recruit workers for possible participation in the study, explain the study to interested workers, and obtain informed consent from workers agreeing to participate. The primary contact person at each facility also helped substantially in identifying workers in the appropriate jobs for study recruitment. Recruitment of workers for participation typically occurred on an ongoing basis. Additionally, the production workforce was informed by the company about the NIOSH study prior to actual recruitment.

3.4.2 Consent

The study required workers to undergo audiometric testing before the start of their work shift and again after their work shift ended. Additionally, workers were asked to commit to being monitored for noise exposure three times over the period of the study (from June 2003 to January 2004). Therefore, a consent form outlining the study methods and what information the workers would be providing during the study was prepared as part of the study protocol for workers to sign, indicating their agreement to participate in the study. NIOSH research study procedures and protocols specified that the consent form would be signed by employees agreeing to participate prior to the start of audiometric testing and noise exposure monitoring.

Because the primary language of the workforce at each study site was French, the research study consent form was translated into French. However, during the translation process some essential consent elements of the English-language version of the consent form were inadvertently omitted. Additionally, in many cases workers recruited for the study did not sign the written consent form prior to the start of their participation in the study. Following completion of field data collection, a review by the NIOSH Human Subjects Review Board (HSRB) of the actual consent form used and the consent process during actual data collection led the HSRB to determine that some deviations from the NIOSH protocol occurred during the study. Following review, the NIOSH HSRB required re-consent of the workers participating in the study.

3.5 Training Procedures for Field Data Collectors

3.5.1 Initial Training

Initial training of the field data collectors occurred approximately one week prior to the beginning of data collection (June 2003). The following topics were addressed during initial training

- Overview and Background of the NIOSH noise study
- Noise Exposure Measurement
 - * Noise metrics
 - * Operating principles of sound level meters and dosimeters
 - * General guidelines for instrument use in surveys
 - * Application of measurements
- Field Study Activities and Procedures

- * Overview of daily field study activities
- * Review and procedures for use of data collection forms
- * Instructions for task-based observations
- * Operating instructions and practice using noise monitoring instruments
- * Procedures for use of Change in Hearing Audio Tester (CHAT) instrument
- * Procedures for saving noise monitoring data
- * Questions and discussion about study procedures and forms

All of the field data collection technicians had also received prior training on use of the CHAT instrument from Bertrand Johnson Acoustique, Inc. The CHAT is a portable prototype hearing testing device. Additionally, two of the field data collection technicians had received prior training and certification to conduct audiometric testing from Bertrand Johnson Acoustique, Inc.

3.5.2 Training during First Two Weeks of Data Collection

During the first few weeks of field data collection the NIOSH industrial hygienist accompanied the field data collectors to the plant study sites. Immediate feedback and guidance were provided to the data collectors as questions arose during this initial period of data collection. Field data collection forms were also reviewed at the end of each day so that the NIOSH IH could provide instruction to the data collectors regarding improvements in data collection techniques or reporting.

3.5.3 Training Prior to Initial Data Collection at Plant C

Employees' noise exposures at the Plant C study site were somewhat different than the other two study plants. The primary difference was that for most of the jobs high level noise exposure commonly occurred during short duration (typically less than one minute duration per occurrence) and intermittent use of hand held power tools and hammers whereas, for the other two plants noise exposure was typically from continuous noise. In order to adequately capture these short duration and intermittent noise exposure events, additional data collection procedures were necessary and additional data columns were added to the data collection forms. The field data collectors were trained about the modifications to these forms and additional or new procedures for field data collection at this facility prior to commencing data collection. Additionally, the NIOSH IH was available during the first two weeks of data collection to respond to questions from the field data collection team, review data collection forms, and instruct the data collectors, when necessary.

3.5.4 Refresher Training Prior to the Start of Phase II Data Collection

Prior to starting Phase II (Phase II refers to the 2nd and 3rd noise measurement and data collection surveys) of noise study, refresher training was provided to the field data collection team. This training primarily addressed some minor modifications of the Phase I data collection forms and related data collection procedures as outlined in the following section of this report. This training occurred concurrent with the training for initial data collection at the third study site.

3.6 Procedures for Data Collection

The following section provides the field study procedures for the NIOSH noise study. Noise project data collectors were trained on these procedures during initial training and refresher training. A copy of the field study procedures manual was available at the study site for field data technician to refer to, if necessary.

3.6.1 Set-up and Calibration of Dosimeters

A Larson Davis Spark & Blaze Personal Noise Dosimeters & Analysis Software User Manual was provided to the field data collection team for detailed instructions regarding use of the dosimeters and Blaze analysis computer program. Field data collection technicians were trained on proper procedures for set-up, calibration, use, and downloading of the dosimeters during training prior to the start of the noise surveys. Additionally, summary instructions for set-up, calibration, data downloading, and use of the equipment were also prepared and provided to the field technicians as quick reference tools.

The noise dosimeters were programmed prior to data collection based on the instrument setting parameters established for the NIOSH noise study, as shown in Table 2 of this report. The specific procedures used by field data collection personnel to set-up and calibrate each type of dosimeter used in the study are provided in Appendix D.

Calibration of the noise dosimeters was conducted prior to each use and again following each use based on guidelines specified by the American National Standards Institute [ANSI S12.19-1996]. Calibration procedures specified in the Larson Davis User Manual were followed. A Larson Davis Model CAL200 noise calibrator was used for calibration and all calibration was done through the Larson Davis Blaze Analysis Program, which automatically saved calibration records to a computer file [CalHistory.log]. A copy of the calibration log file output records for this study are presented in Appendix E.

3.6.2 Pre-Shift Hearing Protection Assessment, Audiometric Test, and CHAT Test

In Phase I of the study the pre-shift audiometric test and CHAT test were completed prior to the start of the work shift, however in Phase II (repeat surveys 2 and 3) they were not conducted.

- 3.6.2.1 Approximately 20 to 30 minutes before the typical start of the work shift recruited employees met the noise study technicians at a location in the plant that had been pre-selected for conducting audiometric testing and CHAT testing. The tests were conducted in a room with quiet background noise so that the noise level in the audiometric test booth met the requirements necessary for audiometric testing.
- 3.6.2.2 Noise project data collection technicians introduced themselves to the plant employee they had been assigned to monitor on that day. (Prior to the day of noise monitoring the NIOSH Montreal study contractor recruited employees in the jobs that had been selected by NIOSH for inclusion in the study. Company representatives helped identify which employees were in these jobs and provided employee ID numbers.)
- 3.6.2.3 Each noise project technician briefly spoke one on one with the employee they had been assigned in order to explain what would occur during data collection and the basic order of occurrence, as outlined below. Because most, if not all, of the employees participating in the study did not have a technical background in occupational health and safety, the importance of discussing the study with employees using simple non-scientific terminology had been explained to noise project technicians during study training.

*** Objectives of Study**

- compare different methods of measuring noise exposure
- evaluate risk of hearing loss from impact noise
- evaluate how effective hearing protection is

- * Pre-shift Activities
 - Audiometric test
 - CHAT Test
- * During Shift Activities
 - Dosimetry Monitoring
 - Sound Level Meter Readings
 - Record Work Tasks
 - Note Sources of Noise and Other Noise Information
 - Observe Use of Hearing Protection
- * Post-shift Activities
 - CHAT Test
 - Post-shift Actual Workday Time-at-Task Evaluation

Employees were reminded that the study was a research study about noise exposure and that they would not be observed for the purpose of evaluating work habits, but to document job tasks and measure noise levels. Employees were also asked if they had any questions about the study.

- 3.6.2.4 After the introductions and summary explanation about the study, the Pre-Shift Hearing Assessment data was collected, and the pre-shift audiometric test and CHAT Test were conducted. Noise study technicians completed the following data collection forms: Study Background Information and CHAT Section I: Pre-Shift Hearing Assessment.

3.6.3 Pre-Shift Preparation for Dosimetry Monitoring

- 3.6.3.1 During pre-shift activities employees were informed that they would wear two noise dosimeters for the entire work shift (during Phase II monitoring employees only wore one dosimeter, on the side of their dominant hand). Operation of the dosimeters was also briefly described (e.g. dosimeters records sound levels continuously, but does not record actual speech).
- 3.6.3.2 The dosimeters were clipped to the employee's belt or waistband. Alternatively the dosimeters were placed in a "fanny pack," which the employee wore around their waist like a belt. Usually, the dosimeters were placed at the employee's waist on their back or side. However, if the employee was in a job in which they frequently sat, the dosimeter might have been placed somewhere else such as in a pocket, depending on the employee's preference.
- 3.6.3.3 Employees were asked whether they were "right" or "left" handed, and the information noted on the data collection form.
- 3.6.3.4 Dosimeter microphones were attached in an upright position at the top of each shoulder, half-way between the employee's neck and outer edge of the shoulder. For Phase II monitoring the dosimeter microphone was attached on the side of the employee's dominant hand. During use small open foam windscreens were always placed over the microphones to reduce or prevent integration of noise generated by wind blowing across the microphone, fabric rubbing against the microphone, or inadvertent bumping of the microphone as the employee worked. Masking tape or duct tape was used when necessary to secure the microphones to the shoulders.
- 3.6.3.5 Clips or tape were used to hold the microphone cords to the employees back so that the cords did not get caught on a piece of equipment.

- 3.6.3.6 Dosimeter operating parameters were set-up according to the study protocol and were also pre-set to start operating before the work shift started, so there was no need to manually turn the instruments “on.”
- 3.6.3.7 After attaching the dosimeters, employees were shown the sound level meter (Larson Davis Model 706 RC) and where the instrument would be held when taking measurements in the worker’s hearing zone. Additionally, employees were reminded that noise study project technicians might occasionally ask some questions about noise sources, work tasks, and tools but would try to not to interfere with work activities.
- 3.6.3.8 Noise study project technicians went with the employee to the work area, noted the exact time that the shift started, and begin recording information on the “Direct Observation Time-at-Task Assessment Form,” as appropriate.

3.6.4 Time-at-Task Data Collection and Measurement of Task Sound Levels during the Work Shift

Project data collection technicians used the Direct Observation Time-at-Task Assessment Forms to document the information collected during the work shift. Specific instructions for entry of data onto these forms and example completed forms were provided during training and also detailed in the Data Collection Forms instructions section of the Field Procedures Manual, which was provided to each technician.

- 3.6.4.1 Each data collection technician observed a single employee from a safe distance. During observation the technician documented each task the employees conducted, the start and stop time of each task, percent of time hearing protection was worn, whether hearing protection appeared to fit properly, and comments such as location, tool or machines used, and other pertinent notes on “Direct Observation Form 1.” For the heavy equipment repair facility additional information about the use of power tools during repair tasks, the number of times used, and the range of use times (min. and max.) was also documented.
- 3.6.4.2 During at least one occurrence of each task a Larson Davis Model 706RC sound level meter was used to measure sound levels for a short time (approximately 30 seconds to 2 minutes) in the employee’s hearing zone. Measurements were collected on the same side as the employee’s dominant hand. The sound level for each of the four instrument dose settings, I_{max} level, peak level, name of task, time of measurement, and duration of measurement were documented on “direct observation form 2A.” The data collection technicians were provided with a two-page summary of the proper instrument operating and use procedures and an “Example Timeline for Task SLM Measurements” in the instrument section of the field data collection manual. A copy of these documents is provided in Appendix F. Noise project study technicians also had a copy of the Larson Davis Company instrument manual at each data collection site in case questions related to instrument operation arose.
- 3.6.4.3 Technicians also documented other information related to the source(s) of noise at the same time each sound level measurement was taken on “direct observation form 2B.”
- 3.6.4.4 Periodically throughout the day field data collection technicians checked the dosimeters worn by employees for proper function. Specifically, they looked for the rapidly blinking green light on the upper left front panel of the dosimeter, which indicated that the dosimeter was “running,” and the low battery light on the upper right front panel which started blinking if battery power was low. If a dosimeter problem arose the technicians attempted to correct the problem by switching to a new dosimeter or replacing the battery, if necessary.

3.6.5 Post-Shift Employee Hearing Protection Assessment, Audiometric Test, and CHAT Test

- 3.6.5.1 At the end of the work shift the technicians returned with the employees to the audiometric and CHAT test location (same place where these tests were conducted before the shift) and removed the dosimeters. The dosimeters were set-up to automatically turn themselves off a few minutes after the end of the work shift.
- 3.6.5.2 The Post-shift Hearing Protection Assessment, Audiometric Test, and CHAT Test were conducted. Post-shift data was entered on the following forms: CHAT Section II: Post-Shift Hearing Assessment. Specific instructions for collecting these data and completing the forms was provided during training and in guidance documents provided to the employees in the field data collection manual.

3.6.6 Post-Shift Employee Actual Workday Time-at-Task Assessment

- 3.6.6.1 After completing the post-shift Audiometric test and CHAT test, technicians worked with employees to complete the "Employee Actual Workday Time-at-Task Assessment Form." In Phase I of the study a structured free-form approach was used. Employees were asked to think about the work tasks they conducted during the work shift on the day of noise monitoring and then estimate the amount of time that they spent at each task. Sometimes the technicians needed to help employees try to understand what was meant by "task." Generally employees provided the names of work tasks on their own, but data collection technicians also helped remind employees of the various tasks that the employee conducted during the day. Technicians were instructed to not provide employees with assistance on the amount of time that was spent at various tasks. The technicians wrote the employee's estimated time at task and the names of the tasks on the data collection form, translating the task name the employee used for the task to the matching task name from the task list developed by the study team for that job. Because the French term for a task that an employee used might not directly translate into an English named task on the list, technicians sometimes had to ask employees a few questions about the task to determine if the employee was referring to a task already on the list or was referring to a new task. If an employee was referring to a new task the technicians wrote the task on the form using an English term and provided a description of the task on the data collection form.

In Phase II of the study the task names associated with each job were pre-printed on the Actual Workday Time-at-Task (TAT) form. To obtain estimated time at task, technicians read each task on the list and, after reading each task, asked the employee to provide a time-at-task estimate if the employee thought that he or she had conducted the task during the work shift. The technicians used French terms for the tasks (unless English was an employee's primary language), but sometimes had to explain what was meant by the task term so the employee clearly understood. Employees were also encouraged to provide the names and times for tasks which might not have been included on the pre-printed task list.

In both the Phase I and Phase II, after the employee had estimated task times the data collection technician summed the individual task times and compared the result with the approximate amount of time the employee had actually worked on the day of the study. If this difference was more than 10 minutes (approximately 20 minutes in Phase I) the employees were supposed to revise some or all of the task time estimates. This process sometimes required more than one revision to task time estimates. The technicians had been instructed during training that they should not provide the "answers" to employees regarding

TAT. Technicians might help employees think of TAT for one task in relation to TAT for other tasks that the employee reported. For example during TAT revisions, a technician could remind an employee that he or she had estimated an hour TAT for task A and then ask whether the employee thinks that TAT for task B was more or less than the TAT for task A as the employee was estimating TAT for task B.

3.6.6.2 After the post-shift audiometric test, CHAT test, and completion of the Employee Actual Workday Time-at-Task Assessment were completed, the monitored employees were told that they had completed everything they needed to do on the survey day. Employees were asked if they had any questions or problems regarding the study activities. If an employee was interested, technicians also shared sound level measurement information that they had collected during the work shift. Employees were thanked for participating in the study and reminded that noise monitoring and the Post-Shift Actual Workday Time-at-Task assessment would be repeated two additional times.

3.6.6.3 After the employees had left the test room, noise project technicians downloaded the dosimeter and sound level meter data to a study computer (noise data were downloaded using the Larson Davis company Blaze 4.01 noise exposure and analysis software), changed batteries if needed, post-calibrated the instruments, and set-up the instruments for the next day of monitoring, if necessary. Instruments were stored in the protective field cases. At least once each week downloaded instrument field data was copied to a CD-ROM. A copy of the procedures for downloading data from the noise monitoring instruments is included in Appendix G. A checklist table used by technicians to document completion of dosimeter downloading is also included in Appendix G.

3.6.7 Notes and Observations Regarding Employee Actual Workday Time-at-Task Assessment

The following are some notes and observations regarding the method of collecting Post-Shift Actual Workday TAT data in Phase I.

- Some employees seemed to have a great deal of difficulty in conceptualizing tasks the same way researchers broke down jobs into task components. This led to some employees becoming frustrated by the process of estimating TAT at the end of the workday. Employees seemed more likely to think of their tasks in a very broad sense and to also think primarily of large production tasks while ignoring smaller tasks. For example an employee might think of the time spent at or around a machine making a product as a single task even if the process involved several distinct smaller tasks. Employees tended to underestimate their times at tasks under the approach used in Phase I.
- Because employees provided task names in free-form fashion it was critical that field technicians correctly translated terminology for tasks that employees used to the terminology used by the study team. Additionally, data collection technicians, especially at the beginning of the study, were unfamiliar with task terms the employees used therefore, there was a risk of misinterpretation. It should be noted, however, that field technician did not indicate having excessive difficulty with this. A lesson learned from this approach is to have well defined or described job tasks to help the data collection technician match study defined tasks to employee task terms.

- Since field data collection technicians observed employees for the entire work shift, they had a good sense of how much time an employee actually spent in various tasks. This task knowledge by data collectors could bias or influence employee time estimates, particularly when an employee might be experiencing difficulty in estimating time or when revising task time estimates, which happened frequently. Though technician had been instructed to not provide TAT to employees, it was not possible to determine how much and what type of guidance the technicians had to provide to the employees during this process.

The following are some notes and observations regarding the method of collecting Post-Shift Actual Workday TAT data in Phase II.

- As was the case in Phase I it was equally important in Phase II to have clear definitions of tasks in Phase II. This was much easier during Phase II because the TAT data collection forms had the typical task names and definitions provided on the form. Additionally, the data collection technicians had spent a substantial amount of time in the facility observing employees and typical work activities, and the NIOSH study team had also had more time to review work tasks and refine task definitions.
- Because the tasks were pre-printed on the actual workday TAT data collection forms and the employees had already been through the experience of estimating their task times at the end of the workday the TAT estimation process was perhaps less frustrating in Phase II. It was unclear whether employees tended to overestimate or underestimate task time estimates (perhaps both were done equally) in Phase II. It seemed, however, that employees were less likely to disregard tasks that they might not have considered when using the free-form approach during Phase I.
- The same risk of bias or influence from the data collection technicians in Phase I was also possible in Phase II.
- A deficiency in this study regarding the employee actual workday TAT data collection process was that the NIOSH study team did not have an opportunity to debrief the data collection technicians at the end of data collection. A debriefing would have allowed NIOSH to obtain more detailed information about the field implementation of the two approaches to obtaining this data and for their reflection about difficulties related to this data collection.

3.6.8 Supervisor Typical Workday Time-at-Task Assessment

At least one supervisor of employees in each of the job groups selected for monitoring was asked to provide an estimate of the average time-at-task for the typical worker in the job or job group. The list of work tasks associated with each job group was pre-printed on the Supervisor Typical Workday Time-at-Task Assessment forms. The supervisors were asked to review the list of work tasks and estimate how much time (hours/minutes) employees in the job group typically spent doing each applicable task on an average work day. The data collection technicians, either NIOSH or Montreal contractors, read through each task on the list and then recorded the supervisor's time estimate on the form. Supervisors were also instructed to provide the names and times for tasks which might not have been included on the pre-printed task list. The sum of the individual task time estimates was supposed to be equivalent to the length of a typical workday for that job, if not, the supervisors were asked to revise task times until the sum was approximately equal to the length of the workday. It should be noted that during this revision process, supervisors were not directed by the data collection staff to revise any specific task times, but were simply told that the sum of the revised task times should add

up to the length of their work time. Copies of the Supervisor Typical Workday Time-at-Task Assessment form and instructions for collecting these data are included in Appendix J.

Supervisors at Plant C found estimating TAT very difficult, especially because they were attempting to estimate a “typical” workday tasks and times. One supervisor noted that employees usually conducted 10 to 12 of the 20 tasks on the list on any given day, but the 10 to 12 tasks an employee conduct tended to change day to day. Additionally, supervisors tended to overestimate times for typically short duration tasks, such as using compressed air, and underestimate task time for typically long duration tasks, such as repair. Supervisors’ initial TAT estimates usually exceeded the length of a normal workday, substantially. When this occurred, the supervisors were asked to try to revise their initial task time estimates to ensure that the sum of task times was equivalent to the length of a typical work day, as was specified in the study procedures.

3.6.9 Type of Data Collected during each Field Survey

The study was divided into two phases. Phase I consisted of the first noise measurement survey (Survey 1) of employees participating in the study. During Phase I pre- and post-shift audiometric testing, CHAT testing, direct observation of time-at-task and sound level measurements by field data collection technicians, dosimetry monitoring (both left and right side dosimetry), and post-shift employee time-at-task assessments was completed for all job groups. Phase II of the study consisted of the second and third repeats of noise monitoring for employees participating in the study. However, during Phase II, because of financial considerations and pre- and post-shift time commitment concerns for participating employees some of the data collected during Phase I was not collected. Audiometric testing and CHAT testing were not done for any of the job groups during Phase II. Additionally, direct observation of time-at-task and sound level measurements by field data collection technicians was only conducted for three of the job groups. For the other two job groups only dosimetry monitoring was conducted. Dosimetry monitoring and collection of post-shift employee time-at-task assessments was done for all employees in all phases. Table 6 summarizes the type of data collected for employees in each job group for each field survey of the study.

Copies of data collection forms used during Phase I and instructions for completing Phase I forms are included in Appendix H. Copies of the data collection forms used during Phase II and additional instructions necessary for Phase II are included in Appendix I.

Table 6: Type of data collected during each data collection survey

Plant	Department	Job Title	Survey 1	Survey 2	Survey 3
A	Thermoforming	Thermoforming Operator	1, 2, 3, 4, 5	2, 3, 4	2, 3, 4
A	Thermoforming	Thermoforming General Aid	1, 2, 3, 4, 5	3, 4	3, 4
A	Thermoforming	Thermoforming Mechanic	1, 2, 3, 4, 5	3, 4	3, 4
A	Extrusion	Extrusion Operator	1, 2, 3, 4, 5	2, 3, 4	2, 3, 4
A	Extrusion	Slitter Operator	1, 2, 3, 4, 5	2, 3, 4	2, 3, 4
A	Extrusion	Weigh Station Operator	1, 2, 3, 4, 5	3, 4	3, 4
A	Extrusion	Grinder Operator	1, 2, 3, 4, 5	3, 4	3, 4
A	Extrusion	Pelletizer	1, 2, 3, 4, 5	3, 4	3, 4
A	Mold	Mold Machinist	1, 2, 3, 4, 5	3, 4	3, 4
A	Maintenance	Maintenance Mechanic, Electrician, Building Maintenance	1, 2, 3, 4, 5	3, 4	3, 4
A	Expedition	Fork Lift Driver	1, 2, 3, 4, 5	3, 4	3, 4
B	Canning	Decorator	1, 2, 3, 4, 5	3, 4	3, 4
B	Canning	Stretcher Operator and Stretcher Mechanic	1, 2, 3, 4, 5	3, 4	3, 4
B	Canning	General Mechanic and Mechanic-Rear Section	1, 2, 3, 4, 5	3, 4	3, 4
B	Canning	Department Aid and Packaging Operator	1, 2, 3, 4, 5	3, 4	3, 4
B	Assembly	Counting Operator	1, 2, 3, 4, 5	3, 4	3, 4
B	Assembly	Press Operator 26 mm	1, 2, 3, 4, 5	3, 4	3, 4
B	Assembly	Rotary Operator	1, 2, 3, 4, 5	3, 4	3, 4
B	Lithography	Printing Press Operator, Varnisher, and Measurer	1, 2, 3, 4, 5	3, 4	3, 4
C	New, Used, and Rental Equipment Repair Sections	Heavy Equipment Repair Technician (Mechanic)	1, 2, 3, 4, 5	2, 3, 4	2, 3, 4
C	Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas	Rebuilding Technician (Mechanic)	1, 2, 3, 4, 5	2, 3, 4	2, 3, 4
C	Machining Areas	Machinist – Operations, Welding, or Bay 56/58	1, 2, 3, 4, 5	2, 3, 4	2, 3, 4
C	Welding	Welder	1, 2, 3, 4, 5	3, 4	3, 4
C	Track	Track Repair and Painter	1, 2, 3, 4, 5	3, 4	3, 4

Key: 1 = Audiometric Test and CHAT Test conducted
 2 = Direct Observation TAT – researchers conduct full-shift TAT observations and sound level measurements during at least one occurrence of each job task
 3 = Dosimetry Monitoring – employees wear noise dosimeter
 4 = Post-shift employee actual workday time-at-task assessment conducted
 5 = Supervisor typical workday time-at-task assessment conducted

3.7 Octave Band Sound Level Measurements

Noise engineers from Battelle Laboratories (Columbus, Ohio), contracted by NIOSH, conducted sound level and octave band noise measurements using Larson Davis Model 824 Type I sound level meters. The primary purpose of these measurements was to identify job locations where exposure to impact noise might occur, based on peak sound levels greater than 120 dBA. Octave band measurements provide information about the frequency distribution of noise. Since the energy from sound sources is usually widely distributed over many frequencies, the frequency range is broken into a smaller range of frequencies (called bandwidths), the most common being the octave band (defined as a frequency band where the upper band frequency is twice the lower band-edge frequency).

Octave band analysis provides information about the dominant noise frequencies generated by specific equipment or prevalent in a work area and can be useful for identifying potential engineering controls. For example, if low frequency noise is dominant (i.e. the highest octave-band sound levels occur in frequencies of 500 Hz or less), noise is likely generated by vibration, and noise controls that reduce or isolate the vibration from machines or equipment might decrease noise levels. If high frequency noise is dominant (i.e. the highest octave-band sound levels occur in frequencies of 2000 Hz or greater), the installation of noise enclosures, barriers, or sound absorption systems is typically the most effective approach for noise reduction [Driscoll 2000].

Two separate measurements were recorded at most of the locations where the sound level and octave band monitoring was conducted. One set of measurements was taken a distance of less than one meter from the machine or equipment that was thought to generate the most noise in the area (designated as "SLM 1"). The second set of measurements was taken at the typical employee work location within that area (designated as "SLM 2"). Each sound level meter was usually mounted on a tripod at a height representative of an employee in a standing or sitting position, depending on which position the employee would typically be in during work activities at that location. In some cases, such as a location where a tripod wouldn't fit, the sound level meter was held by the noise researcher. Octave band measurements were collected at the following eight center band frequencies: 63, 125, 250, 500, 1000, 2000, 4000, and 8000 hertz (Hz).

3.8 Quality Control Procedures for Collection of Field Data

There were several quality control procedures established to ensure the quality and consistency of field data collected at the study sites during the study.

3.8.1 Communication and Coordination Plan

The NIOSH project manager developed a study communication and coordination plan to identify the key personnel, roles, and responsibilities during field data collection. Additionally, a summary list of important study activities and procedures necessary to help ensure proper data quality was prepared by the NIOSH project manager. Copies of the communication and coordination plan are provided in Appendix K.

3.8.2 Quality Control of Field Data during Initial Data Collection

During the first two weeks of data collection in Phase I and first week of data collection in Phase II, the NIOSH industrial hygienist accompanied the field data collectors to the plant study sites to help ensure that field data was collected consistently and properly. The NIOSH industrial hygienist provided immediate feedback and guidance to the data collectors when questions arose. Most questions during this period were generally related to identifying and differentiating tasks. Field data

collection forms were also reviewed at the end of each day so that the NIOSH IH could resolve incomplete or ambiguous data and provide instruction to the data collectors regarding improvements in data collection quality, techniques, or documentation.

3.8.3 Quality Control of Field Data by Field Data Collection Technicians

NIOSH and Bertrand Johnson Acoustics developed a quality assurance checklist for use by the contract field data collection team to help ensure that all necessary data were collected each day and necessary information on the data collection forms was provided. At the end of each day of data collection the technicians briefly reviewed the field data collection forms of one of the other technicians (they were instructed not to review their own set of data collection forms) and noted whether all the necessary forms were present, completed, dosimeter and sound level meter data properly downloaded, and audiometric and CHAT data recorded. The field technicians were also instructed to scan the information on the data collection forms and note or correct any inconsistencies or items that needed further clarification. The quality assurance checklists were used to document quality check, problems identified, and the plan for resolving problems. A second quality assurance review and verification of data collection forms was conducted by the Montreal Contract Leader (Robert Bertrand M.D. – BJA) or the Montreal Field Coordinator (Nino Bertrand – BJA). Problems identified during this review were identified and then resolved through consultation with the field data collection technician responsible for the completing the data collection form. An example of the Quality Assurance Checklist used by BJA is in Appendix L.

3.8.4 Review and Quality Control of Field Data by NIOSH

Approximately once every one or two weeks copies of the field data collection forms and downloaded noise instrument data collected during the previous one or two-week period were mailed to the NIOSH Project Field Team Leader (Lead Industrial Hygienist). (Original procedures were to photocopy data collection forms each day and fax copies to NIOSH, but this proved logistically impractical for the contractor and would have added additional cost.) The NIOSH Lead IH also informed the NIOSH Principle Investigator of quality control activities and any problems that needed to be addressed by the PI.

The sound level meter and noise dosimeter downloaded files for each employee ID were reviewed by the NIOSH Lead IH for the following:

- The appropriate downloaded data had been sent for each employee ID sampled.
- The date of the downloaded dosimeter or sound level meter data for the employee ID matched the date of data collection specified on the data collection form for the same employee ID (If the dates did not match the noise instrument memory had not been cleared of previous data and therefore measurements had to be repeated. This problem only occurred on two occasions)
- The dosimeter and sound level meter data was valid (not corrupted)

Field data collection forms for each employee ID were reviewed for the following:

- Completeness of the data collection forms. Specifically all the necessary data collection forms should have been completed and within each form appropriate information in each data entry cell should have been provided or an explanation for missing information provided.
- Errors or inconsistencies in recording of data on the forms, such as incorrect task names or times
- New work tasks that had not been included in the original task lists. When new tasks were identified the new task names and definitions were added to the master task list.

Following quality review of the data collection forms and downloaded instrument data a spreadsheet that noted data quality-related issues such as missing data, inconsistent data, need for additional information, or problems with downloaded noise instrument data was sent via email to the Montreal Contract Field Coordinator for resolution. Copies of the actual data collection forms where problems or questions had been identified were also faxed to the Montreal Field Coordinator with written notations identifying the problem or questions. The Montreal Field Coordinator then consulted with the data collection technicians to resolve problems or inconsistencies noted by NIOSH and faxed or emailed the quality resolution responses back to NIOSH. In a few cases, where noise measurement data was not properly collected or saved, the field data collection team was asked to conduct re-monitoring of the employee's noise exposure. If a problem or question, which had been noted by NIOSH, could not be resolved, the data collection team in Montreal informed NIOSH that they were not able to resolve the problem.

NIOSH documented responses to quality issues and resolution of problems or questions on the quality control spreadsheet and also entered or corrected the information on the data collection forms when applicable. Based on quality issues, NIOSH also provided additional written instructions to the field data collection technicians to clarify data collection procedures and strategies or to update task definitions.

3.8.5 Tracking of Field Data

- a) For workers recruited for participation in the study, BJA used a tracking system table to document scheduling of monitoring and completion of monitoring. Updated copies of this tracking table were regularly sent to NIOSH to compare with the data collection forms and noise instrument download data received by NIOSH.
- b) The NIOSH project statistician and Lead IH provided weekly statistics to the NIOSH Project Officer regarding the number of sets of data collection forms received each week, the period of time covered, the overall number and percent of sampling completed at each plant site, and summary of the remaining number of workers to sample at each plant.
- c) Three additional tracking tables were also developed by the NIOSH project statistician and/or Lead IH to track progress of data collection.
 - Summary tables for each plant and phase showing the worker ID number, worker name, department name, job name, left or right dosimeter files, and slm files
 - Tracking table for each plant, department, work station (job), worker name, and ID number, showing the dates of monitoring in each phase, if applicable; dosimeter downloads available or problems with download data identified; whether sound level meter download available or problems with download data identified; whether data collection forms received; and additional comments
 - Tracking tables for dosimeter and sound level meter downloaded files for each plant, survey, and employee ID showing date of noise measurements, whether left and/or right side dosimeter download files received, sound level meter download file received, number of separate records within each file, completed conversion to .csv format files, number of records converted to .csv files, and comments.

4. NOISE STUDY DATA PROCESSING AND ANALYSIS PROCEDURES

4.1 Review of Completed Data Collection Forms

Upon completion of project data collection at the study sites the NIOSH IH and Statistician conducted a thorough review of each of the data collection forms. There were several goals for this review.

- Identify any new tasks which needed to be added to the master task list. The decision whether a task should be considered a new task was based primarily on the description or notes about the “new” tasks that were provided on the data collection forms by the field technicians. (Note: the task list had also been updated after completion of the first survey.) The review process also involved standardizing the names of work tasks and developing a translational table that showed variations of task names that might have been used by technicians when recording observed tasks (i.e. variations of the standardized task name “office work” were “office activities,” “activities in office,” and “office.”) In some instances, especially on data collected during the first few weeks of the field surveys, the technician may have used the same task term for what would eventually be considered two separate tasks. Corrections to the task names on the data collection forms were made based on accompanying notes that allowed the reviewers to clearly distinguish the tasks as separate. Similarly, during the first few weeks of field surveys tasks that were initially entered on the forms as two separate tasks were later considered the same task, and therefore renamed on the data collection form during review.
- In some cases the task names initially written on the data collection forms by the field technicians were replaced with the standardized task names developed by NIOSH to eliminate potential confusion and ease the data entry process.
- Develop a master list for task locations or machines and tools used during tasks. In a number of cases during direct observation of work tasks, data collection technicians documented the location where the task was conducted and also documented the machine or tool that an employee used while conducting a task. It should be noted, however, that documentation of location information and machine or tool use information had not been specified as a data collection procedure (with the exception of power tools used during “repair” in Plant C and the location of sound level measurements in form 2b). Therefore, this information was not collected consistently and in a standardized way across the entire data collection process. However, the study team felt that this information could be useful and entered into the database. Location information and machine/tool information on the data collection forms was highlighted to ease the data entry process.
- Develop a master list of the different types of hearing protection noted on the data collection forms.
- Highlight additional notes recorded by the data collection technicians so that notes were clearly separated from task, location, or machine/tool information.
- Writing the variable codes for the Plant, Department, and Job Titles written on the data collection forms. This was done because there was some inconsistency in the names the field data technicians used for these on the data collection forms.
- Correct any obvious problems or mistakes on the data collection forms such as grammatical errors or mistakes in writing down task times.

4.2 Coding of Field Data

The NIOSH noise project IH and Statistician developed variable names and codes for the data. A variable name was created for each data entry field on the data collection forms. For each variable, alpha-numeric or numeric codes were developed for all data linked to the variable. It was not

necessary to code numeric or time-related data on the data collection forms, because these would be entered into the database as they were written on the data collection forms. Likewise, free form field notes were not coded and would be entered as notes.

For coding of tasks a coding scheme was developed to allow for ease of combining tasks during data analysis, if desired. For example the 1st, 2nd, and 3rd digits of the 7-digit task codes were the same for all tasks in the same department in the same plant, and the 1st, 2nd, 3rd, and 4th digits were the same for all tasks within the same job code and department within a plant. The last three digits of all task codes were the same for all tasks with the same task name independent of plant, department, or job. For example, all tasks called “cleaning” ended with the number “122.” A similar coding scheme was also used for the coding of machines and tools.

Copies of coding tables are included in Appendix M.

4.3 Development of Access Database

A Microsoft Access database was developed by Lian Luo (NIOSH Programmer) for entry of field survey data. The data entry pages for the database were designed to appear nearly identical to the hard copy data collection forms. However, columns for entry of task locations and machines/tools used during tasks were added to the Access versions of the direct observation data collection forms to permit entry of this data because field data collectors often included this information even though specific entry fields on the survey data collection forms had not been included. The NIOSH IH and statistician provided guidance on layout, format, and entry restrictions. The database was designed to allow entry of most data using a dropdown box and mouse or direct keyboard entry. Validation loops were designed for most of the data entry fields to permit only valid data to be entered and error boxes to warn the user of an attempt to enter data outside of the specified parameters. Testing of the database design and working characteristics was on-going during development and necessary design changes were made or problems resolved as they were identified. After completion of the database, several field data collection forms were entered by the NIOSH IH and Statistician to learn the necessary data entry procedures and assess the completed working version for any additional problems that needed to be fixed. A diagram showing the linkage relationships between tables in the Access database is provided in Appendix N.

4.4 Data Entry and Coding Instructions

Upon completion of the database, a comprehensive manual containing data entry instructions was prepared by the NIOSH IH and Statistician and reviewed by the project manager. Entry instructions were prepared for each field of the data collection forms and screen captured pages of various Access database entry screens were also utilized to highlight important or complicated data entry information. A comprehensive *Data Entry and Coding Instruction Manual* was written by the NIOSH IH and Statistician and is available separately. NIOSH program support staffs (data entry clerks) were trained to enter the field data collection forms into the database. Training consisted of a review of the field data collection forms and Access database entry instructions followed by hands-on practice entering actual data under direct guidance by the NIOSH IH or Statistician. The support staff also read the instruction manual and asked questions about information or instructions that needed more explanation.

4.5 Entry of Data into Access Database

NIOSH program support staff entered field survey data into the Access database. During the data entry process the program support staff members asked questions as needed to clarify entry

instructions or to help interpret information on the data collection forms. The first few forms that data entry clerks entered were data collection forms that had been previously entered by the NIOSH IH and Statistician. This allowed for comparison of the previously entered data to that entered by the data entry clerks and therefore identification of entry errors by the programmers. Based on entry errors identified, re-instruction or additional clarification of entry procedures was provided.

4.6 Quality Control and Review of Data Entry

Data entered into the Access database was evaluated for quality at several stages.

4.6.1 Data Quality Review during Data Entry

Some of the data collection forms were entered in duplicate (two different data entry clerks entered the same data collection forms). Duplicate entry allowed comparison of the entered data through SAS programs written by the NIOSH project statistician which provided a list of discrepancies between the two sets of entered data. The NIOSH IH and Statistician reviewed disparate data and determined which entry was correct using the field data collection form. Incorrect entries were then corrected in the Access database and then one of the duplicate sets of data was deleted from the database.

During the first week of data entry while the data entry clerks were becoming accustomed to the field data collection forms and data entry process, each data collection form was entered in duplicate. This duplicate entry was typically conducted for data from one or two employee ID's for each job code. For data collection forms that were not entered in duplicate a different SAS program was written to help identify possible entry errors. This program checked for data that appeared to be outside expected parameters, such as task start times that did not match the previous task stop time. If any systematic data entry errors were identified during the review process, the incorrect data were corrected and data entry clerks were informed about the errors and re-instructed about how to enter the data correctly. Error rates for all the data entry clerks were tracked through the entire data entry process. The average error rates, calculated upon completion of data entry, were less than 2.5%.

4.6.2 Data Quality Review after Completion of Data Entry

After all of the field data was entered into the Access database additional quality checks of the data were conducted. The following are examples of data quality checks.

- On "Direct Observation Time-at-Task Assessment Form 2B" the sound level measurements were checked to ensure that for each row Dose 3 was greater or equal to Dose 1; Dose 4 was greater than or equal to Dose 2; Dose 2 was greater than or equal to Dose 1; Dose 4 was greater than or equal to Dose 3; Lmax was greater than Dose 4; and Lpeak was greater than Lmax.
- On the "Actual Workday Time-at-Task Assessment Form" any duplicate entries were identified and reviewed and the sum of individual task times was compared to the typical length of the workday.
- Tasks listed on Direct Observation Forms 2A and 2B were checked to determine if there was a corresponding task on Direct Observation Form 1 (In most cases each task listed on Direct Observation Forms 2A and 2B should have a corresponding task on Form 1. Exceptions to this include sound level measurements of specific power hand tools or stationary machines). Likewise the list of tasks on Form 2A was compared with the lists of tasks on Form 2B.

The actions taken for each of the variables checked on the data collection forms are summarized in Appendix O (Post Entry Quality Control Documentation). Any questionable data identified during this quality review was checked by looking at the field data collection forms and incorrect data entries were corrected in the Access database.

4.7 Preparation of Dosimeter Data for Analysis

After each day of data collection the dosimeter data were downloaded from the instruments to the computer via the Larson Davis Blaze software. In preparation for analysis the NIOSH noise project noise measurement data statistician exported the dosimeter time history noise measurement data (one second averaging rate) from the Blaze program in .csv format into a Microsoft Excel spreadsheet. The data was subsequently imported into a SAS dataset.

The time history records for full shift dosimetry measurements included noise measurements that were recorded before employees started working and after they stopped working. (This occurred because the dosimeters had been programmed to start measurements before the work shift actually began and stop measurements after the work shift had ended. For example a dosimeter might have been programmed to automatically start sampling at 6:50 AM and stop sampling at 4:10 PM, but the employee didn't actually start working until 7:05 AM and stopped working at 3:40 PM) Therefore, to prevent erroneous calculation of full-shift dosimeter TWA's, the "non-work" time history noise measurement data recorded before and after work shift were eliminated based on the start and stop times that had been noted on either the direct observation or employee actual workday data collection forms.

After the "non-work" time-history measurements were eliminated from the SAS dataset, the full-shift TWA for each of the dosimeter measurements was calculated in SAS. A summary of the steps and formulas used to re-calculate the noise measurement data are included in Appendix P.

4.8 Preparation of Access Data for Analysis

The NIOSH noise project statistician prepared the noise sampling access data for analysis in SAS in two stages. The first stage was importation of the study data from the Access database into SAS data sets. The second stage was extraction of the additional machines, locations, HPD variables, and other variables containing multiple values, on the Direct Observation Forms and the CHAT Form. Summaries of steps necessary to import, extract, and prepare the data are provided in Appendix Q. The tables of variables in the SAS data sets are also included in Appendix Q.

5. NOISE EXPOSURE MEASUREMENT RESULTS

5.1 Occupational Noise Exposure Limits and Recommendations

For workplace noise exposure in Québec, Canada, the Commission de la Santé et de la Sécurité du Travail (CSST) has established an eight-hour TWA occupational exposure limit (OEL) of 90 dBA, using a 5-dB exchange rate and 80-dB threshold [CSST 1981]. The company should consult with the Quebec, Canada, provincial regulations and authorities, for detailed information about applicable regulatory requirements in Quebec regarding workplace noise exposure.

For companies in the United States, the Occupational Safety and Health Administration (OSHA) enforces a Permissible Exposure Limit (PEL) of 90 dBA [OSHA 1974] and an Action Level of 85 dBA [OSHA 1983]. Both OSHA limits are also based on a 5-dB exchange rate and 80-dB threshold. If worker exposures exceed the OSHA PEL, the use of hearing protection is required and noise control measures must be implemented. If TWA noise exposures exceed the OSHA Action Level, companies must implement a hearing conservation program that requires noise monitoring, audiometric testing, employee training, providing hearing protection, and recordkeeping [OSHA 1983].

NIOSH has established a Recommended Exposure Limit (REL) of 85 dBA, using a 3-dB exchange rate and 80-dB threshold to calculate TWA exposure [NIOSH 1998]. If TWA noise exposures exceed the REL of 85 dBA, NIOSH recommends that companies implement a Hearing Loss Prevention Program (HLPP). The elements of the NIOSH hearing loss prevention program include noise monitoring, noise exposure reduction, required use of hearing protection, medical surveillance of hearing acuity, communication of noise hazards, employee training, program evaluation, and recordkeeping. Although the NIOSH REL for noise is not a legally enforceable regulatory standard, the current body of scientific evidence indicates that it is more protective in the prevention of hearing loss than occupational exposure limits of 85 dBA or 90 dBA, that are based on a 5-dB exchange rate. Additional information regarding NIOSH recommendations for noise and hearing loss prevention can be found on the NIOSH internet site: <http://www.cdc.gov/niosh/topics/noise/>.

Hearing loss due to noise depends on the level of sound exposure and duration exposed. The use of a 3-dB or 5-dB exchange rate is based on different models of hearing damage in relation to duration and intensity level of noise exposure [NIOSH 1998]. The 5-dB exchange rate used by regulatory agencies in Canada and the U.S. attempts to account for interruptions in noise exposure during the workday, assuming that some recovery from temporary threshold shifts occur during these interruptions and that hearing loss would be less than that observed for continuous noise exposure. The 3-dB exchange rate used by NIOSH assumes that equal amounts of sound energy will produce equal amounts of hearing impairment regardless of how the sound energy is distributed in time [Driscoll 2000]. For compliance purposes the exchange rate has been defined as the increase in decibels that requires halving the exposure time or the decrease in decibels that permits doubling the exposure time, to result in an equivalent amount of noise exposure. A 3-dB exchange rate requires that noise exposure time be halved for each 3-dB increase in noise level above the occupational exposure limit, whereas a 5-dB exchange rate requires that exposure time be halved for each 5-dB increase in noise level above the occupational exposure limit. For example, if the occupational exposure limit for noise is 90 dBA for eight hours, based on an exchange rate of 5-dB, a worker could only be exposed to 95 dBA for four hours or 100 dBA for two hours to ensure that the equivalent eight hour TWA remained at or below 90 dBA.

5.2 Calculation of Average Noise Exposure across Jobs

Average noise exposures for all monitored employees across a job were calculated using Equation 1.

$$\text{Equation 1: } \text{Average TWA Sound Level} = q \text{Log}_{10} \left[\frac{1}{N} \sum_{i=1}^N 10^{L_{Ai}/q} \right]$$

i = measurement number

q = Exchange Rate / $\text{Log}_{10}(2)$

L_{Ai} = A-weighted TWA sound levels for each employee within job

N = Total number of noise measurements for job

5.3 Plant A Results

5.3.1 Number of Workers Monitored (Plant A)

A total of 229 full-shift dosimetry measurements were collected on 69 workers participating in the study from this plant. Most of the measurements were collected during the first survey. Forty-three of the workers had noise measurements taken three separate times during the period from August 2003 to January 2004. The number of workers monitored in each job title, the total number of workers monitored, and the total number of noise measurements during each survey is shown in Table 7.

Table 7: Number of employees in each job title monitored for noise at Plant A

Department	Job Title	Survey 1	Survey 2	Survey 3
Thermoforming	Thermoforming Operator	7	6	5
Thermoforming	Thermoforming General Aid	7	4	3
Thermoforming	Thermoforming Mechanic	7	7	7
Mold	Mold Machinist	6	6	6
Extrusion	Extrusion Operator	7	7	6
Extrusion	Slitter Operator	7	6	2
Extrusion	Weigh Station Operator	7	7	8
Extrusion	Grinder Operator	7	7	6
Extrusion	Pelletizer	7	0	0
Expedition	Fork Lift Driver	1	0	0
Maintenance	Maintenance Mechanic	2	0	0
Maintenance	Maintenance Electrician	2	0	0
Maintenance	Building Maintenance	2	0	0
Total number of workers monitored during each survey		69	50	43
Total number of TWA measurements		136*	50	43

* The total number of TWA measurements is "136" because nearly all employees, except for two, wore two dosimeters during the first survey (left side sample and right side sample).

5.3.2 Full-shift Time-weighted Average Noise Monitoring Results (Plant A)

The average and range (minimum and maximum) of TWA noise exposure of employees monitored in each job title across the three noise surveys is shown in Table 8.

Table 8: Full-shift TWA noise exposures by job title across all surveys for Plant A

Department	Job Title	Total Number of Samples	Number of Workers Sampled	Dose 1 Settings*: 5-dB Exchange Rate, 80 dB Threshold			Dose 3 Settings*: 3-dB Exchange Rate, 80-dB Threshold		
				Average** TWA (dBA)	Min. TWA (dBA)	Max. TWA (dBA)	Average** TWA (dBA)	Min. TWA (dBA)	Max. TWA (dBA)
Extrusion	Grinder Operator	27	7	93.6	82.7	100.4	97.9	86.6	103.5
Extrusion	Weigh Station Operator	29	7	86.8	76.4	89.6	90.6	82	97.4
Maintenance	Maintenance Mechanic	4	2	86.3	80.6	90.1	90.2	84.1	93.3
Extrusion	Slitter Operator	21	7	86.1	76.1	91.6	88.6	84.6	92.8
Extrusion	Pelletizer	13	7	85.6	83.9	87	87.9	86.4	90.3
Extrusion	Extrusion Operator	27	7	85.1	79.1	88.8	88.2	82.9	93
Thermoforming	Thermoforming Operator	26	7	84.5	81.1	89.7	86.3	82.6	91.5
Thermoforming	Thermoforming General Aid	21	7	84.1	81.1	87.3	87.3	83.1	94.8
Thermoforming	Thermoforming Mechanic	28	7	83.6	76.2	88.2	86	80.1	89.9
Expedition	Fork Lift Driver	2	1	78.9	77.7	80	84.4	83.3	85.2
Maintenance	Maintenance Electrician	4	2	78.7	75.7	80.3	82.7	80.4	84.3
Mold	Mold Machinist	24	6	78.3	70.9	83.5	83.9	78.1	88.5
Maintenance	Building Maintenance	4	2	75.7	69.4	79.4	80.8	76	83

*Dose 1 setting results (in bold) are used for Quebec and OSHA noise exposure limits. Dose 3 setting results are used for NIOSH recommended noise exposure limits.

** Calculated using Equation 1

These results show that the average full-shift noise exposure of employees in the grinder job title exceeded the Quebec OEL and OSHA PEL of 90 dBA, based on a 5-dB exchange rate and 80-dB threshold (dose 1 instrument setting). Additionally, the TWA noise exposure reached a maximum of 100.4 dBA for one of the grinders monitored. Noise exposure of employees in the maintenance mechanic and slitter operator job titles sometimes exceeded 90 dBA, and the noise exposure of employees in the weigh station operator and thermoforming operator job titles nearly exceeded 90 dBA, as evidenced by the maximum TWA measured in these jobs. Noise exposures of employees in the pelletizer, thermoforming general aid, thermoforming mechanic, fork lift driver, maintenance electrician, mold machinist, building maintenance job titles were below regulatory limits.

By contrast, noise measurement results using a 3-dB exchange rate and 80-dB threshold (dose 3 instrument setting) show that the average TWA exceeded the NIOSH REL of 85 dBA for employees in the grinder, weigh station operator, maintenance mechanic, slitter operator, pelletizer, extrusion operator, thermoforming operator, thermoforming general aid, and thermoforming mechanic job titles. Noise exposures sometimes exceeded the NIOSH REL for employees in the fork lift driver and mold machinist job titles, based on a maximum TWA greater than 85 dBA.

The range of TWA exposures (Maximum TWA – Minimum TWA) was greater than or equal to 10 dBA for the following jobs: grinder, weigh station operator, slitter operator, thermoforming mechanic, mold machinist, and building maintenance. The range of TWA exposure was between 6 dBA and 10

dB(A) for the maintenance mechanic, extrusion operator, thermoforming operator, and thermoforming general aid jobs. The range of exposures was less than 5 dB(A) for the pelletizer, maintenance electrician, and fork lift driver.

Full-shift time-weighted average noise monitoring results for each employee who participated in the study are provided in Appendix R. The results for all four dose instrument settings are shown for each of the three noise monitoring surveys. Worker TWA noise exposure measurements, for compliance with both Quebec CSST and OSHA noise regulations, were measured using the Dose 1 instrument settings, which are highlighted with bold font in the table. Because of U.S. government confidentiality requirements for research study participants, individual employee identification numbers are not provided in the table.

5.3.3 Comparison of Results Based on Dosimeter Microphone Placement (Plant A)

During Survey 1, nearly all employees wore dosimeter microphones on both their left and right shoulder to compare whether TWA noise exposures differed based on the microphone position. Table 9 shows the TWA results between the left side versus right side microphone position for both dose 1 and dose 3 instrument settings. For the dose 1 settings the absolute difference between the left and right side measurement ($n=67$) was 2.0 dB(A) or less for 89.6% of the measurements and the absolute difference was 1.0 dB(A) or less for 65.7% of the measurements. For approximately 55% of the measurement pairs the right side measurement was greater than the left side measurement; for 42% the left side measurement was greater than the right side measurement; and for 3% the left and right side measurements were identical. The mean absolute difference across all jobs was 0.99 dB(A) (SD=0.94 dB(A)) for the dose 1 instrument setting and was 1.21 dB(A) (SD=1.30 dB(A)) for the dose 3 instrument setting. Overall, these results indicate minimal difference in TWA noise results between left and right shoulder dosimeter microphone placement. However, additional analysis will be conducted on this data to determine statistical significance.

Table 9: Comparison of 8-hour time-weighted average noise levels by left and right side microphone placement and exchange rate during Survey 1 for Plant A

Department	Job	Left Side		Right Side		Dose 1 Left vs. Right Difference (Absolute Value)	Dose 3 Left vs. Right Difference (Absolute Value)
		Dose 1 (dBA)	Dose 3 (dBA)	Dose 1 (dBA)	Dose 3 (dBA)		
Extrusion	Extrusion Operator	88	89.5	88.5	90.2	0.5	0.7
Extrusion	Extrusion Operator	87.8	89.5	87.8	89.5	0	0
Extrusion	Extrusion Operator	85.8	88.1	86.4	89.2	0.6	1.1
Extrusion	Extrusion Operator	84.9	87.3	84.2	86.6	0.7	0.7
Extrusion	Extrusion Operator	83.7	87.1	83.4	86.6	0.3	0.5
Extrusion	Extrusion Operator	80.8	84.8	80.9	85	0.1	0.2
Extrusion	Extrusion Operator	79.1	82.9	80.6	83.8	1.5	0.9
Extrusion	Grinder Operator	97.5	101.3	98.1	102.4	0.6	1.1
Extrusion	Grinder Operator	95.6	98.9	93.7	97.7	1.9	1.2
Extrusion	Grinder Operator	93.1	99.2	95.7	99.9	2.6	0.7
Extrusion	Grinder Operator	91.7	94	90.6	92.8	1.1	1.2
Extrusion	Grinder Operator	90.4	92.4	89.6	91.7	0.8	0.7
Extrusion	Grinder Operator	89.3	90.6	89.8	91.2	0.5	0.6
Extrusion	Grinder Operator	88.8	90.4	87.5	89.2	1.3	1.2
Extrusion	Pelletizer	87	90.3	86.6	89.5	0.4	0.8
Extrusion	Pelletizer	86.7	88.4	87	88.7	0.3	0.3
Extrusion	Pelletizer	85.3	86.4	86.7	87.9	1.4	1.5
Extrusion	Pelletizer	85	86.8	85.4	87.3	0.4	0.5
Extrusion	Pelletizer	84.5	87.1	85.1	87.8	0.6	0.7
Extrusion	Pelletizer	83.9	86.6	83.9	86.8	0	0.2
Extrusion	Slitter Operator	88.4	90.2	88.9	92.3	0.5	2.1
Extrusion	Slitter Operator	87.1	88.8	87	88.5	0.1	0.3
Extrusion	Slitter Operator	84.3	86.2	84	86	0.3	0.2
Extrusion	Slitter Operator	83.9	85.9	82.9	84.6	1	1.3
Extrusion	Slitter Operator	83.5	85.1	83.8	85.5	0.3	0.4
Extrusion	Slitter Operator	82.8	84.6	83	84.7	0.2	0.1
Extrusion	Weigh Station Operator	88.3	90	89.6	96.7	1.3	6.7
Extrusion	Weigh Station Operator	87.2	88.2	87.6	88.9	0.4	0.7
Extrusion	Weigh Station Operator	87.1	88.8	86.6	88.1	0.5	0.7
Extrusion	Weigh Station Operator	86.9	88.2	87.1	88.5	0.2	0.3
Extrusion	Weigh Station Operator	86.2	89.2	85.1	88	1.1	1.2
Extrusion	Weigh Station Operator	85	87.2	85.5	87.8	0.5	0.6
Extrusion	Weigh Station Operator	80.7	85.8	76.4	82	4.3	3.8
Thermoforming	Thermoforming General Aid	86.5	88.9	85.8	88	0.7	0.9
Thermoforming	Thermoforming General Aid	86.3	88.4	85.5	94.8	0.8	6.4
Thermoforming	Thermoforming General Aid	82.9	84.6	82.4	84	0.5	0.6
Thermoforming	Thermoforming General Aid	82.2	83.9	83.7	85.5	1.5	1.6
Thermoforming	Thermoforming General Aid	82	84.5	82.9	85.6	0.9	1.1
Thermoforming	Thermoforming General Aid	81.6	83.3	82.4	83.9	0.8	0.6
Thermoforming	Thermoforming General Aid	81.1	83.1	81.3	83.3	0.2	0.2
Thermoforming	Thermoforming Mechanic	85	86.6	85.4	87.7	0.4	1.1
Thermoforming	Thermoforming Mechanic	84.4	86.4	83.8	85.7	0.6	0.7
Thermoforming	Thermoforming Mechanic	83	84.5	82.8	84.6	0.2	0.1
Thermoforming	Thermoforming Mechanic	82.1	84.4	81.5	84.1	0.6	0.3
Thermoforming	Thermoforming Mechanic	81.4	84.1	80.2	82.9	1.2	1.2
Thermoforming	Thermoforming Mechanic	80.9	83.1	81.1	83.2	0.2	0.1
Thermoforming	Thermoforming Mechanic	76.2	80.1	77.7	81.8	1.5	1.7

Department	Job	Left Side		Right Side		Dose 1 Left vs. Right Difference (Absolute Value)	Dose 3 Left vs. Right Difference (Absolute Value)
		Dose 1 (dBA)	Dose 3 (dBA)	Dose 1 (dBA)	Dose 3 (dBA)		
Thermoforming	Thermoforming Operator	89.7	91.5	86	87.6	3.7	3.9
Thermoforming	Thermoforming Operator	84.7	85.5	85.7	86.7	1	1.2
Thermoforming	Thermoforming Operator	83.7	85.1	83.4	84.7	0.3	0.4
Thermoforming	Thermoforming Operator	82.5	84.1	84.7	86.7	2.2	2.6
Thermoforming	Thermoforming Operator	81.7	83.5	81.3	83.2	0.4	0.3
Thermoforming	Thermoforming Operator	81.4	82.8	81.1	82.6	0.3	0.2
Thermoforming	Thermoforming Operator	81.3	83.4	81.9	84.2	0.6	0.8
Mold	Mold Machinist	80.7	86	79.8	85.5	0.9	0.5
Mold	Mold Machinist	80.6	84.6	80.7	85.1	0.1	0.5
Mold	Mold Machinist	76.6	80.9	79.1	83.6	2.5	2.7
Mold	Mold Machinist	75.9	82	74.1	80.4	1.8	1.6
Mold	Mold Machinist	75.5	80.5	76.5	81.4	1	0.9
Mold	Mold Machinist	74.1	79.1	76.1	80.8	2	1.7
Maintenance	Building Maintenance	78.3	81.8	79.4	83	1.1	1.2
Maintenance	Building Maintenance	69.4	76	70.5	79.4	1.1	3.4
Maintenance	Maintenance Electrician	80.3	84.3	75.7	80.4	4.6	3.9
Maintenance	Maintenance Electrician	78.7	82.2	79.5	83	0.8	0.8
Maintenance	Maintenance Mechanic	88.4	91.6	90.1	93.3	1.7	1.7
Maintenance	Maintenance Mechanic	80.6	84.1	81.8	85.2	1.2	1.1
Expedition	Fork Lift Driver	80	85.2	77.7	83.3	2.3	1.9
Mean difference between left and right						0.99	1.21
Standard deviation						0.94	1.30

5.3.4 Sound Level Measurement of Work Tasks (Plant A)

The average and range (minimum and maximum) of task sound level measurements across all jobs, based on the results of sound levels measured in the workers hearing zone using a hand-held sound level meter (Type-2) are presented in table 10 from highest to lowest task sound level average.

Table 10: Sound levels of tasks conducted by employees during noise monitoring surveys at Plant A

Task (Machine)	Number of Measurements	Sound Level (dBA)*		
		Average	Minimum	Maximum
Start-Up Extruder Line 1	1	99.1	99.1	99.1
Load Grinder	18	98.4	91.8	104
Compressed Air	18	97.6	86.4	108.2
Emergency Scrap Removal (Extruder)	30	92.1	81.7	97.4
Unload Pelletizer	2	91.9	90.9	92.7
Hand Tool Use	4	91.4	83.1	94.7
Monitor Machine (Extruder)	39	90.1	68	96.7
Activities in Pelletizer Area	6	90	85.6	94.9
Activities in Extrusion Department	21	89.8	82.3	97.6
Repair Fork Lift	5	89.7	58.8	96.8
Load/Unload Winder	22	89.4	78.4	95.5
Using Vacuum	1	88.4	88.4	88.4
Repair/Maintenance	16	87.3	43	94.5
Drive Fork Lift	46	87.2	52.8	95.1
Use Pallet Truck	5	87	77.8	94.2
Cleaning	57	86.6	43.9	97.6
Compressor Room	1	86.5	86.5	86.5
Package Plastic Rolls	12	86.4	71.7	89.3
Load Pelletizer	6	86	82.5	88.1
Outside Grinder Room	18	85.9	53.9	90.6
Slitter Activities	60	85.6	54.2	94.7
Work Near Machine (thermoforming)	64	85.4	67.1	92
Grinder Room	15	85	67.3	89.8
Machining	21	85	70.3	91.6
Weigh Station Activities	20	84.9	60.3	90
Power Tool Use	13	84.8	59.8	91
Unload/Inspect/Package (thermoforming)	102	84.3	68.6	90.1
Set-Up/Repair	80	84	42.5	90.6
Cut Tube	17	83.7	78.4	86.6
Activities in Shipping	2	83.4	81.4	85
Machine Downtime (thermoforming)	22	82.4	46.8	88.3
Garbage Disposal Activities	1	82.2	82.2	82.2
Activities in Thermoforming Department	19	81.4	59.5	91.2
Empty Garbage	1	81.2	81.2	81.2
Activities Outside Mold Department	4	79.5	74.4	81.9
Activities Outside Shipping Department	1	76.2	76.2	76.2
Drive Electronic Pallet Roll Jack	2	76.2	66.1	80.2
Mold Shop	12	75.4	61.5	85.8

Task (Machine)	Number of Measurements	Sound Level (dBA)*		
		Average	Minimum	Maximum
Activities in Mechanic Department	1	75.2	75.2	75.2
Machine Shop Activities	10	74.7	62.3	83.1
Control Booth	46	70.8	42.2	84.8
Office Work	30	67.9	35.3	74.9
Break	129	66.1	41.7	79.5
Lunch	94	66.1	40.3	78.2
Activities in Warehouse	3	62.8	58	66.4
Activities in Mold Department	3	60.3	48.2	65.6
Activities in Lamination	3	50.7	44.3	54

* Dose 1 instrument settings: 5-dB exchange rate and 80-dB threshold

Average sound levels exceeded 90 dBA for the following tasks (highlighted in bold font in Table 10): start-up extruder line 1, load grinder, compressed air, emergency scrap removal at extruder, unload pelletizer, hand tool use, monitor machine (extruder), activities in pelletizer area. The maximum sound level for the tasks compressed air and load grinder were well above 100 dBA. Notably, the maximum sound level for several other tasks exceeded 90 dBA (maximum highlighted in bold font in Table 10), even though the task average sound level was below 90 dBA.

Average task sound levels for each job title are shown in Appendix S. These results, displayed from highest to lowest task sound level average, show the tasks in each job that have the highest sound levels and are potentially the most important contributors to workers' overall noise exposures in each job title, depending on the time spent in the task.

5.3.5 Octave Band Sound Level Measurements (Plant A)

Octave band noise measurements were recorded at several machines which were considered to have the potential to generate impact noise. The results, which show the average sound level, peak level, and octave band sound level, are presented in Table 11. These measurements were taken at positions close to the primary noise source and at the typical employee work position.

Octave band sound levels were dominant in the middle to upper frequencies near the scrap grinder, but were predominant at low frequencies in the grinder room at a distance of approximately four meters from the scrap grinder. In the extrusion department, octave band sound levels were generally highest at the frequencies of 2000 and 4000 Hz. However, low frequency noise was dominant at the film trimming area. In the thermoforming department octave band noise at the 2000 to 4000 Hz frequencies were dominant for one of the measurements, but the location of this measurement was not specified so more detailed information cannot be provided. At the thermoforming machines, the highest octave band levels were generally less than or equal to 250 Hz or greater than or equal to 2000 Hz. Octave band levels were uniform across frequencies at the thermoforming machine trim press area, with the exception of a high level at 250 Hz for one measurement. In the Mold department octave band levels during air chuck tapping were highest from 1000 to 4000 Hz.

Octave band results presented in this report should be viewed as preliminary because the measurements were not collected for the purpose of formulating an engineering noise control plant. These measurements were used primarily to identify areas where peak sound levels potentially exceeded 120 dB for further measurement of impact noise, as part of the study.

Table 11: Octave Band Sound Level Measurements for Plant A, June 2003

Department	Machine or Location	Activity	Position	SPL (dBA)	Peak (dB)	Sound Level (dB) at Octave-Band Center Frequencies, Hz							
						63	125	250	500	1000	2000	4000	8000
Extrusion	LAV-EXT-GRI-1	Scrap Grinder	SLM1	102.8	130.2	83.4	80.0	91.6	106.4	106.5	100.5	99.6	97.1
			SLM2	96.4	124.4	Octave-band measurements not taken.							
Extrusion	LAV-EXT-GRI-1	Scrap Grinder	SLM1	93.3	121.5	74.6	78.4	77.7	86.3	94.6	102.7	97.0	89.5
			SLM2	No SLM 2 data		Octave-band measurements not taken.							
Extrusion	LAV-EXT-GRI-1	Grinder Room	SLM1	94.6	124.1	101.5	99.5	94.4	86.7	87.1	93.2	93.8	88.3
			SLM2	94.2	122.9	86.6	83.3	84.4	83.4	83.1	86.6	85.9	80.5
Extrusion	LAV-EXT-STR-1, LAV-EXT-WIN-01	Film Trimming	SLM1	100.4	123.4	104.0	101.1	93.5	90.0	90.3	94.6	94.6	87.1
			SLM2	92.4	110.8	Octave-band measurements not taken.							
Extrusion	LAV-EXT-STR-1, LAV-EXT-WIN-01	Scrap Vacuum	SLM1	108.6	130.4	No workers in this location, in a side room unattended.							
			SLM2	93.0	115.0	77.4	83.7	86.0	82.9	79.5	89.6	89.9	83.0
Extrusion	LAV-EXT-STR-1, LAV-EXT-WIN-01	Installing Mandral	SLM1	93.3	133.7	81.6	80.7	80.7	80.5	78.8	80.6	80.2	73.5
			SLM2	91.4	127.2	81.3	83.1	81.8	79.7	78.5	80.3	79.9	73.8
Extrusion	LAV-EXT-STR-1, LAV-EXT-WIN-01	Slitter Re grinder	SLM1	100.1	127.0	81.9	83.3	85.5	86.5	89.0	82.2	80.7	77.7
			SLM2	94.2	115.0	85.3	84.1	84.7	83.7	85.6	86.6	87.3	83.3
Thermoforming	GN07, GN01, PI24, PI25	Thermo Machine	SLM1	87.5	117.6	83.7	90.6	84.9	85.9	87.4	88.3	88.5	86.5
			SLM2	85.3	112.6	85.3	84.1	84.7	83.7	85.6	86.6	87.3	83.3
			SLM1	87.8	118.0	63.8	70.9	85.1	89.4	90.1	82.8	76.1	68.0
Thermoforming	GN07, GN01, PI24, PI25	Trim Press	SLM1	91.8	118.7	80.6	81.1	82.0	79.3	79.4	78.4	77.3	72.7
			SLM2	85.2	108.6	Octave-band measurements not taken.							
			SLM1	89.2	117.8	80.5	83.6	98.8	82.8	80.3	81.1	80.0	81.7
			SLM2	85.3	111.2	Octave-band measurements not taken.							
Thermoforming	Not Specified	Not Specified	SLM1	95.1	121.4	73.6	79.1	76.2	84.3	92.6	100.5	96.5	87.2
			SLM2	91.8	126.0	71.3	77.9	75.8	83.7	90.8	96.6	94.3	83.3
Mold	MOLD ROOM	Hammer Pins	SLM1	95.1	131.0	73.6	80.9	77.1	73.3	79.7	74.5	65.2	67.0
			SLM2	92.1	124.1	71.5	77.0	73.2	68.8	73.2	70.8	65.4	65.9
Mold	MOLD ROOM	Air Chuck Tapping	SLM1	98.1	113.7	67.7	65.8	65.9	78.4	82.4	80.7	82.0	75.5
			SLM2	97.3	111.7	66.4	66.5	68.6	77.1	86.7	84.9	87.3	79.5

Note: SLM1 refers to measurements taken near the noise source, typically about 1/3 meter distance. SLM2 refers to measurements taken at a typical employee work position

5.3.6 Hearing Protector Usage (Plant A)

During direct observation of workers, data collection technicians noted the amount of time monitored workers wore hearing protection during the work shift. The percent time hearing protectors were worn by observed workers are presented in Table 12. It should be noted that these results are based on only one day of observation for each worker during the first survey.

Table 12: Percent time hearing protection worn during the work shift at Plant A (first survey)

Job	Percent Time HPD Used*	Job	Percent Time HPD Used*
Thermoforming Operator	100	Weigh Station Operator	100
Thermoforming Operator	100	Weigh Station Operator	100
Thermoforming Operator	100	Weigh Station Operator	100
Thermoforming Operator	100	Weigh Station Operator	99.5
Thermoforming Operator	97.7	Weigh Station Operator	98.6
Thermoforming Operator	97.3	Weigh Station Operator	94.8
Thermoforming Operator	94.8	Weigh Station Operator	91.4
Thermoforming General Aid	100	Grinder Operator	100
Thermoforming General Aid	100	Grinder Operator	100
Thermoforming General Aid	100	Grinder Operator	100
Thermoforming General Aid	99.3	Grinder Operator	100
Thermoforming General Aid	94.2	Grinder Operator	100
Thermoforming General Aid	93.9	Grinder Operator	100
Thermoforming General Aid	84.3	Grinder Operator	98
Thermoforming Mechanic	100	Pelletizer	100
Thermoforming Mechanic	99.1	Pelletizer	100
Thermoforming Mechanic	99.1	Pelletizer	100
Thermoforming Mechanic	97.2	Pelletizer	100
Thermoforming Mechanic	93.9	Pelletizer	97.6
Thermoforming Mechanic	82.2	Pelletizer	93.9
Thermoforming Mechanic	0	Pelletizer	80.4
Extrusion Operator	100	Mold Machinist	94.8
Extrusion Operator	100	Mold Machinist	89.4
Extrusion Operator	99.8	Mold Machinist	83
Extrusion Operator	94.9	Mold Machinist	26.1
Extrusion Operator	77.5	Mold Machinist	14.2
Extrusion Operator	69	Mold Machinist	10.7
Extrusion Operator	43.1	Maintenance Mechanic	92.5
Slitter Operator	100	Maintenance Mechanic	86.8
Slitter Operator	100	Maintenance Electrician	81.7
Slitter Operator	100	Building Maintenance	93.6
Slitter Operator	100	Building Maintenance	14
Slitter Operator	100	Fork Lift Driver	61.3
Slitter Operator	100		
Slitter Operator	95.8		

* Data excludes hearing protection use percentages during lunch or breaks

The percent time hearing protection was worn by observed employees during the work shift varied. Overall, 68 employees were observed for the entire work shift during the first survey. Twenty-nine employees wore hearing protection for the entire work shift, 12 employees wore hearing protection from 95 to 99.8% of the shift, 11 employees wore hearing protection from 90 to 94.9% of the shift, eight employees wore hearing protection from 80 to 89.9% of the shift, and only nine of the observed employees wore hearing protection for less than 80% of the shift.

Grinder operator, slitter operator, and maintenance mechanic were the only job titles with measured noise exposures exceeding Quebec noise exposure limits during the noise monitoring surveys, based on a maximum TWA for the job group greater than 90 dBA. In both the grinder and slitter job titles all of the observed employees, except one, wore hearing protection for the entire work shift. The two observed maintenance mechanics wore hearing protection for 86.8% and 92.5% of the shift. More detailed tables showing the percent time hearing protection was used for each job group during each task are provided in Appendix T.

5.4 Plant B Results

5.4.1 Number of Workers Monitored (Plant B)

A total of 162 full-shift dosimetry measurements were collected on 50 workers participating in the study from this plant. Most of the measurements were collected during the first survey. Twenty-six of the workers had noise measurements taken three separate times during the period from August 2003 to January 2004. The number of workers monitored in each job title, the total number of workers monitored, and the total number of noise measurements during each survey is shown in Table 13.

Table 13: Number of employees in each job title monitored for noise at Plant B

Department	Job Title	Survey 1	Survey 2	Survey 3
Canning	Decorator	7	6	6
Canning	Stretcher Operator	4	3	3
Canning	Stretcher Mechanic	4	4	5
Canning	General Mechanic	2	2	1
Canning	Mechanic - Rear Section	5	4	3
Canning	Department Aid	4	3	3
Canning	Packaging Operator	3	2	2
Assembly	Counting Operator	6	4	0
Assembly	Press Operator 26 mm	4	2	0
Assembly	Rotary Operator	3*	4	3
Lithography	Printing Press Operator	2	1	1
Lithography	Varnisher (Coater)	3	1	1
Lithography	Measurer	2	1	2
Total number of workers monitored during each survey		49	37	30
Total number of TWA measurements		95**	37	30

* Four rotary operators were actually monitored during the first survey, but the dosimeter for one of these workers malfunctioned. Therefore, noise measurement results were only available for three of rotary operators.

** The number of TWA measurements in the first survey is "95" because nearly all employees, except for three, wore two dosimeters (left side sample and right side sample).

5.4.2 Full-shift Time-weighted Average Noise Monitoring Results (Plant B)

The average and range (minimum and maximum) of TWA noise exposure of employees monitored in each job title across the three noise surveys is shown in Table 14.

Table 14: Full-shift TWA noise exposures by job title across all surveys for Plant B

Department	Job Title	Total Number of Samples	Number of Workers Sampled	Dose 1 Settings*: 5-dB Exchange Rate, 80 dB Threshold			Dose 3 Settings*: 3-dB Exchange Rate, 80 dB Threshold		
				Average** TWA (dBA)	Min TWA (dBA)	Max TWA (dBA)	Average** TWA (dBA)	Min TWA (dBA)	Max TWA (dBA)
Assembly	Counting Operator	15	6	97.3	95.8	98.3	98.3	96.7	99.2
Canning	Decorator	26	7	97.1	95.4	98.5	99	97.9	100
Assembly	Rotary Operator	12	3	96.2	95.2	97.1	98	97.1	98.9
Assembly	Press Operator 26 mm	10	4	95.8	93.6	97.5	97.4	95	98.8
Canning	Stretcher Operator	14	4	94.9	92.3	96.1	96.9	94.7	97.6
Canning	Stretcher Mechanic	17	4	93.4	88.7	96.3	95.7	94.2	98
Canning	Department Aid	14	4	92.4	90.8	93.8	94.9	93.4	96
Canning	General Mechanic	7	2	92.4	88.1	94.3	96.1	92	100.1
Canning	Mechanic - Rear Section	16	5	91.9	83.2	93.3	95.4	88.2	97.2
Lithography	Printing Press Operator	6	2	90.7	90	91	91.7	90.7	92
Lithography	Measurer	7	2	90.4	88.7	91.4	91.2	89.6	92
Lithography	Varnisher (Coater)	8	3	89.7	88.3	90.8	91.9	89.5	94
Canning	Packaging Operator	10	3	89.3	88.3	90.2	91.2	90.6	91.9

*Dose 1 setting results (in bold) are used for Quebec and OSHA noise exposure limits. Dose 3 setting results are used for NIOSH recommended noise exposure limits.

** Calculated using Equation 1

These results show that the average full-shift noise exposure of employees in all of the monitored job titles, except varnisher (coater) and packaging operator exceeded the Quebec OEL and OSHA PEL of 90 dBA, based on a 5-dB exchange rate and 80-dB threshold (dose 1 instrument setting). However, the average noise exposure for the varnisher and packaging operator job titles were nearly 90 dBA and sometimes exceeded 90 dBA, as evidenced by the maximum TWA measured in these jobs.

Additionally, it should be noted that the average noise exposure for all of the assembly department job titles monitored (counting operator, rotary operator, and press operator 26 mm) and for the canning department decorator job title were greater than 95 dBA.

Noise measurement results based on a 3-dB exchange rate and 80-dB threshold (dose 3 instrument setting) show that the average TWA was more than 6 dB greater than the NIOSH REL of 85 dBA for all of the monitored job titles.

The range of TWA exposures (Maximum TWA – Minimum TWA) was greater than 6 dB for employees in the following jobs: stretcher mechanic, general mechanic, and mechanic – rear section. By contrast, the range of TWA exposures was less than four dBA for all the other jobs and less than

two dBA for employees in the job titles printing press operator, rotary operator, and packaging operator.

Full-shift time-weighted average noise monitoring results for each employee who participated in the study are provided in Appendix R. The results for the dose 1 and dose 3 instrument settings are shown for each of the three noise monitoring surveys. Worker TWA noise exposure measurements, for compliance with both Quebec CSST and OSHA noise regulations, were measured using the Dose 1 instrument settings, which are highlighted with bold and italic font in the table. Because of U.S. government confidentiality requirements for research study participants, individual employee identification numbers are not provided in the table.

5.4.3 Comparison of Results Based on Dosimeter Microphone Placement (Plant B)

During Survey 1, nearly all employees wore dosimeter microphones on both their left and right shoulder to compare whether TWA noise exposures differed based on the microphone position. Table 15 shows the TWA results between the left side versus right side microphone position for both dose 1 and dose 3 instrument settings. For all of the left side versus right side dosimetry measurement comparisons ($n=46$), except one, the difference between the left and right TWA noise measurement result was less than or equal to 1 dBA. For one of the press operators the difference was nearly 4 dBA. The absolute difference between the left and right side measurement was 0.5 dBA or less for more than 70% of the measurements. For approximately 63% of the measurement pairs the left side measurement was greater than the right side measurement; for 26% the right side measurement was greater than the left side measurement; and for 11% the left and right side measurements were identical. The mean absolute difference across all jobs was 0.42 dBA ($SD=0.59$ dBA) for the dose 1 instrument settings and was 0.49 dBA ($SD=0.61$ dBA) for the dose 3 instrument settings. These results indicate minimal difference in TWA noise results between left and right shoulder dosimeter microphone placement. However, additional analysis will be conducted on this data to determine statistical significance.

Table 15: Comparison of 8-hour time-weighted average noise levels by left and right side microphone placement and exchange rate during Survey 1 for Plant B

Department	Job	Left Side		Right Side		Dose 1 Left vs Right Difference (Absolute Value)	Dose 3 Left vs Right Difference (Absolute Value)
		Dose 1 (dBA)	Dose 3 (dBA)	Dose 1 (dBA)	Dose 3 (dBA)		
Canning	Decorator	98.4	100	97.7	99.3	0.7	0.7
Canning	Decorator	98.1	99.6	97.9	99.4	0.2	0.2
Canning	Decorator	98	99.8	97.4	99.3	0.6	0.5
Canning	Decorator	97.4	99.9	97.7	99.5	0.3	0.4
Canning	Decorator	97.1	99.3	96.5	98.5	0.6	0.8
Canning	Decorator	96.7	98.6	96.9	98.8	0.2	0.2
Canning	Decorator	96.2	98.3	96	98.2	0.2	0.1
Canning	Stretcher Operator	95.8	97.3	95.5	97.4	0.3	0.1
Canning	Stretcher Operator	95.6	97.3	95.1	96.7	0.5	0.6
Canning	Stretcher Operator	94.3	97.4	94.1	97.1	0.2	0.3
Canning	Stretcher Operator	92.3	94.7	93.1	95.6	0.8	0.9
Canning	Stretcher Mechanic	95.8	96.9	96.1	97.2	0.3	0.3
Canning	Stretcher Mechanic	94	96	93.3	95.3	0.7	0.7
Canning	Stretcher Mechanic	92.3	95.3	91.4	94.3	0.9	1
Canning	Stretcher Mechanic	91.1	94.3	91.1	94.2	0	0.1
Canning	General Mechanic	94.1	96.2	93.9	95.9	0.2	0.3
Canning	General Mechanic	88.1	92	88.8	92.7	0.7	0.7
Canning	Mechanic - Rear Section	93.3	95	93	94.8	0.3	0.2
Canning	Mechanic - Rear Section	93	96	93.2	96.3	0.2	0.3
Canning	Mechanic - Rear Section	92.9	97.2	92.9	97.1	0	0.1
Canning	Mechanic - Rear Section	92.9	95.5	92.6	96.5	0.3	1
Canning	Department Aid	93.8	95.5	93.6	95.8	0.2	0.3
Canning	Department Aid	93.7	96	92.8	95	0.9	1
Canning	Department Aid	91.9	94.9	91.7	94.3	0.2	0.6
Canning	Department Aid	91.2	94.2	90.9	93.9	0.3	0.3
Canning	Packaging Operator	89.7	91.6	89.7	91.6	0	0
Canning	Packaging Operator	89.2	90.9	89.6	91.3	0.4	0.4
Canning	Packaging Operator	88.9	90.9	88.8	90.9	0.1	0
Assembly	Counting Operator	97.9	98.8	97.6	98.4	0.3	0.4
Assembly	Counting Operator	97.6	98.4	97	97.8	0.6	0.6
Assembly	Counting Operator	97.5	98.5	97	98	0.5	0.5
Assembly	Counting Operator	97.4	98.3	97.2	98.1	0.2	0.2
Assembly	Counting Operator	96.9	98.1	96.7	97.9	0.2	0.2
Assembly	Press Operator 26 mm	97.5	98.8	93.6	95	3.9	3.8
Assembly	Press Operator 26 mm	96.2	97.8	96.2	97.7	0	0.1
Assembly	Press Operator 26 mm	96.1	97.6	96.9	98.6	0.8	1
Assembly	Press Operator 26 mm	95.9	97.7	95.7	97.5	0.2	0.2
Assembly	Rotary Operator	97.1	98.8	97.1	98.9	0	0.1
Assembly	Rotary Operator	96.6	98.4	96.5	98.4	0.1	0
Lithography	Printing Press Operator	90.9	91.5	90	90.7	0.9	0.8
Lithography	Printing Press Operator	90.7	91.9	90.5	91.9	0.2	0
Lithography	Varnisher (Coater)	90.7	91.7	90.8	91.8	0.1	0.1
Lithography	Varnisher (Coater)	90.4	92.5	90.3	94	0.1	1.5
Lithography	Varnisher (Coater)	88.7	89.8	88.8	89.7	0.1	0.1
Lithography	Measurer	91.1	91.8	91.4	92	0.3	0.2
Lithography	Measurer	90.7	91.2	91.1	91.8	0.4	0.6
Mean difference between left and right						0.42	0.49
Standard deviation between left and right						0.59	0.61

5.4.4 Sound Level Measurement of Work Tasks (Plant B)

The average and range (minimum and maximum) of task sound level measurements across all jobs, based on the results of sound levels measured in the workers hearing zone using a hand-held sound level meter (Type-2) are presented in table 16 from highest to lowest task sound level average.

Table 16: Sound levels of tasks conducted by employees during noise monitoring surveys at Plant B

Task (machine)	Number of measurements	Sound Level (dBA)*		
		Average	Minimum	Maximum
Repair/Maintenance (Body Varnish Machine)	1	109.4	109.4	109.4
Repair/Maintenance (Decorator)	5	101	98	103.8
Monitor Operation (Inspection) of the decorator	14	100.8	97.4	103.2
Adjust Machine (press 26 mm or counting machine)	16	100.4	95.8	102.8
Cleaning (Counting Machine)	6	100.3	98.1	102.3
Choosing Ink (near decorator)	1	100.1	100.1	100.1
Monitor Machine Rotary or Press 26 mm)	14	99.9	94.7	103.1
Monitor Spray Machine	1	99.9	99.9	99.9
Repair/Maintenance (Flanger)	1	99.2	99.2	99.2
Repair/Maintenance (Stretcher)	4	99.2	96.7	102.3
Repair/Maintenance (canning department)	47	99.1	82.1	104.9
Monitor Production (close)	11	99	96.5	101.6
Repair/Maintenance (Necker)	5	99	92.7	101.6
Finishing Station	3	98.8	96.9	99.8
Repair/Maintenance (Waxer Machine)	3	98.5	96.8	99.6
Repair/Maintenance (Spray Cleaning Machine)	1	98.4	98.4	98.4
Repair/Maintenance (Recycling Machine)	2	97.6	96.5	98.6
Clean Tools with Degreaser	1	97.5	97.5	97.5
Monitor Production (distance)	4	97.4	95.7	99
Repair/Maintenance (Spin Necker Flanger)	1	97.3	97.3	97.3
Repair/Maintenance (Conveyor)	4	96.8	95.6	98
Repair/Maintenance (Aluminum Compactor)	1	96.7	96.7	96.7
Repair/Maintenance (Coater)	1	96.7	96.7	96.7
Change Decorations (Decorator)	9	96.3	90.8	103.7
Repair/Maintenance (Washer/Dryer)	4	96.1	91.3	98
Work Bench (near stretcher area)	6	96.1	91.3	97.2
Repair/Maintenance (Anti-Pollution Sheet)	4	95.7	92.6	98.7
Replace Aluminum Sheet	3	95.7	94.8	96.9
Quality Control	29	95	37.1	102.1
Palletizer Area	3	94.4	92.8	95.7
Cleaning of Garbage Waste	1	94.3	94.3	94.3
Repair/Maintenance (Light Test Machine)	1	94	94	94
Set-Up	14	93.6	87.1	100.5
Change Aluminum Roll	15	93.5	85.3	98
Drive Fork Lift	14	93.2	82.1	98.8
Monitor Press (infeed)	2	92.4	92	92.7
Maintenance (feeder)	4	91.7	88.3	93.9
Machine Downtime	2	91.6	90.9	92.2
Repair/Maintenance (Palletizer)	1	91.5	91.5	91.5
Repair/Maintenance (Cyclone)	2	91.3	80.8	95.4

Task (machine)	Number of measurements	Sound Level (dBA)*		
		Average	Minimum	Maximum
Monitor Press (along press)	5	91.2	89.4	92.6
Repair/Maintenance (Incinerator or Damper)	7	91	84	95.6
Closing (Shut Down)	2	90.4	88.8	91.7
Power Tool Use	5	90	83.1	94.8
Repair/Maintenance (Wrapper Machine)	1	89.1	89.1	89.1
Repair/Maintenance (Roof)	3	86.1	71.4	93.2
Working at computer	1	86	86	86
Aluminum Recycling Area	1	85.6	85.6	85.6
Mixing Products	2	84.7	83.1	86
Machine Shop Activities	18	83.7	43.8	97.7
Pallet Area	1	83.6	83.6	83.6
Office Work	26	75.4	43.6	84.9
Repair/Maintenance (Duster)	1	75.3	75.3	75.3
Break	82	74.7	40.2	94.3
Machining	5	72.2	43.6	79.3
Lunch	22	66	43.1	80.2
Tool Room	6	65.8	57.1	70.3
Filling Chemicals	1	51.7	51.7	51.7

* Dose 1 instrument settings: 5-dB exchange rate and 80-dB threshold

Average sound levels for nearly 75% of the tasks observed during the study exceeded 90 dBA (in bold font in Table 8) and the sound level for 50% of the tasks were greater than 95 dBA. Six tasks had an average sound level greater than 100 dBA and for one of the tasks the sound level was nearly 110 dBA. Most tasks with sound levels above 95 dBA were conducted near equipment in the canning and assembly departments and were related to repair/maintenance or monitoring activities.

Average task sound levels for each job title are shown in Appendix S. These results, displayed from highest to lowest task sound level average, show the tasks in each job that have the highest sound levels and are potentially the most important contributors to workers' overall noise exposures in each job title, depending on the time spent in the task.

5.4.5 Octave Band Sound Level Measurements (Plant B)

Octave band sound noise measurements were conducted at several machines considered to have the potential to generate impact noise. The results, which show the average sound level, peak level, and octave band sound levels recorded during each measurement, are presented in Table 17. These measurements were taken at positions close to the primary noise source and also at the typical employee work position.

Octave band sound levels were primarily high frequency in nature at the spin necker flanger. At the finishing machine the highest sound levels were measured across the middle and high frequencies. Sound levels were dominant in both the low and high frequencies at the cap presses. For the decorator, sound levels were greater than 90 dB across the entire frequency spectrum with the highest levels at 4000 and 8000 Hz. At the cap presses, sound levels were generally the highest at 8000 Hz, with secondary high levels between 63 Hz and 500 Hz. Sound levels were highest in the low and middle frequencies at the stretcher machines and middle frequencies at the aluminum stamping press.

Octave band results presented in this report should be viewed as preliminary because the measurements were not collected for the purpose of formulating an engineering noise control plant.

These measurements were used primarily to identify areas where peak sound levels potentially exceeded 120 dB for further measurement of impact noise, as part of the study.

Table 17: Octave Band Sound Level Measurements at Plant B, June 2003

Department	Machine	Measurement Location	Position	Sound Level (dBA)	Peak (dBA)	Octave Band Center Frequency, Hz							
						63	125	250	500	1000	2000	4000	8000
Canning	Aluminum Stamping Press	Near Aluminum Press	SLM1	96.5	116.9	86.1	82.3	89.3	88.4	89.7	83.0	80.5	74.8
		Typical Operator Location	SLM2	93.0	111.9	85.1	82.7	87.1	87.4	89.6	82.8	81.1	78.6
Canning	Can Extruder (Stretcher)	Near Extruder	SLM1	101.1	121.4	93.3	93.8	92.8	95.0	92.6	94.0	88.6	87.7
Canning	Decorator	Under Output Conveyor	SLM1	109.9	128.7	92.0	94.8	90.8	94.6	94.4	94.7	96.0	99.8
		Typical Operator Location	SLM2	103.5	122.5	87.3	95.7	92.7	93.8	95.3	97.4	97.1	94.8
Canning	Finishing Machine	Near Press	SLM1	102.1	121.3	86.1	92.6	91.0	95.0	95.3	95.2	95.9	96.7
		Typical Operator Location	SLM2	100.1	117.3	91.1	86.9	90.1	93.7	93.4	93.3	94.8	86.9
Canning	Spin Necker Flanger	Near Machine	SLM1	106.2	117.1	80.0	86.2	82.7	88.8	90.9	94.1	91.7	87.8
		Typical Operator Location	SLM2	101.1	116.9	Machine shut down before measurement taken							
Assembly	Cap Press	Near Press Machine #3	SLM1	100.8	123.4	86.3	91.1	95.7	92.2	92.9	88.4	89.2	95.4
		Typical Operator Location	SLM2	100.3	116.0	Machine shut down before measurement taken							
Assembly	Cap Presses	Near Press Machine #5	SLM1	100.4	121.1	Machine shut down before measurement taken							
		Between Press #5 and #6	SLM2	100.2	116.8								
Assembly	Cap Presses	Near Press Machine # 3	SLM1	103.2	121.5	90.5	94.6	90.0	89.5	88.5	88.2	89.7	96.0
		Between Press #3 and #4	SLM2	98.0	117.2	87.6	92.6	89.3	90.1	94.3	92.3	90.5	92.2
Assembly	Cap Presses	Near Press Machine #4	SLM1	101.2	121.2	89.1	93.4	95.5	100.8	96.4	93.3	91.6	95.9
		Between Press #4 and #5	SLM2	96.5	97.1	87.5	89.6	87.6	95.8	91.8	89.3	89.2	91.4
Assembly	Cap Presses	Bin End of Machine #5	SLM1	99.4	120.4	94.7	88.8	92.4	89.1	86.3	89.0	88.4	98.1
		Between Machines	SLM2	96.3	114.6	89.3	89.2	87.1	89.0	92.0	88.4	87.5	90.4

Note: SLM1 refers to measurements taken near the noise source, typically about 1/3 meter distance. SLM2 refers to measurements taken at a typical employee work position

5.4.6 Hearing Protector Usage (Plant B)

During direct observation of workers, data collection technicians noted the amount of time monitored workers wore hearing protection during the work shift. The percent time hearing protectors were worn by observed workers is presented in Table 18. It should be noted that these results are based on only one day of observation for each worker during the first survey.

Table 18: Percent of time hearing protection worn during the work shift (first survey)

Job	Percent Time HPD Used*	Job	Percent Time HPD Used*
Decorator	100	Packaging Operator	98.4
Decorator	100	Packaging Operator	96.5
Decorator	100	Packaging Operator	94.2
Decorator	99.5	Counting Operator	100
Decorator	98.1	Counting Operator	100
Decorator	98.1	Counting Operator	100
Decorator	83.9	Counting Operator	100
Stretcher Operator	100	Counting Operator	100
Stretcher Operator	100	Counting Operator	100
Stretcher Operator	100	Press Operator 26 mm	100
Stretcher Operator	100	Press Operator 26 mm	100
Stretcher Mechanic	100	Press Operator 26 mm	100
Stretcher Mechanic	100	Press Operator 26 mm	100
Stretcher Mechanic	100	Rotary Operator	100
Stretcher Mechanic	72.1	Rotary Operator	100
General Mechanic	100	Rotary Operator	100
General Mechanic	99.3	Rotary Operator	100
Mechanic - Rear Section	100	Printing Press Operator	100
Mechanic - Rear Section	97.8	Printing Press Operator	100
Mechanic - Rear Section	95.6	Varnisher (Coater)	100
Mechanic - Rear Section	88.5	Varnisher (Coater)	100
Mechanic - Rear Section	66.2	Varnisher (Coater)	91.7
Department Aid	100	Measurer	100
Department Aid	100	Measurer	100
Department Aid	100		
Department Aid	92.7		

* Data excludes hearing protection use percentages during lunch or breaks

All of the observed employees in the assembly department jobs (counting, press 26 mm, and rotary operator) and nearly all of the observed employees in the lithography department jobs (printing press, varnisher, and measurer) wore hearing protection for the entire work shift. Overall, 50 employees were observed during the first survey of the study, 35 employees wore their hearing protection for the entire work shift, 11 wore hearing protection from 90 to 99.5% of the work shift, two wore hearing protection from 80 to 90% of the work shift, and two wore hearing protection from 65 to 80% of the work shift.

Based on TWA noise monitoring results, employees in all of the observed job titles are required to wear hearing protection by Quebec noise regulations. More detailed tables showing the average percent time hearing protection was used for each job group during each task are provided in Appendix T.

5.5 Plant C Results

5.5.1 Number of Workers Monitored (Plant C)

A total of 110 full-shift dosimetry measurements were collected on 30 workers participating in the study from this plant. Most of the measurements were collected during the first survey. Twenty-six of the workers had noise measurements taken three separate times during the period from August 2003 to January 2004. The number of noise measurements and workers monitored during each survey is shown in Table 19.

Table 19: Number of employees in each job title monitored for noise at Plant C

Department	Job Title	Survey 1	Survey 2	Survey 3
New, Used, and Rental Equipment Repair Sections	Heavy Equipment Repair Technician (Mechanic)	9*	8	8
Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas	Motor Rebuilding Technician (Mechanic)	4	3	3
Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas	Transmission Rebuilding Technician (Mechanic)	1	1	1
Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas	Cylinder Head Rebuilding Technician (Mechanic)	1	1	1
Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas	Hydraulic Pump Rebuilding Technician (Mechanic)	1	1	1
Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas	Fuel Injector Rebuilding Technician (Mechanic)	1	1	1
Machining Areas	Machinist - Operations Section	3	3	3
Machining Areas	Machinist - Welding Section	2	2	2
Machining Areas	Machinist - Hydraulic Cylinder Repair, Bay 56/58	2	2	2
Welding	Welder	4	4	4
Track	Painter	1	1	0
Track	Track Repair	1	0	0
Total number workers monitored during each survey		30	27	26
Total number of TWA measurements		57**	27	26

* Note 1: One of these employees was a supervisor and had substantially different job tasks compared to the other employees in this job title. The supervisor was not monitored in the 2nd and 3rd surveys and his TWA exposure was not used when averaging noise exposures for this job group.

** The number of TWA measurements in the first survey is "57" because nearly all employees, except for three, wore two dosimeters (left side sample and right side sample).

5.5.2 Full-shift Time-weighted Average Noise Monitoring Results (Plant C)

The average and range (minimum and maximum) of TWA noise exposure of employees monitored in each job title across the three noise surveys is shown in Table 20.

Table 20: Full-shift TWA noise exposures by job title across all surveys for Plant C

Department	Job Title	Total Number of Samples	Number of Workers Sampled	Dose 1 Settings*: 5-dB Exchange Rate, 80 dB Threshold			Dose 3 Settings*: 3-dB Exchange Rate, 80 dB Threshold		
				Average** TWA (dBA)	Min TWA (dBA)	Max TWA (dBA)	Average** TWA (dBA)	Min TWA (dBA)	Max TWA (dBA)
Machining Areas	Machinist - Bay 56/58	8	2	69.7	61.8	74.4	78.5	71.6	83
Machining Areas	Machinist - Operations Section	11	3	75.5	69.7	81.1	81.8	78	86.4
Machining Areas	Machinist - Welding Section	7	2	78.7	70	81.2	83.8	78.2	86.3
Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas	Cylinder Head Rebuilding Technician (Mechanic)	4	1	76.4	73.4	79.9	82.9	79.8	85.1
Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas	Fuel Injector Rebuilding Technician (Mechanic)	4	1	73.1	72.2	75	80.3	78.8	81.7
Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas	Hydraulic Pump Rebuilding Technician (Mechanic)	4	1	75	73	76.3	82.3	80.7	83.3
Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas	Motor Rebuilding Technician (Mechanic)	14	4	79.6	70.3	86.9	89.7	78.2	95.2
Motor, Transmission, Cylinder Head, Hydraulic Pump, and Fuel Injector Rebuilding Areas	Transmission Rebuilding Technician (Mechanic)	4	1	81.7	80.4	83.8	87.1	86.1	87.8
New, Used, and Rental Equipment Repair Sections	Heavy Equipment Repair Technician (Mechanic)	33	9	76.3	65.4	83.2	84	73.9	90.4
Track	Painter	3	1	80.8	78.6	83.1	86.4	81.9	89.5
Track	Track Repair	2	1	83.2	83	83.4	89.1	89.1	89.1
Welding	Welder	16	4	90.3	79.9	101.4	97.5	84.1	105.7

* Dose 1 setting results (in bold) are used for Quebec and OSHA noise exposure limits. Dose 3 setting results are used for NIOSH recommended noise exposure limits.

** Calculated using Equation 1

These results show that the average TWA noise exposure of employees in the welder job title exceeded the Quebec OEL and OSHA PEL of 90 dBA, based on a 5-dB exchange rate and 80-dB threshold (Dose 1 settings). Additionally, the TWA noise exposure reached a maximum of 101.4 dBA for one of the welder's monitored. Noise exposures in the motor rebuilding technician job sometimes exceed the OSHA Action Level of 85 dBA, as evidenced by a maximum TWA of 86.9 dBA in this job. Average noise exposure levels in none of the other jobs monitored exceeded Canadian or U.S. regulatory limits.

By contrast, noise measurement results using a 3-dB exchange rate and 80-dB threshold (dose 3 instrument setting) show that the average TWA exceeded the NIOSH REL of 85 dBA for the welder,

motor rebuilding technician, transmission rebuilding technician, track repair, and painter jobs. Noise exposures also sometimes exceeded the NIOSH REL for the heavy equipment repair technician, cylinder head rebuilding technician, welding section machinist, and operation section machinist jobs, based on maximum TWA values greater than 85 dBA for these jobs.

The range of TWA exposures was greater than 10 dBA for employees in the following jobs: welder, motor rebuilding technician, heavy equipment repair technician, and all the machinist jobs. Only one worker was monitored in the cylinder head rebuilding technician, fuel injector rebuilding technician, hydraulic pump rebuilding technician, transmission rebuilding technician, painter, and track repair job titles, therefore, there were not enough TWA noise measurements to adequately evaluate noise exposure variability in these job titles.

Full-shift time-weighted average noise monitoring results for each employee who participated in the NIOSH noise study are provided in Appendix R. The results for the dose 1 and dose 3 instrument settings are shown for each of the three noise monitoring surveys. Worker TWA noise exposure measurements, for compliance with both Quebec CSST and OSHA noise regulations, were measured using the Dose 1 instrument settings, which are highlighted with bold and italic font in the table. Because of U.S. government confidentiality requirements for research study participants, NIOSH assigned employee identification numbers are used instead of company-assigned employee identification numbers.

5.5.3 Comparison of Results Based on Dosimeter Microphone Placement (Plant C)

During Survey 1, nearly all employees wore dosimeter microphones on both their left and right shoulder to compare whether TWA noise exposures differed based on the microphone position. Table 21 shows the TWA results between the left side versus right side microphone position for dose 1 and dose 3 instrument settings. For nearly all jobs the difference between the right side and left side TWA noise levels was less than 2 dBA. For two of the welders the difference was greater than 2 dBA. The mean difference across all jobs was 0.77 dBA (SD=0.79 dBA) for the dose 1 instrument settings and was 0.91 dBA (SD=1.00 dBA) for the dose 3 instrument settings. These results indicate minimal difference in TWA noise results between left and right shoulder dosimeter microphone placement. However, additional analysis will be conducted on this data to determine statistical significance.

Table 21: Comparison of 8-hour time-weighted average noise levels by left and right side microphone placement and exchange rate during Survey 1 at Plant C

Job	Survey 1				Dose 1 Left vs Right Difference (Absolute Value)	Dose 3 Left vs Right Difference (Absolute Value)
	Dose 1		Dose 3			
	Left Side (dBA)	Right Side (dBA)	Left Side (dBA)	Right Side (dBA)		
Heavy Equipment Repair Technician (Mechanic)	79.9	79.4	87.6	87.4	0.5	0.2
Heavy Equipment Repair Technician (Mechanic)	77.9	80	85.3	84.3	2.1	1.0
Heavy Equipment Repair Technician (Mechanic)	77.1	76.9	81.7	81.3	0.2	0.4
Heavy Equipment Repair Technician (Mechanic)	76.9	76.4	84.6	83.5	0.5	1.1
Heavy Equipment Repair Technician (Mechanic)	75.5	75.9	84	83.9	0.4	0.1
Heavy Equipment Repair Technician (Mechanic)	73.5	73.4	79.5	79.7	0.1	0.2
Heavy Equipment Repair Technician (Mechanic)	70.3	70.3	79.1	78.3	0.0	0.8
Heavy Equipment Repair Technician (Mechanic)	65.4	66	73.9	74.4	0.6	0.5
Cylinder Head Rebuilding Technician (Mechanic)	75.7	75.1	82.3	82.7	0.6	0.4
Fuel Injector Rebuilding Technician (Mechanic)	72.3	72.7	79.9	80.1	0.4	0.2
Hydraulic Pump Rebuilding Technician (Mechanic)	76.3	75.8	83.3	83.1	0.5	0.2
Motor Rebuilding Technician (Mechanic)	86.5	86.9	94.9	95.2	0.4	0.3
Motor Rebuilding Technician (Mechanic)	84.9	85.8	94	95	0.9	1.0
Motor Rebuilding Technician (Mechanic)	71.3	72.3	78.4	79.6	1.0	1.2
Motor Rebuilding Technician (Mechanic)	70.5	70.3	80	78.6	0.2	1.4
Transmission Rebuilding Technician (Mechanic)	80.7	80.4	87.8	86.5	0.3	1.3
Machinist - Bay 56/58	70.5	70.2	79.1	78.6	0.3	0.5
Machinist - Bay 56/58	61.8	62.7	71.6	72.4	0.9	0.8
Machinist - Operations Section	76.5	76.2	81.2	81.1	0.3	0.1
Machinist - Operations Section	74.6	75.8	80.9	81.7	1.2	0.8
Machinist - Welding Section	76.7	77.5	81.1	81.8	0.8	0.7
Welder	93.5	93.7	99.1	99.3	0.2	0.2
Welder	89.2	85.5	95.8	91.5	3.7	4.3
Welder	85.2	87.3	93.8	97.3	2.1	3.5
Welder	82.1	82.9	86.1	87.3	0.8	1.2
Track Repair	83	83.4	89.1	89.1	0.4	0.0
Painter	78.6	80.1	81.9	84	1.5	2.1
Mean difference between left and right					0.77	0.91
Standard deviation					0.79	1.00

5.5.4 Sound Level Measurement of Work Tasks (Plant C)

The average and range (minimum and maximum) of task sound level measurements across all jobs, based on the results of sound levels measured in the workers hearing zone using a hand-held sound level meter (Type-2), based on a 5-dB exchange rate and 80 dB threshold, are presented in Table 22.

Table 22: Sound levels of tasks conducted by employees during noise monitoring surveys at Plant C

Task	Number of measurements	Sound Level (dBA)*		
		Average	Minimum	Maximum
Bearing Heating	2	72.9	69.4	75.3
Break	79	69.8	45.2	82.2
Chemical Dip Tank	3	85.9	82.1	89.4
Cleaning	22	76.8	40.1	87.7
Compressed Air	35	94.3	66.7	107.7
Control Booth	3	58.5	56.8	59.8
<i>Cutting Torch (acetylene)</i>	9	87.5	65.8	99.6
<i>Drive Fork Lift</i>	12	87.7	63.1	97.5
Driving Service Car	1	77.2	77.2	77.2
Hammer	32	92.4	40	102.4
Hand Truck	7	75.2	68.4	82.9
Lunch	66	65.9	30.9	84.2
Metalizing	4	84.5	83.1	85.3
Office Work	59	60.8	44.6	72
Open and Close Bay Door	2	84.6	82.3	86.4
<i>Operate Heavy Equipment</i>	18	85.3	53.7	93.6
Overhead Hoist/Pulley	38	74.3	49	89.4
Paint Storage Room	1	82.5	82.5	82.5
Painting Activities	2	64.3	57.4	67.8
Parts Washers	14	76.5	42.7	84.3
Planning Work	94	74.4	33	86.8
Power Hand Tools (pneumatic or electric)	83	91.9	58	103.3
<i>Pumping Fluids</i>	6	85.6	69	91.9
<i>Repair</i>	79	83.5	24.2	100.3
Spray Painting	1	83.5	83.5	83.5
Spray with high pressure washer	14	91.4	80.3	101.5
<i>Stationary Machine Use</i>	53	80.9	52.9	98.7
<i>Stationary Power Tools</i>	37	83.7	51.6	94
Test Engines	4	104.3	91	109.5
Test Fuel Injection Pump	3	82.9	50.1	87.6
Test Fuel Injector	2	85.1	83.1	86.7
Test Hydraulic Pump	2	93.5	87.7	96.7
Tool Room	1	58.8	58.8	58.8
Use Press	1	83.8	83.8	83.8
Welding	12	94.5	56.2	111.4

* Dose 1 instrument settings: 5-dB exchange rate and 80-dB threshold

Average sound levels exceeded 90 dBA for the following tasks (highlighted in bold and italic font in Table 22): compressed air, hammer, power hand tools (pneumatic or electric), spray with high pressure water, test engines, test hydraulic pump, welding. Notably the sound level for the task, test engines, was greater than 104 dBA. Additionally, sound levels for the following tasks also exceeded 90 dBA sometimes (in italic font), based on the maximum sound level measured: cutting torch (acetylene), drive fork lift, operate heavy equipment, pumping fluids, repair, stationary machine use, and stationary power tools.

Average task sound levels for each job title are shown in Appendix S. These results, displayed from highest to lowest task sound level average, show the tasks in each job that have the highest sound levels and are potentially the most important contributors to workers' overall noise exposures in each job title, depending on the time spent in the task.

5.5.5 Octave Band Sound Level Measurements (Plant C)

Sound levels and octave band noise measurements were collected during the use of several different tool or activities which were considered to generate impact noise. The results, which show the average sound level, peak level, and octave band sound levels recorded during each measurement, are presented in Table 23. These measurements were taken at positions close to the primary noise source and at the typical employee work position.

Sound levels were found to be primarily high frequency in nature for the following repair activities: use of a ¾" air wrench, removing bolts from the track or from other equipment, and welding. For each of these activities, sound levels in the high frequencies were greater than 100 decibels. For removing of wear plates sound levels were predominant in both high and low frequencies. The middle frequencies were dominant for removing pins. Peak sound levels exceeded 120 dBA for all except one of the noise events measured. Additionally, the average sound level during each event measurement ranged from 95 dBA to 110 dBA, for nearly all of the measurements.

Octave band results presented in this report should be viewed as preliminary because the data represent spot checks at several different locations in the facility or during use of various tools, but were not collected for the purpose of formulating a noise control plan. These measurements were used primarily to identify areas where peak sound levels exceeded 120 dBA for further measurement of impact noise, as part of the NIOSH study. The company should consider conducting additional octave band analysis in future surveys to verify these results and help determine the type of noise engineering controls that might be feasible.

Table 23: Octave Band Sound Level Measurements for Plant C, June 2003

Noise Event	Position	Sound Level (dBA)	Peak (dBA)	Octave Band Center Frequency, Hz.							
				63	125	250	500	1000	2000	4000	8000
3/4" Air Wrench	SLM1	99.9	128.5	82.0	83.5	93.1	97.3	99.4	97.8	99.5	103.4
	SLM2	101.2	131.7	87.6	88.2	96.6	99.8	103.1	103.8	105.2	107.5
3/4" Air Wrench	SLM1	100.1	125.9	Job completed before octave data taken							
	SLM2	91.2	118.4								
Remove Track Bolts	SLM1	109.3	136.4	71.3	76.4	80.0	72.8	72.9	74.2	76.2	73.6
	SLM2	103.1	131.8	69.4	74.6	75.8	68.7	69.7	69.1	66.8	68.1
Remove Track Bolts	SLM1	108.4	134.9	84.6	88.0	99.4	99.2	98.5	102.9	107.8	102.2
	SLM2	106.7	130.5	71.6	73.5	72.8	69.5	64.5	67.8	65.8	61.8
Remove Pins	SLM1	98.6	141.9	66.8	72.3	86.2	90.5	87.9	88.9	84.9	78.0
	SLM2	91.5	136.0	67.6	73.1	86.3	90.3	86.3	85.7	79.1	71.6
Air Wrench to Remove Bucket Bolts	SLM1	107.8	136.6	Job completed before octave data taken							
	SLM2	104.9	129.3								
Welding	SLM1	104.1	129.3	76.9	77.6	81.5	91.1	98.2	105.5	109.1	106.2
	SLM2	100.2	121.0	77.6	77.3	78.3	86.3	92.3	97.3	99.3	95.7
Remove Wear Plate	SLM1	101.5	135.0	83.2	90.4	94.5	91.9	93.3	92.9	95.6	96.6
	SLM2	98.4	127.9	79.2	86.6	92.6	91.5	91.9	95.7	98.3	99.6
Remove Bolts	SLM1	99.2	135.0	84.4	83.9	88.3	89.2	92.7	95.1	96.4	98.1
	SLM2	96.9	127.9	80.4	81.9	86.1	86.9	87.6	90.1	92.7	93.9
Remove Bolts	SLM1	101.8	135.5	73.0	75.6	70.8	67.9	73.2	68.6	66.9	61.6
	SLM2	97.2	125.8	72.2	73.6	67.4	61.3	61.8	57.2	55.1	50.6
Remove Bolts	SLM1	108.4	138.1	81.9	93.4	88.2	93.3	98.3	100.7	103.8	102.0
	SLM2	105.6	126.8	76.5	93.5	92.6	95.8	94.6	101.3	110.0	105.0
Dropping Tread	SLM1	104.1	141.6	75.1	67.5	67.3	70.9	82.4	81.6	62.1	56.7
	SLM2	102.5	140.0	73.6	68.2	68.4	69.9	79.0	78.1	61.3	55.7

NOTE: SLM1 refers to measurements taken near the noise source, typically about 1/3 meter distance. SLM2 refers to measurements taken at a typical employee work position.

5.5.6 Hearing Protector Usage (Plant C)

During direct observation of workers, data collection technicians noted the amount of time monitored workers wore hearing protection during the work shift. A summary of the percent of time hearing protectors were worn by observed workers during the first survey are presented in Table 24. It should be noted that these results are based on only one day of observation for each worker during the first survey.

Table 24: Percent of work shift hearing protection worn during the first survey

Job Group*	Number of Monitored Workers	Percent Time HPD Worn	
		Minimum	Maximum
Heavy Equipment Repair Technicians (Mechanic)	9	0	46.4
Machinists	7	0	98.9
Rebuilding Technicians (Mechanic)	8	0	41.8
Welders	4	0	100

* Track Repair and Painter were not included in this table because only 1 worker was in each job group.

The percent of time hearing protection was worn by observed employees during the work shift varied greatly. Some of the workers in each job group did not wear hearing protection at all. The maximum amount of time hearing protection was used by workers in the heavy equipment repair and rebuilding groups was less than 50% of the work shift. However, the maximum amount of time hearing protection was worn by workers in the machinist and welder groups was 98.9% and 100%, respectively. Based on TWA noise monitoring results, welder is the only job title in which hearing protection use would be required by Quebec noise regulations. More detailed tables showing the average percent time hearing protection was used for each job group during each task are provided in Appendix T. Overall, welders wore hearing protection for more than 85% of the time during three of the four tasks with the highest sound levels (welding, power hand tools, cutting torch). However, hearing protection was only worn an average of 33% of the time during the task, hammer, which had the highest task sound levels.

5.6 Time-at-Task Results for Job Groups

For all of the jobs during the first survey the employees participating in the study were observed by data collection technicians for the entire work shift. One of the purposes of direct worker observation was to document the different work tasks that workers conducted and the total time for each task (by noting the start and stop time of each task occurrence). Appendix U provides a summary of time-at-task results for each job group. In addition to the number of workers observed and a list of tasks conducted in each job group, the tables provide the mean number of different tasks conducted by these workers; and the mean, minimum, and maximum number of total minutes each task was conducted during the work shift. NIOSH analysis of time-at-task is ongoing and will be presented in future research publications.

5.7 Impact Noise Measurements

As part of the study, NIOSH also collected comprehensive detailed noise measurements of multiple impact noise sources at several locations and near multiple pieces of equipment in the facility. A report of the impact noise measurement survey has been prepared and is available separately [Faulkner 2004]. Comprehensive analysis of the impact noise measurements will provide more data on the frequency distribution of noise at this plant and will be used to estimate worker risk of hearing loss, based on exposure to both impact noise and continuous noise in the work place. This analysis is ongoing and will be presented in future research publications.

6. DISCUSSION AND RECOMMENDATIONS

6.1 Plant A Discussion and Recommendations

6.1.1 Employee Noise Exposures (Plant A)

The average full shift time-weighted average (TWA) noise exposure of grinder operators exceeded the Quebec occupational exposure limit of 90 dBA. Individually, the TWA noise exposure of grinder operators (Appendix R) ranged from a low of 82.7 dBA to a high of 100.4 dBA. Eight of the individual TWA noise exposure measurements exceeded 95 dBA. The large range of TWA noise exposures indicates that exposures are highly variable and dependent on the amount of time spent in the highest noise level tasks. For grinder operators two tasks, "compressed air" and "load grinder" had substantially high noise levels, with an average noise level during the task of 101 dBA (range: 87.2 - 108.2 dBA) and 97.8 dBA (range: 91.8 - 103.7 dBA), respectively. Grinder operators spent the most number of minutes per day (average = 172.4 minutes) in the task "load grinder" and an additional 31 minutes, on average, in the task "compressed air." At the average noise level for "load grinder" of 97.8 dBA, a worker's TWA noise exposure would exceed 90 dBA after only 2 hours and 43 minutes of loading the grinder, even if the employee worked in very low noise tasks (noise exposure less than 80 dBA) for the remainder of the work shift. At the maximum noise level of 103.7 dBA for "load grinder" a workers TWA noise exposure would exceed 90 dBA in only 1 hour and 12 minutes.

Employees in none of the other monitored job titles had average exposures in excess of Quebec noise exposure limits. However, the maximum TWA noise exposure measured in two of the jobs, slitter operator and maintenance mechanic, were greater than 90 dBA. Additionally, maximum TWA noise exposures in the job titles, weigh station operator and thermoforming operator, were less than ½ dBA below 90 dBA. Review of individual TWA noise exposure results in these jobs indicates that in most cases exposures are less than 90 dBA. However, TWA noise exposures within these job titles varied from 9 to 15 dBA, which is indicative of variable amounts of time spent in high noise tasks. On any given day, depending on the amount of time an employees conducts high noise tasks (i.e. those tasks with noise levels greater than 90 dBA), an employee's TWA exposure could exceed 90 dBA. Based on task sound levels, the number of minutes employees could spend in various tasks before Quebec noise exposure limits would be exceeded can be calculated using the following equation:

$$T = \frac{8}{2^{(L-90)/5}}$$

Where T = maximum time allowed at given sound level before Quebec exposure limit is exceeded and L = measured sound level (dBA)

It should be noted that employees in the thermoforming department work 12-hour shifts. Because of the increased risk of hearing loss from extended exposures to high noise levels (> 85 dBA), NIOSH recommends adjusting exposure limits downward for extended work shifts. If an extended shift noise exposure limit adjustment were applied to the Quebec 8-hour OEL of 90 dBA, the 12-hour limit would be reduced to 87.1 dBA. The average TWA noise exposure in thermoforming department job titles did not exceed this downward adjusted level. However, the maximum TWA measured in the thermoforming department jobs were greater than 87.1 dBA. Because it is more protective of hearing, it is advisable for the company to use the extended work shift adjusted noise exposure limit for employees who work 12-hour shifts.

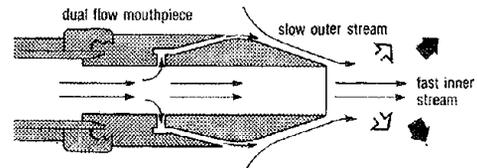
Measured TWA noise exposures for employees in all of the monitored job titles, except fork lift driver, maintenance electrician, mold machinist, and building maintenance, exceeded the NIOSH REL of 85 dBA, based on integrating noise levels using a 3-dB exchange rate (dose 3 settings) instead of the 5-dB exchange rate specified by Quebec regulations. For employees working a 12-hour shift the adjusted NIOSH REL is 83.2 dBA. Although the NIOSH REL for noise is not a legally enforceable regulatory standard, the current body of scientific evidence indicates that it is more protective in the prevention of hearing loss than noise exposure limits that are based on an exchange rate of 5-dB. NIOSH would therefore encourage the company to utilize the noise exposure measurement results based on NIOSH noise monitoring criteria to determine which employees to include in the hearing loss prevention program.

6.1.2 Noise Control (Plant A)

The optimal method of reducing worker noise exposure is through the implementation of effective noise control measures such as reduction of noise generated by equipment, proper maintenance and repair of equipment, complete or partial enclosure of equipment, or isolation of the workers from the equipment noise. Successful reduction of noise levels to below occupational exposure limits can reduce the long term costs associated with hearing loss prevention program and medical treatment of employees with hearing loss. Some noise controls are relatively inexpensive and easy to implement. However, noise controls can also be very difficult to successfully implement and may have high initial costs.

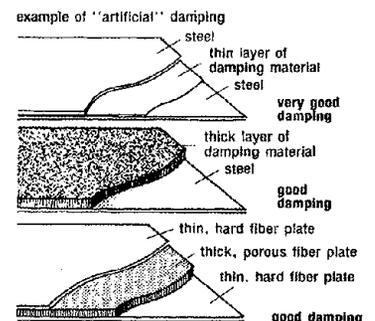
Because the grinder operators had the highest TWA noise exposures and were exposed to some of the highest task-related noise levels from work activities near the grinder (load grinder) and the use of compressed air, the company should initially focus its noise control efforts on noise reduction in the grinder. Therefore, consider the following noise control options to reduce noise levels and exposures in the grinder rooms, and in other areas of the plant, if applicable.

1) Replace simple tubular compressed air nozzles with dual flow nozzles or other type of low noise compressed air nozzle. Air exits simple tubular nozzles at very high speeds and usually generates strong high frequency noise. In a dual flow air nozzle a central stream of air moves at a high velocity, but the outer stream of compressed air moves at a slower velocity and generates less noise. Some manufacturers of low noise compressed air nozzles indicate that noise levels can be reduced by 10 dB or more by using low noise nozzles. Low noise nozzles may also use less compressed air, which can save money.



2) Construct a noise enclosure around the grinders. Properly designed enclosures are particularly effective at reducing mid to high frequency noise. A full enclosure, when feasible, is typically the best control technique. Sometimes machines or equipment cannot be fully enclosed and still function properly. In these situations a partial enclosure, which encloses the noisiest part(s), should be used.

3) Transmission of vibration and noise across the metal surface of the grinder infeed chute is generated when plastic pieces strike the inner surface of the chute as material is fed into the grinder. Therefore, consider installing a layer of damping material to the external metal surface on the infeed chute of the grinder. Generally, two methods of damping are commonly utilized: free layer damping or constrained layer damping.



Free layer damping involves applying a polymer plastic material to the surface of the vibrating surface. Constrained layer damping involves sandwiching a layer of viscoelastic material between the vibrating surface and an outer constraining layer, which is usually metal. Constrained layer damping is more commonly used when the vibrating surface is thick and large vibrational reduction is necessary. Damping is usually most effective for reducing low frequency noise transmission.

4) Another approach for reduction of low frequency noise commonly generated by equipment such as scrap grinders or large machinery is vibration isolation. Vibration isolation is a method of limiting the transfer of machine vibrations to surrounding surfaces. Placement of equipment on vibration damping pads made of felt, cork, rubber, or more durable elastomeric material can reduce vibration transfer. It should be noted that vibration damping alone does not typically result in substantial noise exposure reduction, but when used in combination with other noise control measures can help with overall noise reduction.

5) When new equipment is purchased in the future, the company should attempt to purchase equipment that is designed to generate less noise. U.S. automobile manufacturers use this approach for new equipment purchases and actually require that equipment generate less than a baseline (typically 80 to 85 dBA) noise level in order to purchase.

Though published more than 20 year ago (printed in 1978) the NIOSH industrial noise control manual (website address: www.cdc.gov/niosh/pdfs/79-117.pdf) has some examples of noise controls. Because of the difficulty and complexity of noise controls, particularly machine enclosures, it is recommended that the company consult with experienced and reputable noise control engineers or companies for specific noise control design, construction, and installation options.

6.2 Plant B Discussion and Recommendations

6.2.1 Employee Noise Exposures (Plant B)

The average full shift time-weighted average (TWA) noise exposure for all of the monitored job titles, except varnisher and packaging operator, exceeded the Quebec occupational exposure limit of 90 dBA. Noise exposures for employees in some of the jobs were substantially greater than 90 dBA. Specifically, all of the monitored employees in the assembly department jobs monitored (counting operator, press operator 26 mm, and rotary operator) and the decorator operators in the canning department had TWA noise exposures in excess of 95 dBA. Additionally, the average noise exposure for the stretcher operator was 94.9 dBA.

The high TWA noise exposures in the canning and assembly department is indicative of the high noise levels generated by equipment and the fact that employees in these jobs typically spend a substantial amount of time during the work shift in high noise tasks conducted at or near the equipment. For example, the task with the highest noise level for the stretcher operator is repair/maintenance (98.9 dBA, from Appendix S) and the task which these employees spend the most time, on average, is also repair/maintenance (330.1 average minutes, from Appendix U). This pattern is generally repeated for most of the monitored jobs in the canning and assembly departments. Employees in the canning and assembly department generally took a 15 to 20 minute break in quiet areas outside the production departments each hour, if the amount of break times were less, and they spent more time in the canning and assembly departments, the TWA noise exposure of these employees would be even higher.

The average noise exposure measured for the varnisher in the lithography department and packaging operator in the canning department were only slightly below 90 dBA. Review of individual results for employees in these two jobs across the three surveys (Appendix R), reveals TWA noise exposures were 88.3 dBA or greater and one or more of the monitored employees had a TWA noise exposure greater than 90 dBA in at least one of the surveys. Additionally, the sound levels in some of the tasks conducted by these employees sometimes exceed 90 dBA (for example, the packaging operator task, palletizer area, had an average measured sound level of 94.4 dBA and the varnisher task, monitor press (along press), had an average measured sound level of 91.2 dBA. Therefore, it is advisable to consider these employees overexposed to noise and include them in the company's hearing loss prevention program.

Measured TWA noise exposures for employees in all of the monitored job titles were well in excess of the NIOSH REL of 85 dBA, based on integrating noise levels using a 3-dB exchange rate specified by NIOSH instead of the 5-dB exchange rate specified by Quebec regulations. Although the NIOSH REL for noise is not a legally enforceable regulatory standard, the current body of scientific evidence indicates that it is more protective in the prevention of hearing loss than noise exposure limits that are based on an exchange rate of 5-dB. NIOSH would therefore encourage the company to utilize the noise exposure measurement results based on NIOSH noise monitoring criteria to determine which employees to include in a hearing loss prevention program. It should be noted that employees in the canning and assembly department work 12-hour shifts. Because of the increased risk of hearing loss from extended exposures to high noise levels (> 85 dBA), NIOSH recommends adjusting the REL downward for extended work shifts. The adjusted NIOSH REL for a 12-hour work shift is 83.2 dBA. If an extended work shift noise exposure limit adjustment were applied to the Quebec 8-hour OEL of 90 dBA, the 12-hour limit would be reduced to 87.1 dBA. Because it is more protective of hearing, it is advisable for the company to use the extended work shift adjusted noise exposure limits for employees who work 12-hour shifts.

The range of TWA exposure was less than four dBA for most of the monitored jobs, indicating that exposures are fairly consistent within the monitored jobs. In contrast, the range of exposures for the stretcher mechanic, general mechanic, and mechanic rear section was greater than six dBA. This higher exposure variability is related to the amount of time mechanics spend on tasks in the machine shop or tool room where noise levels are generally less than 80 dBA versus the amount of time spent in production areas where noise levels are commonly between 95 and 100 dBA near operating equipment. At an average noise level 97 dBA, a worker's TWA noise exposure would exceed the Quebec OEL after only three hours and would exceed the NIOSH REL after only 30 minutes, even if the employee worked in very low noise tasks (noise exposure less than 80 dBA) for the remainder of the work shift. At a noise level of 105 dBA, which was measured for some of the repair/maintenance tasks, the Quebec OEL would be exceeded in 60 minutes and the NIOSH REL would be exceeded in 4.75 minutes. Based on task sound levels, the number of minutes employees could spend in various tasks before Quebec noise exposure limits would be exceeded can be calculated using the following equation:

$$T = \frac{8}{2^{(L-90)/5}}$$

Where T = maximum time allowed at given sound level before Quebec exposure limit is exceeded and L = measured sound level (dBA)

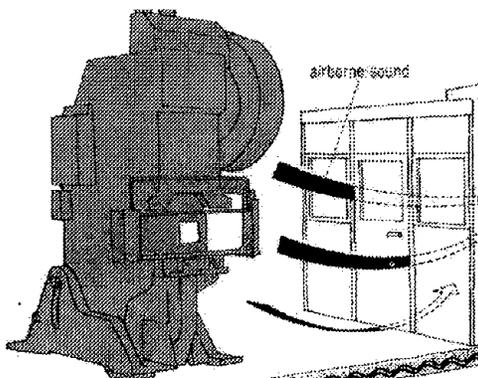
6.2.2 Noise Control (Plant B)

The optimal method of reducing worker noise exposure is through the implementation of effective noise control measures such as reduction of noise generated by equipment, proper maintenance and repair of equipment, complete or partial enclosure of equipment, or isolation of the workers from the equipment noise. Successful reduction of noise levels to below occupational exposure limits can reduce the long term costs associated with hearing loss prevention program and medical treatment of employees with hearing loss. However, some noise controls can be very difficult to successfully implement and may have high initial costs.

Noise levels in the production areas of the canning department and assembly department often exceeded 95 dBA and in some cases were near 100 dBA. Octave band analysis of the noise generated by equipment in these departments indicates that the predominant frequency varied with equipment. In some cases the frequency spectrum was somewhat bimodal in nature with the highest noise levels in both high frequencies (>4000 Hz) and low frequencies (<250 Hz). However, at some equipment noise levels were high in the middle frequencies (500 Hz – 2000 Hz). Therefore, engineering noise controls need to focus on methods that would potentially achieve the greatest reduction at the dominant frequencies.

Noise enclosures are commonly utilized to reduce mid to high frequency noise exposure. The company has installed some partial enclosures constructed of quilted noise blankets at approximately half of the 26 mm cap presses in the assembly department. The partially-enclosed presses were not in operation when octave band measurements were taken during the study and therefore noise levels at these presses could not be compared to the presses without the noise blankets. Partial enclosures such as these could be used at all the presses, but also at the rotary presses and counting machines. A partial enclosure or noise barrier may be particularly effective at separating the counting operators, when they are working at the cap off-feed area, from noise generated by the counting machine. Partial noise enclosures could also be installed on equipment in the canning department, however; the amount of equipment, operational requirements, and layout of the department may make enclosures in these operations less feasible.

An alternate or additional noise control approach for reduction of mid to high frequency noise exposure involves the placement and use of small noise isolation booths in the canning and assembly departments. A properly designed booth would isolate employees from some of their noise exposure, but still permit observation of production. Employees could stand in these booths



at times when they are observing or monitoring an operation, but do not need to work directly at equipment. Lumber mill sometimes use this type of approach to isolate workers from the high noise levels generated by large cross-cut saws, but still allow the workers to observe the operation and respond quickly to problems. It might be possible for mechanics to construct a prototype booth from wood and plastic to determine the feasibility of utilizing this approach for noise exposure reduction. The company already has large scale versions of noise isolation booths near the feeder of the printing press and the feeder to the oven,

which some employees used for smoke breaks.

Low frequency noise can sometimes be reduced by eliminating the transfer of vibrational energy from equipment to surrounding floors, platforms, or walls. Placement of equipment on vibration

damping pads made of felt or more durable elastomeric material can reduce vibration transfer. It should be noted that vibration damping alone does not typically result in substantial noise exposure reduction, but when used in combination with other noise control measures can help with overall noise reduction.

When new equipment is purchased in the future, the company should attempt to purchase equipment that is designed to generate less noise. U.S. automobile manufacturers use this approach for new equipment purchases and actually require that equipment generate less than a baseline (typically 80 to 85 dBA) noise level in order to purchase.

Though published more than 20 years ago (printed in 1978) the NIOSH industrial noise control manual (website address: www.cdc.gov/niosh/pdfs/79-117.pdf) has some examples of noise controls. Because of the difficulty and complexity of noise engineering controls, it recommended that the company consult with experienced and reputable noise control engineers or companies for more specific noise control options.

6.3 Plant C Discussion and Recommendations

6.3.1 Employee Noise Exposures (Plant C)

The only job title in the study in which full-shift TWA noise exposures exceeded the Quebec occupational exposure limit of 90 dBA was welder. The average exposure of the four welders monitored in this study was slightly greater than 90 dBA. However, TWA noise exposures ranged from a low of 79.9 dBA to a high of 101.4 dBA. The large range of TWA noise exposures indicates that employee noise exposures are variable and dependent on the amount of time spent in the highest noise level tasks. The four tasks in the welder job with the highest average noise levels, as shown in Appendix C, were “hammer” (99.6 dBA), “welding” (97.3 dBA), “power hand tools” (95.4 dBA), and “cutting torch” (92.7 dBA). The maximum noise level was greater than 99 dBA for each of these four tasks and was over 111 dBA for “welding”. The welders monitored during the study spent the second and third highest average minutes per day in the tasks “welding” and “cutting torch”; an average of 89 and 73 minutes, respectively, as shown in Appendix D. At the average noise level for “welding” of 97.3 dBA, a worker’s TWA noise exposure would exceed 90 dBA after only three total hours of welding, even if the employee worked in very low noise tasks (noise exposure less than 80 dBA) for the remainder of the work shift. At the maximum noise level of 111 dBA for the task “welding” a workers TWA noise exposure would exceed 90 dBA in only 26 minutes.

Employees in none of the other jobs monitored for noise had average TWA exposures in excess of Quebec noise exposure limits. However employees in the following jobs had average TWA exposures in excess of the NIOSH Recommended Exposure Limit of 85 dBA, based on integrating noise levels using a 3-dB exchange rate specified by NIOSH instead of the 5-dB exchange rate specified by Quebec regulations: welder, motor rebuilding technician, transmission rebuilding technician, track repair, and painter jobs. Noise exposures also sometimes exceeded the NIOSH REL for the heavy equipment repair technician, cylinder head rebuilding technician, welding section machinist, and operation section machinist jobs, based on maximum TWA values greater than 85 dBA for these jobs. These results show a substantial difference in which jobs and employees would be considered overexposed to noise, based on whether Quebec noise regulations or NIOSH recommended exposure limits are referenced. Although the NIOSH REL for noise is not a legally enforceable regulatory standard, the current body of scientific evidence indicates that it is more protective in the prevention of hearing loss than noise exposure limits that are based on

an exchange rate of 5-dB. NIOSH would therefore encourage the company to utilize the noise exposure measurement results based on NIOSH noise monitoring criteria to determine which employees to include in a hearing loss prevention program.

Though TWA noise exposures in none of the jobs except welder exceeded Quebec exposure limits, task-specific noise levels in several of the jobs monitored during the study were greater than 90 dBA and in many cases had maximum sound levels exceeding 100 dBA. The implication of this information is that any employee in a job where tasks with high noise levels are conducted could be overexposed to noise depending on the amount of time spent in high noise tasks. For example a mechanic in the heavy equipment repair job could have TWA noise exposures greater than 90 dBA if approximately five total hours of the work shift were spent using “power hand tools”, which had an average noise level of 94.1 dBA. Based on task sound levels, the number of minutes employees could spend in various tasks before Quebec noise exposure limits would be exceeded can be calculated using the following equation:

$$T = \frac{8}{2^{(L-90)/5}}$$

Where T = maximum time allowed at given sound level before Quebec exposure limit is exceeded and L = measured sound level (dBA)

6.3.2 Noise Controls (Plant C)

Since TWA noise exposures for welders exceeded the Quebec noise exposure limit, the company should explore potential noise exposure reduction options for the high noise tasks in this job. Noise generated by the use of hammers, powered hand tools such as grinders, cutting torch, and welding are quite difficult to reduce because much of the noise is generated by the interaction of the tool with the metal part, rather than the tool itself. However, in some cases it may be possible to reduce tool noise.

Octave band measurement results collected during use of hand-held tools, such as ¾ in air wrench, and welding (presented in Table 9) indicated that sound levels had peak noise levels in excess of 120 dBA and were predominantly high frequency in nature. This may be due to noise generated by the release or movement of air and/or gases at high velocity from the tool during use or from the internal movement of the rotary motor or percussion/reciprocating motor typically found in pneumatic tools. While control of high frequency noise can sometimes be achieved for stationary noise sources through the use of noise enclosures or sound barriers, these controls are not feasible for this company because employees use the hand-held tools and equipment throughout the work area. However, it might be possible to obtain pneumatic powered hand tools which are designed to generate less tool noise or to use a specially designed nozzle for the cutting torch which reduces the noise generated by high velocity air and gas flow out of the nozzle tip. The company should contact the manufacturers of these types of tool to determine if models which generate less internal noise or dissipate compressed air exhaust more quietly are available. Additionally, the company should investigate whether a reduction in the overall air pressure in its compressed air system could reduce noise generated by air exhaust from tools and compressed air lines.

Another approach to noise exposure reduction is to limit the amount of time that workers spend in the high noise tasks. As noted in the preceding section a worker conducting welding would exceed the Quebec OEL of 90 dBA in approximately 3 hours. Therefore, if the amount of time workers spend in the highest noise tasks is limited TWA noise exposures could also be kept below

90 dBA. This type of noise reduction approach requires very careful organization and planning of employee work activities so that the time in high noise tasks is adequately and consistently controlled.

6.4 Hearing Loss Prevention

Companies must include overexposed employees in a hearing loss prevention program unless noise exposures can be successfully reduced to below occupational exposure limits through noise control and reduction measures. Based on noise monitoring results from the NIOSH study some of the monitored employees were exposed to noise levels exceeding Quebec exposure limits. Additionally, employees in some other jobs have the potential for noise exposures exceeding Quebec limits, depending on the amount of time spent in high noise tasks. The range of TWA exposures greater than 6 dBA in many jobs monitored for the study indicates that there is substantial noise exposure variability within jobs and suggests the need to take TWA noise measurements on multiple workers when assessing exposures. Periodic (i.e. yearly) noise exposure monitoring should be conducted to document noise levels, particularly if noise controls have been installed. Companies in Canada should refer to the Quebec noise regulations established by the Commission de la Santé et de la Sécurité du Travail (CSST) for specifically applicable compliance requirements [CSST 1981].

All employees overexposed to noise must continue to wear hearing protection. NIOSH recommends that employees wear hearing protection during all tasks in which the task sound level is greater than 85 dBA. Observation of hearing protection use indicated that most observed employees wore their hearing protection, but not always for the entire work shift. For maximum protection, hearing protection must be properly and consistently used. The company should enforce appropriate hearing protection use through training that stresses the importance of maintaining hearing and enforcement of use when necessary. Additionally, NIOSH recommends that employees use of dual hearing protection (the use of insert type ear plugs and ear muffs) when noise exposure levels exceed or would likely exceed 100 dBA. Refer to the tables in this report (Appendix T) to determine which tasks have the potential to exceed 100 dBA. The key to prevention of hearing loss is to identify high noise activities, properly use hearing protection, continued audiometric testing (annually) to assess employees' hearing ability, and implementation of a hearing loss prevention program. NIOSH recommends that a hearing loss prevention program include the following components [NIOSH 1998]:

- 1) Initial and annual audits of procedures
- 2) Assessment of noise exposures
- 3) Engineering or administrative control of noise exposures
- 4) Audiometric evaluation and monitoring of worker's hearing
- 5) Use of hearing protection for exposures equal to or greater than 85 dBA, regardless of exposure duration.
- 6) Education and motivation of workers
- 7) Recordkeeping
- 8) Evaluation of the Hearing Loss Prevention Program to ensure its continued effectiveness

Additional information regarding NIOSH recommendations for occupational hearing loss prevention can be found on the NIOSH internet site: <http://www.cdc.gov/niosh/topics/noise>.

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APPENDIX A: STATISTICAL POWER AND SAMPLE SIZE ANALYSIS

NORA Noise – Power and Sample Size Analysis Misty Hein – August 31, 2001

Goal: For a given job, determine the number of workers (n) that must be included in **Phase I** sampling in order to determine whether the noise level obtained from the task-based sampling method (supervisor, worker pre-shift, or worker post-shift) significantly differs from the gold-standard (noise level obtained via dosimetry plus full-shift IH direct observation) using the paired-sample t-test.

Assumptions:

1. On a given sampling day, four estimates of noise exposure will be made for each worker: three task-based estimates (supervisor, worker pre-shift, and worker post-shift) and one dosimetry-based estimate (dosimeter plus full-shift IH direct observation).
2. The variable of interest is the difference between the task-based estimate and the dosimetry estimate. That is, $Y = TWA_{\text{task-based}} - TWA_{\text{dosimetry}}$. There are three such differences, one for each of the task-based sampling methods.
3. We assume that the task-based and dosimetry estimates are normally distributed.
4. We assume that the minimum detectable difference (δ) of interest is 3 dB.
5. Assuming normality, the variance of the difference (σ_d^2) is a function of the variance of the task-based estimates (σ_1^2), the variance of the dosimetry estimates (σ_2^2), and the correlation between the task-based and dosimetry estimates (ρ). That is

$$\sigma_d^2 = \sigma_1^2 + \sigma_2^2 - 2\rho\sigma_1\sigma_2.$$

We will assume that the task-based and dosimetry estimates have a common variance, that is $\sigma_1^2 = \sigma_2^2$, which implies that

$$\sigma_d^2 \approx 2\sigma^2(1 - \rho).$$

Variability of the task-based noise exposures was estimated using data from both the Indiana and Michigan plants obtained in the 1998 and 1999 surveys. Jobs were classified with respect to (a) production status (production or non-production), (b) mobility (stationary, mobile-routine, or mobile-random), (c) presence of impact noise (yes or no), and (d) complexity (1-3 or more than 3 tasks per job). Salary jobs were excluded along with low exposure jobs with noise levels less than 50 dB. Results are presented in Table 1. Some job categories did not exist, and others did not contain sufficient jobs for estimation of variability. While most of the categories have standard deviations of around 3 dB, all were less than 7 dB.

The correlation between the task-based noise exposures and the dosimetry-based noise exposures is approximately 0.75, based on a small sample of unpublished data ($n=15$).

6. To estimate the sample size, we used the standard formula

$$n = \left(\frac{\sigma_d}{\delta} \right)^2 (z_{\alpha/2} + z_{\beta})^2$$

where z_p refers to the value of the standard normal distribution with upper tail probability p . The sample size n was adjusted to reflect uncertainty in σ_d .

$$n^* = n \left(\frac{n+2}{n} \right)$$

Table 1. Standard deviation of 8 hour TWA task-based noise estimates at Indiana and Michigan facilities in 1998 and 1999 for jobs categorized by production status, mobility, presence of impact noise, and job complexity with at least 6 jobs per category.

Job Type ^a	Job Mobility ^b	Impact Noise ^c	Job Complexity ^d	Standard Deviation	
				Indiana	Michigan
N	S	N	L	2.7	4.5
N	S	N	H	-	3.3
N	S	Y	L	-	-
N	S	Y	H	-	-
N	M	N	L	2.9	4.0
N	M	N	H	3.6	-
N	M	Y	L	-	6.1
N	M	Y	H	-	2.4
N	R	N	L	4.0	-
N	R	N	H	0.3	5.2
N	R	Y	L	-	0.6
N	R	Y	H	3.9	2.8
P	S	N	L	3.0	2.8
P	S	N	H	2.9	2.1
P	S	Y	L	2.6	2.5
P	S	Y	H	4.3	3.0
P	M	N	L	2.3	1.8
P	M	N	H	2.7	-
P	M	Y	L	-	0.5
P	M	Y	H	-	-
P	R	N	L	-	-
P	R	N	H	-	-
P	R	Y	L	-	-
P	R	Y	H	-	-

^a N=Non-production, P=Production; ^b S=Stationary, M=Mobile-routine, R=mobile-Random;

^c N=No, Y=Yes; ^d L=Low, H=High; - Fewer than 6 jobs in category

Table 2. Required sample size for testing whether the noise level obtained from the task-based sampling method (supervisor, worker pre-shift, or worker post-shift) significantly differs from the gold-standard (noise level obtained via dosimetry plus full-shift IH direct observation), assuming a 5% type I error rate, a correlation of 0.75, and a 3 dB minimum detectable difference.

Standard Deviation of Task-based and Dosimetry Estimates	Power = 0.8	Power = 0.9	Power=0.95
1 dB	2	2	3
2 dB	4	4	5
3 dB	6	8	9
4 dB	9	12	14
5 dB	13	17	20
6 dB	18	23	28

Conclusion:

Since the current sampling plan calls for 7 workers to be selected in each job, a difference of 3dB or more is detectable with 80% power for jobs with variability of 3dB or less.

Goal: For a given job category, estimate the amount of attenuation in the dose-response relationship due to within-subject variability with 3 repeated observations per worker.

Assuming a simple linear regression analysis is used to relate a response variable to an exposure variable, the attenuation (k) in the exposure response relationship due to measurement error can be expressed as a function of the number of repeat observations per worker and the ratio of the within-worker variance to the between-worker variance in the exposure variable (λ), or

$$k = \frac{n}{n + \lambda}$$

The value of the ratio (λ) is greater than one if the within-worker variance is greater than the between-worker variance. Likewise, if the between-worker variance is greater than the within-worker variance, the ratio will be less than one. In general, the larger the ratio, the more severe the attenuation. Also, the larger the number of repeats, the smaller the attenuation.

λ	Attenuation Ratio (k)		
	$n=1$	$n=3$	$n=10$
10	0.09	0.23	0.50
6	0.14	0.33	0.63
4	0.20	0.43	0.71
2	0.33	0.60	0.83
1	0.50	0.75	0.91
0.5	0.67	0.86	0.95
0.2	0.83	0.94	0.98

To estimate the degree of attenuation based on 3 repeat subjects per worker, estimates of between-job and within-job variation were obtained using data from both the Indiana and Michigan plants obtained in the 1998 and 1999 surveys. Jobs were classified with respect to (a) production status (production or non-production), (b) mobility (stationary, mobile-routine, or mobile-random), (c) presence of impact noise (yes or no), and (d) complexity (1-3 or more than 3 tasks per job). Salary jobs were excluded along with low exposure jobs with noise levels less than 50 dB. Jobs with fewer than three repeats were omitted. Estimates of between-job and within-job variability were obtained using PROC MIXED in SAS for different job categories.

Conclusion:

Since the sampling plan calls for 3 repeat measurements per worker, unless there is no within worker variability, there could be some attenuation in the dose-response relationship. The degree of attenuation will depend on the ratio of between-worker variability to within-worker variability. If between-job and within-job estimates of variability are any guide, then the attenuation ratio could be as severe as 0.33, which implies that the observed regression slope would only be 1/3 the true regression slope.

APPENDIX B: MASTER LIST OF WORK TASKS FOR EACH JOB

Task Name	Task Name Variations	Job Code	Job Name
Activities in Thermoforming Department	Talking with Colleagues, Other Thermoforming Department Activities	A1A	Thermoforming Operator
Break		A1A	Thermoforming Operator
Cleaning		A1A	Thermoforming Operator
Compressed Air	Clean with Compressed Air, Use of Compressed Air	A1A	Thermoforming Operator
Lunch	Supper	A1A	Thermoforming Operator
Machine Downtime	Downtime	A1A	Thermoforming Operator
Office Work		A1A	Thermoforming Operator
Set-Up/Repair	Set-Up, Fix Problem, Repairing	A1A	Thermoforming Operator
Unload/Inspect/Package	Packaging, Assembling Boxes, Packaging Activities, Helping assemble boxes	A1A	Thermoforming Operator
Work Near Machine	Inspecting for repacking near machines, Making box piles (stacking boxes), Apply Stickers on Boxes	A1A	Thermoforming Operator
Activities in Extrusion Department		A1B	Thermoforming General Aid
Activities in Thermoforming Department	Thermo Activities, Thermo Shop Activities, Activities, Wrap Pallets, Wrap Boxes, Using Wrap Machine, Removing Scrap From Around Machine, Put Garbage in Container, Turn Around Thermo Dept Looking for What to Do, Other Thermoforming Department Activities	A1B	Thermoforming General Aid
Break		A1B	Thermoforming General Aid
Drive Fork Lift	Driving Fork Lift	A1B	Thermoforming General Aid
Lunch	Supper	A1B	Thermoforming General Aid
Mold Shop	Mold Activities, Mold Room (in thermoforming), Mold Shop (in thermoforming)	A1B	Thermoforming General Aid
Office Work	Office 2nd Floor	A1B	Thermoforming General Aid
Set-Up/Repair	Set-Up	A1B	Thermoforming General Aid
Unload/Inspect/Package		A1B	Thermoforming General Aid
Use Pallet Truck	Pallet Use, Pallet Use and Rapper (sp.) Machine	A1B	Thermoforming General Aid
Warehouse Activities	Activities in Warehouse	A1B	Thermoforming General Aid
Work Near Machine	Empty Scrap From Under Machine + Stack Boxes, Near Machine, Stack Boxes, Material Handling, Moving Boxes, Sweeping the Floor	A1B	Thermoforming General Aid
Activities in Lamination		A1C	Thermoforming Mechanic
Activities in Mechanic Department		A1C	Thermoforming Mechanic
Activities in Mold Department	Mold Department Room	A1C	Thermoforming Mechanic
Activities in Shop	Activities in Thermo Shop	A1C	Thermoforming Mechanic
Activities in Thermoforming Department	Activities, Thermo Department Activities, Miscellaneous work in Thermo, Miscellaneous Activities (waiting for someone), Miscellaneous Work , Other Thermoforming Department Activities	A1C	Thermoforming Mechanic
Break		A1C	Thermoforming Mechanic
Compressor Room		A1C	Thermoforming Mechanic
Drive Fork Lift	Fork Lift Drive	A1C	Thermoforming Mechanic
Lunch	Supper	A1C	Thermoforming Mechanic
Mold Shop	Mold Room, Preparing a Mold in the Molding Room, Fill Some Documents in the Molding Room,	A1C	Thermoforming Mechanic
Office Work	Miscellaneous Work in Supervisors Office	A1C	Thermoforming Mechanic
Set-Up/Repair	Set-Up, Repair, Repairing, Loading Big Roll of Plastic, Cleaning Machine, Installing a Mold, Repair Machine, Remove a Mold in Machine	A1C	Thermoforming Mechanic

Task Name	Task Name Variations	Job Code	Job Name
Use Pallet Truck		A1C	Thermoforming Mechanic
Work Near Machine	Talk with Colleague, Stack Boxes	A1C	Thermoforming Mechanic
Activities in Extrusion Department	Other Extrusion Department Activities, Activities in Extrusion, Miscellaneous Activities in Extrusion Department	A2A	Extrusion Operator
Activities in Pelletizer Area	Pelletizer Area	A2A	Extrusion Operator
Break		A2A	Extrusion Operator
Control Booth		A2A	Extrusion Operator
Emergency Scrap Removal	Emergency, Emergency Scrap	A2A	Extrusion Operator
Lunch		A2A	Extrusion Operator
Monitor Machine	Monitor/Adjust, Monitor	A2A	Extrusion Operator
Office Work		A2A	Extrusion Operator
Set-Up/Repair	Set-up	A2A	Extrusion Operator
Slitter Activities	Load Slitter	A2A	Extrusion Operator
Activities in Pelletizer Area		A2B	Slitter Operator
Break		A2B	Slitter Operator
Cleaning		A2B	Slitter Operator
Compressed Air	Clean with Compressed Air	A2B	Slitter Operator
Control Booth		A2B	Slitter Operator
Cut Tube		A2B	Slitter Operator
Drive Electronic Pallet Roll Jack	Drive Pallet Truck	A2B	Slitter Operator
Drive Fork Lift		A2B	Slitter Operator
Emergency Scrap Removal		A2B	Slitter Operator
Grinder Room		A2B	Slitter Operator
Load/Unload Winder	Set-Up Winder, Unload Winder	A2B	Slitter Operator
Lunch		A2B	Slitter Operator
Office Work		A2B	Slitter Operator
Package Plastic Rolls		A2B	Slitter Operator
Slitter Activities	Operate Slitter, Load Slitter, Unload Slitter, Set-Up Slitter, Set-Up	A2B	Slitter Operator
Weigh Station Activities	Package Plastic Rolls	A2B	Slitter Operator
Activities in Extrusion Department	Extrusion Activities	A2C	Weigh Station Operator
Activities in Lamination	Activities Inside Lamination Department	A2C	Weigh Station Operator
Activities in Pelletizer Area		A2C	Weigh Station Operator
Break		A2C	Weigh Station Operator
Cleaning		A2C	Weigh Station Operator
Compressed Air	Clean with Compressed Air	A2C	Weigh Station Operator
Control Booth		A2C	Weigh Station Operator
Cut Tube		A2C	Weigh Station Operator
Drive Fork Lift		A2C	Weigh Station Operator
Emergency Scrap Removal		A2C	Weigh Station Operator
Empty Garbage		A2C	Weigh Station Operator
Grinder Room		A2C	Weigh Station Operator
Load/Unload Winder		A2C	Weigh Station Operator
Lunch		A2C	Weigh Station Operator
Office Work		A2C	Weigh Station Operator
Outside Grinder Room		A2C	Weigh Station Operator
Package Plastic Rolls		A2C	Weigh Station Operator
Slitter Activities	Load/Unload Slitter, Set-Up Slitter, Set-Up, Operate Slitter	A2C	Weigh Station Operator
Start-Up Machine Line 1		A2C	Weigh Station Operator
Weigh Station Activities		A2C	Weigh Station Operator
Break	Mini-Break, Bathroom Break	A2D	Grinder Operator
Compressed Air	Clean with Compressed Air, Cleaning underground with compressed air, Using Compressed Air	A2D	Grinder Operator
Control Booth		A2D	Grinder Operator
Drive Fork Lift	Fork Lift Drive	A2D	Grinder Operator
Grinder Room	In Grinder Room, Inside Grinder Room, Inside	A2D	Grinder Operator
Load Grinder	Load 1 ... 4	A2D	Grinder Operator
Lunch	Supper	A2D	Grinder Operator
Office Work	Office Activities	A2D	Grinder Operator

Task Name	Task Name Variations	Job Code	Job Name
Outside Grinder Room	Outside	A2D	Grinder Operator
Activities in Extrusion Department	Other Activities	A2E	Pelletizer
Activities in Shipping	Wrapping Boxes for Garbage, Activities in Expedition	A2E	Pelletizer
Activities in Thermoforming Department	Activities in Thermo Department	A2E	Pelletizer
Activities in Warehouse		A2E	Pelletizer
Break		A2E	Pelletizer
Cleaning	Clean-up (end of day)	A2E	Pelletizer
Compressed Air	Clean with Compressed Air, Cleaning (end of day - when compressed air used), Clean-up (end of day - when compressed air used), Clean Up, Using compressed air	A2E	Pelletizer
Control Booth		A2E	Pelletizer
Drive Fork Lift	Fork Lift Driving	A2E	Pelletizer
Garbage Disposal Activities	Garbage Compactor	A2E	Pelletizer
Load Grinder		A2E	Pelletizer
Load Pelletizer	Load	A2E	Pelletizer
Lunch		A2E	Pelletizer
Monitor Machine	Activities in Pelletizer Department, Verification of Little Plastic Balls, Paperwork, Start Up Line Production	A2E	Pelletizer
Office Work	2nd Floor Control Booth, Activities in Office	A2E	Pelletizer
Repair Fork Lift		A2E	Pelletizer
Unload Pelletizer	Unload	A2E	Pelletizer
Using Vacuum	Cleaning Little Plastic Ball Filter using a vacuum, Change Filter	A2E	Pelletizer
Activities Outside Mold Department	Other Activity, Activities Outside Mold Room, Cleaning Activities Outside Mold Department	A3A	Mold Machinist
Activities in Thermoforming Department	Activities in Thermo Department	A3A	Mold Machinist
Break		A3A	Mold Machinist
Calibration		A3A	Mold Machinist
Cleaning	Cleaning Mold Department, Cleaning the Department	A3A	Mold Machinist
Compressed Air	Cleaning with Compressed Air	A3A	Mold Machinist
Drive Fork Lift		A3A	Mold Machinist
Hand Tool Use	Tool Use	A3A	Mold Machinist
Lunch		A3A	Mold Machinist
Machine Shop Activities	Mold Assembly, Assembly, Setup Turning Table, Preparing a New Mold for Piercing, Piercing a Mold, Preparing Drill Press, Washing a Mold, Clean Some Molds	A3A	Mold Machinist
Machining	Monitor Machine, Machining - Grinder/Buffer, Mold Assembly	A3A	Mold Machinist
Mold Shop		A3A	Mold Machinist
Office Work		A3A	Mold Machinist
Power Tool Use	Tool Use	A3A	Mold Machinist
Using Vacuum Forming Machine		A3A	Mold Machinist
Welding	Machining - Welder, Machining - Welding	A3A	Mold Machinist
Activities in Extrusion Department		A4A	Maintenance Mechanic
Activities in Lamination		A4A	Maintenance Mechanic
Break		A4A	Maintenance Mechanic
Building Maintenance		A4A	Maintenance Mechanic
Cleaning		A4A	Maintenance Mechanic
Drive Fork Lift		A4A	Maintenance Mechanic
Lunch		A4A	Maintenance Mechanic
Machine Shop Activities		A4A	Maintenance Mechanic
Machining		A4A	Maintenance Mechanic
Office Work		A4A	Maintenance Mechanic

Task Name	Task Name Variations	Job Code	Job Name
Power Tool Use	Tool Use	A4A	Maintenance Mechanic
Repair/Maintenance		A4A	Maintenance Mechanic
Storage Room	Mechanics Store	A4A	Maintenance Mechanic
Welding		A4A	Maintenance Mechanic
Break		A4B	Maintenance Electrician
Building Maintenance		A4B	Maintenance Electrician
Cleaning		A4B	Maintenance Electrician
Lunch		A4B	Maintenance Electrician
Machine Shop Activities	Mechanic Shop, Mechanic Shop Activities	A4B	Maintenance Electrician
Machining		A4B	Maintenance Electrician
Office Work		A4B	Maintenance Electrician
Power Tool Use	Tool Use	A4B	Maintenance Electrician
Repair/Maintenance		A4B	Maintenance Electrician
Storage Room		A4B	Maintenance Electrician
Welding		A4B	Maintenance Electrician
Break		A4C	Plant Maintenance
Building Maintenance		A4C	Plant Maintenance
Cleaning		A4C	Plant Maintenance
Drive Fork Lift		A4C	Plant Maintenance
Lunch		A4C	Plant Maintenance
Machine Shop Activities		A4C	Plant Maintenance
Machining		A4C	Plant Maintenance
Power Tool Use	Tool Use	A4C	Plant Maintenance
Repair/Maintenance		A4C	Plant Maintenance
Welding		A4C	Plant Maintenance
Activities Outside Shipping Department		A5A	Fork Lift Driver
Activities in Shipping	Activities in Shipping Department	A5A	Fork Lift Driver
Activities in Warehouse	Activities in Warehouse Department	A5A	Fork Lift Driver
Break		A5A	Fork Lift Driver
Drive Fork Lift		A5A	Fork Lift Driver
Lunch		A5A	Fork Lift Driver
Office Work		A5A	Fork Lift Driver
Repair Fork Lift		A5A	Fork Lift Driver
Break		B1A	Decorator
Change Decorations	Deco. Change, Changing Decorations	B1A	Decorator
Choosing Ink		B1A	Decorator
Lunch		B1A	Decorator
Machine Downtime	Inspection Stopped	B1A	Decorator
Monitor Operation (Inspection)	Checking Machines	B1A	Decorator
Office Work	Office	B1A	Decorator
Quality Control	Inspecting Cans, Quality Control Check (Can Inspections)	B1A	Decorator
Aluminum Recycling Area		B1B	Stretcher Operator
Break		B1B	Stretcher Operator
Change Aluminum Roll	Replace Aluminum Roll, Prepare Aluminum, Loading Aluminum	B1B	Stretcher Operator
Drive Fork Lift		B1B	Stretcher Operator
Lunch		B1B	Stretcher Operator
Machine Shop Activities	Machining, Mechanic Shop Activities	B1B	Stretcher Operator
Office Work	Office Activities	B1B	Stretcher Operator
Printer Area Activities		B1B	Stretcher Operator
Quality Control	Quality Control (Sample Test)	B1B	Stretcher Operator
Repair/Maintenance	Repair/Monitor/Maintain Stretcher Machines, Repair/Maintain, Monitoring Machine, Monitoring Tend Machine, Inspecting Production	B1B	Stretcher Operator
Repair/Maintenance (Punch Press)	Repair/Maintain Punch Press	B1B	Stretcher Operator
Set-Up		B1B	Stretcher Operator
Tool Room	Tooling Room	B1B	Stretcher Operator
Warehouse Activities		B1B	Stretcher Operator
Welding		B1B	Stretcher Operator
Work Bench	Cleaning Tools, Inspecting Tools	B1B	Stretcher Operator

Task Name	Task Name Variations	Job Code	Job Name
Aluminum Recycling Area		B1C	Stretcher Mechanic
Break		B1C	Stretcher Mechanic
Change Aluminum Roll	Replace Aluminum Roll, Prepare Aluminum, Loading Aluminum	B1C	Stretcher Mechanic
Drive Fork Lift		B1C	Stretcher Mechanic
Lunch		B1C	Stretcher Mechanic
Machine Shop Activities	Machining, Mechanic Shop Activities	B1C	Stretcher Mechanic
Office Work	Office Activities	B1C	Stretcher Mechanic
Printer Area Activities		B1C	Stretcher Mechanic
Quality Control	Quality Control (Sample Test)	B1C	Stretcher Mechanic
Repair/Maintenance	Repair/Monitor/Maintain Stretcher Machines, Repair/Maintain, Monitoring Machine, Monitoring Tend Machine, Inspecting Production	B1C	Stretcher Mechanic
Repair/Maintenance (Punch Press)	Repair/Maintain Punch Press	B1C	Stretcher Mechanic
Set-Up		B1C	Stretcher Mechanic
Tool Room	Tooling Room	B1C	Stretcher Mechanic
Warehouse Activities		B1C	Stretcher Mechanic
Welding		B1C	Stretcher Mechanic
Work Bench	Cleaning Tools, Inspecting Tools	B1C	Stretcher Mechanic
Break		B1D	Mechanic - Canning Department (General Mechanic)
Clean Tools with Degreaser		B1D	Mechanic - Canning Department (General Mechanic)
Film Preparation		B1D	Mechanic - Canning Department (General Mechanic)
Lunch		B1D	Mechanic - Canning Department (General Mechanic)
Machine Shop Activities	Mechanic Shop Activities	B1D	Mechanic - Canning Department (General Mechanic)
Machining		B1D	Mechanic - Canning Department (General Mechanic)
Office Work	Office Activities	B1D	Mechanic - Canning Department (General Mechanic)
Power Tool Use	Tool Use	B1D	Mechanic - Canning Department (General Mechanic)
Quality Control		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance	Maintenance/Repair, Mechanics Duties, Maintenance, Repair	B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Aluminum Compactor)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Anti Pollution Sheet or Anti Pollution Map)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Body Varnish Machine)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Coater)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Conveyor)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Cyclone)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Decorator or Decoration Machine)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Duster)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Flanger)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Incinerator or Damper)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Light Test Machine)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Necker)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Palletizer)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Press - Canning)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Recycling Machine)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Roof)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Spin Necker Flanger)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Spray Cleaning Machine)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Strapping Machine)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Stretcher)		B1D	Mechanic - Canning Department (General Mechanic)

Task Name	Task Name Variations	Job Code	Job Name
Repair/Maintenance (Washer/Dryer)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Waxer Machine)		B1D	Mechanic - Canning Department (General Mechanic)
Repair/Maintenance (Wrapper Machine)		B1D	Mechanic - Canning Department (General Mechanic)
Set-Up		B1D	Mechanic - Canning Department (General Mechanic)
Tool Room		B1D	Mechanic - Canning Department (General Mechanic)
Break		B1E	Mechanic - Rear Section
Clean Tools with Degreaser		B1E	Mechanic - Rear Section
Drive Fork Lift		B1E	Mechanic - Rear Section
Film Preparation		B1E	Mechanic - Rear Section
Lunch		B1E	Mechanic - Rear Section
Machine Shop Activities	Mechanic Shop Activities	B1E	Mechanic - Rear Section
Machining		B1E	Mechanic - Rear Section
Office Work	Office Activities	B1E	Mechanic - Rear Section
Power Tool Use	Tool Use	B1E	Mechanic - Rear Section
Quality Control		B1E	Mechanic - Rear Section
Repair/Maintenance	Maintenance/Repair, Mechanics Duties, Maintenance, Repair	B1E	Mechanic - Rear Section
Repair/Maintenance (Aluminum Compactor)		B1E	Mechanic - Rear Section
Repair/Maintenance (Anti Pollution Sheet or Anti Pollution Map)		B1E	Mechanic - Rear Section
Repair/Maintenance (Body Varnish Machine)		B1E	Mechanic - Rear Section
Repair/Maintenance (Coater)		B1E	Mechanic - Rear Section
Repair/Maintenance (Conveyor)		B1E	Mechanic - Rear Section
Repair/Maintenance (Cyclone)		B1E	Mechanic - Rear Section
Repair/Maintenance (Decorator or Decoration Machine)		B1E	Mechanic - Rear Section
Repair/Maintenance (Duster)		B1E	Mechanic - Rear Section
Repair/Maintenance (Flanger)		B1E	Mechanic - Rear Section
Repair/Maintenance (Incinerator or Damper)		B1E	Mechanic - Rear Section
Repair/Maintenance (Light Test Machine)		B1E	Mechanic - Rear Section
Repair/Maintenance (Necker)		B1E	Mechanic - Rear Section
Repair/Maintenance (Palletizer)		B1E	Mechanic - Rear Section
Repair/Maintenance (Press - Canning)		B1E	Mechanic - Rear Section
Repair/Maintenance (Recycling Machine)		B1E	Mechanic - Rear Section
Repair/Maintenance (Roof)		B1E	Mechanic - Rear Section
Repair/Maintenance (Spin Necker Flanger)		B1E	Mechanic - Rear Section
Repair/Maintenance (Spray Cleaning Machine)		B1E	Mechanic - Rear Section
Repair/Maintenance (Strapping Machine)		B1E	Mechanic - Rear Section
Repair/Maintenance (Stretcher)		B1E	Mechanic - Rear Section
Repair/Maintenance (Washer/Dryer)		B1E	Mechanic - Rear Section
Repair/Maintenance (Waxer Machine)		B1E	Mechanic - Rear Section
Repair/Maintenance (Wrapper Machine)		B1E	Mechanic - Rear Section
Set-Up		B1E	Mechanic - Rear Section
Tool Room	Made Plates	B1E	Mechanic - Rear Section
Break		B1F	Department Aid
Cleaning of Garbage Waste		B1F	Department Aid
Drive Fork Lift	D.L.T., Drive Lift Truck	B1F	Department Aid
Drive Lift Truck - Assembly		B1F	Department Aid

Task Name	Task Name Variations	Job Code	Job Name
Drive Lift Truck - Canning		B1F	Department Aid
Drive Lift Truck - Pallets Area		B1F	Department Aid
Drive Lift Truck - Production		B1F	Department Aid
Drive Lift Truck - Recycling Area		B1F	Department Aid
Drive Lift Truck - Shipping	Drive Lift Truck - Shipping (Zone 4)	B1F	Department Aid
Drive Lift Truck - Warehouse		B1F	Department Aid
Drive Lift Truck - Zone 1		B1F	Department Aid
Filling Chemicals		B1F	Department Aid
Finishing Station		B1F	Department Aid
Lunch		B1F	Department Aid
Monitor Spray Machine		B1F	Department Aid
Office Work		B1F	Department Aid
Pallet Area		B1F	Department Aid
Palletizer Area	Monitor Palletizer	B1F	Department Aid
Planning Work		B1F	Department Aid
Break		B1G	Packaging Operator
Cleaning of Garbage Waste		B1G	Packaging Operator
Drive Fork Lift	D.L.T., Drive Lift Truck	B1G	Packaging Operator
Drive Lift Truck - Assembly		B1G	Packaging Operator
Drive Lift Truck - Canning		B1G	Packaging Operator
Drive Lift Truck - Pallets Area		B1G	Packaging Operator
Drive Lift Truck - Production		B1G	Packaging Operator
Drive Lift Truck - Recycling Area		B1G	Packaging Operator
Drive Lift Truck - Shipping	Drive Lift Truck - Shipping (Zone 4)	B1G	Packaging Operator
Drive Lift Truck - Warehouse		B1G	Packaging Operator
Drive Lift Truck - Zone 1		B1G	Packaging Operator
Filling Chemicals		B1G	Packaging Operator
Finishing Station		B1G	Packaging Operator
Lunch		B1G	Packaging Operator
Monitor Spray Machine		B1G	Packaging Operator
Office Work		B1G	Packaging Operator
Pallet Area		B1G	Packaging Operator
Palletizer Area	Monitor Palletizer	B1G	Packaging Operator
Planning Work		B1G	Packaging Operator
Adjust Machine	Unjam Machine, Adjust Maintenance, Adjust/Maintain Machine	B2A	Counting Operator
Break		B2A	Counting Operator
Cleaning	Cleaning 1, Cleaning 2	B2A	Counting Operator
Lunch		B2A	Counting Operator
Machine Downtime	Machine Stopped	B2A	Counting Operator
Monitor Production (close)	Monitor Production (C), Monitor Machine (C), Monitor Machine (close), Monitor Machine (distance not specified)	B2A	Counting Operator
Monitor Production (distance)	Monitor Production (D), Monitor Machine (D), Monitor Machine (distant), Monitor Machine (far)	B2A	Counting Operator
Repair/Maintenance	Repair	B2A	Counting Operator
Set-Up		B2A	Counting Operator
Adjust Machine	Adjusting Machine	B2B	Press Operator
Break		B2B	Press Operator
Drive Fork Lift	Driving Fork Lift	B2B	Press Operator
Lunch		B2B	Press Operator
Monitor Machine	Monitor Production	B2B	Press Operator
Quality Control	Quality Control (Conformity Test)	B2B	Press Operator
Repair/Maintenance	Repair	B2B	Press Operator
Replace Aluminum Sheet	Filling Press with Metal Sheets	B2B	Press Operator
Break		B2C	Rotary Operator
Counter Operation		B2C	Rotary Operator
Lunch		B2C	Rotary Operator
Monitor Machine	Checking Machines, Monitor Production	B2C	Rotary Operator
Quality Control		B2C	Rotary Operator
Repair/Maintenance	Maintenance/Repair, Maintenance	B2C	Rotary Operator
Set-Up		B2C	Rotary Operator
Break		B3A	Printing Press

Task Name	Task Name Variations	Job Code	Job Name
Closing (Shut Down)		B3A	Printing Press
Lunch		B3A	Printing Press
Maintenance (feeder)		B3A	Printing Press
Maintenance (press)		B3A	Printing Press
Mixing Products		B3A	Printing Press
Monitor Press (along press)	Monitor Coater	B3A	Printing Press
Monitor Press (infeed)		B3A	Printing Press
Office Work		B3A	Printing Press
Set-Up		B3A	Printing Press
Working at computer		B3A	Printing Press
Break		B3B	Varnisher (Coater)
Closing (Shut Down)		B3B	Varnisher (Coater)
Lunch		B3B	Varnisher (Coater)
Maintenance (feeder)		B3B	Varnisher (Coater)
Maintenance (press)		B3B	Varnisher (Coater)
Mixing Products	Chemical Storage	B3B	Varnisher (Coater)
Monitor Press (along press)	Monitor Coater, Monitor Production	B3B	Varnisher (Coater)
Monitor Press (infeed)		B3B	Varnisher (Coater)
Office Work		B3B	Varnisher (Coater)
Set-Up		B3B	Varnisher (Coater)
Break		B3C	Measurer
Closing (Shut Down)		B3C	Measurer
Lunch		B3C	Measurer
Maintenance (feeder)		B3C	Measurer
Maintenance (press)		B3C	Measurer
Mixing Products		B3C	Measurer
Monitor Press (along press)	Monitor Coater	B3C	Measurer
Monitor Press (infeed)		B3C	Measurer
Office Work		B3C	Measurer
Set-Up		B3C	Measurer
Bearing Heating		C1A	Heavy Equipment Repair Technician (Mechanic)
Break		C1A	Heavy Equipment Repair Technician (Mechanic)
Cleaning	Cleaning, sweeping, Cleaning/Sweeping/Vacuum	C1A	Heavy Equipment Repair Technician (Mechanic)
Compressed Air	Use Compressed Air	C1A	Heavy Equipment Repair Technician (Mechanic)
Cutting Torch (acetylene)		C1A	Heavy Equipment Repair Technician (Mechanic)
Drive Fork Lift		C1A	Heavy Equipment Repair Technician (Mechanic)
Hammer		C1A	Heavy Equipment Repair Technician (Mechanic)
Hand Truck		C1A	Heavy Equipment Repair Technician (Mechanic)
Lunch		C1A	Heavy Equipment Repair Technician (Mechanic)
Office Work	Office	C1A	Heavy Equipment Repair Technician (Mechanic)
Open and Close Bay Door	Open Bay Door	C1A	Heavy Equipment Repair Technician (Mechanic)
Operate Heavy Equipment	Operate Engine, Test Engine	C1A	Heavy Equipment Repair Technician (Mechanic)
Overhead Hoist/Pulley		C1A	Heavy Equipment Repair Technician (Mechanic)
Parts Washers		C1A	Heavy Equipment Repair Technician (Mechanic)
Planning Work	Planning	C1A	Heavy Equipment Repair Technician (Mechanic)
Power Hand Tools (pneumatic or electric)	Power Tool(s)	C1A	Heavy Equipment Repair Technician (Mechanic)
Pumping Fluids	Pumping Oil	C1A	Heavy Equipment Repair Technician (Mechanic)
Repair	Repair Machine or Part	C1A	Heavy Equipment Repair Technician (Mechanic)
Spray with high pressure washer		C1A	Heavy Equipment Repair Technician (Mechanic)
Stationary Power Tools	SandBlast, Hydraulic Press	C1A	Heavy Equipment Repair Technician (Mechanic)
Welding		C1A	Heavy Equipment Repair Technician (Mechanic)
Break		C2A	Motor Rebuilding Technician (Mechanic)
Chemical Dip Tank	Metalizing (used for rebuilding dept)	C2A	Motor Rebuilding Technician (Mechanic)
Cleaning	Cleaning/Sweeping/Vacuum	C2A	Motor Rebuilding Technician (Mechanic)
Compressed Air	Air Pressure	C2A	Motor Rebuilding Technician (Mechanic)
Control Booth	Control Room	C2A	Motor Rebuilding Technician (Mechanic)
Cutting Torch (acetylene)		C2A	Motor Rebuilding Technician (Mechanic)
Drive Fork Lift		C2A	Motor Rebuilding Technician (Mechanic)
Hammer		C2A	Motor Rebuilding Technician (Mechanic)
Hand Truck		C2A	Motor Rebuilding Technician (Mechanic)
Lunch		C2A	Motor Rebuilding Technician (Mechanic)

Task Name	Task Name Variations	Job Code	Job Name
Office Work	Office Activities	C2A	Motor Rebuilding Technician (Mechanic)
Overhead Hoist/Pulley	Hoist	C2A	Motor Rebuilding Technician (Mechanic)
Parts Washers		C2A	Motor Rebuilding Technician (Mechanic)
Planning Work		C2A	Motor Rebuilding Technician (Mechanic)
Power Hand Tools (pneumatic or electric)		C2A	Motor Rebuilding Technician (Mechanic)
Pumping Fluids		C2A	Motor Rebuilding Technician (Mechanic)
Repair	Repair Part, Repair Machine or Part, Repair Engine	C2A	Motor Rebuilding Technician (Mechanic)
Spray with high pressure washer	Pressure Washer, Spray with Pressure Washer, Spray Washer	C2A	Motor Rebuilding Technician (Mechanic)
Stationary Machine Use		C2A	Motor Rebuilding Technician (Mechanic)
Stationary Power Tools		C2A	Motor Rebuilding Technician (Mechanic)
Test Engines	Test Room	C2A	Motor Rebuilding Technician (Mechanic)
Test Fuel Injection Pump	Testing of Injection Pumps, Test Fuel Injection	C2A	Motor Rebuilding Technician (Mechanic)
Test Fuel Injector	Test Injector	C2A	Motor Rebuilding Technician (Mechanic)
Test Hydraulic Pump		C2A	Motor Rebuilding Technician (Mechanic)
Test Transmission		C2A	Motor Rebuilding Technician (Mechanic)
Tool Room		C2A	Motor Rebuilding Technician (Mechanic)
Use Press		C2A	Motor Rebuilding Technician (Mechanic)
Welding		C2A	Motor Rebuilding Technician (Mechanic)
Break		C2B	Transmission Rebuilding Technician (Mechanic)
Chemical Dip Tank	Metalizing (used for rebuilding dept)	C2B	Transmission Rebuilding Technician (Mechanic)
Cleaning	Cleaning/Sweeping/Vacuum	C2B	Transmission Rebuilding Technician (Mechanic)
Compressed Air	Air Pressure	C2B	Transmission Rebuilding Technician (Mechanic)
Control Booth	Control Room	C2B	Transmission Rebuilding Technician (Mechanic)
Cutting Torch (acetylene)		C2B	Transmission Rebuilding Technician (Mechanic)
Drive Fork Lift		C2B	Transmission Rebuilding Technician (Mechanic)
Hammer		C2B	Transmission Rebuilding Technician (Mechanic)
Hand Truck		C2B	Transmission Rebuilding Technician (Mechanic)
Lunch		C2B	Transmission Rebuilding Technician (Mechanic)
Office Work	Office Activities	C2B	Transmission Rebuilding Technician (Mechanic)
Overhead Hoist/Pulley	Hoist	C2B	Transmission Rebuilding Technician (Mechanic)
Parts Washers		C2B	Transmission Rebuilding Technician (Mechanic)
Planning Work		C2B	Transmission Rebuilding Technician (Mechanic)
Power Hand Tools (pneumatic or electric)		C2B	Transmission Rebuilding Technician (Mechanic)
Pumping Fluids		C2B	Transmission Rebuilding Technician (Mechanic)
Repair	Repair Part, Repair Machine or Part, Repair Engine	C2B	Transmission Rebuilding Technician (Mechanic)
Spray with high pressure washer	Pressure Washer, Spray with Pressure Washer, Spray Washer	C2B	Transmission Rebuilding Technician (Mechanic)
Stationary Machine Use		C2B	Transmission Rebuilding Technician (Mechanic)
Stationary Power Tools		C2B	Transmission Rebuilding Technician (Mechanic)
Test Engines	Test Room	C2B	Transmission Rebuilding Technician (Mechanic)
Test Fuel Injection Pump	Testing of Injection Pumps, Test Fuel Injection	C2B	Transmission Rebuilding Technician (Mechanic)
Test Fuel Injector	Test Injector	C2B	Transmission Rebuilding Technician (Mechanic)
Test Hydraulic Pump		C2B	Transmission Rebuilding Technician (Mechanic)
Test Transmission		C2B	Transmission Rebuilding Technician (Mechanic)
Tool Room		C2B	Transmission Rebuilding Technician (Mechanic)
Use Press		C2B	Transmission Rebuilding Technician (Mechanic)
Welding		C2B	Transmission Rebuilding Technician (Mechanic)
Break		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Chemical Dip Tank	Metalizing (used for rebuilding dept)	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Cleaning	Cleaning/Sweeping/Vacuum	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Compressed Air	Air Pressure	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Control Booth	Control Room	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Cutting Torch (acetylene)		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Drive Fork Lift		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Hammer		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Hand Truck		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Lunch		C2C	Cylinder Head Rebuilding Technician (Mechanic)

Task Name	Task Name Variations	Job Code	Job Name
Office Work	Office Activities	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Overhead Hoist/Pulley	Hoist	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Parts Washers		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Planning Work		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Power Hand Tools (pneumatic or electric)		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Pumping Fluids		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Repair	Repair Part, Repair Machine or Part, Repair Engine	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Spray with high pressure washer	Pressure Washer, Spray with Pressure Washer, Spray Washer	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Stationary Machine Use		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Stationary Power Tools		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Test Engines	Test Room	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Test Fuel Injection Pump	Testing of Injection Pumps, Test Fuel Injection	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Test Fuel Injector	Test Injector	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Test Hydraulic Pump		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Test Transmission		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Tool Room		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Use Press		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Welding		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Break		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Chemical Dip Tank	Metalizing (used for rebuilding dept)	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Cleaning	Cleaning/Sweeping/Vacuum	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Compressed Air	Air Pressure	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Control Booth	Control Room	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Cutting Torch (acetylene)		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Drive Fork Lift		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Hammer		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Hand Truck		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Lunch		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Office Work	Office Activities	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Overhead Hoist/Pulley	Hoist	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Parts Washers		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Planning Work		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Power Hand Tools (pneumatic or electric)		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Pumping Fluids		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Repair	Repair Part, Repair Machine or Part, Repair Engine	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Spray with high pressure washer	Pressure Washer, Spray with Pressure Washer, Spray Washer	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Stationary Machine Use		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Stationary Power Tools		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Test Engines	Test Room	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Test Fuel Injection Pump	Testing of Injection Pumps, Test Fuel Injection	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Test Fuel Injector	Test Injector	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Test Hydraulic Pump		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Test Transmission		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Tool Room		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Use Press		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Welding		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Break		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Chemical Dip Tank	Metalizing (used for rebuilding dept)	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Cleaning	Cleaning/Sweeping/Vacuum	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Compressed Air	Air Pressure	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Control Booth	Control Room	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Cutting Torch (acetylene)		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Drive Fork Lift		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Hammer		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Hand Truck		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Lunch		C2E	Fuel Injector Rebuilding Technician (Mechanic)

Task Name	Task Name Variations	Job Code	Job Name
Office Work	Office Activities	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Overhead Hoist/Pulley	Hoist	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Parts Washers		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Planning Work		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Power Hand Tools (pneumatic or electric)		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Pumping Fluids		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Repair	Repair Part, Repair Machine or Part, Repair Engine	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Spray with high pressure washer	Pressure Washer, Spray with Pressure Washer, Spray Washer	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Stationary Machine Use		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Stationary Power Tools		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Test Engines	Test Room	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Test Fuel Injection Pump	Testing of Injection Pumps, Test Fuel Injection	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Test Fuel Injector	Test Injector	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Test Hydraulic Pump		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Test Transmission		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Tool Room		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Use Press		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Welding		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Break		C3A	Machinist - Operations Section
Cleaning	Sweeping, Cleaning Up, Cleaning/Sweeping/Vacuum	C3A	Machinist - Operations Section
Compressed Air	Air Pressure	C3A	Machinist - Operations Section
Cutting Torch (acetylene)	Torch	C3A	Machinist - Operations Section
Drive Fork Lift	Fork Lift, Barret Lift	C3A	Machinist - Operations Section
Driving Service Car		C3A	Machinist - Operations Section
Hammer		C3A	Machinist - Operations Section
Hand Truck		C3A	Machinist - Operations Section
Lunch		C3A	Machinist - Operations Section
Metalizing	Metalizing Gun	C3A	Machinist - Operations Section
Office Work		C3A	Machinist - Operations Section
Overhead Hoist/Pulley	Overhead Crane	C3A	Machinist - Operations Section
Parts Washers		C3A	Machinist - Operations Section
Planning Work		C3A	Machinist - Operations Section
Power Hand Tools (pneumatic or electric)		C3A	Machinist - Operations Section
Repair	Repair Part, Repair Machine or Part	C3A	Machinist - Operations Section
Stationary Machine Use	Stationary Machining Equipment, Stationary Machine	C3A	Machinist - Operations Section
Stationary Power Tools		C3A	Machinist - Operations Section
Welding		C3A	Machinist - Operations Section
Break		C3B	Machinist - Welding Section
Cleaning	Sweeping, Cleaning Up, Cleaning/Sweeping/Vacuum	C3B	Machinist - Welding Section
Compressed Air	Air Pressure	C3B	Machinist - Welding Section
Cutting Torch (acetylene)	Torch	C3B	Machinist - Welding Section
Drive Fork Lift	Fork Lift, Barret Lift, Barret Truck	C3B	Machinist - Welding Section
Driving Service Car		C3B	Machinist - Welding Section
Hammer		C3B	Machinist - Welding Section
Hand Truck		C3B	Machinist - Welding Section
Lunch		C3B	Machinist - Welding Section
Metalizing	Metalizing Gun	C3B	Machinist - Welding Section
Office Work		C3B	Machinist - Welding Section
Overhead Hoist/Pulley	Overhead Crane	C3B	Machinist - Welding Section
Parts Washers		C3B	Machinist - Welding Section
Planning Work		C3B	Machinist - Welding Section
Power Hand Tools (pneumatic or electric)		C3B	Machinist - Welding Section
Repair	Repair Part, Repair Machine or Part	C3B	Machinist - Welding Section
Stationary Machine Use	Stationary Machining Equipment, Stationary Machine	C3B	Machinist - Welding Section

Task Name	Task Name Variations	Job Code	Job Name
Stationary Power Tools		C3B	Machinist - Welding Section
Welding		C3B	Machinist - Welding Section
Break		C3C	Machinist - Bay 56/58
Cleaning	Sweeping, Cleaning Up, Cleaning/Sweeping/Vacuum	C3C	Machinist - Bay 56/58
Compressed Air	Air Pressure	C3C	Machinist - Bay 56/58
Cutting Torch (acetylene)	Torch	C3C	Machinist - Bay 56/58
Drive Fork Lift	Fork Lift	C3C	Machinist - Bay 56/58
Driving Service Car		C3C	Machinist - Bay 56/58
Hammer		C3C	Machinist - Bay 56/58
Hand Truck		C3C	Machinist - Bay 56/58
Lunch		C3C	Machinist - Bay 56/58
Metalizing	Metalizing Gun	C3C	Machinist - Bay 56/58
Office Work		C3C	Machinist - Bay 56/58
Overhead Hoist/Pulley	Overhead Crane	C3C	Machinist - Bay 56/58
Parts Washers		C3C	Machinist - Bay 56/58
Planning Work		C3C	Machinist - Bay 56/58
Power Hand Tools (pneumatic or electric)		C3C	Machinist - Bay 56/58
Repair	Repair Part, Repair Machine or Part	C3C	Machinist - Bay 56/58
Stationary Machine Use	Stationary Machining Equipment, Stationary Machine	C3C	Machinist - Bay 56/58
Stationary Power Tools		C3C	Machinist - Bay 56/58
Welding		C3C	Machinist - Bay 56/58
Break		C4A	Welder
Cleaning	Cleaning/Sweeping/Vacuum	C4A	Welder
Compressed Air		C4A	Welder
Cutting Torch (acetylene)		C4A	Welder
Drive Fork Lift	Fork Lift, Fork Lift (354, Hydraulic Shovel), Barret Lift	C4A	Welder
Hammer		C4A	Welder
Hand Truck		C4A	Welder
Lunch		C4A	Welder
Office Work		C4A	Welder
Overhead Hoist/Pulley		C4A	Welder
Planning Work		C4A	Welder
Power Hand Tools (pneumatic or electric)		C4A	Welder
Repair	Repair Part Using Hands or Non-powered Hand Tools	C4A	Welder
Stationary Machine Use	Stationary Machining Equipment Use	C4A	Welder
Stationary Power Tools	Stationary Tool	C4A	Welder
Welding		C4A	Welder
Break		C5A	Track Repair
Cleaning	Cleaning/Sweeping/Vacuum	C5A	Track Repair
Compressed Air		C5A	Track Repair
Cutting Torch (acetylene)		C5A	Track Repair
Drive Fork Lift		C5A	Track Repair
Hammer		C5A	Track Repair
Hand Truck		C5A	Track Repair
Lunch		C5A	Track Repair
Office Work	Office Activities	C5A	Track Repair
Overhead Hoist/Pulley		C5A	Track Repair
Planning Work		C5A	Track Repair
Power Hand Tools (pneumatic or electric)		C5A	Track Repair
Repair		C5A	Track Repair
Spray with high pressure washer		C5A	Track Repair
Stationary Machine Use		C5A	Track Repair
Stationary Power Tools		C5A	Track Repair
Break		C5B	Painter
Cleaning	Cleaning/Sweeping/Vacuum	C5B	Painter
Compressed Air		C5B	Painter
Lunch		C5B	Painter

Task Name	Task Name Variations	Job Code	Job Name
Office Work		C5B	Painter
Paint Storage Room		C5B	Painter
Painting Activities		C5B	Painter
Planning Work		C5B	Painter
Power Hand Tools (pneumatic or electric)		C5B	Painter
Spray Painting	Painting	C5B	Painter
Stationary Machine Use		C5B	Painter

APPENDIX C: MASTER LIST OF MACHINES OR TOOLS FOR EACH JOB

Machine Name	Machine Name Variations	Job Code	Job Name
GN1		A1A	Thermoforming Operator
GN2		A1A	Thermoforming Operator
GN3		A1A	Thermoforming Operator
GN4		A1A	Thermoforming Operator
GN5		A1A	Thermoforming Operator
GN6		A1A	Thermoforming Operator
GN7		A1A	Thermoforming Operator
GN8		A1A	Thermoforming Operator
GN9		A1A	Thermoforming Operator
KK10		A1A	Thermoforming Operator
KK11		A1A	Thermoforming Operator
LG-23	GL-23	A1A	Thermoforming Operator
LY-22		A1A	Thermoforming Operator
PI-21		A1A	Thermoforming Operator
PI-24		A1A	Thermoforming Operator
PI-25		A1A	Thermoforming Operator
PI-26		A1A	Thermoforming Operator
PI-27		A1A	Thermoforming Operator
GN1		A1B	Thermoforming General Aid
GN2		A1B	Thermoforming General Aid
GN3		A1B	Thermoforming General Aid
GN4		A1B	Thermoforming General Aid
GN5		A1B	Thermoforming General Aid
GN6		A1B	Thermoforming General Aid
GN7		A1B	Thermoforming General Aid
GN8		A1B	Thermoforming General Aid
GN9		A1B	Thermoforming General Aid
Grinder		A1B	Thermoforming General Aid
KK10		A1B	Thermoforming General Aid
KK11		A1B	Thermoforming General Aid
LG-23	GL-23	A1B	Thermoforming General Aid
LY-22		A1B	Thermoforming General Aid
PI-21		A1B	Thermoforming General Aid
PI-24		A1B	Thermoforming General Aid
PI-25		A1B	Thermoforming General Aid
PI-26		A1B	Thermoforming General Aid
PI-27		A1B	Thermoforming General Aid
Air Gun		A1C	Thermoforming Mechanic
Drill		A1C	Thermoforming Mechanic
File		A1C	Thermoforming Mechanic
GN Location	GN Section	A1C	Thermoforming Mechanic
GN1		A1C	Thermoforming Mechanic
GN2		A1C	Thermoforming Mechanic
GN3		A1C	Thermoforming Mechanic
GN4		A1C	Thermoforming Mechanic
GN5		A1C	Thermoforming Mechanic
GN6		A1C	Thermoforming Mechanic
GN7		A1C	Thermoforming Mechanic
GN8		A1C	Thermoforming Mechanic
GN9		A1C	Thermoforming Mechanic
Hammer		A1C	Thermoforming Mechanic
KK10		A1C	Thermoforming Mechanic
KK11		A1C	Thermoforming Mechanic
LG-23	GL-23	A1C	Thermoforming Mechanic
LY-22		A1C	Thermoforming Mechanic
PI-21		A1C	Thermoforming Mechanic
PI-24		A1C	Thermoforming Mechanic
PI-25		A1C	Thermoforming Mechanic
PI-26		A1C	Thermoforming Mechanic
PI-27		A1C	Thermoforming Mechanic
Pneumatic Screwdriver		A1C	Thermoforming Mechanic

Machine Name	Machine Name Variations	Job Code	Job Name
OPS #1		A2A	Extrusion Operator
OPS #2		A2A	Extrusion Operator
Slitter #1		A2A	Extrusion Operator
Slitter #2		A2A	Extrusion Operator
Slitter #1		A2B	Slitter Operator
Slitter #2		A2B	Slitter Operator
Slitter #3		A2B	Slitter Operator
Slitter #4	Slitter in Lamination	A2B	Slitter Operator
Tube Cutter #1		A2B	Slitter Operator
Tube Cutter #2		A2B	Slitter Operator
Winder #1		A2B	Slitter Operator
Winder #2		A2B	Slitter Operator
Winder #3		A2B	Slitter Operator
Slitter #1		A2C	Weigh Station Operator
Slitter #2		A2C	Weigh Station Operator
Slitter #3		A2C	Weigh Station Operator
Slitter #4	Slitter in Lamination	A2C	Weigh Station Operator
Winder #1		A2C	Weigh Station Operator
Winder #2		A2C	Weigh Station Operator
Winder #3		A2C	Weigh Station Operator
Grinder #1		A2D	Grinder Operator
Grinder #2		A2D	Grinder Operator
Grinder #3		A2D	Grinder Operator
Grinder #4		A2D	Grinder Operator
#1		A2E	Pelletizer
#2		A2E	Pelletizer
Grinder #1		A2E	Pelletizer
Bench Mold Lathe T1 (LAV-MOU-TOU-1)		A3A	Mold Machinist
CNC Machine (LAV-MOU-CNC-1)		A3A	Mold Machinist
Compressed Air		A3A	Mold Machinist
Drill		A3A	Mold Machinist
Drill Press		A3A	Mold Machinist
Drill Press (LAV-MOU-DRI-1)	Drill #1	A3A	Mold Machinist
Drill Press (LAV-MOU-DRI-2)		A3A	Mold Machinist
Drill Press (LAV-MOU-DRI-3)	Drill #3	A3A	Mold Machinist
Elevator Hand Truck (LAV-MOU-ELE-4)		A3A	Mold Machinist
Grinder		A3A	Mold Machinist
Grinder (LAV-MOU-GRI-1)		A3A	Mold Machinist
Grinder (LAV-MOU-GRI-2)		A3A	Mold Machinist
Hammer		A3A	Mold Machinist
Lathe (LAV-MAI-TOU-2)	Maintenance Lathe	A3A	Mold Machinist
Milling F1 Mold (LAV-MOU-MIL-1)		A3A	Mold Machinist
Milling F2 Mold (LAV-MOU-MIL-2)	Milling Machine#2	A3A	Mold Machinist
Milling F3 Mold (LAV-MOU-MIL-3)		A3A	Mold Machinist
Milling Machine		A3A	Mold Machinist
Pneumatic Tools - Band Polisher		A3A	Mold Machinist
Pneumatic Tools - Band Polisher #1		A3A	Mold Machinist
Pneumatic Tools - Band Polisher #2		A3A	Mold Machinist
Pneumatic Tools - Band Polisher #3		A3A	Mold Machinist
Pneumatic Tools - Disc Polisher	Polisher	A3A	Mold Machinist
Pneumatic Tools - Drill to Drill Vacuum Holes		A3A	Mold Machinist
Sander	Rotary Sander	A3A	Mold Machinist
Scouring Pad		A3A	Mold Machinist
Taroder Drill (LAV-MOU-TAR-1)	Tapper	A3A	Mold Machinist
Transfer Point		A3A	Mold Machinist
Vacuum Former		A3A	Mold Machinist
Vertical Band Saw (LAV-MOU-VBS-1)		A3A	Mold Machinist
Welder	Welding Machine	A3A	Mold Machinist
Compressor #2		A4A	Maintenance Mechanic
Compressor #3		A4A	Maintenance Mechanic
Compressor #5		A4A	Maintenance Mechanic
Hammer		A4A	Maintenance Mechanic
OPS #2		A4A	Maintenance Mechanic
Saw	Mechanic Saw	A4A	Maintenance Mechanic

Machine Name	Machine Name Variations	Job Code	Job Name
Condensateur (extrusion)		A4B	Maintenance Electrician
OPS #2		A4B	Maintenance Electrician
Vacuum Cleaner		A4C	Plant Maintenance
		A5A	Fork Lift Driver
		B1A	Decorator
Air Wrench		B1B	Stretcher Operator
Aluminum Compactor		B1B	Stretcher Operator
Can Washer	Washer Machine	B1B	Stretcher Operator
Grinder		B1B	Stretcher Operator
Milling Machine		B1B	Stretcher Operator
Polisher		B1B	Stretcher Operator
Press		B1B	Stretcher Operator
Sander		B1B	Stretcher Operator
Stretcher		B1B	Stretcher Operator
Air Wrench		B1C	Stretcher Mechanic
Aluminum Compactor		B1C	Stretcher Mechanic
Can Washer	Washer Machine	B1C	Stretcher Mechanic
Grinder		B1C	Stretcher Mechanic
Milling Machine		B1C	Stretcher Mechanic
Polisher		B1C	Stretcher Mechanic
Press		B1C	Stretcher Mechanic
Sander		B1C	Stretcher Mechanic
Stretcher		B1C	Stretcher Mechanic
Aluminum Compactor		B1D	Mechanic - Canning Department (General Mechanic)
Anti Pollution Sheet	Anti Pollution Map	B1D	Mechanic - Canning Department (General Mechanic)
Body Varnish Machine		B1D	Mechanic - Canning Department (General Mechanic)
Coater		B1D	Mechanic - Canning Department (General Mechanic)
Compressed Air		B1D	Mechanic - Canning Department (General Mechanic)
Conveyor		B1D	Mechanic - Canning Department (General Mechanic)
Cyclone		B1D	Mechanic - Canning Department (General Mechanic)
Decorator		B1D	Mechanic - Canning Department (General Mechanic)
Drill	Drill (hand held)	B1D	Mechanic - Canning Department (General Mechanic)
Drill Press	Heavy Drill	B1D	Mechanic - Canning Department (General Mechanic)
Duster		B1D	Mechanic - Canning Department (General Mechanic)
Flanger		B1D	Mechanic - Canning Department (General Mechanic)
Grinder		B1D	Mechanic - Canning Department (General Mechanic)
Hammer		B1D	Mechanic - Canning Department (General Mechanic)
Incinerator (Damper)		B1D	Mechanic - Canning Department (General Mechanic)
Lathe		B1D	Mechanic - Canning Department (General Mechanic)
Light Test Machine		B1D	Mechanic - Canning Department (General Mechanic)
Milling Machine		B1D	Mechanic - Canning Department (General Mechanic)
Necker		B1D	Mechanic - Canning Department (General Mechanic)
Palletizer		B1D	Mechanic - Canning Department (General Mechanic)
Press (Canning)		B1D	Mechanic - Canning Department (General Mechanic)
Recycling Machine		B1D	Mechanic - Canning Department (General Mechanic)
Sander		B1D	Mechanic - Canning Department (General Mechanic)
Saw		B1D	Mechanic - Canning Department (General Mechanic)
Shear Press		B1D	Mechanic - Canning Department (General Mechanic)
Spin Necker Flanger		B1D	Mechanic - Canning Department (General Mechanic)
Spray Cleaning Machine		B1D	Mechanic - Canning Department (General Mechanic)
Strapping Machine		B1D	Mechanic - Canning Department (General Mechanic)
Stretcher		B1D	Mechanic - Canning Department (General Mechanic)
Washer/Dryer		B1D	Mechanic - Canning Department (General Mechanic)
Waxer		B1D	Mechanic - Canning Department (General Mechanic)
Welder		B1D	Mechanic - Canning Department (General Mechanic)
Wrapper		B1D	Mechanic - Canning Department (General Mechanic)
Aluminum Compactor		B1E	Mechanic - Rear Section
Anti Pollution Sheet	Anti Pollution Map	B1E	Mechanic - Rear Section
Body Varnish Machine		B1E	Mechanic - Rear Section
Coater		B1E	Mechanic - Rear Section
Compressed Air		B1E	Mechanic - Rear Section
Conveyor		B1E	Mechanic - Rear Section
Cyclone		B1E	Mechanic - Rear Section
Decorator		B1E	Mechanic - Rear Section

Machine Name	Machine Name Variations	Job Code	Job Name
Drill	Drill (hand held)	B1E	Mechanic - Rear Section
Drill Press	Heavy Drill	B1E	Mechanic - Rear Section
Duster		B1E	Mechanic - Rear Section
Flanger		B1E	Mechanic - Rear Section
Grinder		B1E	Mechanic - Rear Section
Hammer		B1E	Mechanic - Rear Section
Incinerator (Damper)		B1E	Mechanic - Rear Section
Lathe		B1E	Mechanic - Rear Section
Light Test Machine		B1E	Mechanic - Rear Section
Milling Machine		B1E	Mechanic - Rear Section
Necker		B1E	Mechanic - Rear Section
Palletizer		B1E	Mechanic - Rear Section
Press (Canning)		B1E	Mechanic - Rear Section
Recycling Machine		B1E	Mechanic - Rear Section
Sander		B1E	Mechanic - Rear Section
Saw		B1E	Mechanic - Rear Section
Shear Press		B1E	Mechanic - Rear Section
Spin Necker Flanger		B1E	Mechanic - Rear Section
Spray Cleaning Machine		B1E	Mechanic - Rear Section
Strapping Machine		B1E	Mechanic - Rear Section
Stretcher		B1E	Mechanic - Rear Section
Washer/Dryer		B1E	Mechanic - Rear Section
Waxer		B1E	Mechanic - Rear Section
Welder		B1E	Mechanic - Rear Section
Wrapper		B1E	Mechanic - Rear Section
		B1F	Department Aid
		B1G	Packaging Operator
Counter #1		B2A	Counting Operator
Counter #2		B2A	Counting Operator
Counter #3		B2A	Counting Operator
Counter #4		B2A	Counting Operator
Press #1		B2B	Press Operator
Press #2		B2B	Press Operator
Press #3		B2B	Press Operator
Press #4		B2B	Press Operator
Press #5		B2B	Press Operator
		B2C	Rotary Operator
		B3A	Printing Press
		B3B	Varnisher (Coater)
		B3C	Measurer
Air Drill	Drill	C1A	Heavy Equipment Repair Technician (Mechanic)
Air Wrench	Impact Wrench	C1A	Heavy Equipment Repair Technician (Mechanic)
Buffing Machine		C1A	Heavy Equipment Repair Technician (Mechanic)
Compressed Air		C1A	Heavy Equipment Repair Technician (Mechanic)
Deboring	Deborer	C1A	Heavy Equipment Repair Technician (Mechanic)
Drill Press	Stationary Drill	C1A	Heavy Equipment Repair Technician (Mechanic)
Grease Pump	Grease Gun	C1A	Heavy Equipment Repair Technician (Mechanic)
Grinder	Air Grinder	C1A	Heavy Equipment Repair Technician (Mechanic)
Hammer		C1A	Heavy Equipment Repair Technician (Mechanic)
Hydraulic Press		C1A	Heavy Equipment Repair Technician (Mechanic)
Oil Pump		C1A	Heavy Equipment Repair Technician (Mechanic)
Overhead Hoist/Pulley		C1A	Heavy Equipment Repair Technician (Mechanic)
Pedestal Grinder		C1A	Heavy Equipment Repair Technician (Mechanic)
Polisher		C1A	Heavy Equipment Repair Technician (Mechanic)
Pressure Washer		C1A	Heavy Equipment Repair Technician (Mechanic)
Sandblast Box	Sandblast(er)	C1A	Heavy Equipment Repair Technician (Mechanic)
Sander	Disc Sander (Sanding)	C1A	Heavy Equipment Repair Technician (Mechanic)
Saw		C1A	Heavy Equipment Repair Technician (Mechanic)
Stationary Grinder		C1A	Heavy Equipment Repair Technician (Mechanic)
Stationary Saw		C1A	Heavy Equipment Repair Technician (Mechanic)
Torch		C1A	Heavy Equipment Repair Technician (Mechanic)
Track Welding Machine		C1A	Heavy Equipment Repair Technician (Mechanic)
Air Wrench		C2A	Motor Rebuilding Technician (Mechanic)
Bearing Heater		C2A	Motor Rebuilding Technician (Mechanic)

Machine Name	Machine Name Variations	Job Code	Job Name
Buffing Machine		C2A	Motor Rebuilding Technician (Mechanic)
Compressed Air	Air Pressure	C2A	Motor Rebuilding Technician (Mechanic)
Drill Press		C2A	Motor Rebuilding Technician (Mechanic)
Grease Pump	Grease Gun	C2A	Motor Rebuilding Technician (Mechanic)
Grinder	Air Grinder, Circular Grinder, Die Grinder	C2A	Motor Rebuilding Technician (Mechanic)
Hammer		C2A	Motor Rebuilding Technician (Mechanic)
Hand Truck		C2A	Motor Rebuilding Technician (Mechanic)
Hydraulic Cylinder Activator		C2A	Motor Rebuilding Technician (Mechanic)
Hydraulic Press		C2A	Motor Rebuilding Technician (Mechanic)
Overhead Hoist/Pulley		C2A	Motor Rebuilding Technician (Mechanic)
Parts Washer	Washer Machine, Typhoon, Magnus	C2A	Motor Rebuilding Technician (Mechanic)
Polisher		C2A	Motor Rebuilding Technician (Mechanic)
Pressure Washer		C2A	Motor Rebuilding Technician (Mechanic)
Rotary File	File, Air Scribe	C2A	Motor Rebuilding Technician (Mechanic)
Sandblast Box	Sandblast Glove Box	C2A	Motor Rebuilding Technician (Mechanic)
Sander	Disc Sander	C2A	Motor Rebuilding Technician (Mechanic)
Stationary Grinder		C2A	Motor Rebuilding Technician (Mechanic)
Stationary Saw		C2A	Motor Rebuilding Technician (Mechanic)
Stone Resurfacer		C2A	Motor Rebuilding Technician (Mechanic)
Surfacer		C2A	Motor Rebuilding Technician (Mechanic)
Torch		C2A	Motor Rebuilding Technician (Mechanic)
Valve Grinder		C2A	Motor Rebuilding Technician (Mechanic)
Air Wrench		C2B	Transmission Rebuilding Technician (Mechanic)
Bearing Heater		C2B	Transmission Rebuilding Technician (Mechanic)
Buffing Machine		C2B	Transmission Rebuilding Technician (Mechanic)
Compressed Air	Air Pressure	C2B	Transmission Rebuilding Technician (Mechanic)
Drill Press		C2B	Transmission Rebuilding Technician (Mechanic)
Grease Pump	Grease Gun	C2B	Transmission Rebuilding Technician (Mechanic)
Grinder	Air Grinder, Circular Grinder, Die Grinder	C2B	Transmission Rebuilding Technician (Mechanic)
Hammer		C2B	Transmission Rebuilding Technician (Mechanic)
Hand Truck		C2B	Transmission Rebuilding Technician (Mechanic)
Hydraulic Cylinder Activator		C2B	Transmission Rebuilding Technician (Mechanic)
Hydraulic Press		C2B	Transmission Rebuilding Technician (Mechanic)
Overhead Hoist/Pulley		C2B	Transmission Rebuilding Technician (Mechanic)
Parts Washer		C2B	Transmission Rebuilding Technician (Mechanic)
Polisher		C2B	Transmission Rebuilding Technician (Mechanic)
Pressure Washer		C2B	Transmission Rebuilding Technician (Mechanic)
Rotary File	File, Air Scribe	C2B	Transmission Rebuilding Technician (Mechanic)
Sandblast Box	Sandblast Glove Box	C2B	Transmission Rebuilding Technician (Mechanic)
Sander	Disc Sander	C2B	Transmission Rebuilding Technician (Mechanic)
Stationary Grinder		C2B	Transmission Rebuilding Technician (Mechanic)
Stationary Saw		C2B	Transmission Rebuilding Technician (Mechanic)
Stone Resurfacer		C2B	Transmission Rebuilding Technician (Mechanic)
Surfacer		C2B	Transmission Rebuilding Technician (Mechanic)
Torch		C2B	Transmission Rebuilding Technician (Mechanic)
Valve Grinder		C2B	Transmission Rebuilding Technician (Mechanic)
Air Wrench		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Bearing Heater		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Buffing Machine		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Compressed Air	Air Pressure	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Drill	Air Drill	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Drill Press		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Grease Pump	Grease Gun	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Grinder	Air Grinder, Circular Grinder, Die Grinder	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Hammer		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Hand Truck		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Hydraulic Cylinder Activator		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Hydraulic Press		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Overhead Hoist/Pulley		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Parts Washer		C2C	Cylinder Head Rebuilding Technician (Mechanic)

Machine Name	Machine Name Variations	Job Code	Job Name
Polisher		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Pressure Washer		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Rotary File	File, Air Scribe	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Sandblast Box	Sandblast Glove Box	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Sander	Disc Sander	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Stationary Grinder		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Stationary Saw		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Stone Resurfacer	Stone Refacer	C2C	Cylinder Head Rebuilding Technician (Mechanic)
Surfacer		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Torch		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Valve Grinder		C2C	Cylinder Head Rebuilding Technician (Mechanic)
Air Wrench		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Bearing Heater		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Buffing Machine		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Compressed Air	Air Pressure	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Drill Press		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Grease Pump	Grease Gun	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Grinder	Air Grinder, Circular Grinder, Die Grinder	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Hammer		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Hand Truck		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Hydraulic Cylinder Activator		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Hydraulic Press		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Overhead Hoist/Pulley		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Parts Washer		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Polisher		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Pressure Washer		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Rotary File	File, Air Scribe	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Sandblast Box	Sandblast Glove Box	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Sander	Disc Sander	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Stationary Grinder		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Stationary Saw		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Stone Resurfacer		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Surfacer		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Torch		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Valve Grinder		C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
Air Wrench		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Bearing Heater		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Buffing Machine		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Compressed Air	Air Pressure	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Drill Press		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Grease Pump	Grease Gun	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Grinder	Air Grinder, Circular Grinder, Die Grinder	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Hammer		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Hand Truck		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Hydraulic Cylinder Activator		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Hydraulic Press		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Overhead Hoist/Pulley		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Parts Washer		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Polisher		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Pressure Washer		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Rotary File	File, Air Scribe	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Sandblast Box	Sandblast Glove Box	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Sander	Disc Sander	C2E	Fuel Injector Rebuilding Technician (Mechanic)
Stationary Grinder		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Stationary Saw		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Stone Resurfacer		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Surfacer		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Torch		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Valve Grinder		C2E	Fuel Injector Rebuilding Technician (Mechanic)
Air Wrench		C3A	Machinist - Operations Section
Bearing Heater	Induction Bearing Heater	C3A	Machinist - Operations Section
Boring Machine		C3A	Machinist - Operations Section

Machine Name	Machine Name Variations	Job Code	Job Name
Boring Mill 73-1		C3A	Machinist - Operations Section
Boring Mill 73-2		C3A	Machinist - Operations Section
Buffing Machine		C3A	Machinist - Operations Section
Compressed Air	Air Pressure	C3A	Machinist - Operations Section
Drill	Electric Drill	C3A	Machinist - Operations Section
Drill Press		C3A	Machinist - Operations Section
Grinder	Grinding	C3A	Machinist - Operations Section
Honing Machine		C3A	Machinist - Operations Section
Honing Machine 56-12		C3A	Machinist - Operations Section
Hydraulic Cylinder Activator		C3A	Machinist - Operations Section
Hydraulic Press		C3A	Machinist - Operations Section
Lathe		C3A	Machinist - Operations Section
Lathe (Tour 50-1)		C3A	Machinist - Operations Section
Lathe (Tour 50-3)		C3A	Machinist - Operations Section
Lathe (Tour 50-4)		C3A	Machinist - Operations Section
Lathe (Tour 50-5)	Lathe 50-5	C3A	Machinist - Operations Section
Lathe (Tour 50-6)		C3A	Machinist - Operations Section
Lathe 73-8		C3A	Machinist - Operations Section
Machining Drill	Drill	C3A	Machinist - Operations Section
Machining Drill 50-7	Drill 50-7	C3A	Machinist - Operations Section
MagnaFlux 56-10		C3A	Machinist - Operations Section
Metal Enlarger Machine		C3A	Machinist - Operations Section
Metalizing Gun		C3A	Machinist - Operations Section
Milling 50-10		C3A	Machinist - Operations Section
Milling 50-11		C3A	Machinist - Operations Section
Milling 50-9		C3A	Machinist - Operations Section
Milling Machine		C3A	Machinist - Operations Section
Overhead Hoist/Pulley		C3A	Machinist - Operations Section
Polisher 56-8		C3A	Machinist - Operations Section
Polisher/Sander	Stationary Sander	C3A	Machinist - Operations Section
Sandblast Box		C3A	Machinist - Operations Section
Sander	Disc Sander (hand held)	C3A	Machinist - Operations Section
Sander #1 (hand held)		C3A	Machinist - Operations Section
Sander #2 (hand held)		C3A	Machinist - Operations Section
Stationary Circular Saw	Circular Saw	C3A	Machinist - Operations Section
Stationary Grinder	Pedestal Grinder	C3A	Machinist - Operations Section
Stationary Saw	Saw	C3A	Machinist - Operations Section
Stationary Saw 73-3	Saw 73-3	C3A	Machinist - Operations Section
Surface Grinder		C3A	Machinist - Operations Section
Surface Grinder 50-8		C3A	Machinist - Operations Section
Surface Grinder 56-1		C3A	Machinist - Operations Section
Air Wrench		C3B	Machinist - Welding Section
Bearing Heater	Induction Bearing Heater	C3B	Machinist - Welding Section
Boring Machine		C3B	Machinist - Welding Section
Boring Mill 73-1		C3B	Machinist - Welding Section
Boring Mill 73-2		C3B	Machinist - Welding Section
Buffing Machine		C3B	Machinist - Welding Section
Compressed Air	Air Pressure	C3B	Machinist - Welding Section
Drill	Electric Drill	C3B	Machinist - Welding Section
Drill Press		C3B	Machinist - Welding Section
Grinder	Grinding	C3B	Machinist - Welding Section
Honing Machine		C3B	Machinist - Welding Section
Honing Machine 56-12		C3B	Machinist - Welding Section
Hydraulic Cylinder Activator		C3B	Machinist - Welding Section
Hydraulic Press		C3B	Machinist - Welding Section
Lathe		C3B	Machinist - Welding Section
Lathe (Tour 50-1)		C3B	Machinist - Welding Section
Lathe (Tour 50-3)		C3B	Machinist - Welding Section
Lathe (Tour 50-4)		C3B	Machinist - Welding Section
Lathe (Tour 50-5)	Lathe 50-5	C3B	Machinist - Welding Section
Lathe (Tour 50-6)		C3B	Machinist - Welding Section
Lathe 73-8		C3B	Machinist - Welding Section
Machining Drill	Drill	C3B	Machinist - Welding Section
Machining Drill 50-7	Drill 50-7	C3B	Machinist - Welding Section

Machine Name	Machine Name Variations	Job Code	Job Name
MagnaFlux 56-10		C3B	Machinist - Welding Section
Metal Enlarger Machine		C3B	Machinist - Welding Section
Metalizing Gun		C3B	Machinist - Welding Section
Milling 50-10		C3B	Machinist - Welding Section
Milling 50-11		C3B	Machinist - Welding Section
Milling 50-9		C3B	Machinist - Welding Section
Milling Machine		C3B	Machinist - Welding Section
Overhead Hoist/Pulley		C3B	Machinist - Welding Section
Polisher 56-8		C3B	Machinist - Welding Section
Polisher/Sander	Stationary Sander	C3B	Machinist - Welding Section
Sandblast Box		C3B	Machinist - Welding Section
Sander	Disc Sander (hand held)	C3B	Machinist - Welding Section
Sander #1 (hand held)		C3B	Machinist - Welding Section
Sander #2 (hand held)		C3B	Machinist - Welding Section
Stationary Circular Saw	Circular Saw	C3B	Machinist - Welding Section
Stationary Grinder	Pedestal Grinder	C3B	Machinist - Welding Section
Stationary Saw	Saw	C3B	Machinist - Welding Section
Stationary Saw 73-3	Saw 73-3	C3B	Machinist - Welding Section
Surface Grinder		C3B	Machinist - Welding Section
Surface Grinder 50-8		C3B	Machinist - Welding Section
Surface Grinder 56-1		C3B	Machinist - Welding Section
Air Wrench		C3C	Machinist - Bay 56/58
Bearing Heater	Induction Bearing Heater	C3C	Machinist - Bay 56/58
Boring Machine		C3C	Machinist - Bay 56/58
Boring Mill 73-1		C3C	Machinist - Bay 56/58
Boring Mill 73-2		C3C	Machinist - Bay 56/58
Buffing Machine		C3C	Machinist - Bay 56/58
Compressed Air	Air Pressure	C3C	Machinist - Bay 56/58
Drill	Electric Drill	C3C	Machinist - Bay 56/58
Drill Press		C3C	Machinist - Bay 56/58
Grinder	Grinding	C3C	Machinist - Bay 56/58
Honing Machine		C3C	Machinist - Bay 56/58
Honing Machine 56-12		C3C	Machinist - Bay 56/58
Hydraulic Cylinder Activator		C3C	Machinist - Bay 56/58
Hydraulic Press		C3C	Machinist - Bay 56/58
Lathe		C3C	Machinist - Bay 56/58
Lathe (Tour 50-1)		C3C	Machinist - Bay 56/58
Lathe (Tour 50-3)		C3C	Machinist - Bay 56/58
Lathe (Tour 50-4)		C3C	Machinist - Bay 56/58
Lathe (Tour 50-5)	Lathe 50-5	C3C	Machinist - Bay 56/58
Lathe (Tour 50-6)		C3C	Machinist - Bay 56/58
Lathe 73-8		C3C	Machinist - Bay 56/58
Machining Drill	Drill	C3C	Machinist - Bay 56/58
Machining Drill 50-7	Drill 50-7	C3C	Machinist - Bay 56/58
MagnaFlux 56-10		C3C	Machinist - Bay 56/58
Metal Enlarger Machine		C3C	Machinist - Bay 56/58
Metalizing Gun		C3C	Machinist - Bay 56/58
Milling 50-10		C3C	Machinist - Bay 56/58
Milling 50-11		C3C	Machinist - Bay 56/58
Milling 50-9		C3C	Machinist - Bay 56/58
Milling Machine		C3C	Machinist - Bay 56/58
Overhead Hoist/Pulley		C3C	Machinist - Bay 56/58
Polisher 56-8		C3C	Machinist - Bay 56/58
Polisher/Sander	Stationary Sander	C3C	Machinist - Bay 56/58
Sandblast Box		C3C	Machinist - Bay 56/58
Sander	Disc Sander (hand held)	C3C	Machinist - Bay 56/58
Sander #1 (hand held)		C3C	Machinist - Bay 56/58
Sander #2 (hand held)		C3C	Machinist - Bay 56/58
Stationary Circular Saw	Circular Saw	C3C	Machinist - Bay 56/58
Stationary Grinder	Pedestal Grinder	C3C	Machinist - Bay 56/58
Stationary Saw	Saw	C3C	Machinist - Bay 56/58
Stationary Saw 73-3	Saw 73-3	C3C	Machinist - Bay 56/58
Surface Grinder		C3C	Machinist - Bay 56/58
Surface Grinder 50-8		C3C	Machinist - Bay 56/58

Machine Name	Machine Name Variations	Job Code	Job Name
Surface Grinder 56-1		C3C	Machinist - Bay 56/58
Torch		C3C	Machinist - Bay 56/58
Air Chipper	Chipper	C4A	Welder
Air Wrench	Wrench	C4A	Welder
Arc-Air Welder	Air-Arc	C4A	Welder
Compressed Air		C4A	Welder
Cutting Torch	Acetylene Torch	C4A	Welder
Drill Press		C4A	Welder
Grinder	Air Grinder, Grinding	C4A	Welder
Hammer		C4A	Welder
Hydraulic Press		C4A	Welder
Hydraulic Pump		C4A	Welder
MIG Welder	Automatic MIG	C4A	Welder
Overhead Hoist/Pulley		C4A	Welder
Polisher/Sander		C4A	Welder
Rotary File		C4A	Welder
Sandblast Box		C4A	Welder
Sander		C4A	Welder
Sander - Belt Sander		C4A	Welder
Saw		C4A	Welder
Semi-Automatic Welder		C4A	Welder
Stationary Sander 73-4	Sander 73-4	C4A	Welder
Stationary Saw 73-6	Saw 73-6	C4A	Welder
Torch Cutting Machine 75-2 (Bay 75)		C4A	Welder
Welder	Welding, Welding Machine	C4A	Welder
Air Wrench		C5A	Track Repair
Bolt Wrench 72-1		C5A	Track Repair
Grinder	Grinding	C5A	Track Repair
Hammer		C5A	Track Repair
Overhead Hoist/Pulley		C5A	Track Repair
Pin Press 72-2		C5A	Track Repair
Press 72-5		C5A	Track Repair
Press Roller 70-3		C5A	Track Repair
Sandblast Box		C5A	Track Repair
Sander		C5A	Track Repair
Track Press		C5A	Track Repair
Centurian Idler		C5A	Track Repair
Compressed Air		C5B	Painter
Hydraulic Press		C5B	Painter
Machining Drill		C5B	Painter
Milling Machine		C5B	Painter
Polisher/Sander	Stationary Machine	C5B	Painter
Sander		C5B	Painter
Track Roller Machine		C5B	Painter

Z

APPENDIX D: DOSIMETER SET-UP AND CALIBRATION INSTRUCTIONS

Instructions for Setting up the Larson Davis Spark 705P for Data Collection:

1. Connect the infra-red communicator (“dongle”) to the computer.
2. Open Blaze software program on computer.
3. Position dosimeter within few inches of dongle (there is an IR symbol on the top left side of the dosimeter to show where the IR connection is located).
4. Press the connect button on the blaze software toolbar to connect the instrument with the blaze program (page 2-2 to 2-4 shows the toolbar symbols and functions).
5. Press the **instrument manager** button on the toolbar
 - 5.1 Press the *instrument status tab* and note the battery life (replace the battery if less than 14 hours remain).
 - 5.2 Review the instrument time and synchronize with the computer time if necessary (instructions start on page 2-9 of the blaze manual).
6. Press the *calibrate tab* and calibrate the dosimeter according to the directions starting on page 2-12 of the blaze manual (the calibrator level should be set to 114dB). Calibration should be done before each day of noise monitoring, but only after noise study data has been downloaded. Note: be careful when inserting and removing the dosimeter microphone from the calibration collar.
7. Press the *general settings tab* and make sure that the instruments has the following settings (instructions for modifying these can be found starting on page 2-18 of the blaze manual):

RMS weighting: A-weighted
 Peak weighting: Unweighted
 Detector Setting: Slow
 Sample interval: 1 Sec.
 Gain: 0 dB
 Battery type: Alkaline

<i>Settings</i>	Dose Parameters			
	<i>Dose 1</i>	<i>Dose 2</i>	<i>Dose 3</i>	<i>Dose 4</i>
Exchange Rate	5	5	3	3
Threshold Level (dB)	80	0	80	0
Criterion Level (dB)	85	85	85	85
Criterion Duration (hrs)	8	8	8	8

Once the settings have been established the “configure instrument” button must be pushed to configure the dosimeter.

Note 1: A user defined configuration can be set-up (page 2-25 of blaze manual). I will set up the NIOSH configuration with the name “noise study settings.”

Note 2: After the dosimeter has been set-up the first time it should not need to be reconfigured each time.

8. Press the ***Auto-Timer tab*** to set the times for the 705P dosimeter to automatically turn on and off. (This will need to be done before each day of sampling. Instructions are found starting on page 2-28 of the blaze manual)

8.1 Set the timer mode to “Block Timer”

8.2 Set the “first day” and “last day” to the date on which the sample will be collected.

8.3 Set the “Time1” start and stop times so that the dosimeter will turn on 10 minutes before the anticipated start of the next day’s work shift and turn off 30 minutes after the anticipated end of the work shift. For example if the work shift is supposed to start 8:00 AM and end at 4:30 PM you would set the start time to 7:50 and the end time to 17:00 (note that a 24 hr timer is used).

8.4 Press the “Set Timer” button to save the timer settings

Instructions for Setting up the Larson Davis Spark 706RC for Data Collection:

1. Connect the infra-red communicator (“dongle”) to the computer.
2. Open Blaze software program on computer.
3. Turn on the 706RC dosimeter and position the dosimeter within few inches of dongle (there is an IR symbol on the top left side of the dosimeter to show where the IR connection is located).
4. Press the connect button on the blaze software toolbar to connect the instrument with the blaze program (page 2-2 to 2-4 shows the toolbar symbols and functions).
5. Press the **instrument manager** button on the toolbar
 - 5.1 Press the **instrument status tab** and note the battery life (replace the battery if less than 14 hours remain).
 - 5.2 Review the instrument time and synchronize with the computer time if necessary (instructions start on page 2-9 of the blaze manual).
6. Press the **calibrate tab** and calibrate the dosimeter according to the directions starting on page 2-12 of the blaze manual (the calibrator level should be set to 114dB). Calibration should be done before each day of noise monitoring, but only after noise study data has been downloaded. Note: be careful when inserting and removing the dosimeter microphone from the calibration collar.
7. Press the **general settings tab** and make sure that the instruments has the following settings (instructions for modifying these can be found starting on page 2-18 of the blaze manual):

RMS weighting: A-weighted
Peak weighting: Unweighted
Detector Setting: Slow
Sample interval: 1 Sec.
Gain: 0 dB
Battery type: Alkaline

	Dose Parameters			
Settings	Dose 1	Dose 2	Dose 3	Dose 4
Exchange Rate	5	5	3	3
Threshold Level (dB)	80	0	80	0
Criterion Level (dB)	85	85	85	85
Criterion Duration (hrs)	8	8	8	8

Once the settings have been established the “configure instrument” button must be pushed to configure the dosimeter.

Note 1: A user defined configuration can be set-up (page 2-25 of blaze manual). I will set up the NIOSH configuration with the name “noise study settings.”

Note 2: After the dosimeter has been set-up the first time it should not need to be reconfigured each time.

8. Press the **Auto-Timer tab**. Make sure the timer mode is set to “timer off.” Note this applies to the 706RC dosimeter only.

APPENDIX E: CALIBRATION HISTORY RECORDS

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
17184	114 dB	10.4 dB	Aug	11	2003	12:58:11	Mon
17184	114 dB	10.4 dB	Aug	11	2003	13:00:00	Mon
17184	114 dB	10.1 dB	Aug	19	2003	16:08:23	Tue
17184	114 dB	10.1 dB	Aug	19	2003	16:08:00	Tue
17184	114 dB	11.0 dB	Aug	19	2003	15:18:17	Tue
17184	114 dB	11.0 dB	Aug	19	2003	15:20:00	Tue
17184	114 dB	11.1 dB	Aug	20	2003	15:24:41	Wed
17184	114 dB	11.1 dB	Aug	20	2003	15:27:00	Wed
17184	114 dB	11.0 dB	Aug	21	2003	15:09:47	Thu
17184	114 dB	11.0 dB	Aug	21	2003	15:12:00	Thu
17184	114 dB	11.1 dB	Aug	22	2003	15:03:28	Fri
17184	114 dB	11.1 dB	Aug	22	2003	15:06:00	Fri
17184	114 dB	10.7 dB	Aug	25	2003	15:39:44	Mon
17184	114 dB	10.7 dB	Aug	25	2003	15:42:00	Mon
17184	114 dB	10.4 dB	May	26	2003	19:46:00	Mon
17184	114 dB	9.9 dB	Nov	6	2003	11:13:00	Thu
17185	114 dB	10.9 dB	Aug	7	2003	13:19:23	Thu
17185	114 dB	11.2 dB	Dec	1	2003	15:07:23	Mon
17185	114 dB	10.6 dB	Dec	3	2003	14:07:51	Wed
17185	114 dB	11.1 dB	Dec	4	2003	0:10:36	Thu
17185	114 dB	11.1 dB	Dec	4	2003	19:20:26	Thu
17185	114 dB	11.1 dB	Dec	9	2003	18:27:33	Tue
17185	114 dB	11.3 dB	Dec	10	2003	15:24:50	Wed
17185	114 dB	11.0 dB	Dec	15	2003	7:02:13	Mon
17185	114 dB	11.3 dB	Dec	15	2003	15:41:48	Mon
17185	114 dB	11.1 dB	Dec	16	2003	15:22:43	Tue
17185	114 dB	11.1 dB	Dec	17	2003	15:29:15	Wed
17185	114 dB	11.1 dB	Dec	18	2003	16:04:53	Thu
17185	114 dB	11.4 dB	Dec	19	2003	15:57:44	Fri
17185	114 dB	11.1 dB	Jul	3	2003	18:39:00	Thu
17185	114 dB	11.1 dB	Jul	4	2003	15:05:40	Fri
17185	114 dB	11.0 dB	Jul	8	2003	18:42:41	Tue
17185	114 dB	11.1 dB	Jul	9	2003	15:08:52	Wed
17185	114 dB	11.0 dB	Jul	10	2003	18:37:24	Thu
17185	114 dB	11.0 dB	Jul	11	2003	15:16:00	Fri
17185	114 dB	11.0 dB	Jul	11	2003	15:16:52	Fri
17185	114 dB	11.1 dB	Jul	15	2003	14:56:00	Tue
17185	114 dB	11.1 dB	Jul	15	2003	14:56:37	Tue
17185	114 dB	11.1 dB	Jul	24	2003	15:19:00	Thu
17185	114 dB	11.0 dB	Jul	25	2003	10:29:00	Fri
17185	114 dB	11.1 dB	Jul	29	2003	18:20:00	Tue
17185	114 dB	11.0 dB	Jun	9	2003	15:07:21	Mon
17185	114 dB	11.0 dB	Jun	9	2003	15:09:00	Mon
17185	114 dB	11.0 dB	Jun	16	2003	19:02:00	Mon
17185	114 dB	11.0 dB	Jun	17	2003	15:21:17	Tue
17185	114 dB	11.0 dB	Jun	17	2003	15:24:00	Tue
17185	114 dB	11.1 dB	Jun	18	2003	15:10:33	Wed
17185	114 dB	11.1 dB	Jun	18	2003	15:13:00	Wed
17185	114 dB	11.0 dB	Jun	19	2003	18:59:35	Thu
17185	114 dB	11.1 dB	Jun	26	2003	19:05:00	Thu
17185	114 dB	11.1 dB	Jun	27	2003	18:41:00	Fri
17185	114 dB	10.2 dB	Nov	18	2003	9:06:23	Tue
17185	114 dB	10.2 dB	Nov	18	2003	10:02:00	Tue
17185	114 dB	11.1 dB	Nov	19	2003	15:37:02	Wed
17185	114 dB	11.1 dB	Nov	19	2003	16:32:00	Wed
17185	114 dB	11.1 dB	Nov	21	2003	15:35:59	Fri
17185	114 dB	11.2 dB	Nov	24	2003	15:05:01	Mon
17185	114 dB	11.2 dB	Nov	25	2003	19:13:24	Tue
17185	114 dB	11.0 dB	Nov	26	2003	15:38:01	Wed
17185	114 dB	11.2 dB	Nov	27	2003	15:48:45	Thu

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
17185	114 dB	10.5 dB	Oct	10	2003	19:04:00	Fri
17186	114 dB	9.3 dB	Aug	3	2002	12:31:00	Sat
17186	114 dB	11.3 dB	Aug	11	2003	12:21:00	Mon
17186	114 dB	11.3 dB	Aug	11	2003	12:21:46	Mon
17186	114 dB	10.5 dB	Aug	18	2003	15:46:10	Mon
17186	114 dB	10.6 dB	Aug	19	2003	15:40:16	Tue
17186	114 dB	11.2 dB	Aug	20	2003	16:02:08	Wed
17186	114 dB	10.5 dB	Aug	21	2003	15:56:10	Thu
17186	114 dB	11.2 dB	Aug	25	2003	15:31:08	Mon
17186	114 dB	11.2 dB	Aug	26	2003	14:52:47	Tue
17186	114 dB	10.4 dB	Aug	27	2003	6:45:42	Wed
17186	114 dB	11.7 dB	Dec	16	2003	15:38:04	Tue
17186	114 dB	11.7 dB	Dec	16	2003	16:36:00	Tue
17186	114 dB	11.6 dB	Dec	17	2003	15:31:39	Wed
17186	114 dB	11.6 dB	Dec	17	2003	16:30:00	Wed
17186	114 dB	11.6 dB	Dec	18	2003	16:00:56	Thu
17186	114 dB	11.6 dB	Dec	18	2003	16:59:00	Thu
17186	114 dB	11.8 dB	Dec	19	2003	15:37:19	Fri
17186	114 dB	9.1 dB	Jun	19	2003	16:29:00	Thu
17186	114 dB	9.1 dB	Jun	19	2003	16:29:51	Thu
17186	114 dB	10.8 dB	Oct	14	2003	19:09:00	Tue
17188	114 dB	9.6 dB	Aug	4	2003	15:06:00	Mon
17188	114 dB	9.3 dB	Aug	5	2003	15:11:36	Tue
17188	114 dB	9.3 dB	Aug	5	2003	15:12:00	Tue
17188	114 dB	9.6 dB	Aug	6	2003	15:21:40	Wed
17188	114 dB	9.6 dB	Aug	6	2003	15:22:00	Wed
17188	114 dB	9.2 dB	Aug	7	2003	23:06:53	Thu
17188	114 dB	9.2 dB	Aug	7	2003	23:07:00	Thu
17188	114 dB	9.7 dB	Aug	11	2003	19:20:00	Mon
17188	114 dB	9.7 dB	Aug	12	2003	15:08:45	Tue
17188	114 dB	9.7 dB	Aug	12	2003	15:09:00	Tue
17188	114 dB	9.5 dB	Aug	18	2003	15:56:57	Mon
17188	114 dB	9.5 dB	Aug	18	2003	15:57:00	Mon
17188	114 dB	9.4 dB	Aug	19	2003	15:32:03	Tue
17188	114 dB	9.4 dB	Aug	20	2003	15:52:43	Wed
17188	114 dB	9.4 dB	Aug	20	2003	15:53:00	Wed
17188	114 dB	9.6 dB	Aug	21	2003	15:37:35	Thu
17188	114 dB	9.6 dB	Aug	21	2003	15:38:00	Thu
17188	114 dB	9.3 dB	Aug	22	2003	15:23:47	Fri
17188	114 dB	9.3 dB	Aug	22	2003	15:24:00	Fri
17188	114 dB	8.6 dB	Aug	25	2003	15:44:04	Mon
17188	114 dB	8.6 dB	Aug	25	2003	15:45:00	Mon
17188	114 dB	9.0 dB	Aug	25	2003	14:11:05	Mon
17188	114 dB	9.0 dB	Aug	25	2003	14:12:00	Mon
17188	114 dB	8.4 dB	Aug	26	2003	15:28:27	Tue
17188	114 dB	8.8 dB	Aug	26	2003	15:29:31	Tue
17188	114 dB	8.8 dB	Aug	26	2003	15:30:00	Tue
17188	114 dB	11.8 dB	Dec	16	2003	15:35:44	Tue
17188	114 dB	11.8 dB	Dec	16	2003	15:36:00	Tue
17188	114 dB	11.5 dB	Dec	18	2003	16:10:02	Thu
17188	114 dB	11.5 dB	Dec	18	2003	16:11:00	Thu
17188	114 dB	12.3 dB	Jul	2	2003	19:15:01	Wed
17188	114 dB	12.4 dB	Jul	3	2003	15:34:51	Thu
17188	114 dB	11.9 dB	Jul	4	2003	15:07:08	Fri
17188	114 dB	11.7 dB	Jul	7	2003	15:26:16	Mon
17188	114 dB	13.0 dB	Jul	8	2003	15:07:22	Tue
17188	114 dB	12.0 dB	Jul	9	2003	15:19:15	Wed
17188	114 dB	12.4 dB	Jul	10	2003	23:12:02	Thu
17188	114 dB	11.9 dB	Jul	14	2003	15:24:10	Mon
17188	114 dB	12.2 dB	Jul	15	2003	14:51:57	Tue
17188	114 dB	8.8 dB	Jul	16	2003	16:18:05	Wed
17188	114 dB	9.3 dB	Jul	17	2003	23:33:02	Thu
17188	114 dB	9.0 dB	Jul	21	2003	18:54:02	Mon

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
17188	114 dB	9.4 dB	Jul	22	2003	14:47:11	Tue
17188	114 dB	9.2 dB	Jul	23	2003	15:41:49	Wed
17188	114 dB	9.6 dB	Jul	24	2003	19:16:37	Thu
17188	114 dB	9.2 dB	Jul	28	2003	16:02:58	Mon
17188	114 dB	9.2 dB	Jul	28	2003	16:03:00	Mon
17188	114 dB	9.4 dB	Jul	29	2003	19:09:35	Tue
17188	114 dB	9.3 dB	Jul	30	2003	19:05:35	Wed
17188	114 dB	9.3 dB	Jul	30	2003	19:06:00	Wed
17188	114 dB	11.6 dB	Jun	6	2003	12:05:00	Fri
17188	114 dB	11.6 dB	Jun	6	2003	12:06:00	Fri
17188	114 dB	12.4 dB	Jun	12	2003	19:26:00	Thu
17188	114 dB	12.4 dB	Jun	16	2003	18:57:00	Mon
17188	114 dB	16.3 dB	Jun	17	2003	15:21:51	Tue
17188	114 dB	16.3 dB	Jun	17	2003	15:22:00	Tue
17188	114 dB	13.5 dB	Jun	18	2003	6:47:37	Wed
17188	114 dB	13.5 dB	Jun	18	2003	6:48:00	Wed
17188	114 dB	13.6 dB	Jun	18	2003	6:47:08	Wed
17188	114 dB	13.8 dB	Jun	18	2003	14:49:03	Wed
17188	114 dB	12.6 dB	Jun	19	2003	14:53:37	Thu
17188	114 dB	12.6 dB	Jun	19	2003	14:54:00	Thu
17188	114 dB	19.7 dB	Jun	25	2003	19:18:21	Wed
17188	114 dB	10.9 dB	Jun	26	2003	19:17:42	Thu
17188	114 dB	12.3 dB	Jun	27	2003	19:03:12	Fri
17188	114 dB	10.5 dB	Nov	6	2003	9:52:00	Thu
17188	114 dB	7.0 dB	Sep	16	2003	11:54:15	Tue
17188	114 dB	7.3 dB	Sep	16	2003	15:14:03	Tue
17189	114 dB	11.8 dB	Aug	3	2002	13:14:00	Sat
17189	114 dB	12.1 dB	Aug	11	2003	12:53:50	Mon
17189	114 dB	11.9 dB	Jun	6	2003	12:24:35	Fri
17189	114 dB	17.3 dB	Jun	9	2003	20:51:00	Mon
17189	114 dB	10.6 dB	Nov	6	2003	10:12:00	Thu
17189	114 dB	11.5 dB	Oct	8	2003	14:06:00	Wed
17189	114 dB	11.0 dB	Oct	16	2003	8:02:19	Thu
17189	114 dB	11.5 dB	Oct	16	2003	15:07:00	Thu
17189	114 dB	10.6 dB	Oct	21	2003	8:55:45	Tue
17189	114 dB	10.6 dB	Oct	21	2003	8:56:00	Tue
17189	114 dB	10.7 dB	Oct	23	2003	22:20:59	Thu
17190	114 dB	9.9 dB	Aug	4	2003	14:46:01	Mon
17190	114 dB	9.9 dB	Aug	4	2003	15:42:00	Mon
17190	114 dB	9.7 dB	Aug	5	2003	15:13:24	Tue
17190	114 dB	9.7 dB	Aug	5	2003	16:10:00	Tue
17190	114 dB	9.1 dB	Aug	6	2003	22:46:19	Wed
17190	114 dB	9.1 dB	Aug	6	2003	23:43:00	Wed
17190	114 dB	10.5 dB	Aug	7	2003	14:51:29	Thu
17190	114 dB	10.5 dB	Aug	7	2003	15:48:00	Thu
17190	114 dB	10.4 dB	Aug	11	2003	12:16:00	Mon
17190	114 dB	10.4 dB	Aug	11	2003	12:16:53	Mon
17190	114 dB	10.4 dB	Aug	18	2003	15:34:26	Mon
17190	114 dB	10.1 dB	Jul	2	2003	18:44:48	Wed
17190	114 dB	10.1 dB	Jul	2	2003	19:41:00	Wed
17190	114 dB	10.3 dB	Jul	3	2003	15:05:19	Thu
17190	114 dB	10.3 dB	Jul	3	2003	16:02:00	Thu
17190	114 dB	9.9 dB	Jul	4	2003	14:40:42	Fri
17190	114 dB	9.9 dB	Jul	4	2003	15:37:00	Fri
17190	114 dB	10.1 dB	Jul	7	2003	15:02:20	Mon
17190	114 dB	10.1 dB	Jul	7	2003	15:59:00	Mon
17190	114 dB	10.8 dB	Jul	8	2003	15:16:11	Tue
17190	114 dB	10.8 dB	Jul	8	2003	16:13:00	Tue
17190	114 dB	11.3 dB	Jul	9	2003	22:48:17	Wed
17190	114 dB	11.3 dB	Jul	9	2003	23:45:00	Wed
17190	114 dB	10.2 dB	Jul	10	2003	18:59:19	Thu
17190	114 dB	10.2 dB	Jul	10	2003	19:55:00	Thu
17190	114 dB	9.8 dB	Jul	10	2003	23:07:31	Thu

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
17190	114 dB	9.8 dB	Jul	11	2003	0:03:00	Fri
17190	114 dB	10.8 dB	Jul	14	2003	15:43:23	Mon
17190	114 dB	10.8 dB	Jul	14	2003	16:39:00	Mon
17190	114 dB	10.7 dB	Jul	15	2003	15:55:12	Tue
17190	114 dB	10.7 dB	Jul	15	2003	16:51:00	Tue
17190	114 dB	9.0 dB	Jul	16	2003	16:00:17	Wed
17190	114 dB	9.0 dB	Jul	16	2003	16:56:00	Wed
17190	114 dB	10.1 dB	Jul	17	2003	23:47:30	Thu
17190	114 dB	10.1 dB	Jul	18	2003	0:43:00	Fri
17190	114 dB	9.7 dB	Jul	21	2003	19:12:00	Mon
17190	114 dB	9.7 dB	Jul	21	2003	20:08:00	Mon
17190	114 dB	10.2 dB	Jul	22	2003	19:02:59	Tue
17190	114 dB	10.2 dB	Jul	22	2003	19:59:00	Tue
17190	114 dB	9.7 dB	Jul	23	2003	15:02:11	Wed
17190	114 dB	9.7 dB	Jul	23	2003	15:58:00	Wed
17190	114 dB	9.4 dB	Jul	24	2003	15:14:34	Thu
17190	114 dB	9.4 dB	Jul	24	2003	16:11:00	Thu
17190	114 dB	9.8 dB	Jul	30	2003	17:00:29	Wed
17190	114 dB	9.8 dB	Jul	30	2003	17:57:00	Wed
17190	114 dB	10.3 dB	Jun	10	2003	17:11:00	Tue
17190	114 dB	10.4 dB	Jun	16	2003	20:02:00	Mon
17190	114 dB	10.6 dB	Jun	17	2003	15:06:42	Tue
17190	114 dB	10.6 dB	Jun	17	2003	16:04:00	Tue
17190	114 dB	10.8 dB	Jun	18	2003	14:53:13	Wed
17190	114 dB	10.8 dB	Jun	18	2003	15:50:00	Wed
17190	114 dB	10.3 dB	Jun	19	2003	15:20:09	Thu
17190	114 dB	10.3 dB	Jun	19	2003	16:15:00	Thu
17190	114 dB	10.4 dB	Jun	25	2003	18:47:54	Wed
17190	114 dB	10.4 dB	Jun	25	2003	19:43:00	Wed
17190	114 dB	10.3 dB	Jun	26	2003	19:01:20	Thu
17190	114 dB	10.3 dB	Jun	26	2003	19:56:00	Thu
17190	114 dB	10.2 dB	Jun	27	2003	18:52:14	Fri
17190	114 dB	10.2 dB	Jun	27	2003	19:47:00	Fri
17190	114 dB	10.5 dB	Sep	16	2003	15:46:44	Tue
17190	114 dB	10.5 dB	Sep	17	2003	16:22:06	Wed
17190	114 dB	9.4 dB	Sep	18	2003	15:26:00	Thu
17191	114 dB	12.0 dB	Aug	1	2003	18:15:00	Fri
17191	114 dB	11.9 dB	Aug	7	2003	13:21:00	Thu
17191	114 dB	11.9 dB	Aug	20	2003	21:53:00	Wed
17191	114 dB	11.9 dB	Dec	10	2003	7:28:24	Wed
17191	114 dB	12.0 dB	Dec	10	2003	15:21:59	Wed
17191	114 dB	11.8 dB	Dec	15	2003	7:04:10	Mon
17191	114 dB	12.0 dB	Dec	15	2003	15:29:12	Mon
17191	114 dB	12.0 dB	Dec	16	2003	15:33:04	Tue
17191	114 dB	12.0 dB	Dec	17	2003	15:35:19	Wed
17191	114 dB	11.9 dB	Dec	18	2003	16:07:43	Thu
17191	114 dB	11.9 dB	Jul	3	2003	6:25:37	Thu
17191	114 dB	12.1 dB	Jul	3	2003	19:01:00	Thu
17191	114 dB	11.9 dB	Jul	4	2003	18:35:07	Fri
17191	114 dB	11.9 dB	Jul	4	2003	18:38:00	Fri
17191	114 dB	12.0 dB	Jul	8	2003	18:57:43	Tue
17191	114 dB	12.0 dB	Jul	8	2003	19:00:00	Tue
17191	114 dB	12.0 dB	Jul	9	2003	15:27:29	Wed
17191	114 dB	12.0 dB	Jul	9	2003	15:30:00	Wed
17191	114 dB	12.2 dB	Jul	10	2003	18:07:12	Thu
17191	114 dB	12.2 dB	Jul	10	2003	18:10:00	Thu
17191	114 dB	12.0 dB	Jul	15	2003	17:36:32	Tue
17191	114 dB	11.9 dB	Jul	16	2003	14:33:00	Wed
17191	114 dB	11.9 dB	Jul	23	2003	22:25:00	Wed
17191	114 dB	11.9 dB	Jul	30	2003	14:35:00	Wed
17191	114 dB	12.1 dB	Jul	31	2003	18:01:00	Thu
17191	114 dB	11.7 dB	Jun	9	2003	15:11:14	Mon
17191	114 dB	11.9 dB	Jun	9	2003	14:59:17	Mon

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
17191	114 dB	12.2 dB	Jun	10	2003	19:18:00	Tue
17191	114 dB	12.0 dB	Jun	12	2003	18:39:00	Thu
17191	114 dB	12.0 dB	Jun	16	2003	18:33:00	Mon
17191	114 dB	11.9 dB	Jun	17	2003	15:03:41	Tue
17191	114 dB	11.9 dB	Jun	17	2003	15:06:00	Tue
17191	114 dB	11.9 dB	Jun	18	2003	15:05:24	Wed
17191	114 dB	11.9 dB	Jun	18	2003	15:08:00	Wed
17191	114 dB	11.9 dB	Jun	19	2003	18:33:11	Thu
17191	114 dB	12.0 dB	Jun	27	2003	19:06:00	Fri
17191	114 dB	11.7 dB	Nov	4	2003	8:03:42	Tue
17191	114 dB	11.7 dB	Nov	4	2003	9:03:00	Tue
17191	114 dB	12.0 dB	Nov	6	2003	7:38:10	Thu
17191	114 dB	12.5 dB	Nov	6	2003	18:30:09	Thu
17191	114 dB	11.8 dB	Nov	10	2003	3:51:54	Mon
17191	114 dB	11.8 dB	Nov	11	2003	0:09:38	Tue
17191	114 dB	12.1 dB	Nov	11	2003	15:05:59	Tue
17191	114 dB	11.9 dB	Nov	12	2003	14:38:22	Wed
17191	114 dB	12.0 dB	Nov	14	2003	9:33:03	Fri
17191	114 dB	12.0 dB	Nov	14	2003	15:21:47	Fri
17191	114 dB	11.5 dB	Nov	17	2003	7:40:03	Mon
17191	114 dB	11.8 dB	Nov	17	2003	8:24:48	Mon
17191	114 dB	11.9 dB	Nov	18	2003	6:30:47	Tue
17191	114 dB	12.0 dB	Nov	18	2003	19:04:32	Tue
17191	114 dB	12.0 dB	Nov	26	2003	15:55:57	Wed
17191	114 dB	12.0 dB	Nov	26	2003	15:56:00	Wed
17191	114 dB	10.9 dB	Nov	27	2003	15:41:34	Thu
17191	114 dB	12.1 dB	Oct	10	2003	11:46:38	Fri
17191	114 dB	12.1 dB	Oct	10	2003	11:47:00	Fri
17191	114 dB	12.1 dB	Sep	19	2003	15:21:11	Fri
17191	114 dB	11.7 dB	Sep	23	2003	15:32:28	Tue
17191	114 dB	11.9 dB	Sep	24	2003	15:52:18	Wed
17191	114 dB	11.8 dB	Sep	25	2003	13:36:16	Thu
17191	114 dB	11.9 dB	Sep	25	2003	22:56:36	Thu
17242	114 dB	10.9 dB	Aug	11	2003	12:25:00	Mon
17242	114 dB	10.9 dB	Aug	11	2003	12:25:53	Mon
17242	114 dB	10.9 dB	Aug	18	2003	14:18:39	Mon
17242	114 dB	11.0 dB	Aug	19	2003	15:49:03	Tue
17242	114 dB	9.9 dB	Aug	19	2003	16:05:03	Tue
17242	114 dB	10.5 dB	Aug	20	2003	15:39:52	Wed
17242	114 dB	10.4 dB	Aug	21	2003	15:23:40	Thu
17242	114 dB	10.5 dB	Aug	22	2003	15:41:43	Fri
17242	114 dB	10.8 dB	Jul	22	2003	15:54:50	Tue
17242	114 dB	11.0 dB	Jul	23	2003	15:03:00	Wed
17242	114 dB	11.0 dB	Jul	23	2003	15:03:45	Wed
17242	114 dB	10.4 dB	Jun	6	2003	16:31:51	Fri
17242	114 dB	10.4 dB	Jun	6	2003	16:33:00	Fri
17242	114 dB	10.4 dB	Jun	6	2003	16:33:32	Fri
17242	114 dB	10.8 dB	Jun	6	2003	12:49:13	Fri
17242	114 dB	9.6 dB	Mar	4	2003	14:43:00	Tue
17242	114 dB	10.8 dB	Oct	1	2003	14:55:09	Wed
17242	114 dB	10.7 dB	Oct	2	2003	14:26:53	Thu
17242	114 dB	10.7 dB	Oct	2	2003	14:27:00	Thu
17242	114 dB	10.8 dB	Oct	6	2003	15:28:56	Mon
17242	114 dB	10.8 dB	Oct	6	2003	15:29:00	Mon
17242	114 dB	10.7 dB	Oct	7	2003	14:59:30	Tue
17242	114 dB	10.7 dB	Oct	7	2003	15:00:00	Tue
17242	114 dB	10.4 dB	Oct	8	2003	15:16:37	Wed
17242	114 dB	10.4 dB	Oct	8	2003	15:17:00	Wed
17242	114 dB	10.7 dB	Oct	9	2003	15:39:05	Thu
17242	114 dB	10.7 dB	Oct	9	2003	15:40:00	Thu
17242	114 dB	10.7 dB	Oct	10	2003	14:25:20	Fri
17242	114 dB	10.7 dB	Oct	10	2003	14:26:00	Fri
17242	114 dB	10.8 dB	Oct	14	2003	14:58:54	Tue

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
17242	114 dB	10.8 dB	Oct	14	2003	14:59:00	Tue
17242	114 dB	10.8 dB	Oct	15	2003	15:08:20	Wed
17242	114 dB	10.8 dB	Oct	15	2003	15:09:00	Wed
17242	114 dB	11.1 dB	Oct	16	2003	14:54:15	Thu
17242	114 dB	10.8 dB	Oct	17	2003	14:45:57	Fri
17242	114 dB	10.6 dB	Oct	20	2003	14:56:40	Mon
17242	114 dB	10.6 dB	Oct	21	2003	15:06:27	Tue
17242	114 dB	10.6 dB	Oct	22	2003	14:58:22	Wed
17242	114 dB	10.7 dB	Oct	23	2003	15:14:34	Thu
17242	114 dB	10.7 dB	Oct	29	2003	7:25:53	Wed
17242	114 dB	10.7 dB	Oct	29	2003	8:26:00	Wed
17242	114 dB	10.9 dB	Oct	29	2003	14:56:57	Wed
17242	114 dB	10.9 dB	Oct	29	2003	15:57:00	Wed
17242	114 dB	10.9 dB	Oct	31	2003	6:56:32	Fri
17242	114 dB	10.9 dB	Oct	31	2003	7:56:00	Fri
17242	114 dB	10.7 dB	Sep	9	2003	15:38:52	Tue
17242	114 dB	10.9 dB	Sep	11	2003	0:11:44	Thu
17242	114 dB	10.7 dB	Sep	16	2003	15:32:31	Tue
17242	114 dB	10.8 dB	Sep	17	2003	15:23:46	Wed
17242	114 dB	10.7 dB	Sep	19	2003	15:07:36	Fri
17242	114 dB	10.8 dB	Sep	25	2003	13:34:35	Thu
17242	114 dB	10.8 dB	Sep	25	2003	22:55:15	Thu
17242	114 dB	10.8 dB	Sep	29	2003	14:51:34	Mon
17242	114 dB	10.8 dB	Sep	30	2003	14:53:09	Tue
40253	114 dB	10.4 dB	May	10	2002	10:21:00	Fri
40253	114 dB	10.2 dB	Aug	4	2003	14:52:45	Mon
40253	114 dB	10.2 dB	Aug	4	2003	14:53:00	Mon
40253	114 dB	10.2 dB	Aug	5	2003	14:58:33	Tue
40253	114 dB	10.2 dB	Aug	5	2003	14:59:00	Tue
40253	114 dB	10.2 dB	Aug	6	2003	22:43:14	Wed
40253	114 dB	10.2 dB	Aug	6	2003	22:44:00	Wed
40253	114 dB	10.4 dB	Aug	7	2003	14:59:53	Thu
40253	114 dB	10.4 dB	Aug	7	2003	15:00:00	Thu
40253	114 dB	10.4 dB	Aug	11	2003	11:56:31	Mon
40253	114 dB	10.4 dB	Aug	11	2003	11:57:00	Mon
40253	114 dB	10.2 dB	Aug	13	2003	7:38:05	Wed
40253	114 dB	10.3 dB	Aug	18	2003	15:44:42	Mon
40253	114 dB	9.8 dB	Aug	19	2003	15:36:07	Tue
40253	114 dB	10.3 dB	Aug	20	2003	15:56:02	Wed
40253	114 dB	9.4 dB	Aug	21	2003	15:51:45	Thu
40253	114 dB	10.2 dB	Aug	22	2003	16:01:45	Fri
40253	114 dB	10.2 dB	Aug	25	2003	15:20:43	Mon
40253	114 dB	10.1 dB	Aug	27	2003	6:59:00	Wed
40253	114 dB	10.1 dB	Aug	27	2003	6:59:07	Wed
40253	114 dB	10.8 dB	Dec	2	2003	18:48:01	Tue
40253	114 dB	10.1 dB	Jul	9	2003	23:04:33	Wed
40253	114 dB	10.1 dB	Jul	10	2003	23:16:58	Thu
40253	114 dB	10.5 dB	Jul	14	2003	15:03:48	Mon
40253	114 dB	10.0 dB	Jul	15	2003	15:53:12	Tue
40253	114 dB	10.5 dB	Jul	16	2003	15:44:20	Wed
40253	114 dB	10.1 dB	Jul	17	2003	23:55:14	Thu
40253	114 dB	9.6 dB	Jul	21	2003	19:09:55	Mon
40253	114 dB	9.9 dB	Jul	22	2003	19:01:28	Tue
40253	114 dB	10.4 dB	Jul	23	2003	15:17:08	Wed
40253	114 dB	10.0 dB	Jul	24	2003	15:10:04	Thu
40253	114 dB	9.9 dB	Jul	28	2003	6:48:42	Mon
40253	114 dB	10.3 dB	Jul	30	2003	17:02:45	Wed
40253	114 dB	10.3 dB	Jul	30	2003	17:03:00	Wed
40253	114 dB	10.3 dB	Jun	9	2003	20:37:00	Mon
40253	114 dB	10.2 dB	Nov	6	2003	10:51:00	Thu
40253	114 dB	10.3 dB	Nov	25	2003	18:24:00	Tue
40253	114 dB	10.5 dB	Nov	27	2003	18:55:00	Thu
40253	114 dB	10.7 dB	Nov	29	2003	17:42:28	Sat

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40253	114 dB	10.7 dB	Nov	29	2003	18:42:00	Sat
40253	114 dB	10.2 dB	Oct	21	2003	9:06:13	Tue
40253	114 dB	10.2 dB	Oct	23	2003	22:53:54	Thu
40254	114 dB	11.2 dB	Aug	7	2003	13:14:16	Thu
40254	114 dB	10.9 dB	Aug	8	2003	18:18:00	Fri
40254	114 dB	11.0 dB	Aug	15	2003	18:13:00	Fri
40254	114 dB	10.8 dB	Aug	26	2003	18:08:00	Tue
40254	114 dB	10.8 dB	Dec	1	2003	15:02:57	Mon
40254	114 dB	10.7 dB	Dec	3	2003	13:42:23	Wed
40254	114 dB	11.0 dB	Dec	3	2003	23:18:08	Wed
40254	114 dB	10.9 dB	Dec	4	2003	7:45:57	Thu
40254	114 dB	10.8 dB	Dec	9	2003	1:04:32	Tue
40254	114 dB	11.0 dB	Dec	9	2003	18:19:23	Tue
40254	114 dB	10.8 dB	Dec	15	2003	5:10:14	Mon
40254	114 dB	11.0 dB	Dec	15	2003	15:10:10	Mon
40254	114 dB	10.9 dB	Dec	16	2003	15:45:11	Tue
40254	114 dB	10.9 dB	Dec	16	2003	15:46:40	Tue
40254	114 dB	10.7 dB	Dec	17	2003	15:22:51	Wed
40254	114 dB	10.9 dB	Dec	18	2003	15:45:03	Thu
40254	114 dB	11.0 dB	Dec	19	2003	15:45:00	Fri
40254	114 dB	11.0 dB	Dec	19	2003	15:45:14	Fri
40254	114 dB	11.3 dB	Jul	3	2003	18:35:00	Thu
40254	114 dB	10.9 dB	Jul	4	2003	15:16:41	Fri
40254	114 dB	10.9 dB	Jul	8	2003	18:37:28	Tue
40254	114 dB	11.0 dB	Jul	9	2003	15:05:26	Wed
40254	114 dB	10.9 dB	Jul	10	2003	18:42:53	Thu
40254	114 dB	10.9 dB	Jul	11	2003	15:13:00	Fri
40254	114 dB	10.9 dB	Jul	11	2003	15:13:14	Fri
40254	114 dB	10.8 dB	Jul	15	2003	15:11:00	Tue
40254	114 dB	10.8 dB	Jul	15	2003	15:11:16	Tue
40254	114 dB	10.8 dB	Jul	16	2003	14:40:00	Wed
40254	114 dB	10.9 dB	Jul	29	2003	18:41:00	Tue
40254	114 dB	11.1 dB	Jun	9	2003	15:30:13	Mon
40254	114 dB	10.9 dB	Jun	16	2003	19:08:00	Mon
40254	114 dB	10.9 dB	Jun	17	2003	15:27:05	Tue
40254	114 dB	10.9 dB	Jun	17	2003	15:30:00	Tue
40254	114 dB	10.8 dB	Jun	18	2003	15:24:33	Wed
40254	114 dB	10.8 dB	Jun	19	2003	19:06:40	Thu
40254	114 dB	10.9 dB	Jun	27	2003	18:57:00	Fri
40254	114 dB	10.6 dB	Nov	6	2003	10:37:00	Thu
40254	114 dB	10.5 dB	Nov	18	2003	9:03:56	Tue
40254	114 dB	10.5 dB	Nov	18	2003	9:06:00	Tue
40254	114 dB	10.8 dB	Nov	24	2003	15:39:31	Mon
40254	114 dB	11.0 dB	Nov	25	2003	19:10:25	Tue
40254	114 dB	10.9 dB	Nov	26	2003	15:43:21	Wed
40254	114 dB	10.9 dB	Nov	27	2003	15:28:31	Thu
40254	114 dB	10.6 dB	Oct	16	2003	14:42:00	Thu
40254	114 dB	10.4 dB	Oct	21	2003	8:48:43	Tue
40255	114 dB	11.1 dB	Aug	4	2003	14:49:17	Mon
40255	114 dB	11.4 dB	Aug	5	2003	14:49:48	Tue
40255	114 dB	11.4 dB	Aug	5	2003	14:50:00	Tue
40255	114 dB	11.3 dB	Aug	6	2003	22:38:01	Wed
40255	114 dB	12.0 dB	Aug	7	2003	15:04:00	Thu
40255	114 dB	12.0 dB	Aug	7	2003	15:04:08	Thu
40255	114 dB	12.0 dB	Aug	11	2003	11:58:37	Mon
40255	114 dB	12.0 dB	Aug	11	2003	11:59:00	Mon
40255	114 dB	11.8 dB	Aug	13	2003	7:43:51	Wed
40255	114 dB	11.9 dB	Aug	18	2003	15:39:35	Mon
40255	114 dB	11.9 dB	Aug	19	2003	15:39:21	Tue
40255	114 dB	11.7 dB	Aug	20	2003	16:00:18	Wed
40255	114 dB	11.9 dB	Aug	21	2003	15:46:52	Thu
40255	114 dB	11.2 dB	Aug	22	2003	16:07:11	Fri
40255	114 dB	10.9 dB	Aug	25	2003	15:03:00	Mon

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40255	114 dB	10.9 dB	Aug	25	2003	15:03:42	Mon
40255	114 dB	11.5 dB	Dec	2	2003	18:55:03	Tue
40255	114 dB	10.4 dB	Jul	2	2003	19:19:13	Wed
40255	114 dB	10.0 dB	Jul	3	2003	15:02:42	Thu
40255	114 dB	10.2 dB	Jul	4	2003	15:03:05	Fri
40255	114 dB	10.8 dB	Jul	7	2003	15:05:57	Mon
40255	114 dB	10.8 dB	Jul	7	2003	15:06:00	Mon
40255	114 dB	11.8 dB	Jul	8	2003	14:47:30	Tue
40255	114 dB	11.8 dB	Jul	8	2003	14:48:00	Tue
40255	114 dB	11.7 dB	Jul	9	2003	23:08:14	Wed
40255	114 dB	11.5 dB	Jul	10	2003	22:47:49	Thu
40255	114 dB	11.3 dB	Jul	14	2003	15:10:57	Mon
40255	114 dB	11.7 dB	Jul	15	2003	15:49:17	Tue
40255	114 dB	11.5 dB	Jul	16	2003	15:57:53	Wed
40255	114 dB	11.8 dB	Jul	18	2003	0:02:39	Fri
40255	114 dB	11.3 dB	Jul	21	2003	18:46:12	Mon
40255	114 dB	11.6 dB	Jul	22	2003	18:57:23	Tue
40255	114 dB	11.8 dB	Jul	23	2003	15:21:48	Wed
40255	114 dB	11.4 dB	Jul	24	2003	15:12:56	Thu
40255	114 dB	11.2 dB	Jul	28	2003	6:43:45	Mon
40255	114 dB	11.9 dB	Jul	28	2003	15:40:17	Mon
40255	114 dB	12.0 dB	Jul	30	2003	17:05:46	Wed
40255	114 dB	12.0 dB	Jul	30	2003	17:06:00	Wed
40255	114 dB	11.4 dB	Jun	6	2003	11:35:00	Fri
40255	114 dB	11.4 dB	Jun	6	2003	11:35:31	Fri
40255	114 dB	11.6 dB	Jun	12	2003	19:08:00	Thu
40255	114 dB	11.6 dB	Jun	16	2003	19:10:00	Mon
40255	114 dB	12.0 dB	Jun	17	2003	15:05:04	Tue
40255	114 dB	11.6 dB	Jun	18	2003	15:02:00	Wed
40255	114 dB	11.5 dB	Jun	19	2003	15:17:51	Thu
40255	114 dB	11.1 dB	Jun	25	2003	19:27:34	Wed
40255	114 dB	11.4 dB	Jun	26	2003	19:08:50	Thu
40255	114 dB	10.0 dB	Jun	27	2003	19:31:43	Fri
40255	114 dB	11.8 dB	Nov	18	2003	18:26:00	Tue
40255	114 dB	12.0 dB	Nov	25	2003	17:55:00	Tue
40255	114 dB	12.0 dB	Nov	25	2003	17:55:48	Tue
40255	114 dB	12.1 dB	Nov	29	2003	17:35:19	Sat
40255	114 dB	12.1 dB	Nov	29	2003	18:35:00	Sat
40255	114 dB	11.5 dB	Oct	16	2003	18:56:00	Thu
40255	114 dB	11.6 dB	Oct	28	2003	18:55:00	Tue
40256	114 dB	9.8 dB	May	10	2002	10:48:00	Fri
40256	114 dB	10.2 dB	Aug	11	2003	12:47:53	Mon
40256	114 dB	11.8 dB	Aug	15	2003	7:39:00	Fri
40256	114 dB	11.8 dB	Aug	15	2003	7:39:14	Fri
40256	114 dB	10.6 dB	Dec	3	2003	14:04:15	Wed
40256	114 dB	10.6 dB	Dec	3	2003	23:12:36	Wed
40256	114 dB	10.6 dB	Dec	4	2003	7:14:50	Thu
40256	114 dB	10.5 dB	Dec	9	2003	1:08:53	Tue
40256	114 dB	10.6 dB	Dec	9	2003	15:31:02	Tue
40256	114 dB	10.6 dB	Dec	10	2003	15:17:37	Wed
40256	114 dB	10.7 dB	Dec	12	2003	0:26:24	Fri
40256	114 dB	10.6 dB	Dec	15	2003	5:00:20	Mon
40256	114 dB	10.7 dB	Dec	15	2003	15:23:30	Mon
40256	114 dB	10.6 dB	Dec	16	2003	15:08:25	Tue
40256	114 dB	10.6 dB	Dec	17	2003	15:26:38	Wed
40256	114 dB	10.5 dB	Dec	18	2003	15:35:22	Thu
40256	114 dB	10.6 dB	Dec	19	2003	15:33:00	Fri
40256	114 dB	10.6 dB	Dec	19	2003	15:33:18	Fri
40256	114 dB	10.6 dB	Jun	5	2003	11:55:00	Thu
40256	114 dB	10.6 dB	Jun	5	2003	11:55:36	Thu
40256	114 dB	10.3 dB	Jun	6	2003	12:39:00	Fri
40256	114 dB	10.3 dB	Jun	6	2003	12:39:51	Fri
40256	114 dB	10.4 dB	Nov	6	2003	9:42:00	Thu

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40256	114 dB	10.2 dB	Nov	18	2003	9:05:28	Tue
40256	114 dB	10.2 dB	Nov	18	2003	9:08:00	Tue
40256	114 dB	11.5 dB	Oct	2	2003	18:05:58	Thu
40256	114 dB	10.4 dB	Oct	8	2003	14:02:00	Wed
40256	114 dB	10.2 dB	Oct	10	2003	18:38:12	Fri
40256	114 dB	10.0 dB	Oct	14	2003	18:27:00	Tue
40256	114 dB	10.4 dB	Oct	16	2003	14:32:00	Thu
40256	114 dB	10.1 dB	Oct	21	2003	8:46:25	Tue
40256	114 dB	11.7 dB	Sep	2	2003	13:29:00	Tue
40256	114 dB	11.7 dB	Sep	2	2003	13:29:53	Tue
40257	114 dB	10.8 dB	Aug	1	2003	18:23:00	Fri
40257	114 dB	10.8 dB	Aug	7	2003	13:03:46	Thu
40257	114 dB	11.0 dB	Jul	3	2003	18:50:47	Thu
40257	114 dB	11.0 dB	Jul	3	2003	18:54:00	Thu
40257	114 dB	11.1 dB	Jul	4	2003	18:19:54	Fri
40257	114 dB	11.1 dB	Jul	4	2003	18:20:37	Fri
40257	114 dB	11.1 dB	Jul	4	2003	18:23:00	Fri
40257	114 dB	10.8 dB	Jul	8	2003	19:01:36	Tue
40257	114 dB	10.8 dB	Jul	8	2003	19:05:00	Tue
40257	114 dB	11.1 dB	Jul	9	2003	15:17:59	Wed
40257	114 dB	11.1 dB	Jul	9	2003	15:21:00	Wed
40257	114 dB	11.3 dB	Jul	10	2003	18:25:48	Thu
40257	114 dB	11.3 dB	Jul	10	2003	18:29:00	Thu
40257	114 dB	10.7 dB	Jul	11	2003	14:03:25	Fri
40257	114 dB	10.7 dB	Jul	11	2003	14:06:00	Fri
40257	114 dB	11.0 dB	Jul	15	2003	18:00:09	Tue
40257	114 dB	11.0 dB	Jul	15	2003	18:03:00	Tue
40257	114 dB	11.2 dB	Jul	16	2003	14:23:00	Wed
40257	114 dB	10.7 dB	Jul	24	2003	14:33:00	Thu
40257	114 dB	10.8 dB	Jul	25	2003	18:36:00	Fri
40257	114 dB	10.7 dB	Jul	30	2003	14:39:51	Wed
40257	114 dB	10.5 dB	Jun	9	2003	15:37:17	Mon
40257	114 dB	10.9 dB	Jun	11	2003	15:28:00	Wed
40257	114 dB	10.6 dB	Jun	16	2003	18:43:00	Mon
40257	114 dB	11.1 dB	Jun	17	2003	14:40:00	Tue
40257	114 dB	10.9 dB	Jun	18	2003	15:02:31	Wed
40257	114 dB	10.9 dB	Jun	18	2003	15:05:00	Wed
40257	114 dB	10.9 dB	Jun	19	2003	18:30:31	Thu
40257	114 dB	10.9 dB	Jun	19	2003	18:33:00	Thu
40257	114 dB	11.0 dB	Jun	25	2003	18:28:00	Wed
40257	114 dB	10.8 dB	Jun	27	2003	19:14:00	Fri
40257	114 dB	10.0 dB	Nov	4	2003	19:02:00	Tue
40257	114 dB	10.3 dB	Nov	18	2003	18:41:00	Tue
40257	114 dB	9.9 dB	Nov	25	2003	18:49:00	Tue
40257	114 dB	10.0 dB	Oct	8	2003	15:35:00	Wed
40257	114 dB	10.1 dB	Oct	9	2003	18:54:00	Thu
40257	114 dB	9.9 dB	Oct	16	2003	19:00:00	Thu
40257	114 dB	10.0 dB	Sep	25	2003	18:38:00	Thu
40258	114 dB	10.0 dB	May	10	2002	11:02:00	Fri
40258	114 dB	9.9 dB	Aug	6	2003	20:58:51	Wed
40258	114 dB	9.9 dB	Aug	6	2003	20:59:00	Wed
40258	114 dB	10.4 dB	Aug	7	2003	21:36:23	Thu
40258	114 dB	10.4 dB	Aug	7	2003	21:37:00	Thu
40258	114 dB	10.2 dB	Aug	11	2003	12:13:00	Mon
40258	114 dB	10.2 dB	Aug	11	2003	12:13:54	Mon
40258	114 dB	11.3 dB	Aug	18	2003	14:08:39	Mon
40258	114 dB	11.3 dB	Aug	19	2003	16:01:29	Tue
40258	114 dB	10.9 dB	Aug	20	2003	15:30:47	Wed
40258	114 dB	11.3 dB	Aug	21	2003	15:14:55	Thu
40258	114 dB	11.2 dB	Aug	22	2003	15:36:00	Fri
40258	114 dB	11.2 dB	Aug	22	2003	15:36:40	Fri
40258	114 dB	11.4 dB	Dec	9	2003	8:47:00	Tue
40258	114 dB	11.1 dB	Dec	12	2003	11:04:00	Fri

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40258	114 dB	10.2 dB	Jul	2	2003	19:12:17	Wed
40258	114 dB	10.2 dB	Jul	2	2003	20:09:00	Wed
40258	114 dB	9.9 dB	Jul	3	2003	15:31:10	Thu
40258	114 dB	9.9 dB	Jul	3	2003	16:28:00	Thu
40258	114 dB	10.3 dB	Jul	22	2003	15:36:25	Tue
40258	114 dB	10.3 dB	Jul	22	2003	16:33:00	Tue
40258	114 dB	10.2 dB	Jul	23	2003	14:46:47	Wed
40258	114 dB	10.2 dB	Jul	23	2003	15:43:00	Wed
40258	114 dB	10.1 dB	Jul	28	2003	6:52:07	Mon
40258	114 dB	10.3 dB	Jun	6	2003	13:06:20	Fri
40258	114 dB	10.8 dB	Jun	16	2003	20:23:00	Mon
40258	114 dB	10.4 dB	Jun	17	2003	15:19:07	Tue
40258	114 dB	10.4 dB	Jun	18	2003	16:04:00	Wed
40258	114 dB	10.6 dB	Jun	19	2003	15:08:26	Thu
40258	114 dB	10.6 dB	Jun	19	2003	16:06:00	Thu
40258	114 dB	10.6 dB	Jun	25	2003	19:14:30	Wed
40258	114 dB	10.6 dB	Jun	25	2003	20:09:00	Wed
40258	114 dB	9.9 dB	Jun	26	2003	19:14:40	Thu
40258	114 dB	9.9 dB	Jun	26	2003	20:10:00	Thu
40258	114 dB	10.1 dB	Jun	27	2003	19:16:44	Fri
40258	114 dB	10.1 dB	Jun	27	2003	20:12:00	Fri
40258	114 dB	11.2 dB	Nov	6	2003	9:48:00	Thu
40258	114 dB	11.3 dB	Oct	2	2003	17:59:00	Thu
40258	114 dB	11.3 dB	Oct	2	2003	18:01:00	Thu
40258	114 dB	10.6 dB	Oct	14	2003	8:04:00	Tue
40258	114 dB	11.2 dB	Oct	16	2003	15:03:00	Thu
40258	114 dB	10.9 dB	Oct	21	2003	8:59:30	Tue
40259	114 dB	16.9 dB	Aug	7	2003	7:03:38	Thu
40259	114 dB	16.9 dB	Aug	7	2003	8:01:00	Thu
40259	114 dB	17.1 dB	Aug	7	2003	21:41:20	Thu
40259	114 dB	17.1 dB	Aug	7	2003	22:39:00	Thu
40259	114 dB	17.5 dB	Aug	11	2003	11:33:45	Mon
40259	114 dB	17.5 dB	Aug	11	2003	12:32:00	Mon
40259	114 dB	10.6 dB	Jul	2	2003	19:06:29	Wed
40259	114 dB	10.6 dB	Jul	2	2003	20:03:00	Wed
40259	114 dB	10.3 dB	Jul	3	2003	15:22:54	Thu
40259	114 dB	10.3 dB	Jul	3	2003	16:20:00	Thu
40259	114 dB	10.2 dB	Jul	23	2003	7:16:51	Wed
40259	114 dB	10.2 dB	Jul	23	2003	8:13:00	Wed
40259	114 dB	10.4 dB	Jun	3	2003	14:16:00	Tue
40259	114 dB	10.4 dB	Jun	3	2003	14:17:03	Tue
40259	114 dB	10.7 dB	Jun	6	2003	12:14:14	Fri
40259	114 dB	10.5 dB	Jun	10	2003	17:31:00	Tue
40259	114 dB	11.0 dB	Jun	16	2003	20:28:00	Mon
40259	114 dB	10.9 dB	Jun	17	2003	15:11:02	Tue
40259	114 dB	10.6 dB	Jun	18	2003	15:11:56	Wed
40259	114 dB	10.6 dB	Jun	18	2003	16:09:00	Wed
40259	114 dB	10.7 dB	Jun	19	2003	14:59:56	Thu
40259	114 dB	10.7 dB	Jun	19	2003	15:57:00	Thu
40259	114 dB	10.6 dB	Jun	25	2003	19:06:23	Wed
40259	114 dB	10.6 dB	Jun	25	2003	19:07:04	Wed
40259	114 dB	10.6 dB	Jun	25	2003	20:02:00	Wed
40259	114 dB	10.7 dB	Jun	26	2003	18:53:44	Thu
40259	114 dB	10.7 dB	Jun	26	2003	19:49:00	Thu
40259	114 dB	10.1 dB	Jun	27	2003	19:10:20	Fri
40259	114 dB	10.1 dB	Jun	27	2003	20:06:00	Fri
40259	114 dB	10.7 dB	Jun	27	2003	19:24:43	Fri
40259	114 dB	10.7 dB	Jun	27	2003	20:20:00	Fri
40259	114 dB	10.3 dB	May	27	2003	9:55:00	Tue
40260	114 dB	10.8 dB	Aug	7	2003	13:16:44	Thu
40260	114 dB	10.6 dB	Aug	8	2003	18:24:00	Fri
40260	114 dB	10.7 dB	Aug	14	2003	18:16:00	Thu
40260	114 dB	10.6 dB	Aug	15	2003	18:06:00	Fri

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40260	114 dB	10.6 dB	Aug	26	2003	18:13:00	Tue
40260	114 dB	10.8 dB	Dec	12	2003	11:31:00	Fri
40260	114 dB	10.7 dB	Jul	3	2003	18:15:00	Thu
40260	114 dB	10.5 dB	Jul	4	2003	15:20:00	Fri
40260	114 dB	10.5 dB	Jul	4	2003	15:20:41	Fri
40260	114 dB	10.6 dB	Jul	8	2003	18:28:45	Tue
40260	114 dB	10.7 dB	Jul	9	2003	14:58:37	Wed
40260	114 dB	10.6 dB	Jul	10	2003	18:17:05	Thu
40260	114 dB	10.5 dB	Jul	11	2003	15:03:00	Fri
40260	114 dB	10.5 dB	Jul	11	2003	15:03:46	Fri
40260	114 dB	10.6 dB	Jul	15	2003	15:05:47	Tue
40260	114 dB	10.6 dB	Jul	16	2003	14:48:00	Wed
40260	114 dB	10.6 dB	Jul	24	2003	15:09:00	Thu
40260	114 dB	10.6 dB	Jul	29	2003	18:36:00	Tue
40260	114 dB	10.6 dB	Jun	9	2003	15:21:12	Mon
40260	114 dB	10.6 dB	Jun	9	2003	15:21:40	Mon
40260	114 dB	10.6 dB	Jun	16	2003	19:14:00	Mon
40260	114 dB	10.6 dB	Jun	17	2003	15:33:03	Tue
40260	114 dB	10.6 dB	Jun	17	2003	15:36:00	Tue
40260	114 dB	10.6 dB	Jun	18	2003	15:18:58	Wed
40260	114 dB	10.5 dB	Jun	19	2003	19:13:31	Thu
40260	114 dB	10.6 dB	Jun	27	2003	18:51:00	Fri
40260	114 dB	10.8 dB	Nov	6	2003	10:09:00	Thu
40260	114 dB	10.7 dB	Oct	16	2003	14:56:00	Thu
40260	114 dB	10.5 dB	Oct	21	2003	8:57:24	Tue
40260	114 dB	10.5 dB	Oct	21	2003	8:58:00	Tue
40260	114 dB	10.4 dB	Oct	23	2003	22:25:00	Thu
40261	114 dB	10.9 dB	Aug	11	2003	12:40:56	Mon
40261	114 dB	11.1 dB	Aug	15	2003	7:12:00	Fri
40261	114 dB	11.1 dB	Aug	15	2003	7:12:40	Fri
40261	114 dB	11.0 dB	Dec	9	2003	18:42:00	Tue
40261	114 dB	10.9 dB	Dec	10	2003	14:48:00	Wed
40261	114 dB	10.8 dB	Dec	17	2003	6:31:41	Wed
40261	114 dB	10.9 dB	Dec	17	2003	14:54:00	Wed
40261	114 dB	11.4 dB	Jun	9	2003	15:45:00	Mon
40261	114 dB	11.4 dB	Jun	9	2003	15:46:03	Mon
40261	114 dB	10.8 dB	Nov	6	2003	9:37:00	Thu
40261	114 dB	10.9 dB	Nov	25	2003	18:38:00	Tue
40261	114 dB	10.9 dB	Oct	8	2003	13:48:00	Wed
40261	114 dB	10.8 dB	Oct	16	2003	14:47:00	Thu
40261	114 dB	10.5 dB	Oct	21	2003	8:50:42	Tue
40261	114 dB	10.5 dB	Oct	21	2003	8:51:00	Tue
40261	114 dB	11.0 dB	Sep	2	2003	13:14:00	Tue
40261	114 dB	11.0 dB	Sep	2	2003	13:14:13	Tue
40262	114 dB	11.3 dB	Aug	6	2003	16:35:57	Wed
40262	114 dB	11.3 dB	Aug	6	2003	16:37:00	Wed
40262	114 dB	11.4 dB	Aug	6	2003	7:03:39	Wed
40262	114 dB	11.4 dB	Aug	6	2003	7:05:00	Wed
40262	114 dB	10.8 dB	Aug	7	2003	14:42:53	Thu
40262	114 dB	10.8 dB	Aug	7	2003	14:44:00	Thu
40262	114 dB	11.2 dB	Aug	11	2003	12:02:00	Mon
40262	114 dB	11.2 dB	Aug	11	2003	12:02:11	Mon
40262	114 dB	11.1 dB	Aug	13	2003	7:34:25	Wed
40262	114 dB	11.1 dB	Aug	18	2003	15:31:16	Mon
40262	114 dB	10.9 dB	Aug	19	2003	15:10:53	Tue
40262	114 dB	11.2 dB	Aug	20	2003	14:58:20	Wed
40262	114 dB	11.1 dB	Aug	21	2003	14:56:25	Thu
40262	114 dB	10.8 dB	Aug	22	2003	15:01:11	Fri
40262	114 dB	10.9 dB	Aug	25	2003	15:37:00	Mon
40262	114 dB	10.9 dB	Aug	25	2003	15:37:04	Mon
40262	114 dB	10.4 dB	Dec	2	2003	18:37:00	Tue
40262	114 dB	10.4 dB	Dec	2	2003	18:37:57	Tue
40262	114 dB	10.5 dB	Dec	3	2003	15:07:18	Wed

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40262	114 dB	11.1 dB	Jul	23	2003	15:23:11	Wed
40262	114 dB	11.1 dB	Jul	23	2003	15:24:00	Wed
40262	114 dB	11.2 dB	Jul	23	2003	6:54:22	Wed
40262	114 dB	11.2 dB	Jul	23	2003	6:55:00	Wed
40262	114 dB	11.3 dB	Jun	9	2003	20:27:00	Mon
40262	114 dB	10.9 dB	Jun	27	2003	6:42:51	Fri
40262	114 dB	11.0 dB	Jun	27	2003	15:02:22	Fri
40262	114 dB	10.3 dB	Nov	5	2003	15:29:00	Wed
40262	114 dB	10.4 dB	Nov	18	2003	18:35:00	Tue
40262	114 dB	10.4 dB	Nov	25	2003	18:45:00	Tue
40262	114 dB	10.4 dB	Nov	27	2003	19:04:00	Thu
40262	114 dB	10.8 dB	Nov	29	2003	17:59:37	Sat
40262	114 dB	10.8 dB	Nov	29	2003	18:59:00	Sat
40262	114 dB	10.3 dB	Oct	2	2003	18:42:00	Thu
40262	114 dB	10.5 dB	Oct	9	2003	18:59:00	Thu
40262	114 dB	10.3 dB	Oct	16	2003	19:12:00	Thu
40262	114 dB	11.1 dB	Sep	25	2003	18:59:00	Thu
40262	114 dB	10.4 dB	Sep	30	2003	18:56:00	Tue
40263	114 dB	9.4 dB	May	10	2002	11:42:00	Fri
40263	114 dB	10.5 dB	Aug	11	2003	12:44:48	Mon
40263	114 dB	10.6 dB	Aug	15	2003	7:06:28	Fri
40263	114 dB	10.8 dB	Aug	15	2003	15:54:00	Fri
40263	114 dB	10.5 dB	Dec	3	2003	23:50:40	Wed
40263	114 dB	10.8 dB	Dec	3	2003	13:51:39	Wed
40263	114 dB	10.6 dB	Dec	9	2003	1:21:11	Tue
40263	114 dB	10.7 dB	Dec	9	2003	18:23:57	Tue
40263	114 dB	10.4 dB	Dec	15	2003	5:03:17	Mon
40263	114 dB	10.4 dB	Dec	16	2003	15:40:26	Tue
40263	114 dB	10.3 dB	Dec	17	2003	9:22:10	Wed
40263	114 dB	10.5 dB	Dec	18	2003	15:56:44	Thu
40263	114 dB	10.3 dB	Dec	19	2003	15:15:00	Fri
40263	114 dB	10.3 dB	Dec	19	2003	15:15:50	Fri
40263	114 dB	10.3 dB	Jun	5	2003	15:46:00	Thu
40263	114 dB	10.3 dB	Jun	5	2003	15:46:53	Thu
40263	114 dB	10.2 dB	Jun	6	2003	11:46:00	Fri
40263	114 dB	10.2 dB	Jun	6	2003	11:46:40	Fri
40263	114 dB	10.3 dB	Jun	9	2003	16:13:00	Mon
40263	114 dB	10.6 dB	Nov	3	2003	14:55:57	Mon
40263	114 dB	10.4 dB	Nov	5	2003	8:14:32	Wed
40263	114 dB	10.4 dB	Nov	5	2003	8:15:00	Wed
40263	114 dB	10.3 dB	Nov	6	2003	6:01:19	Thu
40263	114 dB	10.3 dB	Nov	6	2003	6:02:00	Thu
40263	114 dB	10.7 dB	Nov	6	2003	18:43:26	Thu
40263	114 dB	10.7 dB	Nov	6	2003	18:44:00	Thu
40263	114 dB	10.2 dB	Nov	14	2003	0:34:22	Fri
40263	114 dB	10.5 dB	Nov	14	2003	15:55:24	Fri
40263	114 dB	10.4 dB	Nov	18	2003	6:26:14	Tue
40263	114 dB	10.5 dB	Nov	18	2003	19:15:17	Tue
40263	114 dB	10.7 dB	Nov	24	2003	7:29:30	Mon
40263	114 dB	10.7 dB	Nov	24	2003	15:35:25	Mon
40263	114 dB	10.4 dB	Oct	1	2003	14:47:17	Wed
40263	114 dB	10.5 dB	Oct	2	2003	15:06:03	Thu
40263	114 dB	10.8 dB	Oct	6	2003	15:10:54	Mon
40263	114 dB	10.8 dB	Oct	6	2003	15:11:00	Mon
40263	114 dB	10.5 dB	Oct	7	2003	14:39:16	Tue
40263	114 dB	10.7 dB	Oct	8	2003	15:11:15	Wed
40263	114 dB	10.9 dB	Oct	9	2003	15:06:58	Thu
40263	114 dB	10.9 dB	Oct	9	2003	15:07:00	Thu
40263	114 dB	10.6 dB	Oct	10	2003	14:22:13	Fri
40263	114 dB	10.5 dB	Oct	14	2003	14:53:54	Tue
40263	114 dB	10.5 dB	Oct	14	2003	14:54:00	Tue
40263	114 dB	10.7 dB	Oct	15	2003	14:44:46	Wed
40263	114 dB	10.7 dB	Oct	15	2003	14:45:00	Wed

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40263	114 dB	10.5 dB	Oct	16	2003	14:39:56	Thu
40263	114 dB	10.6 dB	Oct	17	2003	14:42:03	Fri
40263	114 dB	10.4 dB	Oct	20	2003	14:35:27	Mon
40263	114 dB	10.3 dB	Oct	21	2003	15:02:23	Tue
40263	114 dB	10.4 dB	Oct	22	2003	14:38:10	Wed
40263	114 dB	10.3 dB	Oct	31	2003	6:58:52	Fri
40263	114 dB	10.3 dB	Oct	31	2003	7:58:00	Fri
40263	114 dB	10.6 dB	Sep	2	2003	13:20:23	Tue
40263	114 dB	10.6 dB	Sep	11	2003	0:09:25	Thu
40263	114 dB	10.7 dB	Sep	11	2003	14:33:05	Thu
40263	114 dB	10.4 dB	Sep	16	2003	6:00:56	Tue
40263	114 dB	10.7 dB	Sep	16	2003	15:11:23	Tue
40263	114 dB	10.7 dB	Sep	18	2003	15:18:08	Thu
40263	114 dB	10.6 dB	Sep	19	2003	14:56:33	Fri
40263	114 dB	10.4 dB	Sep	25	2003	15:02:23	Thu
40263	114 dB	10.5 dB	Sep	25	2003	23:49:08	Thu
40263	114 dB	10.7 dB	Sep	25	2003	13:40:09	Thu
40264	114 dB	10.3 dB	Aug	1	2003	18:25:00	Fri
40264	114 dB	10.4 dB	Aug	7	2003	13:05:00	Thu
40264	114 dB	10.4 dB	Aug	7	2003	13:09:06	Thu
40264	114 dB	10.5 dB	Dec	12	2003	11:07:00	Fri
40264	114 dB	10.3 dB	Jul	3	2003	18:49:00	Thu
40264	114 dB	10.0 dB	Jul	4	2003	18:31:01	Fri
40264	114 dB	10.0 dB	Jul	4	2003	18:34:00	Fri
40264	114 dB	10.6 dB	Jul	8	2003	18:52:49	Tue
40264	114 dB	10.6 dB	Jul	8	2003	18:56:00	Tue
40264	114 dB	10.1 dB	Jul	9	2003	15:23:53	Wed
40264	114 dB	10.1 dB	Jul	9	2003	15:27:00	Wed
40264	114 dB	10.1 dB	Jul	10	2003	18:32:50	Thu
40264	114 dB	10.1 dB	Jul	10	2003	18:36:00	Thu
40264	114 dB	10.0 dB	Jul	11	2003	14:06:30	Fri
40264	114 dB	10.0 dB	Jul	11	2003	14:09:00	Fri
40264	114 dB	10.3 dB	Jul	15	2003	18:07:08	Tue
40264	114 dB	10.5 dB	Jul	16	2003	14:27:00	Wed
40264	114 dB	10.0 dB	Jul	24	2003	14:37:00	Thu
40264	114 dB	10.1 dB	Jul	25	2003	18:30:00	Fri
40264	114 dB	10.3 dB	Jul	31	2003	18:25:00	Thu
40264	114 dB	10.0 dB	Jun	9	2003	15:40:47	Mon
40264	114 dB	10.4 dB	Jun	17	2003	14:46:00	Tue
40264	114 dB	10.5 dB	Jun	18	2003	14:52:39	Wed
40264	114 dB	10.5 dB	Jun	18	2003	14:55:00	Wed
40264	114 dB	10.5 dB	Jun	19	2003	18:52:39	Thu
40264	114 dB	10.5 dB	Jun	26	2003	18:46:00	Thu
40264	114 dB	10.6 dB	Nov	6	2003	10:06:00	Thu
40264	114 dB	10.4 dB	Oct	21	2003	9:03:02	Tue
40264	114 dB	10.0 dB	Oct	23	2003	22:46:54	Thu
40265	114 dB	10.1 dB	May	10	2002	11:55:00	Fri
40265	114 dB	11.7 dB	Aug	11	2003	12:34:48	Mon
40265	114 dB	11.4 dB	Aug	15	2003	7:09:00	Fri
40265	114 dB	11.4 dB	Aug	15	2003	7:09:52	Fri
40265	114 dB	10.3 dB	Dec	1	2003	15:13:24	Mon
40265	114 dB	10.3 dB	Dec	2	2003	8:12:38	Tue
40265	114 dB	10.4 dB	Dec	3	2003	13:46:50	Wed
40265	114 dB	10.4 dB	Dec	3	2003	23:06:49	Wed
40265	114 dB	10.4 dB	Dec	4	2003	7:39:47	Thu
40265	114 dB	10.3 dB	Dec	9	2003	0:55:42	Tue
40265	114 dB	10.5 dB	Dec	9	2003	15:25:49	Tue
40265	114 dB	10.3 dB	Dec	10	2003	15:12:24	Wed
40265	114 dB	10.1 dB	Dec	11	2003	14:28:39	Thu
40265	114 dB	10.4 dB	Dec	15	2003	15:34:58	Mon
40265	114 dB	10.6 dB	Dec	15	2003	4:55:57	Mon
40265	114 dB	10.8 dB	Dec	16	2003	15:28:48	Tue
40265	114 dB	10.4 dB	Dec	17	2003	15:40:11	Wed

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40265	114 dB	10.2 dB	Dec	18	2003	15:50:53	Thu
40265	114 dB	10.4 dB	Dec	19	2003	15:28:00	Fri
40265	114 dB	10.4 dB	Dec	19	2003	15:28:55	Fri
40265	114 dB	11.8 dB	Jun	3	2003	14:19:00	Tue
40265	114 dB	11.8 dB	Jun	3	2003	14:19:15	Tue
40265	114 dB	10.2 dB	Jun	6	2003	12:53:24	Fri
40265	114 dB	10.6 dB	Jun	10	2003	13:54:08	Tue
40265	114 dB	10.6 dB	Jun	10	2003	13:59:00	Tue
40265	114 dB	10.0 dB	Nov	17	2003	6:09:11	Mon
40265	114 dB	10.3 dB	Nov	17	2003	16:47:35	Mon
40265	114 dB	10.3 dB	Nov	18	2003	19:32:55	Tue
40265	114 dB	10.4 dB	Nov	24	2003	6:14:38	Mon
40265	114 dB	10.6 dB	Nov	24	2003	14:52:32	Mon
40265	114 dB	10.1 dB	Nov	25	2003	19:04:36	Tue
40265	114 dB	10.3 dB	Nov	26	2003	15:32:51	Wed
40265	114 dB	10.4 dB	Nov	27	2003	15:37:41	Thu
40265	114 dB	10.3 dB	Oct	10	2003	11:44:17	Fri
40265	114 dB	10.3 dB	Oct	10	2003	11:45:00	Fri
40265	114 dB	10.8 dB	Sep	2	2003	13:35:56	Tue
40265	114 dB	10.8 dB	Sep	2	2003	13:36:00	Tue
40265	114 dB	10.4 dB	Sep	5	2003	14:59:55	Fri
40265	114 dB	10.4 dB	Sep	5	2003	15:00:00	Fri
40265	114 dB	10.6 dB	Sep	8	2003	14:25:48	Mon
40265	114 dB	10.6 dB	Sep	8	2003	14:26:00	Mon
40265	114 dB	10.5 dB	Sep	9	2003	15:19:03	Tue
40265	114 dB	10.4 dB	Sep	11	2003	14:58:25	Thu
40265	114 dB	10.5 dB	Sep	11	2003	0:01:08	Thu
40265	114 dB	10.4 dB	Sep	16	2003	5:51:15	Tue
40265	114 dB	10.4 dB	Sep	16	2003	15:41:06	Tue
40265	114 dB	10.6 dB	Sep	19	2003	14:52:00	Fri
40265	114 dB	10.6 dB	Sep	19	2003	14:52:14	Fri
40265	114 dB	10.3 dB	Sep	23	2003	15:30:58	Tue
40265	114 dB	10.3 dB	Sep	23	2003	15:31:00	Tue
40265	114 dB	10.8 dB	Sep	24	2003	15:12:42	Wed
40265	114 dB	10.4 dB	Sep	25	2003	22:47:44	Thu
40265	114 dB	10.3 dB	Jan	14	2004	10:05:08	Wed
40265	114 dB	10.3 dB	Jan	14	2004	10:06:00	Wed
40369	114 dB	11.0 dB	Aug	11	2003	12:38:01	Mon
40369	114 dB	11.2 dB	Aug	15	2003	7:15:00	Fri
40369	114 dB	11.2 dB	Aug	15	2003	7:15:49	Fri
40369	114 dB	11.2 dB	Dec	3	2003	13:56:45	Wed
40369	114 dB	11.3 dB	Dec	3	2003	23:56:18	Wed
40369	114 dB	11.4 dB	Dec	4	2003	19:16:14	Thu
40369	114 dB	11.2 dB	Dec	9	2003	1:14:56	Tue
40369	114 dB	11.3 dB	Dec	9	2003	18:13:12	Tue
40369	114 dB	11.4 dB	Dec	9	2003	0:59:00	Tue
40369	114 dB	11.2 dB	Dec	15	2003	5:06:27	Mon
40369	114 dB	10.8 dB	Dec	16	2003	15:48:53	Tue
40369	114 dB	11.0 dB	Dec	17	2003	15:16:55	Wed
40369	114 dB	11.1 dB	Dec	18	2003	15:40:08	Thu
40369	114 dB	10.9 dB	Dec	19	2003	15:52:00	Fri
40369	114 dB	10.9 dB	Dec	19	2003	15:52:59	Fri
40369	114 dB	11.2 dB	Jun	8	2003	21:27:00	Sun
40369	114 dB	11.2 dB	Jun	8	2003	21:27:18	Sun
40369	114 dB	9.9 dB	Mar	4	2003	14:33:00	Tue
40369	114 dB	11.2 dB	Nov	5	2003	8:08:58	Wed
40369	114 dB	11.2 dB	Nov	5	2003	8:09:00	Wed
40369	114 dB	11.2 dB	Nov	6	2003	18:59:15	Thu
40369	114 dB	11.2 dB	Nov	6	2003	19:00:00	Thu
40369	114 dB	11.5 dB	Nov	6	2003	6:06:13	Thu
40369	114 dB	11.5 dB	Nov	6	2003	6:07:00	Thu
40369	114 dB	11.3 dB	Nov	10	2003	3:47:21	Mon
40369	114 dB	11.5 dB	Nov	10	2003	15:00:41	Mon

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40369	114 dB	11.3 dB	Nov	11	2003	15:00:07	Tue
40369	114 dB	10.7 dB	Nov	12	2003	14:54:10	Wed
40369	114 dB	11.1 dB	Nov	14	2003	15:48:19	Fri
40369	114 dB	11.2 dB	Nov	18	2003	19:23:20	Tue
40369	114 dB	11.3 dB	Nov	18	2003	6:20:45	Tue
40369	114 dB	11.1 dB	Nov	19	2003	15:33:23	Wed
40369	114 dB	11.1 dB	Nov	21	2003	15:32:23	Fri
40369	114 dB	11.2 dB	Nov	21	2003	6:02:55	Fri
40369	114 dB	11.1 dB	Nov	24	2003	14:58:09	Mon
40369	114 dB	11.2 dB	Nov	26	2003	11:27:00	Wed
40369	114 dB	11.2 dB	Nov	26	2003	11:27:16	Wed
40369	114 dB	11.1 dB	Oct	1	2003	15:16:27	Wed
40369	114 dB	11.2 dB	Oct	2	2003	14:51:11	Thu
40369	114 dB	11.3 dB	Oct	10	2003	11:45:27	Fri
40369	114 dB	11.3 dB	Oct	10	2003	11:46:00	Fri
40369	114 dB	11.5 dB	Oct	20	2003	7:07:30	Mon
40369	114 dB	11.4 dB	Oct	21	2003	7:14:44	Tue
40369	114 dB	11.4 dB	Oct	21	2003	7:15:00	Tue
40369	114 dB	11.0 dB	Oct	22	2003	14:54:15	Wed
40369	114 dB	11.3 dB	Oct	23	2003	14:54:58	Thu
40369	114 dB	11.3 dB	Oct	23	2003	14:55:00	Thu
40369	114 dB	11.1 dB	Oct	27	2003	6:11:11	Mon
40369	114 dB	11.1 dB	Oct	28	2003	6:26:47	Tue
40369	114 dB	10.9 dB	Oct	29	2003	6:30:17	Wed
40369	114 dB	11.2 dB	Oct	29	2003	14:52:09	Wed
40369	114 dB	11.2 dB	Oct	31	2003	6:53:47	Fri
40369	114 dB	11.2 dB	Oct	31	2003	18:57:02	Fri
40369	114 dB	10.7 dB	Sep	2	2003	13:25:41	Tue
40369	114 dB	10.7 dB	Sep	2	2003	13:26:00	Tue
40369	114 dB	11.1 dB	Sep	5	2003	15:10:49	Fri
40369	114 dB	11.0 dB	Sep	19	2003	15:12:23	Fri
40369	114 dB	7.6 dB	Sep	22	2003	15:23:34	Mon
40369	114 dB	11.1 dB	Sep	23	2003	15:25:44	Tue
40369	114 dB	11.4 dB	Sep	24	2003	15:46:52	Wed
40369	114 dB	11.2 dB	Sep	25	2003	23:07:53	Thu
40369	114 dB	11.1 dB	Sep	29	2003	14:37:19	Mon
40369	114 dB	11.3 dB	Sep	30	2003	14:49:04	Tue
40370	114 dB	10.2 dB	Aug	18	2003	14:11:44	Mon
40370	114 dB	10.1 dB	Aug	19	2003	15:54:25	Tue
40370	114 dB	10.1 dB	Aug	20	2003	15:35:45	Wed
40370	114 dB	10.3 dB	Aug	21	2003	15:20:18	Thu
40370	114 dB	10.3 dB	Aug	22	2003	15:31:38	Fri
40370	114 dB	10.4 dB	Dec	3	2003	23:20:08	Wed
40370	114 dB	10.4 dB	Dec	4	2003	0:18:00	Thu
40370	114 dB	10.4 dB	Dec	4	2003	7:34:50	Thu
40370	114 dB	10.4 dB	Dec	4	2003	8:33:00	Thu
40370	114 dB	10.5 dB	Dec	4	2003	0:00:56	Thu
40370	114 dB	10.5 dB	Dec	4	2003	0:59:00	Thu
40370	114 dB	10.3 dB	Dec	16	2003	15:51:19	Tue
40370	114 dB	10.3 dB	Dec	16	2003	16:49:00	Tue
40370	114 dB	10.6 dB	Jul	11	2003	11:01:00	Fri
40370	114 dB	11.6 dB	Jun	8	2003	21:13:42	Sun
40370	114 dB	11.5 dB	Jun	12	2003	8:06:59	Thu
40370	114 dB	11.0 dB	Mar	4	2003	14:36:00	Tue
40370	114 dB	10.4 dB	Nov	6	2003	6:09:01	Thu
40370	114 dB	10.4 dB	Nov	6	2003	7:08:00	Thu
40370	114 dB	10.4 dB	Nov	17	2003	16:59:09	Mon
40370	114 dB	10.4 dB	Nov	17	2003	17:57:00	Mon
40370	114 dB	10.5 dB	Nov	17	2003	5:59:23	Mon
40370	114 dB	10.5 dB	Nov	17	2003	6:57:00	Mon
40370	114 dB	10.5 dB	Nov	18	2003	16:07:05	Tue
40370	114 dB	10.5 dB	Nov	18	2003	17:05:00	Tue
40370	114 dB	10.5 dB	Nov	26	2003	11:24:37	Wed

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40370	114 dB	10.5 dB	Nov	26	2003	12:22:00	Wed
40370	114 dB	10.7 dB	Oct	10	2003	11:40:53	Fri
40370	114 dB	10.4 dB	Oct	31	2003	7:06:18	Fri
40370	114 dB	10.4 dB	Oct	31	2003	8:04:00	Fri
40370	114 dB	10.4 dB	Oct	31	2003	19:16:41	Fri
40370	114 dB	10.4 dB	Oct	31	2003	19:17:53	Fri
40370	114 dB	10.4 dB	Oct	31	2003	20:16:00	Fri
40370	114 dB	10.4 dB	Sep	2	2003	13:48:00	Tue
40370	114 dB	10.5 dB	Sep	2	2003	13:57:02	Tue
40370	114 dB	10.6 dB	Sep	25	2003	13:28:02	Thu
40371	114 dB	10.7 dB	Aug	4	2003	14:57:57	Mon
40371	114 dB	10.7 dB	Aug	4	2003	14:58:00	Mon
40371	114 dB	10.7 dB	Aug	5	2003	15:09:28	Tue
40371	114 dB	10.7 dB	Aug	5	2003	15:10:00	Tue
40371	114 dB	10.6 dB	Aug	6	2003	15:19:14	Wed
40371	114 dB	10.7 dB	Aug	7	2003	23:03:53	Thu
40371	114 dB	10.7 dB	Aug	7	2003	23:04:00	Thu
40371	114 dB	9.9 dB	Aug	11	2003	19:14:20	Mon
40371	114 dB	9.9 dB	Aug	11	2003	19:15:27	Mon
40371	114 dB	9.9 dB	Aug	11	2003	19:16:00	Mon
40371	114 dB	10.8 dB	Aug	12	2003	15:01:26	Tue
40371	114 dB	10.8 dB	Aug	12	2003	15:02:00	Tue
40371	114 dB	10.7 dB	Aug	13	2003	8:15:09	Wed
40371	114 dB	10.7 dB	Aug	13	2003	8:16:00	Wed
40371	114 dB	10.7 dB	Aug	18	2003	15:54:44	Mon
40371	114 dB	10.7 dB	Aug	18	2003	15:55:00	Mon
40371	114 dB	10.4 dB	Aug	19	2003	15:25:35	Tue
40371	114 dB	10.4 dB	Aug	19	2003	15:26:00	Tue
40371	114 dB	10.6 dB	Aug	20	2003	15:50:32	Wed
40371	114 dB	10.6 dB	Aug	20	2003	15:51:00	Wed
40371	114 dB	10.7 dB	Aug	21	2003	15:32:55	Thu
40371	114 dB	10.7 dB	Aug	21	2003	15:34:00	Thu
40371	114 dB	10.6 dB	Aug	22	2003	15:18:59	Fri
40371	114 dB	10.6 dB	Aug	22	2003	15:20:00	Fri
40371	114 dB	10.0 dB	Aug	25	2003	15:53:13	Mon
40371	114 dB	10.0 dB	Aug	25	2003	15:54:00	Mon
40371	114 dB	10.6 dB	Aug	26	2003	15:17:33	Tue
40371	114 dB	10.6 dB	Aug	26	2003	15:18:00	Tue
40371	114 dB	10.6 dB	Dec	3	2003	15:32:00	Wed
40371	114 dB	10.7 dB	Jul	4	2003	6:49:32	Fri
40371	114 dB	9.7 dB	Jul	4	2003	14:59:49	Fri
40371	114 dB	10.3 dB	Jul	7	2003	15:17:38	Mon
40371	114 dB	10.1 dB	Jul	8	2003	15:11:47	Tue
40371	114 dB	10.1 dB	Jul	8	2003	15:12:00	Tue
40371	114 dB	10.3 dB	Jul	9	2003	15:15:27	Wed
40371	114 dB	9.2 dB	Jul	10	2003	23:04:14	Thu
40371	114 dB	10.6 dB	Jul	14	2003	15:55:57	Mon
40371	114 dB	9.4 dB	Jul	14	2003	7:38:33	Mon
40371	114 dB	9.9 dB	Jul	15	2003	14:47:20	Tue
40371	114 dB	10.8 dB	Jul	16	2003	16:15:54	Wed
40371	114 dB	10.5 dB	Jul	18	2003	0:04:45	Fri
40371	114 dB	10.0 dB	Jul	21	2003	19:05:43	Mon
40371	114 dB	10.1 dB	Jul	22	2003	15:17:29	Tue
40371	114 dB	10.0 dB	Jul	23	2003	15:39:06	Wed
40371	114 dB	10.5 dB	Jul	24	2003	19:11:50	Thu
40371	114 dB	9.9 dB	Jul	28	2003	15:49:42	Mon
40371	114 dB	10.6 dB	Jul	29	2003	19:06:21	Tue
40371	114 dB	9.8 dB	Jul	30	2003	18:44:38	Wed
40371	114 dB	9.8 dB	Jul	30	2003	18:45:00	Wed
40371	114 dB	10.6 dB	Mar	4	2003	14:38:00	Tue
40371	114 dB	10.7 dB	Nov	6	2003	10:04:00	Thu
40371	114 dB	10.6 dB	Nov	25	2003	18:33:00	Tue
40371	114 dB	10.1 dB	Oct	23	2003	15:15:00	Thu

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40371	114 dB	10.1 dB	Oct	23	2003	15:15:52	Thu
40372	114 dB	10.5 dB	Aug	11	2003	12:09:00	Mon
40372	114 dB	10.5 dB	Aug	11	2003	12:09:40	Mon
40372	114 dB	10.5 dB	Aug	13	2003	8:02:40	Wed
40372	114 dB	10.0 dB	Aug	18	2003	15:22:14	Mon
40372	114 dB	10.6 dB	Aug	19	2003	15:04:34	Tue
40372	114 dB	10.6 dB	Aug	20	2003	15:20:27	Wed
40372	114 dB	10.4 dB	Aug	21	2003	15:03:53	Thu
40372	114 dB	10.4 dB	Aug	21	2003	15:04:00	Thu
40372	114 dB	10.5 dB	Aug	22	2003	14:46:39	Fri
40372	114 dB	10.2 dB	Aug	25	2003	15:32:55	Mon
40372	114 dB	10.2 dB	Aug	25	2003	15:33:00	Mon
40372	114 dB	10.9 dB	Dec	2	2003	18:13:00	Tue
40372	114 dB	10.9 dB	Dec	2	2003	18:13:05	Tue
40372	114 dB	10.5 dB	Dec	3	2003	6:36:00	Wed
40372	114 dB	10.5 dB	Dec	10	2003	15:14:00	Wed
40372	114 dB	11.8 dB	Jul	2	2003	19:23:41	Wed
40372	114 dB	11.8 dB	Jul	3	2003	14:51:15	Thu
40372	114 dB	11.4 dB	Jul	4	2003	14:44:28	Fri
40372	114 dB	10.0 dB	Jul	7	2003	14:56:06	Mon
40372	114 dB	10.7 dB	Jul	8	2003	14:50:39	Tue
40372	114 dB	10.7 dB	Jul	9	2003	18:59:40	Wed
40372	114 dB	10.0 dB	Jul	22	2003	15:33:59	Tue
40372	114 dB	10.3 dB	Jul	28	2003	6:52:00	Mon
40372	114 dB	10.3 dB	Jul	28	2003	6:54:41	Mon
40372	114 dB	11.1 dB	Jun	8	2003	21:48:00	Sun
40372	114 dB	11.1 dB	Jun	8	2003	21:48:58	Sun
40372	114 dB	11.1 dB	Jun	10	2003	8:00:57	Tue
40372	114 dB	11.2 dB	Jun	10	2003	8:03:12	Tue
40372	114 dB	12.3 dB	Jun	12	2003	18:59:00	Thu
40372	114 dB	12.2 dB	Jun	16	2003	19:15:00	Mon
40372	114 dB	12.7 dB	Jun	17	2003	14:59:00	Tue
40372	114 dB	12.7 dB	Jun	17	2003	15:01:21	Tue
40372	114 dB	12.3 dB	Jun	18	2003	14:55:00	Wed
40372	114 dB	12.2 dB	Jun	19	2003	14:43:00	Thu
40372	114 dB	12.2 dB	Jun	19	2003	14:46:11	Thu
40372	114 dB	12.2 dB	Jun	25	2003	19:32:40	Wed
40372	114 dB	12.3 dB	Jun	26	2003	19:24:13	Thu
40372	114 dB	11.1 dB	Jun	27	2003	18:57:34	Fri
40372	114 dB	10.6 dB	Mar	4	2003	14:40:00	Tue
40372	114 dB	10.6 dB	Nov	4	2003	18:28:19	Tue
40372	114 dB	10.8 dB	Nov	5	2003	15:04:00	Wed
40372	114 dB	10.5 dB	Nov	27	2003	18:58:00	Thu
40372	114 dB	10.8 dB	Nov	29	2003	17:09:19	Sat
40372	114 dB	10.8 dB	Nov	29	2003	18:09:00	Sat
40372	114 dB	10.8 dB	Oct	2	2003	18:56:00	Thu
40372	114 dB	10.5 dB	Oct	9	2003	19:03:00	Thu
40372	114 dB	10.7 dB	Oct	16	2003	19:08:00	Thu
40372	114 dB	10.6 dB	Oct	28	2003	19:02:00	Tue
40372	114 dB	10.6 dB	Sep	25	2003	19:04:00	Thu
40372	114 dB	10.5 dB	Sep	30	2003	18:52:00	Tue
40373	114 dB	10.7 dB	Aug	4	2003	15:03:14	Mon
40373	114 dB	10.7 dB	Aug	5	2003	15:03:14	Tue
40373	114 dB	10.7 dB	Aug	5	2003	15:04:00	Tue
40373	114 dB	10.7 dB	Aug	6	2003	15:10:36	Wed
40373	114 dB	10.7 dB	Aug	6	2003	15:11:00	Wed
40373	114 dB	10.7 dB	Aug	7	2003	22:58:09	Thu
40373	114 dB	10.7 dB	Aug	7	2003	22:59:00	Thu
40373	114 dB	10.7 dB	Aug	11	2003	19:02:14	Mon
40373	114 dB	10.7 dB	Aug	11	2003	19:03:00	Mon
40373	114 dB	10.8 dB	Aug	12	2003	15:04:55	Tue
40373	114 dB	10.8 dB	Aug	12	2003	15:06:00	Tue
40373	114 dB	10.5 dB	Aug	13	2003	8:11:41	Wed

Dosimeter Serial Number	Calibrator Setting	Offset Setting	Calibration Month	Calibration Day	Calibration Year	Calibration Time	Day of the Week
40373	114 dB	10.5 dB	Aug	13	2003	8:12:00	Wed
40373	114 dB	10.7 dB	Aug	18	2003	15:49:29	Mon
40373	114 dB	10.7 dB	Aug	18	2003	15:50:00	Mon
40373	114 dB	10.2 dB	Aug	19	2003	15:30:15	Tue
40373	114 dB	10.2 dB	Aug	19	2003	15:31:00	Tue
40373	114 dB	10.6 dB	Aug	20	2003	15:45:30	Wed
40373	114 dB	10.6 dB	Aug	20	2003	15:46:00	Wed
40373	114 dB	10.7 dB	Aug	21	2003	15:27:57	Thu
40373	114 dB	10.7 dB	Aug	21	2003	15:29:00	Thu
40373	114 dB	10.6 dB	Aug	22	2003	15:14:11	Fri
40373	114 dB	10.6 dB	Aug	22	2003	15:15:00	Fri
40373	114 dB	10.3 dB	Aug	25	2003	15:49:29	Mon
40373	114 dB	10.3 dB	Aug	25	2003	15:51:00	Mon
40373	114 dB	10.4 dB	Aug	26	2003	15:23:46	Tue
40373	114 dB	10.4 dB	Aug	26	2003	15:25:00	Tue
40373	114 dB	10.5 dB	Aug	27	2003	6:55:19	Wed
40373	114 dB	10.5 dB	Aug	27	2003	6:56:31	Wed
40373	114 dB	10.5 dB	Aug	27	2003	6:58:00	Wed
40373	114 dB	10.6 dB	Aug	27	2003	6:53:31	Wed
40373	114 dB	10.7 dB	Dec	12	2003	11:12:00	Fri
40373	114 dB	10.6 dB	Jul	4	2003	14:52:54	Fri
40373	114 dB	10.8 dB	Jul	4	2003	6:44:24	Fri
40373	114 dB	17.5 dB	Jul	7	2003	15:22:28	Mon
40373	114 dB	17.1 dB	Jul	8	2003	15:02:17	Tue
40373	114 dB	17.1 dB	Jul	9	2003	14:47:59	Wed
40373	114 dB	17.1 dB	Jul	9	2003	14:48:00	Wed
40373	114 dB	16.2 dB	Jul	10	2003	22:59:06	Thu
40373	114 dB	17.1 dB	Jul	14	2003	7:36:21	Mon
40373	114 dB	17.4 dB	Jul	14	2003	16:00:37	Mon
40373	114 dB	16.8 dB	Jul	15	2003	14:41:55	Tue
40373	114 dB	17.3 dB	Jul	16	2003	16:09:43	Wed
40373	114 dB	17.6 dB	Jul	18	2003	0:07:07	Fri
40373	114 dB	16.9 dB	Jul	21	2003	18:58:42	Mon
40373	114 dB	16.9 dB	Jul	22	2003	15:12:24	Tue
40373	114 dB	9.8 dB	Jul	23	2003	15:30:46	Wed
40373	114 dB	10.1 dB	Jul	24	2003	19:14:47	Thu
40373	114 dB	10.2 dB	Jul	24	2003	19:01:30	Thu
40373	114 dB	10.6 dB	Jul	28	2003	15:44:58	Mon
40373	114 dB	10.6 dB	Jul	28	2003	15:45:00	Mon
40373	114 dB	10.6 dB	Jul	29	2003	18:44:47	Tue
40373	114 dB	10.6 dB	Jul	29	2003	18:45:00	Tue
40373	114 dB	10.5 dB	Jul	30	2003	18:49:44	Wed
40373	114 dB	10.5 dB	Jul	30	2003	18:50:00	Wed
40373	114 dB	10.9 dB	Mar	4	2003	14:42:00	Tue
40373	114 dB	10.8 dB	Nov	6	2003	6:55:49	Thu
40373	114 dB	11.2 dB	Nov	6	2003	18:47:00	Thu
40373	114 dB	11.2 dB	Nov	6	2003	18:48:00	Thu
40373	114 dB	11.0 dB	Oct	10	2003	11:42:32	Fri
40373	114 dB	11.0 dB	Oct	10	2003	11:43:00	Fri
40373	114 dB	10.7 dB	Sep	2	2003	13:42:24	Tue
40373	114 dB	10.7 dB	Sep	2	2003	13:44:00	Tue
40373	114 dB	10.8 dB	Sep	5	2003	14:46:26	Fri
40373	114 dB	10.8 dB	Sep	8	2003	14:13:38	Mon
40373	114 dB	11.0 dB	Sep	9	2003	15:30:21	Tue
40373	114 dB	11.2 dB	Sep	10	2003	23:42:17	Wed
40373	114 dB	10.9 dB	Sep	11	2003	14:49:35	Thu
40373	114 dB	10.7 dB	Sep	16	2003	15:27:55	Tue
40373	114 dB	10.9 dB	Sep	16	2003	5:55:58	Tue
40373	114 dB	10.8 dB	Sep	17	2003	15:19:25	Wed
40373	114 dB	10.8 dB	Sep	18	2003	15:12:03	Thu
40373	114 dB	10.9 dB	Sep	19	2003	14:50:07	Fri
40373	114 dB	10.8 dB	Sep	25	2003	19:58:40	Thu

**APPENDIX F: SUMMARY OPERATING PROCEDURES FOR LARSON DAVIS
MODEL 706 RC SOUND LEVEL METER AND EXAMPLE TIMELINE
FOR TASK SLM MEASUREMENTS**

Power-up and Check Battery

1. Turn on the instrument by pushing the on/off button. The dosimeter/sound level meter will go through a 5 second warm up. 
2. Once the instrument is "on" check the battery indicator on the upper left hand corner of the LED screen, if only one of the three bars is lit, turn the instrument back off by pushing the on/off button once and then replace the 2 AA size batteries. 

Reset Procedures

3. With the instrument "on," check to make sure that the most recent measurement data has been cleared using the procedures detailed below (**IMPORTANT NOTE: this reset procedure must be done before every task noise measurement**).
4. Push the up or down  arrow button on the control panel until the **Dose 1** display screen appears. If there are no noise data on the screen you can start taking noise measurements. If there are data on the screen continue with the next set of instructions below. **Error! Not a valid embedded object.**
5. Push the reset button on **Err** the lower left of the instrument control panel. A message appears on the LED screen which queries whether you want to reset the data. Push the left or right arrow button to highlight "YES" (it is highlighted when "yes" is surrounded by a black box), and then push the orange check mark button to reset. Make sure that the noise data has been removed from the **Dose 1** screen.  **Er**
Err
or! 

Measuring Noise

6. After the noise measurement data has been reset and the LED screen cleared you can begin to measure task sound levels.
7. To begin taking noise measurements, hold the sound level meter in the employees hearing zone, and then push the "Run" button located on the upper right corner of the instrument control panel. (**IMPORTANT NOTE: do not initiate a measurement until the sound level meter is in the employees hearing zone**). 
8. When the instrument is "running" a bar graph indicator, located at the top center of the LED screen, will be animated, rolling from left to right. When the instrument is in the "stopped" mode, this icon will disappear. 
9. Usually a task noise measurement will be collected for a time period of 30 seconds to 2 minutes and should be representative of the sound levels during the task. If the task has

short duration cyclical duty cycles, 3 full cycles should be monitored. For example - if a task at a machine is loading, processing, and unloading, but the cycle time to do all three of these is only 20 seconds; the task measurement with the sound level meter should be about a minute in length (3 x 20seconds). If a task has distinctive “sub-tasks” which do not occur in close succession, a measurement can be taken of each part separately. For example - if the task is “repair activities” and involves hammering, grinding, using an air wrench, and making machine adjustments you may need to take a sound level measurements during each of the separate sub-tasks. A good rule of thumb to consider when taking task noise measurements is to view the TWA level on the bottom of the **Dose 1** display screen while taking a measurement and continue to take a measurement until the TWA level stabilizes to within 0.5 dB.

10. When you have completed taking a task sound level measurement stop the “run” function of the instrument by pushing the run button again. The bar graph run icon should disappear from the top of the LED screen. **(IMPORTANT NOTE: stop the instrument run while you are still holding sound level meter in the employee’s hearing zone)**

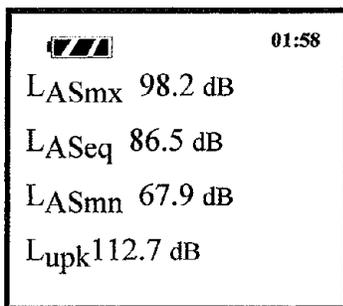
Record Task Noise Data on the Time at Task Data Form

11. After taking each task sound level measurement you will need to immediately record the following measurement data on the Sound Level Information Section of the Direct Observation Time at Task Sound Level Form:

Error! Not a valid embedded object.

Run Time for Task Noise Measurement: The run time will appear on the upper right hand corner of each LED screen is displayed in the format “mm:ss.”

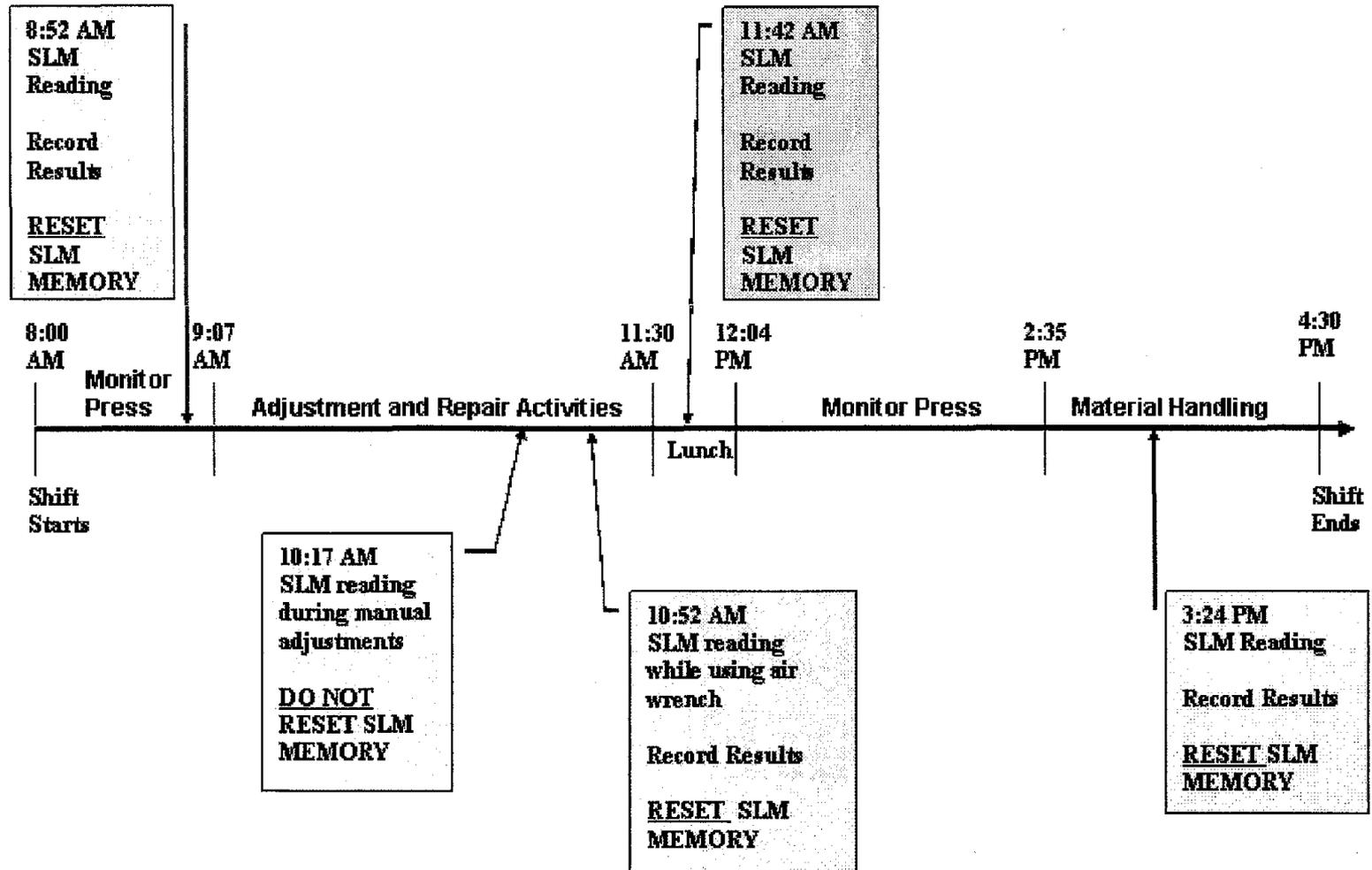
TWA for each Dose Parameter Setup: Use the up and down arrows on the instrument control panel to toggle to each of the 4 dose screens. Record the TWA located on the bottom of each screen.



Lmax and Lpeak: Use the up and down arrows on the control panel to toggle to a screen which looks similar to the example on the left. The Lmax value is at the top of the LED screen and is designated by L_{ASmx} . The Lpeak value is on the bottom of the LED screen and is designated by L_{Upk} .

12. After the sound level data has been recorded, the instrument should be reset using the instructions detailed above, and then turned off by pushing the on/off button.

Example Timeline for Task SLM Measurements



APPENDIX G: DOSIMETER DOWNLOAD INSTRUCTION, DOSIMETER FILE NAMING PROCEDURES, DOSIMETER DOWNLOAD CHECKLIST

Instructions for Downloading Data from the Larson Davis Noise Dosimeters

After each day of data collection, the noise data from each dosimeter must be downloaded using the blaze software. Additionally, all noise data files should be copied to a CD ROM back-up after each day of monitoring.

1. Connect the infra-red communicator (“dongle”) to the computer.
2. Open Blaze software program on computer.
3. Position the dosimeter within few inches of dongle (there is an IR symbol on the top left side of the dosimeter to show where the IR connection is located).
4. Press the connect button on the blaze software toolbar to connect the instrument with the blaze program (page 2-2 to 2-4 of the Larson Davis manual shows the toolbar symbols and functions).
5. Press the **instrument manager** button on the toolbar
 - 5.1 Press the *download tab*.
 - 5.2 Push the download button to start downloading the data.
 - 5.3 After downloading a dialog box will appear with the asking whether you want to reset the instrument data. Press “**YES**,” which will clear the memory and reset the instrument.
 - 5.4 Press the “save” button on the toolbar.
 - 5.5 A “save as” dialog box will appear.
 - 5.6 Change the file name of downloaded file based on the naming procedures specified on the following page for dosimeter download files.
 - 5.7 Make sure the save in file directory is set to the directory that you want to save all the downloaded files into. For example, the directory could be called “Plant A download files”
 - 5.8 Press the “save” button on the dialog box to save the file to the directory you indicated.
6. After the file has been saved you can proceed to calibrating the dosimeter and setting up the timer in preparation for the next day of noise monitoring.

Downloaded File Naming Procedures for Phase I of NIOSH Task Based Noise Study:

These are the procedures for naming files downloaded from the Larson Davis dosimeters.

Each plant will have a unique letter code A, B, or C

Each employee will have a unique identification number:

For task based monitoring, employees will wear a noise dosimeter (model 705P) on their right and/or left shoulder. For some other employees we will not conduct task based monitoring but these employees will still wear a dosimeter on the left and right side.

It is EXTREMELY important that the data downloaded from each dosimeter have a unique file name. This naming system will also allow NIOSH to link the downloaded dosimetry files to the worksheets that the technicians fill out while watching the employee work tasks.

The word "task" followed by the "employee id number" followed by "Left," "Right," or "slm" to indicate if the data was from the left or right or from the sound level meter (the Larson Davis model 706RC instrument)

For example, if we conducted task based monitoring of employee number 900445 and monitoring (but not task monitoring) of employee number 900123, we would name the files after downloading as listed below.

The following 3 files are examples for dosimeters used for task based monitoring:

Task900445Left	-- data downloaded from the dosimeter on employee's left side
Task900445Right	-- data downloaded from the dosimeter on employee's right side
Task900445SLM	-- data downloaded from sound level meter (706RC Model)

The following 2 file names are examples for dosimeters in which task monitoring was not conducted

Notask900123Left	-- data downloaded from the dosimeter on the employee's left side
Notask900123Right	-- data downloaded from the dosimeter on the employee's right side

For Phase II of the NIOSH Noise Study

Download data from the dosimeter onto the computer using the same procedures used during Phase I and name the data download file as described below:

Use the same method as Phase I, except add a number "2" (for survey 2) or a number "3" (for survey 3) at the end of the file name. For example: in survey 2 if the employee identification number was 900123 and the employee wore the dosimeter on their right side you would name the file: **task900123right2** (notice that I added the "2" after "right" in the filename) This will help us distinguish between the dosimeter download data from Phase 1, 2, and 3. Note: A row was added to the background information section of the Phase II data collection form to record the file name after the data is downloaded.

APPENDIX H: PHASE I DATA COLLECTION FORMS AND INSTRUCTIONS

**NIOSH Noise Project
Field Data Collection Forms**

Background Information	
Employee ID Number	
Sex of the employee: M <input type="checkbox"/> F <input type="checkbox"/>	
Birth date of the employee:	
Surveyor Name	
Date of Survey	
Facility Code Name	
Work Area (Department) Number	
Work Area (Department) Name	
Job Code	
Job Name	
Shift Number (1/2/3)	
Survey Number (1/2/3)	
Typical Hours/Day	
Typical Hours/Week	
Dosimeter ID Number (Right)	
Dosimeter ID Number (Left)	
Sound Level Meter ID Number	
Dominant Hand (Left/Right)	

CHAT Test Forms and Checklist

Study ID Number	
Surveyor	
Survey Date	

CHAT Test Information:

The CHAT is a prototype device that allows for a very quick measurement of hearing and will be used in this study to determine if workers could have suffered temporary hearing loss during the work shift because of noise exposure. The CHAT tester works in a manner similar to a "conventional" hearing test, but is not as accurate. Because the CHAT is an experimental device the results of the tests cannot be interpreted the same way as a typical hearing test.

In addition to the CHAT hearing test the NIOSH researchers will ask the employee a few questions about recent noise exposure and hearing loss to help better understand the results of the test. The CHAT hearing test will be conducted both before and after the workshift.

CHAT Test Instructions

- 1) Set the CHAT tester output level to "Phone 0," the tone output pattern to "Ascending" (indicated by the upward sloping triangle symbol), and the frequency dial to 2000 Hz. (The test will also be conducted at 3000 Hz and 4000 Hz).
- 2) Inform the employee that during each CHAT test he/she will need to listen carefully and count the number of short duration sound tones heard.
- 3) Have the employee to put on the headphones, push the "right" or "left" button when so instructed, and count the number of sound tones heard.
- 4) Conduct the test three times at each of the test frequencies (2000 Hz, 3000 Hz, 4000 Hz) for the right ear first and then for the left ear. Record the number of sound tones heard by the employee on the CHAT data collection form after each test.



Employee ID Number		Survey Date	
Surveyor		Time	

CHAT Section I: Pre-Shift Hearing Assessment

Part A: Pre-Shift Checklist Questions		Data to Enter	Additional Comments
1)	Age of employee		
2a)	Did the employee work at the company during the last 24 hours	Yes / No	If "no," go to #3
2b)	If yes, what time was the work shift over		
2c)	Does the employee think that he/she was exposed to unusually loud noise during the most recent works shift	Yes / No	
2d)	Did the employee wear HPD during the most recent work shift	Yes / No	If "no" , go to #3
2e)	Note the kind and NRR (if known) of HPD used		
2f)	If HPD worn, indicate whether it was used for all or part of work shift	All/Part	
3a)	Was employee exposed to loud noise outside of work during the previous 24 hours (e.g. shooting firearms, riding motorcycle, car racing, motor boating, concerts, musician, stereo, power tools, mowing lawn, chainsaw, other - specify)	Yes / No	List if yes.
3b)	If yes, indicate whether HPD were used	Yes / No	
4a)	Has the employee ever had hearing loss diagnosed by a doctor or other health care practitioner	Yes / No	If "no," go to #5
4b)	If yes, indicate which ear affected	Left/Right/Both/Don't Know	
4c)	If known, indicate the hearing loss diagnosis		
5)	Does employee currently have head cold or ear ache	Yes / No	
6)	Does employee currently have ringing in the ears	Yes / No	
7)	At the time of the last audiogram, was the employee told that his/her hearing was normal	Yes / No / Don't Know	

Part B: Pre-Shift CHAT Test Results

Industrial Hygienist:	CHAT Instrument Number:	Time CHAT Test Started:
Tone Output Pattern (Check): <input checked="" type="checkbox"/> Ascending	Output Level Setting (Check): <input checked="" type="checkbox"/> Phone "0"	

Number of Sound Tones Heard	2000 Hz				3000 Hz				4000 Hz			
	Test 1	Test 2	Test 3	Ave.	Test 1	Test 2	Test 3	Ave.	Test 1	Test 2	Test 3	Ave.
Right Ear												
Left Ear												

Test Room Background Sound Level (dBA)	Test Room Background Octave Band Analysis (dB)						
	125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4 KHz	8 KHz

Employee ID Number		Survey Date	
Surveyor		Time	

CHAT Section II: Post-Shift Hearing Assessment

Part A: Post-Shift Checklist Questions		Data to Enter	Additional Comments
1a)	Were HPD worn at any time today	Yes / No	If "no," go to #2
1b)	If worn, indicate number of hours that HPD used today		
1c)	Note the kind and NRR (if known) of HPD used today		
1d)	Indicate whether employee thinks HPD fits correctly	Yes / No	
2)	Does employee feel that his/her noise exposure today was more, less, or the same as a typical work shift.	more / less / same	
3)	Did employee have ringing in ears when the work shift ended	Yes / No	
4a)	Does the employee currently smoke cigarettes, pipes, and/or cigars	Yes / No	If "yes," circle item smoked; if "no," go to #5
4b)	If yes, how many cigarettes (#packs), cigars, and/or pipes smoked per day or week		specify # of each per day or week
5)	Does the employee feel that the overall production rate today was more, less, or the same as normal	more / less / same	
6)	How many parts does the employee estimate were manufactured today		

Part B: Post-Shift CHAT Test Results

Industrial Hygienist:	CHAT Instrument Number:	Time CHAT Test Started:
Tone Output Pattern (Check): <input checked="" type="checkbox"/> Ascending		Output Level Setting (Check): <input checked="" type="checkbox"/> Phone "0"

Number of Sound Tones Heard	2000 Hz				3000 Hz				4000 Hz			
	Test 1	Test 2	Test 3	Ave.	Test 1	Test 2	Test 3	Ave.	Test 1	Test 2	Test 3	Ave.
Right Ear												
Left Ear												

Test Room Background Sound Level (dBA)	Test Room Background Octave Band Analysis (dB)						
	125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4 KHz	8 KHz

**Direct Observation Time-at-Task
Assessment Form (page 1)
Plant C ONLY page _____**

Employee ID Number	
Surveyor Name	
Survey Date	

Task Name or Description	Start Time	Stop Time	If Used During Repair Task, list: power tool type, comp. air, hammer, hoist	Duration of time (seconds)		# of times used	% of time HP use	HP Fit Y/N	Type of HP and Other comments	Engine On Y/N	Other LOUD noise sources lasting more than 1 minute Identify if possible
				Min	Max						
								Y N		Y N	Y N
								Y N		Y N	Y N
								Y N		Y N	Y N
								Y N		Y N	Y N
								Y N		Y N	Y N
								Y N		Y N	Y N
								Y N		Y N	Y N
								Y N		Y N	Y N

NOTE 1: When employees conduct the task "Repair Machine or Part" task, note in column 4 if a power hand tool, compressed air, overhead hoist, or hammer were used, in column 6 note the number of time each was used during the repair task, in column 5 estimate the range of time duration for each.

NOTE 2: Engine on (Y/N) is filled out only for technicians/mechanics working on heavy equipment with a motor, not for all jobs.

Other Notes and Comments:

Direct Observation Time-at-Task Assessment Form (page 2b)

Study ID Number

Task Name or Description	Location	Impulse Noise (Y/N)	Noise from left/right/front/back	Hand Tool Used (Enter Code)	Main Production Sources: (Enter Code)	Age of Machine (yrs)	Distance to Main Prod. Source (ft)	Prod. Source Density (# w/in 15ft.)	Main Non-Prod. Sources: (Enter Code)
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							

CODES for Hand Tools		CODES for Production Noise Sources:		CODES for Production Noise Sources:		CODES for NON-Production Noise Sources:	
HM	Hammering (manual)	AB	Air Blow-Off	MP	Motor - Pneumatic	FF	Floor Fans
HT	Hand tools (manual)	AE	Air Exhaust	PCI	Part to chute impact	PED	Personal entertainment device (radio/headphones)
HTP	Hand Tools (pneumatic)	AL	Air Leak	PI	Part impact	PW	Plant warning/communication systems
		BL	Blower	PFI	Part to fixture impact	R	Radio (for communication)
		CB	Combustion	PPI	Part to part impact	VM	Ventilation exhaust - movable - man-coolers
		CN	Conveyor	PT	Power transmission devices -mechanical	VP	Ventilation exhaust - permanent installation
		EN	Engine (gasoline, diesel, etc)	SL	Steam Leak		
		HD	Hydraulics	TI	Tooling Impact (presses)		
		MI	Machine Impact	TM	Tooling - material removal (grinding, cutting, lathes)		
		MM	Machine - Mechanical	VE	Vibrating Elements		
		MTE	Material Transport Equipment (trucks, fork lifts, etc)	WD	Welding		
		ME	Motor - Electric	WJC	Water jet		

**Employee *Actual* Workday
Time-at-Task Assessment Form
(Complete Post-Shift)**

Study ID Number	
Surveyor	
Survey Date	

INSTRUCTIONS (NOTE: Complete this form after the work shift):
 The work tasks that were actually conducted on the day of the survey should be provided by the employee and listed on the table below. The employee should also indicate the amount of time spent at each task on the day of the survey. List the task time on the table next to each task. The total number of hours should add up to the total time of the work shift.

List of Work Tasks or Activities Conducted on the Day of the Survey	Time Spent on Each Task (complete after the work shift)	
	Hours	Minutes
Total Time of Work Shift		

Other Notes:

**INSTRUCTIONS FOR DIRECT OBSERVATION
TIME-AT-TASK (TAT) ASSESSMENT FORM**

BACKGROUND SECTION

Employee ID Number: This will be a unique identifier assigned to each study subject participating in the study. (We will have a separate list in which the Subject ID will be matched to the study subjects name)

Sex of Employee: Indicate Male or Female

Birth date of employee: Month, day, year of employee's birth

Surveyor Name: Name of person collecting data

Date of Survey: Date that data was collected

Facility Name: Name of company where noise study conducted

Work Area Number: Identification number for the department or area where employee works (if applicable)

Work Area Name: Name of Department or Area where employee works

Job Code: Identification number for the employee's job (if applicable)

Job Name: Name of the employee's job

Shift Number: First, Second, or Third

Survey Number: Either "1," "2," or "3," which corresponds to whether this is the first, second, or third time noise monitoring has been conducted with this study subject

Typical Hours/Day: Number of hours the employee typically works each day

Typical Hours/Week: Number of hours the employee typically works each week

Dosimeter ID Numbers (right and left): The number printed on tape on the Larson Davis model 705P noise dosimeters.

Sound Level Meter ID Number: The number printed on tape on the Larson Davis model 706RC noise dosimeter/sound level meter.

Dominant Hand (left/right): Note whether the employee is right or left handed.

TIME-AT-TASK AND HEARING PROTECTION USE SECTIONS

For each task an employee conducts record the following information:

Task Name or Description:

Write down the name of each work task as it occurs. For each job you will have a list of work tasks that are typical for that job. However, you may need to add tasks, if appropriate. If a task is added, think of a short name to call the task. Sometimes the employee or supervisor may be able to help with the task name.

Start and Stop Times:

Write the times each task starts and stops.

Hearing Protection Use:

This section will be used the same way as the time-at-task section except you will record the times during each task that an employee wore hearing protection. Leave blank if an employee did not wear hearing protection.

HP Fit (Y/N/?): At the time each task sound level is measured, record in the corresponding task row whether it appears that the employee's hearing protection fit appropriately. Use "Y" if HP appears to be worn correctly, "N" if HP appears to be worn incorrectly, and "?" if you are unable to determine by appearance. Put an "X" or leave blank if an employee did not wear hearing protection at during that task on the day of the survey.

Dept. HP Use %: At the time each task sound level is measured, based on your observation, record in the corresponding task row the approximate percentage of other employees in the same department or area who appear to be wearing hearing protection.

Overall Production Rate Today: At the end of the shift ask the employees whether the production rate was more, less, or same as a normal workday.

Number of Parts Mfg. Today: At the end of the shift ask the employee the number of parts or production units manufactured during the observed work shift on the survey date. You may need to ask the supervisor or other manager if the employee doesn't know.

Other Notes: Use this space or additional pages to record any pertinent notes or observations.

SOUND LEVEL AND NOISE SOURCE INFORMATION SECTIONS

Part 1: Sound Level Information:

Most of the following information will be found on one of several Larson Davis model 706RC dosimeter/sound level meter display screens. Refer to the 706RC summary of operating procedures for more specific instructions.

Time of SLM Reading:

Record the time (to the nearest minute) that you started to collect the task sound level measurement. For example, if you used the sound level meter at 9:25 AM to take a 2 minute sound measurement of task 3, you would write 9:25 in the appropriate column next to "Task 3."

Duration of Measurement:

The sound level meter "run time" (minutes:second) for the task noise measurement. The run time can be found on the upper right hand corner of the 706RC dosimeter/sound level meter LED screen.

Dose1; Dose 2; Dose3; Dose 4:

The task time-weighted average noise level for each dose parameter settings from the 706RC sound level meter. The TWA is displayed on the bottom of each of the 4 instrument dose screens.

Lmax and Lpeak:

Maximum and Peak sound levels which occur during the task sound level measurement. Both are found on the same display screen on the 706RC instrument.

Part 2: Noise Source Information

Record the following information for each task the employees conducts after the task sound level is measured. If the information specified by the column heading is not applicable leave the space blank or put an "X" in the space.

Bay Location: Primary location(s) where the employee worked. The facilities use a grid system marked with letters and numbers to identify locations throughout the facility, such as F9 or AA14. Some employees may travel throughout a department or plant rather than stay in one bay area. In those cases you may need to indicate "plantwide" or list the department name.

Impulse noise: Note whether impulse noise is present.

Hand Tool Used: Using the "CODES for Hand Tools" indicate which hand tool or tools were used and contributed the most to the employee's noise exposure during the task.

Main Production Source: Using the “CODES for Noise Sources” indicate which production-related noise source(s) contributed the most to noise exposure.

Age of Machine: The age of the machine that seemed to contribute the most to the employees noise exposure. For this information you will need to ask the employee or supervisor.

Distance to Main Production Source: Estimate, in feet, how far away the main production noise sources were located.

Production Source Density: Indicate how many of the main production related noise sources are within 15 feet of where the employee typically works. For example there may be 3 nearby presses that are the primary contributors to an employee’s noise exposure.

Main Non-production Source: Using the “CODES for Non-Production Noise Sources” indicate which non-production related noise source seemed to contribute the most to the employee’s noise exposure.

Distance to Main Non-Production Source: Estimate, in feet, how far away the main non-production noise sources were located.

Non-Production Source Density: Indicate how many of the main non-production related noise sources are within 15 feet of where the employee typically works. For example there may be 2 nearby floor fans that are the primary non-production contributors to an employee’s noise exposure.

Other Notes: Use this space or additional pages to record any pertinent notes or observations.

INSTRUCTIONS FOR EMPLOYEE ACTUAL WORKDAY TIME-AT-TASK (TAT) ASSESSMENT FORM

ACTUAL WORKDAY TIME-AT-TASK SECTION

For this form the IHs will ask the employee(s) they observed during the work shift to estimate the numbers of hours/minutes the employee spent at each task on the day of noise monitoring. Either the employee can complete the form themselves or the employee can tell the IH the time at task information and the IH can fill out the form. Since in most circumstances the task names should be pre-printed on the form let the employee know that they can add task name to the list if necessary or cross off tasks which are not applicable.

List of Work Tasks or Activities: Write down the name of the tasks the employee conducted on the day of monitoring. In most cases the names of typical work tasks, based on previous data for that job, will be provided on a separate form for reference.

Hours/Minutes: In these columns the employees or IHs will write down the number of hours and minutes that employees estimate they spent at each of the listed tasks during the work shift on the day of noise monitoring..

Total Time of Work Shift: The total number of hours and minutes (including lunch and breaks) that the employee worked on the day of noise monitoring. This number should be the same as that recorded on the "Direct Observation TAT" form.

Note: If the sum of task times is not equal to the total time for the length of the work shift on the survey day, let the employee know what the difference is and ask them to adjust some or all of the task times so that the task time sum and the length of the work shift are the same.

Instructions for CHAT Test Form and Checklist

Employee Study ID: This will be a unique identifier assigned to each study subject participating in the study. (We will have a separate list in which the Subject ID will be matched to the study subjects name). There is a text box at the top of each of the other pages of this form for entering the "study ID number" to identify the forms in case pages get mixed up.

Surveyor: Name of person collecting data

Date: Date that data was collected

Time: Time that CHAT forms were filled out

Section I: PRE-SHIFT HEARING PROTECTION ASSESSMENT

The industrial hygiene researcher will meet with the employee about ½ hour before the start of the work shift and ask the employee a series of checklist questions and then administer the CHAT Hearing Assessment.

Let the employee know that the checklist questions are simply a way of determining whether they might have a pre-existing hearing loss or a temporary hearing loss from recent (within last 24 hours) exposure to loud noise. The checklist responses will help the NIOSH researchers better understand the results of the CHAT assessment.

Part A: Pre-Shift Checklist Questions (complete before the work shift)

CHECKLIST ITEMS	INSTRUCTIONS FOR IH RESEARCHERS
1) Age	This data will be obtained separately from employee records
2a) Did the employee work at the company during the last 24 hours	Ask if employee worked at any time during the previous 24 hours. Note: If the employee worked the previous day or evening shift the answer would be "Yes." Enter "Yes" or "No." If "No," go to checklist item #3a
2b) If yes, what time was the work shift over	Enter the time the employee last worked. e.g. When did they leave work yesterday, last night, etc.?
2c) Does the employee think that he/she was exposed to unusually loud noise during the most recent works shift	Ask if the employee felt if their exposure to noise yesterday/last night was higher than usual. Enter "Yes" or "No"
2d) Did the employee wear HPD during the most recent work shift	Ask if employee they wore hearing protection at any time while at work during previous 24 hours. Enter "Yes" or "No"
2e) Note the kind and NRR (if known) of HPD used	Ask the employee what kind of HPD they wore.
2f) If HPD worn, indicate whether used for all or part of work shift	Did employee wear hearing protection "entire time" while on production floor or only part of the time? Enter "All" or "Part"
3a) Was employee exposed to loud noise outside of work during previous 24 hours (e.g. shooting firearms, motorcycle, car racing, motor boating, concerts, musician, stereo, power tools, mowing lawn, chainsaw, other - specify)	Self explanatory - Enter "Yes" or "No" If employee indicates "Yes" ask them what was the source of the loud noise
3b) If yes, indicate whether HPD were used	Did they wear hearing protection when exposed to the loud non-work noise? Enter "Yes" or "No"

4a)	Ever had hearing loss diagnosed by your doctor other health care practitioner	This data will be obtained separately from employee records
4b)	If yes, indicate which ear affected	This data will be obtained separately from employee records
4c)	If known, indicate the hearing loss diagnosis	This data will be obtained separately from employee records
5)	Does employee currently have head cold or ear ache	Self explanatory - Enter "Yes" or "No"
6)	Does employee currently have ringing in the ears	Self explanatory - Enter "Yes" or "No"
7)	At the time of you last audiogram, were you told that your hearing was normal	This data will be obtained separately from employee records

SECTION II: POST-SHIFT HEARING PROTECTION ASSESSMENT

Part A: Post-Shift Checklist Questions (Complete After Work Shift)

CHECKLIST ITEMS	INSTRUCTIONS FOR IH RESEARCHERS
1a) Were HPD worn at any time today	Self explanatory - Enter "Yes" or "No"
1b) If worn, indicate number of hours of HPD used today	Ask employee to estimate the number of hours they think that they wore hearing protection.
1c) Note the kind and NRR (if known) of HPD used today	Ask employee if they know what kind of hearing protection was used and the Noise Reduction Rating (NRR) for the protection. The IH can also get the information directly from the HPD package if the employee has it or can find it.
1d) Indicate whether employee thinks HPD fits correctly	Ask employee if they feel that the hearing protection fits appropriately when it is used. Enter "Yes," "No," or "Don't Know"
2) Does employee feel that his/her noise exposure today was more, less, or the same as a typical work shift.	Self explanatory - Enter "More," "Less" or "Same"
3) Did employee have ringing in ears when the work shift ended	Self explanatory - Enter "Yes" or "No"
4a) Does the employee currently smoke cigarettes, pipes, and/or cigars	Ask if employee smokes any of the products specified one or more times each week. Enter "Yes" or "No"
4b) If yes, note number of cigarettes, cigars, or pipes smoked per day or per week	Specify number employee estimates he/she smokes per day or per week
5) Does the employee feel that the overall production rate today was more, less, or the same as normal	Compared with typical production rates does the employee think production today was different from normal. Enter "More," "Less" or "Same"
6) How many parts does the employee estimate were manufactured today	

Part B: CHAT Test Results Section

The CHAT Test will be conducted both before and after the work shift after the hearing assessment checklist questions are completed.

Before conducting the CHAT test with the employee, explain that the CHAT Test is a quick and easy hearing assessment that will be conducted before and after the work shift. The results of the before and after work CHAT tests will be compared to help determine if the employee may have suffered a temporary hearing loss during the work shift. If asked, IH may need to explain that a temporary hearing loss would most likely occur because of exposure to loud noise without the protective effects of properly worn hearing protection. Additionally, explain that the CHAT test is not a comprehensive hearing evaluation or capable of identifying hearing related medical problems.

CHAT Instrument Number: Enter the unique identification number for the CHAT Tester used. The same CHAT Tester used before the work shift should also be used after the work shift.

Technician: Name of person collecting the data

Output Level Setting (Check): Check the box next to "Phone + 20" to verify the proper CHAT setting

Tone Output Pattern (Check): Check the box next to "ascending" to verify the proper CHAT setting. Note: the ascending setting is also designated by a triangle with an upward slope on its left side.

Overall Background Sound Level (dBA): One of the industrial hygienists will use a sound level meter to measure the "a-weighted" background sound levels in the room(s) where the CHAT test is conducted.

Background Octave Band Analysis (dB): One of the industrial hygienists will use a sound level meter equipped with an octave band analyzer to measure frequency dependent background sound levels in the room(s) where the CHAT test is conducted.

CHAT Test Results Table:

During each CHAT test the employee will hear up to 13 tones (do not tell employees how many tones it is possible to hear during each test - if employees ask tell them it varies depending on many factors). On the CHAT form table record the number of tones employees said that they heard for each test at each frequency. The CHAT test will be repeated 3 times at each frequency.

Note: The IH's do not need to calculate the averages. These will be calculated automatically when the data is entered into the ACCESS database.

Number of Sound Tones	2000 Hz				3000 Hz				4000 Hz			
	Test	Test 2	Test 3	Ave.	Test 1	Test 2	Test 3	Ave.	Test 1	Test 2	Test 3	Ave.
Right Ear												
Left Ear												

Additional Instructions for the Plant C Direct Observation Form (page 1)

Based on our observations at Plant C, there are many instances during repair activities that employees will use power tools (air or electric), compressed air, hammers, and overhead hoists for very short periods of time (1 second to 30 seconds). They will also switch back and forth between these tools in a very short period of time. For example an employee may use an air wrench for 3 seconds, then use a hammer for 2 seconds, use the air wrench again for 7 seconds, then use compressed air for 10 seconds, and then the air wrench for another 3 seconds, all in a period of less than a minute. Because it would be quite difficult to record these tasks and times as fast as they occur during observation we've modified page 1 of the direct observation form slightly to help capture these short duration high noise tasks and also some of the noises in the work area that are caused by other employees in the work area.

For this next section refer to the **Example Direct Observation Form**

Refer to Row 1:

From 7:05 to 7:21 the employee was conducting the task "Planning Work." Since this is not a repair task I don't record anything in columns 4, 5, 6 on the worksheet. The employee is not working on a specific piece of heavy equipment of I circle "N" in the row titled "engine on." During the time the employee was conducting the "Planning Work" task there was some loud noises which were caused by other employees in the nearby work area. These other loud noises each lasted for more than 1 minute, so I recorded the noises that occurred "engine" for 3 minutes and compressed air noise for 1 minute in the last column on the form.

Refer to Rows 2, 3, and 4:

At 7:21 the employee started repair work on a piece of heavy equipment. Most of the time he worked on this piece of equipment, he was inspecting it, using his hands to move some things around, and using non-powered hand tools. None of these things generate much noise. However, during the "repair machine" task the employees used an air wrench, a hammer, and compressed air, but each was used for a very short period of time. Each time the employee used one of these I made a hash mark in column 6 of the form. When the task ended at 8:37 the employee had used an air wrench 9 times, a hammer 6 times, and compressed air 2 times. I also try to keep track of the amount of time each was used (for example the air wrench was used for only 2 seconds on one occasion and another time it was used for 22 seconds). When the task ends, I record in column 5 the range of time durations the air wrench, hammer, and compressed air were used. For example the hammer was used from 1 second to 6 seconds.

Note also in the last column that during the time period 7:21 to 8:37 other employees in the work area (not the employee that I was observing) used hammers for 1 minute and 2 minutes, and an engine was on for 6 minutes while the employee I observed was conducting the "repair machine" task.

Refer to Row 5

At 8:37 the employee was still repairing the machine, and started to use the air wrench again. However, this time he didn't use it for just a few seconds like he had done previously, instead he used it for 2 minutes. Since the air wrench was used continuously for more than a minute, it was recorded as a separate task on row 5.

Refer to Row 6

At 8:39 the employee went back to the "Repair Machine" task. This time the employee didn't use power tools, compressed air, hammers, or the hoist, so nothing was written down in columns 4, 5, or 6. There were no other loud noises in the nearby area that lasted for more than a minute, so "N" was circled in the last column.

Refer to Row 7

From 8:55 to 8:58 the employee used the Safety Kleen parts washer to clean a part. Columns 4, 5, and 6 do not apply because the employee is not doing a "repair machine or part" task. There were no other loud noises in the nearby area that lasted for more than a minute, so "N" was circled in the last column.

Refer to Row 8

The employee used compressed air from 8:58 to 8:59.

Example Direct Observation Form

Direct Observation Time-at-Task Assessment Form (page 1) Plant C ONLY page _____		Employee ID Number	Surveyor Name	Survey Date	HP	Other LENS noise sources lasting more than 1 minute (check if possible)	Eng-ine On/Off	Type of BP and Other equipment	% of time HP use	# of times used	Duration of time (seconds)	Min. Max.	If Used During Repair task, list power tool type, engine, air, transfer, hose	Start Time	Stop Time	Task Name or Description
Row 1	Planning work	000001	S. J. F.	Aug 15, 2003	X	Engine 3 min	X		0	1	1			7:05	7:21	
Row 2	Repair machine				X	Engine 6 min	X		0	1	3			7:21	8:57	Air Wrench
Row 3					X	Hammer 1 min	X		0	1	1		Hammer			
Row 4					X		X		0	1	15		Compressed air			
Row 5	Air Wrench				X		X	air-mold	100	1				8:57	8:59	
Row 6	Repair Machine				X		X		0	1				8:54	8:55	
Row 7	Parts Washer (Safety Kleen)				X		X		0	1				8:55	8:58	
Row 8	Comp. air				X		X		0	1				8:58	8:59	

**Additional Instructions for the
Employee Actual Workday Time-at-Task Assessment Form**

For Plant C, the work tasks typically conducted by employees are listed on the form already. At the end of the shift use this sheet to prompt employees about the tasks they conducted on the day of the survey and ask them to estimate, to the best of their ability, the amount of time they spent at each task. The total time for all the tasks should add up to approximately the length of the work shift.

If there are tasks on the form that the employees did not do on the day of the survey, you can cross them off without asking the employee about them. You may need to add tasks that are not listed on the form.

For tasks like “Use pneumatic or electric powered hand tools” which list tools that may have been used (air wrench, grinder, sander, other _____), circle the ones the employee used based on your observations.

Additional Instructions for taking sound level measurements

Since some of the power tool, hammer, and compressed air tasks are so short it may be difficult to get a sound level reading for a continuous 30 seconds. If you can't get a 30 second reading for these tasks, try to get a measurement for at least 10 seconds.

APPENDIX I: PHASE II DATA COLLECTION FORMS AND INSTRUCTIONS

NIOSH Noise Project: Data Collection Form (Phase II and III)	
Background Information	
Employee ID Number	
Gender of the employee:	M <input type="checkbox"/> F <input type="checkbox"/>
Date of Survey (YYYY / MM / DD)	
Surveyor	
Facility Code Name	
Work Area (Department) Name	
Job Name	
Shift Number (1/2/3)	
Survey Number (2/3)	
Typical Hours/Day	
Typical Hours/Week	
Dominant hand (left/right)	
Start and End Time of Workshift	Start Time: End Time:
Dosimeter ID Number	
Name of Dosimeter Data Download File	
SLM ID Number (task based samples only)	
Name of SLM Data Download File (task based samples only)	
POST SHIFT QUESTIONS (ask at the end of the work shift)	
1a) Did the employee remove the dosimeter and microphone at any time during the work shift	NO / YES
1b) If "YES," What time period was the dosimeter not worn	Enter the time period that the dosimeter was not worn: _____.
2) Does the employee feel that the production rate was more, less, or the same as normal	MORE / LESS / SAME
3a) Were HPD worn at any time today	YES / NO
3b) If worn, indicate the number of hours HPD used today	
3c) Note the kind and NRR (if known) of HPD used	
3d) Indicate whether employee thinks HPD fits correctly	YES / NO
4) Does the employee feel that his/her noise exposure today was more, less, or the same as a typical work shift	MORE / LESS / SAME
5) Did the employee have ringing in his/her ears when the work shift ended	YES / NO
6a) Does the employee currently smoke cigarettes, pipes, cigars	
6b) If "yes," how many cigarettes (#packs), pipes, or cigars smoked per day or week.	

Phase II (Plant C) Direct Observation Time-at-Task Assessment Form (Form #1)	Page _____	Employee ID Number	
		Surveyor Name	
		Survey Date	

Task Number	Task Name or Description	Start Time	Stop Time	If Used During Repair Task, list: power tool type, comp. air, hammer	# of times used	Duration of time (seconds)		% of time HP use	HP Fit Y/N	Type of HP and Other comments	Engine On Y/N	Other LOUD noise sources lasting more than 1 minute Identify if possible
						Min	Max					
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N
									Y N		Y N	Y N

NOTE 1: When employees conduct the task "Repair Machine or Part" note in column 5 if a power hand tool, compressed air, or hammer were used, in column 6 note the number of times each was used during the repair task, in column 7 estimate the range of time duration for each.

NOTE 2: Engine on (Y/N) is filled out only for technicians/mechanics working on heavy equipment with a motor, not for all jobs

Phase II: Direct Observation Time-at-Task Assessment Form (Form 2b)

Page _____

Employee ID Number _____

Task Name or Description	Location	Impulse Noise (Y/N)	Noise from left/right/front/back	Hand Tool Used (Enter Code)	Main Production Sources: (Enter Code)	Age of Machine (yrs)	Distance to Main Prod. Source (ft)	Prod. Source Density (# w/in 15ft.)	Main Non-Prod. Sources: (Enter Code)
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							
		Y N							

CODES for Hand Tools		CODES for Production Noise Sources:		CODES for Production Noise Sources:		CODES for NON-Prod. Noise Sources:	
HM	Hammering (manual)	AB	Air Blow-Off	MP	Motor - Pneumatic	FF	Floor Fans
HT	Hand tools (manual)	AE	Air Exhaust	PCI	Part to chute impact	PED	Personal entertainment device (radio/headphones)
HTP	Hand Tools (pneumatic)	AL	Air Leak	PI	Part impact	PW	Plant warning/communication systems
		BL	Blower	PFI	Part to fixture impact	R	Radio (for communication)
		CB	Combustion	PPI	Part to part impact	VM	Ventilation exhaust - movable - man-coolers
		CN	Conveyor	PT	Power transmission devices -mechanical	VP	Ventilation exhaust - permanent installation
		EN	Engine (gasoline, diesel, etc)	SL	Steam Leak		
		HD	Hydraulics	TI	Tooling Impact (presses)		
		MI	Machine Impact	TM	Tooling - material removal (grinding, cutting, lathes)		
		MM	Machine - Mechanical	VE	Vibrating Elements		
MTE	Material Transport Equipment (trucks, fork lifts, etc)	WD	Welding				
ME	Motor - Electric	WJC	Water jet				

Phase II: Employee <u>Actual</u> Workday Time-at-Task Assessment Form	Plant C	Study ID Number	
		Surveyor	
		Survey Date	

INSTRUCTIONS: The employee should estimate the amount of time that was spent on each task actually conducted on the day of noise monitoring. If a task was not conducted put a "0" in the time column. If a task that is not listed here was conducted, add the name of the task to this form, write a short task description, and estimate the amount of time spent on the task. **NOTE:** The total number of hours should add up to the total time that the employee worked on the day of monitoring.
 TIME EMPLOYEE STARTED WORKING: _____ TIME EMPLOYEE FINISHED WORKING: _____
 TOTAL AMOUNT OF TIME WORKED ON DAY OF NOISE MONITORING _____

NOTE: THE ABOVE HEADER WAS ON THE TOP OF EACH EMPLOYEE ACTUAL WORKDAY TIME AT TASK FORM

Equipment Technicians (Mechanics) in New and Used Section And Customer Repair Section	Actual Workday Time at Task	
	Hours	Minutes
List of Work Tasks or Activities Conducted on the Day of the Survey		
Lunch		
Break		
Cleaning/Sweeping/Vacuum		
Fork Lift		
Hand Truck		
Office Activities		
Cutting Torch (acetylene)		
Spray with high pressure washer		
Parts washers (Safety Kleen wash, Typhoon washer, other washers...)		
Pumping fluids: Pump oil or transmission fluid into or out of equipment		
Welding		
Operate Heavy Equipment		
Open and Close Bay Door		
Repair machine or part		
Use pneumatic or electric power hand tools (air wrench, grinder, sander, Other _____)		
Compressed air		
Hammer		
Overhead hoist/pulley		
Stationary power tools: (sandblast box, stationary grinder, saw, drill press, buffing machine, Other _____)		
Planning work: in the work area discussing with other employees, reading manuals, using computer, walking around, thinking		
NOTES:		

Rebuilding Technicians (Mechanics) in motor, transmission, hydraulic pump, cylinder, and fuel injector rebuilding areas	Actual Workday Time at Task	
	Hours	Minutes
List of Work Tasks or Activities Conducted on the Day of the Survey		
Lunch		
Break		
Cleaning/Sweeping/Vacuum		
Fork Lift		
Hand Truck		
Office Activities		
Cutting Torch (acetylene)		
Spray with high pressure washer		
Parts washers (Safety Kleen wash, Typhoon washer, other washers...)		
Pumping fluids: Pump oil or transmission fluid into or out of equipment		
Welding		
Repair part		
Use pneumatic or electric power hand tools (air wrench, grinder, sander, Other)		
Compressed air		
Hammer		
Overhead hoist/pulley		
Stationary power tools: (sandblast box, stationary grinder, saw, drill press, buffing machine, Surfacer, hydraulic cylinder activator in bay 58, Other)		
Planning work: in the work area discussing with other employees, reading manuals, using computer, walking around, thinking		
Test engines: test area (behind Bay 54) while engine tested using the "dyno machine"		
Test transmission: in test area (behind Bay 52) while transmission tested		
Test hydraulic pump: in test area (behind Bay 52) while hydraulic pump tested		
Test fuel injection pump: testing fuel injection system (Room in bay 50 near machining area)		
Test fuel injector: testing fuel injector Room in bay 50 near machining area)		
Control room: in control room (behind bays 52 and 54) while engine, hydraulic pump, or transmission tests are conducted		
NOTES:		

Machinists in Operations Section, Motor Rebuilding (crankshaft/camshaft), and Welding Section	Actual Workday Time at Task	
List of Work Tasks or Activities Conducted on the Day of the Survey	Hours	Minutes
Lunch		
Break		
Cleaning/Sweeping/Vacuum		
Fork Lift		
Hand Truck		
Office Activities		
Cutting Torch (acetylene)		
Compressed air		
Hammer		
Overhead hoist/pulley		
Metalizing		
Repair part using hands or non-powered hand tools (wrench, screwdriver)		
Use pneumatic or electric power hand tools (air wrench, grinder, sander, Other _____)		
Stationary machining equipment used	Enter time in spaces below to show how much time spent at each applicable machine.	
Lathe		
Milling Maching		
Polisher/Sander		
Boring Machine		
Honing Machine		
Hydraulic Press		
MagnaFlux		
Metal Enlarger Machine		
Surface Grinder		
Machining Drill		
OTHER:		
OTHER:		
Stationary power tools: (sandblast box, stationary grinder, saw, drill press, buffing machine, hydraulic cylinder activator in bay 58, Other _____)		
Planning work: in the work area discussing with other employees, reading manuals, using computer, walking around, thinking		
NOTES:		

Welding	Actual Workday Time at Task	
	Hours	Minutes
List of Work Tasks or Activities Conducted on the Day of the Survey		
Lunch		
Break		
Cleaning/Sweeping/Vacuum		
Fork Lift		
Hand Truck		
Office Activities		
Cutting Torch (acetylene)		
Compressed air		
Hammer		
Overhead hoist/pulley		
Repair part using hands or non-powered hand tools (wrench, screwdriver)		
Use pneumatic or electric power hand tools (air wrench, grinder, sander, rotary file Other _____)		
Welding: specify if possible Arc-air, MIG, TIG, Arc Cutting, ARM Machine (Hobart Weldtest), Torch cutting machine in Bay 75		
Stationary machining equipment use (Circle equipment used: Lathe, Boring Machine, Machining Drill, Polisher/Sander, Hydraulic Press, Honing Machine, Milling Machine, Other _____)		
Stationary power tools: (sandblast box, stationary grinder, saw, drill press, buffing machine, Other _____)		
Planning work: in the work area discussing with other employees, reading manuals, using computer, walking around, thinking		
NOTES:		

Track Repair	Actual Workday Time at Task	
	Hours	Minutes
List of Work Tasks or Activities Conducted on the Day of the Survey		
Lunch		
Break		
Cleaning/Sweeping/Vacuum		
Fork Lift		
Hand Truck		
Office Activities		
Cutting Torch (acetylene)		
Compressed air		
Hammer		
Overhead hoist/pulley		
Repair part		
Use pneumatic or electric power hand tools (air wrench, grinder, sander, Other)		
Stationary machine use - (Circle equipment used: Track roller machine, Centurion idler welding machine, MLB roller rebuild, roller press, idler press, spring and rod press, boring machine, grinder, saw, lathe, polisher/sander) Other)		
Stationary power tools: (sandblast box, stationary grinder, circular saw, drill press, buffing machine, Other)		
Planning work: in the work area discussing with other employees, reading manuals, using computer, walking around, thinking		
NOTES:		

Instructions for DIRECT OBSERVATION TASK-BASED Monitoring During Phase II of NIOSH Noise Study

Employees in the jobs listed in the following tables (Table A2 and C2) will be included in the study group for which Direct Observation Task-Based Noise Monitoring and Post-Shift Employee Actual Workday Time-at-Task Assessments will be conducted.

TABLE A2: Monitor the workers in these 3 jobs from Plant A in phases II and III using <u>Direct Observation Task-Based Noise Monitoring</u> (in some cases technicians may be able to monitor 2 workers at a time). Additionally collect post shift worker actual workday time-at-task information from these employees.			
Department	Job Title	Number of Workers in each Job	Total Number of workers
Thermoforming	Thermoforming Operator	7 workers	21 total workers
Extrusion	Extrusion Operator	7 workers	
Extrusion	Slitter Operator	7 workers	

TABLE C2: Monitor the workers in these 3 jobs from Plant A in phases II and III using <u>Direct Observation Task-Based Noise Monitoring</u> (in some cases technicians may be able to monitor 2 workers at a time). Additionally collect post shift worker actual workday time-at-task information from these employees.			
Department	Job Title	Number of Workers in each Job	Total Number of workers
Heavy Equipment Mechanics New and Used Section And Customer Repair Section	Heavy Equipment Mechanics	7 workers	21 total workers
Rebuilding Mechanics in Motor, Transmission, Hydraulic Pump, Cylinder, and Fuel Injector Rebuilding Areas	Rebuilding Mechanics	7 workers	
Machinists in Operations, Motor Rebuilding (crankshaft/camshaft), and Welding Section	Machinist	7 workers	

Please note that instructions to Set-up, Use, and Download Data from the noise dosimeters (Larson Davis Model 705P) and sound level meters (Larson Davis Model 706RC) are the same as specified in the procedures provided prior to Phase I of the study.

The following section is intended to clarify and reinforce some key information for Phase II.

1.0 Before the Work Shift Starts

- 1.1 Complete the applicable parts of the *background information section* on the Phase II Data Collection Form for each employee monitored. Remember to note the time the employee started work (the time the worker left the office after the dosimeter was attached)
- 1.2 Place the dosimeter on the same side as the employee's dominant hand. (for example: if the employee is right handed the microphone should be on the right shoulder).
- 1.3 Inform the employees that you will remove the dosimeter at the end of the work shift just like before. Also instruct them that they should not remove the dosimeter themselves during the work shift, but if they have to take the dosimeter off and a technician is not readily available, they need to put the dosimeter back on with the microphone on the same shoulder as before. If

the employee is leaving work unexpectedly before the normal end of the shift, the worker should give the dosimeter to the technician, or if a technician is not available, leave the dosimeter with the manager or supervisor.

- 1.4 Inform the workers that you will be asking them to estimate their time-at-task immediately after they finish work at the end of their shift (Follow the “Instructions to Technicians for Administration of the Actual Workday Time-at-Task Form for Phases II and III”)

2.0 During the Work Shift

- 2.1 Observe workers tasks and record the following information using the “Phase II Direct Observation Time At Task Assessment Form (Form 1).” (NOTE: Use the same procedures as Phase 1.)
 - 2.11 The start and stop time of each work task.
 - 2.12 The name of the work task they are conducting from the list of tasks for (and/or task number which corresponds to the task name).
 - 2.13 Information related hearing protection.
 - 2.14 Relevant observations related to workplace noise and work tasks.
 - 2.15 For Plant C, record information related to use of noise producing tools during repair tasks.
 - 2.16 During at least one occurrence of each task, use the hand-held sound level meter (Larson Davis model 706RC) to take a measurement of noise in the employees hearing zone on the same side as their dominant hand for a time period of at least 30 seconds. Record the sound level information on Form 2A of the Direct Observation Forms.
 - 2.17 Record the applicable noise source related information on Form 2B of the Direct Observation Forms.

3.0 After the Work Shift

- 3.1 Remove the dosimeters
- 3.2 Complete *Post Shift Questions* on the Phase II Data Collection Form. Remember to note the time the employee finished work (the time the worker returned to the office at the end of the work shift).
- 3.3 Get the employees’ estimates for their actual workday task times. (Follow the “Instructions to Technicians for Administration of the Actual Workday Time-at-Task Form for Phases II and III” to get this information)
- 3.4 Download data from the dosimeter onto the computer using the same procedures used during Phase I and name the data download file as described below:

Use the same method as Phase I, except add a number “2” (for phase II) or a number “3” (for phase III) at the end of the file name. For example: in Phase II if the employee identification number was 900123 and the employee wore the dosimeter on their right side you would name the file: **task900123right2** (notice that I added the “2” after “right” in the filename) For the data downloaded from the sound level meter, you would name the file: **task900123slm2**.

This naming method will help us distinguish between the dosimeter download data from Phase I, II, and III. Note: A row was added to the background information section of the Phase II data collection form to record the file name after the data is downloaded.

Instructions for Collecting DOSIMETRY-ONLY Data During Phase II of NIOSH Noise Study

Employees in the jobs listed in the following tables (Table A1, Table B1, Table C1) will be included in the study group for which only dosimetry monitoring and Post-Shift Employee Actual Workday Time-at-Task Assessment will be conducted.

TABLE A1: Monitor the workers in these 5 jobs from Plant A in Phase II using <u>only dosimetry monitoring</u> . Additionally collect post shift worker actual workday time-at-task information from these employees.			
Department	Job Title	Number of Workers to Monitor in Job	Total Number of Workers to Monitor
Thermoforming	Thermoforming General Aid	7 workers	34 total workers
Thermoforming	Thermoforming Mechanic	7 workers	
Extrusion	Grinder	7 workers	
Extrusion	Weigh Station Operator	7 workers	
Mold	Mold Machinist	6 workers	

TABLE B1: Monitor the workers in these 8 jobs from Plant B in Phases II using <u>only dosimetry monitoring</u> . Additionally collect post shift worker actual workday time-at-task information from these employees.			
Department	Job Titles	Number of Workers to Monitor in Job	Total Number of Workers to Monitor
Canning	Stretcher Operator and Stretcher Mechanic	7 workers	~49 - 51 total workers*
Canning	Decorator (Can Painter)	7 workers	
Canning	General Mechanic (includes dept. mechanic and rear section mechanic)	7 workers	
Canning	Packaging Operator and General Aid	7 workers	
Assembly	Counting Operator	6 workers	
Assembly	Rotary Operator	~5 workers*	
Assembly	Press Operator (26 mm press)	~5 workers*	
Lithography	Printing Press Operator and Coater/Varnisher Operator	7 workers	

* Decision regarding number of workers per job and final total to be made and communicated to BJA upon completion of Phase I monitoring

TABLE C1: Monitor the workers in these 2 jobs from Plant C in Phase II using <u>only dosimetry monitoring</u> . Additionally collect post shift worker actual workday time-at-task information from these employees.			
Department	Job Title	Number of Workers to Monitor in Job	Total Number of Workers to Monitor
Track Department	Track Repair Mechanic	~1 or 2*	~5 - 6*
Welding Department	Welders	~4*	

* Decision regarding number of workers per job and final total to be made and communicated to BJA upon completion of Phase I monitoring

Please note that instructions to Set-up, Use, and Download Data from the noise dosimeters (Larson Davis Model 705P) are the same as specified in the procedures provided prior to Phase I of the study.

The following section is intended to clarify and reinforce some key information for Phase II.

1.0 Before the Work Shift Starts

- 1.1 Complete the applicable parts of the *background information section* on the Phase II Data Collection Form for each employee monitored. Remember to note the time the employee started work (the time the worker left the office after the dosimeter was attached)
- 1.2 Place the dosimeter on the same side as the employee's dominant hand. (for example: if the employee is right handed the microphone should be on the right shoulder).
- 1.3 Inform the employees that you will remove the dosimeter at the end of the work shift just like before. Also instruct them that they should not remove the dosimeter themselves during the work shift, but if they have to take the dosimeter off and a technician is not readily available, they need to put the dosimeter back on with the microphone on the same shoulder as before. If the employee is leaving work unexpectedly before the normal end of the shift, the worker should give the dosimeter to the technician, or if a technician is not available, leave the dosimeter with the manager or supervisor.
- 1.4 Inform the workers that you will be asking them to estimate their time-at-task immediately after they finish work at the end of their shift (Follow the "Instructions to Technicians for Administration of the Actual Workday Time-at-Task Form for Phases II and III")

2.0 After the Work Shift

- 2.1 Remove the dosimeters
- 2.2 Complete *Post Shift Questions* on the Phase II Data Collection Form. Remember to note the time the employee finished work (the time the worker returned to the office at the end of the work shift).
- 2.3 Get the employees' estimates for their actual workday task times. (Follow the "Instructions to Technicians for Administration of the Actual Workday Time-at-Task Form for Phases II and III" to get this information)
- 2.4 Download data from the dosimeter onto the computer using the same procedures used during Phase I and name the data download file as described below:

Use the same method as Phase I, except add a number "2" (for phase II) or a number "3" (for phase III) at the end of the file name. For example: in phase 2 if the employee identification number was 900123 and the employee wore the dosimeter on their right side you would name the file: **task900123right2** (notice that I added the "2" after "right" in the filename) This will help us distinguish between the dosimeter download data from Phase 1, 2, and 3. Note: A row was added to the background information section of the Phase II data collection form to record the file name after the data is downloaded.

Instructions to Technicians for Administration of the Actual Workday Time-at-Task Form (AWTAT) for Phases II and III

1. Beginning of the workshift

Before the work shift starts you will need to tell employees that you will be asking them at the end of the work shift to provide an estimate of the amount of time they spent at various work tasks on that day.

Sample script of what the technician could say to the employee before the work shift.

“If you remember from the first time we conducted noise monitoring, at the end of the work shift we asked you to estimate the amount of time you spent doing your work tasks. We want to do the same thing again today, so after we remove the noise monitor at the end of your shift we will go through a list of work tasks that you might have done and we will ask you to estimate how much time you spent at these tasks.”

2. End of the workshift

After you remove the dosimeter you need to get the Actual Workday Time-at-Task Form which lists the typical work tasks for an employee in that job (for example, if the employee is a grinder operator make sure that you get the actual workday form that list the tasks for a grinder operator). You will then need to go through the task list with the employee to get their estimate of time.

STEP 1 (describe what you are going to do with the employee):

Example Script:

“What we need to do now is get your estimate of how much time you spent at various work tasks today. What I have is a list of work tasks that have been divided up in a specific way for our noise study. The first thing I’m going to do is briefly read through this list so you have an idea of what we consider work tasks for your job. After I do that I will go through each one separately and ask if you did that task today. If you did do that task, I will ask you to estimate how much time you spent at the task. After I get your time estimates for the tasks I will add up the total time to see if it matches the amount of time you worked today. If the times do not match we will need to revise your time estimates.”

STEP 2 (review tasks with employee):

Read each task name and briefly tell the employee what we mean when task names that are not self-explanatory. For example every employee will know what we mean by the task term “drive fork lift,” but they may not know what we mean by the task term “unload/inspect/package.”

Additionally, write down the following information on the top of the actual workday form (NOTE: work shift start and end time are also included on the 1st page of the data collection form):

- a) the time the employee started work (the time the worker left the office after you attached the dosimeter),
- b) the time the worker finished work (the time the worker arrived back to the office at the end of the shift), and
- c) the total amount of time the worker actually worked.

STEP 3 (ask for estimate of time at task):

For every task listed on the “Actual Workday Time at Task Assessment” form, starting with the first task listed, ask the worker if the task was conducted during the work shift. If the worker says that the task was conducted, ask the worker to estimate of how much time was spent doing that task during the work shift. If the worker says the task was not done, put a “0” on the time column of the form.

Example Script:

“Did you conduct “name of task 1” today?”

If the worker responds “no” – put a “0” in the time column

If the worker responds “yes,”

Ask, *“How much time do you think you spent doing “name of task 1” today?”*

Write down the worker’s response on the form.

STEP 4 (instructions for adding new task to the list, if necessary):

After you have gone through the list of tasks pre-printed on the actual workday form ask the worker,
“Do you think there are any other tasks you did today that were not included on the list of task I just asked you about”

If the worker says “no,” go to STEP 5

If the worker says “yes,”

Ask, “what task do I need to add to the list?”

After the worker tells you what task they think should be added to the list, the technician will need to decide if the task is really a new unique task or if the task that can grouped with one of the tasks already listed.

For example, if the worker provides a new task called “working at the computer.” You should try to get some more information from the employee about the task, such as “Where does this task occur and are you doing other tasks at the same time?” In this example the employee might say that they work at the computer in the production office. Therefore you would be able to group the task “working at the computer” with the task that is already included on the task list, such as “office activities.”

If the new task seems unique and cannot be grouped with a task that is already on the list. You should add the task to the form, and ask the employee to provide a time estimate for that task. However, you also need to write down the following information on the form:

1) Provide a definition for the task so that when we are analyzing the data we have some idea what the employee is doing during this task.

2) Ask the employee how often they are likely to conduct the task and if other workers in that job also conduct the task.

STEP 5 (adding up the total time):

Once a time estimate for each individual task has been determined, add up the total time. We want the total time of their task estimates to add up to the length of time the employee actually worked that day. (Note: the top of the Actual Workday Time-at-Task Form has a place for you to record the employees start time, stop time, and amount of time the employee worked.)

For example, if the employee worked 8 hours 20 minutes, the sum of task times should add up to approximately 8 hours 20 minutes.

If the total task time does not add up to the approximate length of the work shift, you will need to review the time estimates for the work tasks with the employee and modify the task times, as necessary.

Additional Specific Instructions for asking Time-at-Task Data during completion of Employee Actual Workday Time-at-Task Assessment

For a task such as Unload/Inspect/Package in the job Thermoforming Operator the task instructions specify "List the machines you worked at today: (How much time was spent at each task?)." Because employees usually work at several machines we would like the employees to indicate, to the best of their ability, which machines they worked at and then provide an estimate of how much time they think they spent at each machine.

To get this information from the employee the first thing the technician should do is describe the task to the employee, then ask the employee which machine he worked at while conducting the task, and finally ask the employee to estimate how much time was spent conducting that task at each machine.

Example –

"The task 'Unload/Inspect/Package' means you are working at the thermoforming machines unloading product from the production line and placing it in the box. You might also throw bad product into a recycle bin, move(push) the full box away, and assemble new boxes at the work station."

"For the task 'Unload/Inspect/Package' I'm going to first ask you about which thermoforming machines you worked at today and then I will ask you to estimate how much time you think you spent at each machine."

"Which thermoforming machines did you work at today?"

After the employee responds, write down the machine numbers on the form.

(For jobs in the Thermoforming Dept. of plant A, if an employee is having difficulty remembering which machines were worked at, it might make is easier if you show the employee a plant map of the thermoforming area and have the employee try to point out which machines he or she worked at.)

"How much time do you think you spent conducting the task "unload/inspect/package" at machine _____?"

Ask this same question for each machine they indicated that they had worked at.

Once the employee has provided a time estimate for each machine, you can go to the next task on the task list to obtain a time estimate.

NOTE: This same procedure should be used for other tasks in which we ask employees to specify which machines they worked at during the task and to provide a time estimate for each machine (such as "setup/repair" for Plant A Thermoforming General Aid, etc.).

Addendum to STEP 3 of the “Instructions to Technicians for Administration of the Actual Workday Time-at-Task Form (AWTAT) for Phases II and III.”

NOTE: These instructions apply ONLY to the AWTAT forms for the following jobs at Plant C:

- 1) Equipment Technicians (Mechanics) in New and Used or Customer Repair Sections
- 2) Rebuilding Technicians (Mechanics) in motor, transmission, hydraulic pump, cylinder, and fuel injector rebuilding areas

For the task “Repair Machine or Part” the technician should ask:

“How much time do you estimate you actually spend doing hands on repairs of machines, equipment, or parts? The repair task includes repair work using your hands, non-powered hand tools, and powered hand tools such as air wrenches. It also includes the use of hammers, compressed air, and the overhead hoist during repairs. It does not include the planning work for a task like ordering parts, reading manuals, discussing the repair with supervisors or co-workers and so on.”

After the employee provides a time estimate for the repair task, the technician will need to ask for a time estimate for each of the 4 tasks (“use pneumatic or electric power hand tools,” “compressed air,” “hammer,” and “overhead hoist/pulley”) listed below “Repair Machine or Part” on the AWTAT form.

For each of these 4 tasks the technician should ask:

“During the time you conducted repairs on the machine or part, how much of that time do you estimate that you spent using”:

“pneumatic or electric power hand tools” such as the air wrench, hand grinder, sander or other tools?

“compressed air”

“hammer”

“overhead hoist/pulley”

NOTE #1: The time estimates for these 4 tasks do not need to add up to the time estimate the employee gave for “repair machine or part.” For example an employee might have estimated a time of 4 hours (240 minutes) for task “repair machine or part” and then estimated that of those 240 minutes of repair time, they spent 25 minutes using pneumatic tools, 2 minutes using compressed air, 0 minutes using a hammer, and 15 minutes using the overhead hoist. The 4 subtask time estimates add up to 42 minutes (25 min. + 2 min. + 0 min. + 15 min.) while the time estimate for “repair machine or part” was 240 minutes. However we would expect results such as this because a majority of an employee’s repair time is typically spent using their hands or non-powered hand tools.

NOTE #2: Since these time estimates are considered to be part of the time spent conducting “repair machine or part” you would not include the time estimates of these 4 tasks (42 minutes in the above example) when adding up the total time on the AWTAT form. You would however include the time estimate for the “repair machine or part” (240 minutes in the example above) when adding up the total.

Example Completed Form

Phase II: Employee <i>Actual</i> Workday Time-at-Task Assessment Form	Plant C	Study ID Number	000001
		Surveyor	Tech 1
		Survey Date	any date

INSTRUCTIONS: The employee should estimate the amount of time that was spent on each task actually conducted on the day of noise monitoring. If a task was not conducted put a "0" in the time column. If a task that is not listed here was conducted, add the name of the task to this form, write a short task description, and estimate the amount of time spent on the task. NOTE: The total number of hours should add up to the total time that the employee worked on the day of monitoring.
TIME EMPLOYEE STARTED WORKING: 7:00 AM **TIME EMPLOYEE FINISHED WORKING:** 3:15 PM
TOTAL AMOUNT OF TIME WORKED ON DAY OF NOISE MONITORING: 8:15 (495 min)

Equipment Technicians (Mechanics) In New and Used Section And Customer Repair Section	Actual Workday Time at Task	
	Hours	Minutes
List of Work Tasks or Activities Conducted on the Day of the Survey		
Lunch		30
Break		30
Cleaning/Sweeping/Vacuum		5
Fork Lift		0
Hand Truck		0
Office Activities		15
Cutting Torch (acetylene)		10
Spray with high pressure washer		0
Parts washers (Safety Kleen wash, Typhoon washer, other washers...)		5
Pumping fluids: Pump oil or transmission fluid into or out of equipment		0
Welding		0
Operate Heavy Equipment		10
Open and Close Bay Door		0
Repair machine or part		240
Use pneumatic or electric power hand tools (air wrench, grinder, sander, Other)		25
Compressed air		2
Hammer		0
Overhead hoist/pulley		15
Stationary power tools: (sandblast box, stationary grinder, saw, drill press, buffing machine, Other)	30	45
Planning work: in the work area discussing with other employees, reading manuals, using computer, walking around, thinking		120
NOTES:		510
		Total = 495 min

Do Not include when adding up total time

APPENDIX J: SUPERVISOR ON-AVERAGE TIME AT TASK ASSESSMENT FORMS AND INSTRUCTIONS

Instructions for Administration of the Supervisor On-Average Time-at-Task Form

Objective: The goal is to obtain from a floor supervisor, foreman, or lead person an estimate of the **average** amount of time spent on each task by the **average** worker in the job.

This can be a challenging interview because you are asking the supervisor to account for season to season, day to day, and worker to worker variability in the time spent in tasks. However, with persistence, patience, and enough prompting, supervisors should be able to provide a set of time estimates for job tasks that add up to the total number of hours worked in that job on a typical workday. The way this usually works is that it takes at least 2 rounds to come up with task time estimates that equal the appropriate workday total. The first round usually produces a set of task time estimates that total more than the typical workday, the second round enables the supervisor to reduce the time estimates for some tasks so that the total is correct. The supervisor may feel like he is taking too long to estimate task time, but since this process is not always easy, you may need to acknowledge the difficulty of the task time estimation and provide some encouragement.

Step One: Identify the appropriate supervisor to interview for each job listed. The most accurate time at task estimates will usually be provided by a floor supervisor rather than higher level management, because the floor supervisors are typically more familiar with day to day activities of employees in the work area. It may be possible that some supervisors will be able to provide time at task estimates for more than 1 job.

Step Two: Use the Supervisor On-Average Time-at-Task Assessment form for each specific job. Explain the purpose of the interview to the supervisor.

Example: We would like to get your estimate of the average amount of time that an employee in (Job Name) spends on various tasks each day. We have a list of the work task for the job that have been divided up in a specific way for this noise study. We will show you the list and then ask you to estimate the average amount of time spent on each task by the average worker in this job.

(Show Supervisor Time at Task Assessment Form) Here is the list of job tasks for (Job Name). First we will write down how much time employees in this job work on a typical day. Then we will go through each task on the list so that you can make time estimates. After that we will add up the task time estimates and see how much you need to revise your estimates so that the total time for your estimates equals the total time for a typical workday.

As a reminder, we want you to think about the time spent in each task by all employees in this job across all seasons and days in the week so that you can come up with an estimate of the AVERAGE time workers spend at each work task. (Now ask the supervisor for the total amount of time employees in the job work on a typical work day and then go through each task listed on the form and ask the supervisor for an estimate of task time.)

Step Three: Add up the time estimates for all tasks. If the total does not match the total number of hours employees in that job typically work, inform the supervisor of the difference and ask the supervisor to go back through the task time estimates, reducing or increasing time estimates as needed. Often during this step the supervisor will want to look at the list while revising time estimates; that is okay.

Step Four: Thank the supervisor for his time and effort and tell him that these estimates will be useful to us in the noise research study.

**Supervisor *Typical* Workday
Time-at-Task Assessment Form
(Complete Post-Shift)**

**Task list for
Company C**

Study ID Number	
Surveyor	
Survey Date	

INSTRUCTIONS (NOTE: Complete this form with supervisors):

The supervisor should refer to the list of work tasks below and provide an estimate of the amount of time that a worker spends at each task on a typical work day. Tasks can be added to the list if necessary. If a task on the list is not conducted leave the time column blank. The total number of hours should add up to the total time of the work shift.

**NOTE: THE ABOVE HEADER WAS ON THE TOP OF EACH EMPLOYEE ACTUAL
WORKDAY TIME AT TASK FORM**

Equipment Technicians (Mechanics) in New and Used Section And Customer Repair Section	Actual Workday Time at Task	
	Hours	Minutes
List of Work Tasks or Activities Conducted on the Day of the Survey		
Lunch		
Break		
Cleaning/Sweeping/Vacuum		
Fork Lift		
Hand Truck		
Office Activities		
Cutting Torch (acetylene)		
Spray with high pressure washer		
Parts washers (Safety Kleen wash, Typhoon washer, other washers...)		
Pumping fluids: Pump oil or transmission fluid into or out of equipment		
Welding		
Operate Heavy Equipment		
Open and Close Bay Door		
Repair machine or part		
Use pneumatic or electric power hand tools (air wrench, grinder, sander, Other)		
Compressed air		
Hammer		
Overhead hoist/pulley		
Stationary power tools: (sandblast box, stationary grinder, saw, drill press, buffing machine, Other)		
Planning work: in the work area discussing with other employees, reading manuals, using computer, walking around, thinking		
NOTES:		

Rebuilding Technicians (Mechanics) in motor, transmission, hydraulic pump, cylinder, and fuel injector rebuilding areas	Actual Workday Time at Task	
	Hours	Minutes
List of Work Tasks or Activities Conducted on the Day of the Survey		
Lunch		
Break		
Cleaning/Sweeping/Vacuum		
Fork Lift		
Hand Truck		
Office Activities		
Cutting Torch (acetylene)		
Spray with high pressure washer		
Parts washers (Safety Kleen wash, Typhoon washer, other washers...)		
Pumping fluids: Pump oil or transmission fluid into or out of equipment		
Welding		
Repair part		
Use pneumatic or electric power hand tools (air wrench, grinder, sander, Other)		
Compressed air		
Hammer		
Overhead hoist/pulley		
Stationary power tools: (sandblast box, stationary grinder, saw, drill press, buffing machine, Surfacer, hydraulic cylinder activator in bay 58, Other)		
Planning work: in the work area discussing with other employees, reading manuals, using computer, walking around, thinking		
Test engines: test area (behind Bay 54) while engine tested using the "dyno machine"		
Test transmission: in test area (behind Bay 52) while transmission tested		
Test hydraulic pump: in test area (behind Bay 52) while hydraulic pump tested		
Test fuel injection pump: testing fuel injection system (Room in bay 50 near machining area)		
Test fuel injector: testing fuel injector Room in bay 50 near machining area)		
Control room: in control room (behind bays 52 and 54) while engine, hydraulic pump, or transmission tests are conducted		
NOTES:		

Machinists in Operations Section, Motor Rebuilding (crankshaft/camshaft), and Welding Section	Actual Workday Time at Task	
List of Work Tasks or Activities Conducted on the Day of the Survey	Hours	Minutes
Lunch		
Break		
Cleaning/Sweeping/Vacuum		
Fork Lift		
Hand Truck		
Office Activities		
Cutting Torch (acetylene)		
Compressed air		
Hammer		
Overhead hoist/pulley		
Metalizing		
Repair part using hands or non-powered hand tools (wrench, screwdriver)		
Use pneumatic or electric power hand tools (air wrench, grinder, sander, Other _____)		
Stationary machining equipment used	Enter time in spaces below to show how much time spent at each applicable machine.	
Lathe		
Milling Maching		
Polisher/Sander		
Boring Machine		
Honing Machine		
Hydraulic Press		
MagnaFlux		
Metal Enlarger Machine		
Surface Grinder		
Machining Drill		
OTHER:		
OTHER:		
Stationary power tools: (sandblast box, stationary grinder, saw, drill press, buffing machine, hydraulic cylinder activator in bay 58, Other _____)		
Planning work: in the work area discussing with other employees, reading manuals, using computer, walking around, thinking		
NOTES:		

Welding	Actual Workday Time at Task	
	Hours	Minutes
List of Work Tasks or Activities Conducted on the Day of the Survey		
Lunch		
Break		
Cleaning/Sweeping/Vacuum		
Fork Lift		
Hand Truck		
Office Activities		
Cutting Torch (acetylene)		
Compressed air		
Hammer		
Overhead hoist/pulley		
Repair part using hands or non-powered hand tools (wrench, screwdriver)		
Use pneumatic or electric power hand tools (air wrench, grinder, sander, rotary file Other)		
Welding: specify if possible Arc-air, MIG, TIG, Arc Cutting, ARM Machine (Hobart Weldtest), Torch cutting machine in Bay 75		
Stationary machining equipment use (Circle equipment used: Lathe, Boring Machine, Machining Drill, Polisher/Sander, Hydraulic Press, Honing Machine, Milling Machine, Other)		
Stationary power tools: (sandblast box, stationary grinder, saw, drill press, buffing machine, Other)		
Planning work: in the work area discussing with other employees, reading manuals, using computer, walking around, thinking		
NOTES:		

Track Repair	Actual Workday Time at Task	
	Hours	Minutes
List of Work Tasks or Activities Conducted on the Day of the Survey		
Lunch		
Break		
Cleaning/Sweeping/Vacuum		
Fork Lift		
Hand Truck		
Office Activities		
Cutting Torch (acetylene)		
Compressed air		
Hammer		
Overhead hoist/pulley		
Repair part		
Use pneumatic or electric power hand tools (air wrench, grinder, sander, Other)		
Stationary machine use - (Circle equipment used: Track roller machine, Centurion idler welding machine, MLB roller rebuild, roller press, idler press, spring and rod press, boring machine, grinder, saw, lathe, polisher/sander) Other)		
Stationary power tools: (sandblast box, stationary grinder, circular saw, drill press, buffing machine, Other)		
Planning work: in the work area discussing with other employees, reading manuals, using computer, walking around, thinking		
NOTES:		

APPENDIX K: COMMUNICATION AND COORDINATION PLAN

KEY PERSONNEL AND RESPONSIBILITIES- NIOSH Noise and Hearing Study, Montreal Study Sites

Name (Affiliation)	Role(s)	Responsibilities
Mary Prince (NIOSH, Cincinnati, OH)	Overall Principal Investigator and Project Leader	All aspects of study – technical, budgetary, contractual and logistics. <i>Includes both impact noise study and task-based assessments.</i>
Scott Brueck (NIOSH, Cincinnati, OH)	Project Team Leader	Oversees daily planning, field and office coordination, data collection, and field personnel, equipment, QC and data coding. <i>Includes both impact noise study and task-based assessments.</i>
Daniel Stancescu (NIOSH Data management and Computer Analyst)	Programming, statistical analysis, and data management.	Coordinates all aspects of data processing, management, programming, and analysis. Reports directly to Study PI.
Robert Bertrand (Bertrand Johnson Acoustics, Inc (BJA)).	Montreal Co-investigator and Contract Leader (Westat sub-contractor to NIOSH)	Oversees all personnel, Westat sub-contractual and medical aspects of study and works directly with Study PI on technical aspects and personnel logistics at the Montreal Site. Primary liaison with plant upper management at participating plant sites. Oversees and coordinates gathering audiometric and medical files from plants and data entry. Direct report to Study PI and provides weekly reports on field progress.
Ninon Bertrand (BJA, Inc.).	Montreal Field Coordinator (Westat sub-contractor to NIOSH).	Oversees scheduling at each plant site, overall logistics related to audiometric and CHAT testing and liaison with plant management, unions, and workers. Oversees and coordinates audiometric and medical data entry and files from plants for each plant site. <i>Direct report to Dr. Bertrand and communicates directly with NOISH Team Leader on study logistics and scheduling.</i> Communicates as needed with NIOSH PI on technical issues and troubleshooting.
Lynn Faulkner (Battelle, Columbus, OH)	NIOSH Contractor and Technical Leader for Impact Noise analysis.	Oversees all technical and logistic aspects of impact noise study. Reports directly to NIOSH PI.
Carol Sturwold (Battelle, Columbus, OH)	NIOSH Contractor, Mechanical engineer.	Conducts data collection and equipment testing of instruments under the supervision of the Battelle Technical Leader
Montreal Field Staff (BJA, Inc. contractors)	Field data collection.	Monitor workers for task-based and dosimetry assessments of noise exposure. French-English translators during field activities involving U.S. project staff. <i>Report directly to Montreal Field Coordinator and to NIOSH Team Leader during on-site data collection.</i>

Study Coordination Activities and General Procedures

Activity	Procedures
Data Download, Backup and Transfer of noise data.	<p>All dosimetry and SLM data will be downloaded to PCs at each plant on a daily basis. Backups of these data, copied on CD-ROM will be done every other day of sampling for each plant site. BJA will take primary lead on this and provide the naming convention of files and standardized forms for tracking data storage and backup.</p> <p>Noise data files will be sent to S. Brueck (SB) the day following downloading and / or backup.</p>
Quality Control of data collection forms.	<p>It is suggested that review of the quality of data collected be conducted at the end of each sampling day by a lead technician at each plant site (who working under NB). The choice of lead technician(s) will be discussed and approved by NIOSH. Data collection forms will be copied and faxed to NIOSH Project Leader (S. Brueck) on a <i>daily basis</i> for review. SB will provide feedback to the Montreal Field Coordinator (N. Bertrand) regarding the quality of data collected on these forms and will identify all items that need to be corrected and / or addressed. N. Bertrand (NB) will discuss these items with SB and take actions to ensure that field staff corrects these items.</p>
Data entry and transfer of audiometric data and job information.	<p>Data entry will be conducted by BJA, Inc. staff or sub-contractors for each study site. Procedures for data collection and the database structure of the data will be reviewed and approved by NIOSH before data entry is to begin. Instructions for data entry and quality control procedures will be provided by NIOSH with input from BJA, Inc. Training of data entry personnel, quality control procedures, confidentiality issues, and oversight of all data entry activities will be the responsibility of BJA, Inc. The data will be deemed acceptable to NIOSH only if data entry errors are 2% or lower.</p>
Communication and logistics regarding employee scheduling, number of workers monitored, barriers, equipment and software problems, and inventory of field equipment.	<p>Communication on details of field logistics (e.g., daily, routine activities) will occur between SB (NIOSH) and NB (BJA, Inc.) on a frequent basis (a minimum of every two days during the sampling period). SB will be responsible for informing the NIOSH PI of all activities and any problems that need to be addressed. It is assumed that BJA communication will involve Dr. Bertrand and NB on a daily basis. The primary point of contact for the NIOSH PI will be Dr. Bertrand and NB as needed. Key items requiring attention or summary reports of activities are to be provided to both the NIOSH PI and to SB.</p> <p>A list of jobs and employees that will be scheduled for noise sampling and hearing testing will be provided to SB (NIOSH) at least two days before the day of sampling. This requires that jobs and workers for monitoring be identified for a minimum of two days during the week of sampling. NIOSH will provide spreadsheets for tracking the number of workers and jobs sampled for each Phase of the study. Workers and jobs to be sampled for only dosimetry will also be provided.</p> <p>PCs with data and sampling equipment will be kept in secure, locked areas. An inventory of equipment will be needed that includes the type of equipment, serial numbers, ownership (NIOSH, BJA), current location, and dates if necessary).</p>

APPENDIX L: BERTRAND JOHNSON ACOUSTICS QUALITY ASSURANCE CHECKLIST

GENERAL INSTRUCTIONS ON QUALITY ASSURANCE CHECKLIST

The purpose of this form is to allow immediate, on-site quality assurance of the task based data collected by each of the surveyors in the field. This will be a multi-step process that involves :

- 1) Data form completeness check conducted by surveyors at each plant site at the end of the day or first thing the morning of the next day of sampling. There are two surveyors at each plant site. The surveyors at each plant will exchange their data collection forms with one another and each will review and fill out the first page of the checklist. Forms will be checked for completeness and if there are items that need clarification, the surveyors will obtain the information and document this on the quality assurance (QA) checklist.
- 2) An additional administrative review will be conducted at BJA offices, where additional information may be requested of surveyors to make the forms as complete as possible before transmission to NIOSH.
- 3) BJA will forward copies of the forms to NIOSH for additional technical review. NIOSH will review and forward comments to BJA offices and specific items will be discussed during weekly meetings with NIOSH.

OTHER IMPORTANT FIELD CONSIDERATIONS

1. **Equipment Inventory and tracking system** – NIOSH and BJA has developed a spreadsheet listing the various instruments, PCs, and peripherals (wind screens, dongles) used by the surveyors at each plant site. This sheet summarizes the location of each piece of equipment and allows tracking of items that must be replaced and documents damage that might have occurred with equipment. As necessary, refer to this and update with any changes made to the equipment list. For example, in the situation where replacement of equipment is necessary, list the date equipment became `inactive,` and reason or nature of the problem. The following are several items that require the surveyors attention :
 - Be sure that microphones and other peripherals for dosimeters and SLMs are kept together and packed in the same case at the end of the day.
 - If any equipment is moved from one location to another location, then it must be entered on the sheet.
 - At the end of every week, the data in the spreadsheet will be entered into the computer to have an electronic updated version of the tracking system.
 - Each plant should have an equal number of dosimeters and SLMs for use during sampling plus at least 2 backups. If this changes, please let NIOSH know as soon as possible.
2. **Downloading and verifying SLM and dosimeter data.** Verification includes file name, location (path), size (right approximate number of kilobytes). Please open the file to be sure that a complete download occurred. **Do not clear dosimeter and SLM until this is verified.**
3. NIOSH will provide a NIOSH Field Notebook at each site. This notebook is to be used to record questions or concerns the surveyors may have during the day. At the end of each day, photocopy a copy of the questions of the day at the plant site and fax to Scott Brueck. (BJA should clear with plants that access to photocopying is acceptable.) Scott Brueck will provide an answer by the next day. Since questions could be plant specific or apply generally to all plants, response to questions or issues raised by the surveyors will be provided to only the surveyors at each plant for Plant-specific questions and to all surveyors for general issues applicable to both plants.

QUALITY ASSURANCE CHECKLIST

Items to be Addressed	Information Requested
Date : ____/____/____	Technician: _____
Employee ID number: _____	
Pre-exposure audio: <input type="checkbox"/> Serial number: _____	Technician: _____
Pre exposure CHAT: <input type="checkbox"/> Serial number: _____	Technician: _____
Room evaluation: ____ dBA	Spectral analysis: <input type="checkbox"/>
Data Collection Form Header sheets	Enter BELOW: What information is missing, and what the plan is for getting the missing information.
NIOSH Noise project: <input type="checkbox"/>	
CHAT pre-shift questionnaire <input type="checkbox"/>	
CHAT post-shift questionnaire: <input type="checkbox"/>	
Employee actual work day: <input type="checkbox"/>	
Direct observation page 1 <input type="checkbox"/> Direct observation page 2a <input type="checkbox"/> Direct observation page 2b <input type="checkbox"/>	
Audio test data entry <input type="checkbox"/>	
CHAT test data entry <input type="checkbox"/>	
Dosimeter download * R.E. <input type="checkbox"/> L.E. <input type="checkbox"/>	Note any problems with download.
Sound level meter download* <input type="checkbox"/>	Note any problems with download.
Verified by : _____	Date : ____/____/____

FOR ADMINISTRATIVE REVIEW PURPOSES ONLY

Items discussed with Surveyor <input type="checkbox"/>	Action taken to make corrections <input type="checkbox"/> If not checked, why not. If checked, indicate what will be done.
Transmitted to NIOSH <input type="checkbox"/>	Date : _____ / ____ / ____
Receipt acknowledged by NIOSH <input type="checkbox"/>	Date : _____ / ____ / ____
Data collection tracking <input type="checkbox"/> Accepted To Revise <input type="checkbox"/>	Date : _____ / ____ / ____ Date : _____ / ____ / ____
Revision necessary <input type="checkbox"/> Revision made by _____ Indicate what was revised.	Date : _____ / ____ / ____

*** Additional Instructions on downloading and verifying SLM and dosimetry data:**

Verification includes documenting the file name, location (path), size of file (This is important in verifying that the file is of the approximate size expected- example – if you see a 3 KB file but expect about 159K, you know that there was a downloading failure). Once you check the size file, open the file and look to be sure the data are there and be sure to write down on the revised data collection form, the TWA based on the 4 settings. **Do not clear dosimeter and SLM until this is verified.**

APPENDIX M: DATA CODING TABLES

Background Form Variable	Code	Format / Values	Definition	Comments or Instructions
EMPID		Numeric (integer)	Employee ID Number (2 to 6 digit numeric identifier for each employee in the study)	This is a linking variable for Access tables
M_Gender	F M	Female Male	Gender of the employee:	
M_BirthDate		Date type variable	Birth date of the employee	Enter as (Ask Lian about how it should be entered)
M_SurveyorCode	01 02 03 04 05 06 07 08 09 10 11	Melissa Marc-Antoine Michelet Jocelyn Karine Ninon Dino Eric Scott Martha Susan	Surveyor Name	
M_SurveyDate		Date type variable	Date of Survey	Enter as (Ask Lian about how it should be entered)
M_Plant	A B C	Plant A Plant B Plant C	Facility Name	
M_DeptCode	A1 A2 A3 A4 A5 B1 B2 B3 C1 C2 C3 C4 C5	Thermoforming Extrusion Mold Maintenance Expedition Canning Assembly Lithography New, Used, and Rental Equipment Repair Sections Motor, Transmission, Cylinder Head, Hydraulic Pump, Fuel Injector Rebuilding, and Hydraulic Cylinder Areas Machining Areas Welding Track	Work Area (Department) name	Plant A Department Codes Plant B Department Codes Plant C Department Codes
M_JobCode	A1A A1B A1C A2A A2B A2C A2D A2E A3A	Thermoforming Operator Thermoforming General Aid Thermoforming Mechanic Extrusion Operator Slitter Operator Weigh Station Operator Grinder Operator Pelletizer Mold Machinist	Job Name	Plant A Job Codes

Background Form Variable	Code	Format / Values	Definition	Comments or Instructions
	A4A	Maintenance Mechanic		
	A4B	Maintenance Electrician		
	A4C	Building Maintenance		
	A5A	Fork Lift Driver		
	B1A	Decorator		
	B1B	Stretcher Operator		
	B1C	Stretcher Mechanic		
	B1D	General Mechanic		
	B1E	Mechanic - Rear Section		
	B1F	Department Aid		
	B1G	Packaging Operator		Plant B Job Codes
	B2A	Counting Operator		
	B2B	Press Operator 26 mm		
	B2C	Rotary Operator		
	B3A	Printing Press Operator		
	B3B	Varnisher (Coater)		
	B3C	Measurer		
	C1A	Heavy Equipment Repair Technician (Mechanic)		
	C2A	Motor Rebuilding Technician (Mechanic)		
	C2B	Transmission Rebuilding Technician (Mechanic)		
	C2C	Cylinder Head Rebuilding Technician (Mechanic)		
	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)		
	C2E	Fuel Injector Rebuilding Technician (Mechanic)		Plant C Job Codes
	C2F	Hydraulic Cylinder Rebuilding Technician (Mechanic)		
	C3A	Machinist - Operations Section		
	C3B	Machinist - Welding Section		
	C3C	Machinist - Bay 56/58		
	C4A	Welder		
	C5A	Track Repair		
	C5B	Painter		
M_Shift	1	First Shift (day)	Shift Number	For 12 hour shifts first shift is day shift, second shift is night
	2	Second Shift (late afternoon)		
	3	Third Shift (night)		
Phase	1	Phase I	Survey Number	This is a linking variable for Access tables
	2	Phase II		
	3	Phase III		
M_HoursDay		Numeric (whole number or decimal)	Typical hours per workday	Enter as either whole number or decimal. For example: enter 8 hours as 8, enter 8 hours 30 minutes as 8.5
M_HoursWeek		Numeric (whole number or decimal)	Typical hours per week	Enter as either whole number or decimal. For example: enter 40 hours as 40, enter 42 hours 30 minutes as 42.5
M_DosimeterIDright, M_DosimeterIDleft, M_DosimeterID	A	40261	Dosimeter ID Number (either right or left)	Larson Davis Model 705P NOTE: Variable M_DosimeterIDright and M_DosimeterIDleft is for Phase I. Variable M_DosimeterID is for Phase II and III (only one dosimeter was used)
	B	40260		
	C	40265		
	D	40256		
	E	40253		

Background Form Variable	Code	Format / Values	Definition	Comments or Instructions
	F	40262		per person in phase II and III)
	G	40258		
	H	40255		
	I	40263		
	J	40257		
	K	40264		
	L	40254		
	M	40370		
	N	40369		
	O	40372		
	P	40373		
	Q	40371		
	R	40259		
	1	17186		
	2	17190		
	3	17185		
M_SLMID	4	17189	Sound Level Meter ID	Larson Davis Model 706RC
	5	17191	Number	
	6	17188		
	7	17242		
	8	17184		
	L	Left		
M_Hand	R	Right	Dominant Hand	
	B	Both		
	U	Unknown (not entered)		
M_StartShift		Time type variable	Start Time of Workshift	This data was entered on the PHASE II and III background page, but not on the PHASE I background page. Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
M_EndShift		Time type variable	End Time of Workshift	This data was entered on the PHASE II and III background page, but not on the PHASE I background page. Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
M_DosimeterFileName		Text type variable	Name of Dosimeter Data Download File	Entry of dosimeter download file name in Phases II and III
M_SLMfileName		Text type variable	Name of SLM Data Download File (task based samples only)	Entry of sound level meter download file name in Phases II and III

CHAT Form Variable	Code	Format / Values	Definition	Comments or Instructions
N_EmpAge		Two digit numeric type variable	Age of employee	Enter age of employee as whole number
N_EmpAgeNote		Text type variable	Additional comment for age of employee	Enter comment as it is written on the form
N_WorkedYesterday	1	Yes	Did the employee work at the company during the last 24 hours	
	0	No		
	9	Unknown (not entered)		
N_ShiftOver		Time type variable	If yes, what time was the previous work shift over	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
N_ShiftOverNote		Text type variable	Additional comment related to the time the previous work shift was over	Enter comment as it is written on the form
N_ExposeLoud	1	Yes	Does the employee think that he/she was exposed to unusually loud noise during the most recent works shift	
	0	No		
	9	Unknown (not entered)		
N_ExposeLoudNote		Text type variable	Additional comment related to whether the employee thinks they were exposed to loud noise during most recent workshift	
N_WorkHPD	1	Yes	Did the employee wear HPD during the most recent work shift	
	0	No		
	9	Unknown (not entered)		
N_PreShiftHPDused	HP01	3M 1100 (orange) (NRR29)	Note the kind and NRR (if known) of HPD used during previous workshift	Ask Lian to allow entry of multiple codes separated by commas
	HP02	Bilsom Perfit (green with cord) (NRR26)		
	HP03	Bilsom Viking (ear muff) (NRR29)		
	HP04	Bilsom Warrior (ear muff) (NRR23)		
	HP05	Brown Earmuffs (unknown type) (NRR?)		
	HP06	CaboFlex Model:600 (NRR20)		
	HP07	EAR Classic (NRR29)		
	HP08	EAR EZ Fit (NRR28)		
	HP09	Ear Muff (unknown type) (NRR?)		
	HP10	Ear Plug (unknown type) (NRR29)		
	HP11	Ear Plug (unknown type) (NRR?)		
	HP12	EAR Taperfit 2 (yellow) (NRR32)		
	HP13	EAR Ultrafit (NRR25)		
	HP14	EAR Ultralite (NRR?)		
	HP15	EasyFit (NRR22)		
	HP16	Howard Leight Max Lite (NRR30)		
	HP17	Molded Ear Plug (custom molded) (NRR?)		
	HP18	Peltor (green or yellow ear muff) (NRR22)		
	HP19	Peltor (H7 ear muff) (NRR22)		

CHAT Form Variable	Code	Format / Values	Definition	Comments or Instructions
N_PreShiftHPDusedNote		Text type variable	Additional comment related to HP worn by employee during most recent work shift.	Use this to enter type of HPD, if the type wasn't included on the previous list
N_HPDAIIPart	2 1 9	All Part Unknown (not entered)	If HPD worn, indicate whether it was used for all or part of work shift	
N_HPDAIIPartNote		Text type variable	Additional comment related to whether HPD used for all or part of the work shift	
N_NonWorkNoise	1 0 9	Yes No Unknown (not entered)	Was employee exposed to loud noise outside of work during the previous 24 hours	
N_NonWorkNoiseNote		Text type variable	Additional comment related to source of non-work noise.	Enter source of non work noise (text)
N_NonWorkHPD	1 0 9	Yes No Unknown (not entered)	Did the employee wear HPD during exposure to non-work noise	
N_NonWorkHPDnote		Text type variable	Additional comment related to HPD used during non-work noise exposure	
N_HearingLoss	1 0 9	Yes No Unknown (not entered)	Has the employee ever had hearing loss diagnosed by a doctor or other health care practitioner	
N_HearingLossEar	1 2 3 9	Left Right Both Don't Know	Which ear affected by hearing loss	
N_HearingLossEarNote		Text type variable	Additional comment related to which ear has hearing loss	
N_HearingLossDiagnosis		Text type variable	What is the hearing loss diagnosis	
N_HeadCold	1 0 9	Yes No Unknown (not entered)	Does employee currently have head cold or ear ache	
N_HeadColdNote		Text type variable	Additional comment related to employee's head cold or ear ache	
N_PreRinging	1 0 9	Yes No Unknown (not entered)	Does employee currently have ringing in the ears	
N_PreRingingNote		Text type variable	Additional comment related to ringing in the ears	
N_NormalHearing	1	Yes	At the time of the last	

CHAT Form Variable	Code	Format / Values	Definition	Comments or Instructions
	0	No	audiogram, was the employee told that his/her hearing was normal	
	9	Don't Know		
N_NormalHearingNote		Text type variable	Additional comment related to whether employee had normal hearing at time of last audiogram	
N_PreShiftSurveyor	01	Melissa	Pre-Shift Surveyor Name (Industrial Hygienist)	
	02	Marc-Antoine		
	03	Michelet		
	04	Jocelyn		
	05	Karine		
	06	Ninon		
	07	Dino		
	08	Eric		
	09	Scott		
	10	Martha		
	11	Susan		
N_PreShiftCHATInstrument		Numeric type variable (6 digit integer)	Pre-Shift CHAT instrument number	
N_PreShiftCHATtime		Time type variable	Pre-Shift Time CHAT Test Started	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
N_PreShiftTone	A	Ascending	Pre-Shift Tone Output Pattern (Check)	
	U	Unknown (not checked)		
N_PreShiftOutputLevel	P	Phone "0"	Pre-Shift Output Level Setting (Check)	
	U	Unknown (not checked)		
N_PreShift2KTest1R		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 2000 Hz (Test 1 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift2KTest2R		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 2000 Hz (Test 2 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift2KTest3R		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 2000 Hz (Test 3 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift3KTest1R		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 3000 Hz (Test 1 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift3KTest2R		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 3000 Hz (Test 2 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift3KTest3R		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 3000 Hz (Test 3 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift4KTest1R		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 4000 Hz (Test 1 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)

CHAT Form Variable	Code	Format / Values	Definition	Comments or Instructions
N_PreShift4KTest2R		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 4000 Hz (Test 2 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift4KTest3R		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 4000 Hz (Test 3 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift2KTest1L		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 2000 Hz (Test 1 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift2KTest2L		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 2000 Hz (Test 2 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift2KTest3L		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 2000 Hz (Test 3 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift3KTest1L		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 3000 Hz (Test 1 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift3KTest2L		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 3000 Hz (Test 2 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift3KTest3L		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 3000 Hz (Test 3 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift4KTest1L		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 4000 Hz (Test 1 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift4KTest2L		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 4000 Hz (Test 2 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShift4KTest3L		Numeric type variable (integer)	Pre-Shift Number of Sound Tones Heard at 4000 Hz (Test 3 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
N_PreShiftDBA		Numeric type variable (decimal)	Pre-Shift Test Room Background Sound Level (dBA)	
N_PreShiftOBA125		Numeric type variable (decimal)	Pre-Shift Test Room Background Octave Band Analysis (dB) at 125 Hz	
N_PreShiftOBA250		Numeric type variable (decimal)	Pre-Shift Test Room Background Octave Band Analysis (dB) at 250 Hz	
N_PreShiftOBA500		Numeric type variable (decimal)	Pre-Shift Test Room Background Octave Band Analysis (dB) at 500 Hz	

CHAT Form Variable	Code	Format / Values	Definition	Comments or Instructions
N_PreShiftOBA1000		Numeric type variable (decimal)	Pre-Shift Test Room Background Octave Band Analysis (dB) at 1 KHz	
N_PreShiftOBA2000		Numeric type variable (decimal)	Pre-Shift Test Room Background Octave Band Analysis (dB) at 2 KHz	
N_PreShiftOBA4000		Numeric type variable (decimal)	Pre-Shift Test Room Background Octave Band Analysis (dB) at 4 KHz	
N_PreShiftOBA8000		Numeric type variable (decimal)	Pre-Shift Test Room Background Octave Band Analysis (dB) at 8 KHz	
N_PreShiftDBAnote		Text type variable	Additional comment related to pre-shift test room background sound level	
N_PreShiftOBAnote		Text type variable	Additional comment related to pre-shift test room background octave band analysis	
OM_TodayHPD	1 0 9	Yes No Unknown (not entered)	Were HPD worn at any time today	
OM_DurationHPD		Text type variable	If worn, indicate the number of hours and minutes HPD used today	Enter as XX:YY, where "XX" is number of hours and "YY" is number of minutes. For example if employee wore hearing protection for 9 hours 30 minutes, enter 09:30
OM_DurationHPDnote		Text type variable	Additional comment related to the number of hours HPD worn by employee today	
OM_PostShiftHPDused	HP01 HP02 HP03 HP04 HP05 HP06 HP07 HP08 HP09 HP10 HP11 HP12 HP13 HP14 HP15	3M 1100 (orange) (NRR29) Bilsom Perfit (green with cord) (NRR26) Bilsom Viking (ear muff) (NRR29) Bilsom Warrior (ear muff) (NRR23) Brown Earmuffs (unknown type) (NRR?) CaboFlex Model:600 (NRR20) EAR Classic (NRR29) EAR EZ Fit (NRR28) Ear Muff (unknown type) (NRR?) Ear Plug (unknown type) (NRR29) Ear Plug (unknown type) (NRR?) EAR Taperfit 2 (yellow) (NRR32) EAR Ultrafit (NRR25) EAR Ultralite (NRR?) EasyFit (NRR22)	Note the kind and NRR (if known) of HPD used today	Ask Lian to allow entry of multiple codes separated by commas

CHAT Form Variable	Code	Format / Values	Definition	Comments or Instructions
	HP16	Howard Leight Max Lite (NRR30)		
	HP17	Molded Ear Plug (custom molded) (NRR?)		
	HP18	Peltor (green or yellow ear muff) (NRR22)		
	HP19	Peltor (H7 ear muff) (NRR22)		
OM_PostShiftHPDusedNote		Text type variable	Additional comment related to the kind and NRR (if known) of HPD used today.	If the type of HPD used was not included on the previous list, enter the type used.
OM_FitsHPD	1 0 9	Yes No Unknown (not entered)	Indicate whether the employee thinks HPD fits correctly	
OM_FitsHPDnote		Text type variable	Additional comment related to whether employee thinks HPD fits correctly	
OM_TodayExposure	3 2 1 9	More Same Less Unknown (not entered)	Does employee feel that his/her noise exposure today was more, less, or the same as a typical work shift	
OM_TodayExposureNote		Text type variable	Additional comment related to whether employee thinks that his/her noise exposure today was more, less, or the same as a typical work shift	
OM_PostRinging	1 0 9	Yes No Unknown (not entered)	Did the employee have ringing in ears when the work shift ended	
OM_PostRingingNote		Text type variable	Additional comment related to whether the employee had ringing in ears when the work shift ended	
OM_Smoking	1 0 9	Yes No Unknown (not entered)	Does employee currently smoke cigarettes, pipes, and/or cigars	
OM_NRsmokingDayCig		Numeric (whole number or decimal)	Number of cigarettes smoked per day	If employee smokes cigarettes, enter the number they estimated they smoke per day. Note: may need to convert from number per week to number per day. Note to Lian: If entry of "no" was indicated on the question of smoking (OM_Smoking), deactivate possibility of entries on OM_NRsmokingDayCig, OM_NRsmokingDayCigar, OM_NRsmokingDayPipe
OM_NRsmokingDayCigar		Numeric (whole number or decimal)	Number of cigars smoked per day	If employee smokes cigars, enter the number they estimated they smoke per day. Note: may need to convert from number per

CHAT Form Variable	Code	Format / Values	Definition	Comments or Instructions
OM_NRsmokingDayPipe		Numeric (whole number or decimal)	Number of pipes smoked per day	If employee smokes pipes, enter the number they estimated they smoke per day. Note: may need to convert from number per week to number per day.
OM_ProdRate	3 2 1 9	More Same Less Unknown (not entered)	Does employee feel that production rate today was more, less, or the same as normal	
OM_ProdRateNote		Text type variable	Additional comment related to whether the employee feels that production rate today was more, less, or the same as normal	
O_Parts		Numeric type variable (integer)	How many parts does the employee estimate were manufactured today	If technician entered comment such as "don't know" or "no idea" leave this blank and enter the comment in the additional comments column. If employee specifies type of part manufactured enter in the additional comments column.
O_PartsNote		Text type variable	Additional comment related to how many parts the employee estimates were manufactured today	If employee specifies type of part manufactured enter in this column.
O_PostShiftSurveyor	01 02 03 04 05 06 07 08 09 10 11	Melissa Marc-Antoine Michelet Jocelyn Karine Ninon Dino Eric Scott Martha Susan	Post-Shift Surveyor Name (Industrial Hygienist)	
O_PostShiftCHATinstrument		Numeric type variable (6 digit integer)	Post-Shift CHAT instrument number	
O_PostShiftCHATtime		Time type variable	Post-Shift Time CHAT Test Started	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
O_PostShiftTone	A U	Ascending Unknown (not checked)	Post-Shift Tone Output Pattern (Check)	
O_PostShiftOutputLevel	P U	Phone "0" Unknown (not checked)	Post-Shift Output Level Setting (Check)	

CHAT Form Variable	Code	Format / Values	Definition	Comments or Instructions
O_PostShift2KTest1R		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 2000 Hz (Test 1 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift2KTest2R		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 2000 Hz (Test 2 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift2KTest3R		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 2000 Hz (Test 3 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift3KTest1R		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 3000 Hz (Test 1 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift3KTest2R		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 3000 Hz (Test 2 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift3KTest3R		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 3000 Hz (Test 3 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift4KTest1R		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 4000 Hz (Test 1 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift4KTest2R		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 4000 Hz (Test 2 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift4KTest3R		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 4000 Hz (Test 3 - Right Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift2KTest1L		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 2000 Hz (Test 1 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift2KTest2L		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 2000 Hz (Test 2 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift2KTest3L		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 2000 Hz (Test 3 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift3KTest1L		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 3000 Hz (Test 1 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift3KTest2L		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 3000 Hz (Test 2 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift3KTest3L		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 3000 Hz (Test 3 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)

CHAT Form Variable	Code	Format / Values	Definition	Comments or Instructions
O_PostShift4KTest1L		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 4000 Hz (Test 1 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift4KTest2L		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 4000 Hz (Test 2 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShift4KTest3L		Numeric type variable (integer)	Post-Shift Number of Sound Tones Heard at 4000 Hz (Test 3 - Left Ear)	Enter number of tones (typically 0 to 13, with few exceptions of 14 or 15)
O_PostShiftDBA		Numeric type variable (decimal)	Post-Shift Test Room Background Sound Level (dBA)	
O_PostShiftOBA125		Numeric type variable (decimal)	Post-Shift Test Room Background Octave Band Analysis (dB) at 125 Hz	
O_PostShiftOBA250		Numeric type variable (decimal)	Post-Shift Test Room Background Octave Band Analysis (dB) at 250 Hz	
O_PostShiftOBA500		Numeric type variable (decimal)	Post-Shift Test Room Background Octave Band Analysis (dB) at 500 Hz	
O_PostShiftOBA1000		Numeric type variable (decimal)	Post-Shift Test Room Background Octave Band Analysis (dB) at 1 KHz	
O_PostShiftOBA2000		Numeric type variable (decimal)	Post-Shift Test Room Background Octave Band Analysis (dB) at 2 KHz	
O_PostShiftOBA4000		Numeric type variable (decimal)	Post-Shift Test Room Background Octave Band Analysis (dB) at 4 KHz	
O_PostShiftOBA8000		Numeric type variable (decimal)	Post-Shift Test Room Background Octave Band Analysis (dB) at 8 KHz	
O_PostShiftDBAnote		Text type variable	Additional comment related to post-shift test room background sound level	
O_PostShiftOBAnote		Text type variable	Additional comment related to post-shift test room background octave band analysis	
M_Remove	1 0 9	Yes No Unknown (not entered)	Did employee remove dosimeter and microphone at any time during the workshift	
M_RemoveBegin1		Time type variable	Time the dosimeter was removed the first time.	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30

CHAT Form Variable	Code	Format / Values	Definition	Comments or Instructions
M_RemoveEnd1		Time type variable	Time the dosimeter was put back on after it was removed the first time.	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
M_RemoveBegin2		Time type variable	Time the dosimeter was removed the second time.	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
M_RemoveEnd2		Time type variable	Time the dosimeter was put back on after it was removed the second time.	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30

Direct Observation Form 1 Variable	Code	Format / Values	Definition	Comments or Instructions
PQ_TaskCode	Task Code for each job at each plant is in a separate table in this Appendix	Text type variable	Task Name or Description	
PQ_LocationCode	Location Codes for each plant is in a separate table in this Appendix	Text type variable	Location information from the Task Name Column	The location information is entered on the task column most of the time, but is sometimes entered on the other comments column of the direct observation form
PQ_MachineCode	Machine Codes for each job at each plant is in a separate table in this Appendix	Text type variable	Machine or Tool from the Task Name column	The machine information is entered on the task column most of the time, but is sometimes entered on the other comments column of the direct observation form
PQ_StartTime		Time type variable	Start Time (of the task)	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
PQ_StopTime		Time type variable	Stop Time (of the task)	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
Q_ToolUsedCode	Tool Used Code for each job in Plant C is in a separate table in this Appendix	Text type variable	Tool Type	This information was collected only for Plant C jobs (all phases).
Q_DuraMin		Numeric type variable (integer)	Minimum cycle time in seconds (for the tool used during the task)	
Q_DuraMax		Numeric type variable (integer)	Maximum cycle time in seconds (for the tool used during the task)	
Q_NRTTime		Numeric type variable (integer)	Number of times (tool used during the task)	
PQ_PctHP		Numeric type variable (integer)	Percent of time hearing protection used	This will be a whole number between 0 and 100. Enter "0" if no entry was made in the column.
PQ_HPfit	1 0 9 8	Yes No ? (Don't Know) N/A (Not Applicable)	Hearing Protection Fit	If percent time hearing protection worn is "0," enter "N/A."
PQ_HPDComent	HP01 HP02 HP03	3M 1100 (orange) (NRR29) Bilsom Perfit (green with cord) (NRR26) Bilsom Viking (ear muff) (NRR29)	Type of HPD used as noted in the HP and other comments	Ask Lian to allow entry of multiple codes separated by commas

Direct Observation Form 1 Variable	Code	Format / Values	Definition	Comments or Instructions	
	HP04	Bilsom Warrior (ear muff) (NRR23)	column on the direct observation form		
	HP05	Brown Earmuffs (unknown type) (NRR?)			
	HP06	CaboFlex Model:600 (NRR20)			
	HP07	EAR Classic (NRR29)			
	HP08	EAR EZ Fit (NRR28)			
	HP09	Ear Muff (unknown type) (NRR?)			
	HP10	Ear Plug (unknown type) (NRR29)			
	HP11	Ear Plug (unknown type) (NRR?)			
	HP12	EAR Taperfit 2 (yellow) (NRR32)			
	HP13	EAR Ultrafit (NRR25)			
	HP14	EAR Ultralite (NRR?)			
	HP15	EasyFit (NRR22)			
	HP16	Howard Leight Max Lite (NRR30)			
	HP17	Molded Ear Plug (custom molded) (NRR?)			
	HP18	Peltor (green or yellow ear muff) (NRR22)			
	HP19	Peltor (H7 ear muff) (NRR22)			
PQ_OtherComment		Text type variable		Other comments	If machine or location information was entered here, enter it in the machine code column (variable PQ_MachineCode) or location code column (variable PQ_LocationCode)
Q_EngineOn	1	Yes		Engine On	Was the engine of the equipment that the employee was actually working at "on"? If an "X" was drawn through this column enter as "no."
	0	No			
	9	Unknown (not entered)			
Q_OtherNoise	1	Yes	Other Loud Noise Source (greater than 1 minute)	Other loud noise sources in the area where the employee worked (generated by other workers' activities in the same or adjacent work area). If an "X" was drawn through this column enter as "no"	
	0	No			
	9	Unknown (not entered)			
Q_OtherNoiseSourceCode	NS01	Air Drill (Drill)	Identity of the other noise source.	This information was collected only for Plant C jobs (in all phases). Note for Lian: Allow entry of multiple noise sources	
	NS02	Air Fuel Pump			
	NS03	Air Grinder (Grinder, Hand Grinder)			
	NS04	Air Wrench (Impact Wrench)			
	NS05	Arc-Air			
	NS06	Backup Alarm			
	NS07	Boring Machine			
	NS08	Buzzer (Truck Buzzer)			
	NS09	Chemical Dip Tank (Metalizing, Metalizing Machine)			
	NS10	Compressed Air (Air Pressure)			
	NS11	Cutting Torch or Torch			
	NS12	Engine or Truck Engine			
	NS13	Engine Test (Engine in Test,			

Direct Observation Form 1 Variable	Code	Format / Values	Definition	Comments or Instructions
		Engine Test Room, Test Engine)		
	NS14	Fork Lift		
	NS15	Fuel Injection Pump (Fuel Injector Pump)		
	NS16	Generator		
	NS17	Hammer		
	NS18	Heater		
	NS19	Heavy Drill (Stationary Drill)		
	NS20	Honing Machine Bay 58		
	NS21	Lathe		
	NS22	Lathe 50-2		
	NS23	Lathe 50-5		
	NS24	Load Bench		
		Moving Equipment (Pulling Out Other Equipment, Operation of Other Equipment)		
	NS25	Oil Pump		
	NS26	Part Impact		
	NS27	Parts Washer (Washer Machine, Typhoon, Magnus)		
	NS28	Pressure Washer (High Pressure Washer, Spray with Pressure Washer, Water Jet, Power Washing)		
	NS29	Pump Fuel		
	NS30	Radio		
	NS31	Roof Work (From Roof)		
	NS32	Sand Blast		
	NS33	Saw 73-6 (Stationary Saw)		
	NS34	Surface Grinder 50-8		
	NS35	Surface Grinder 56-1		
	NS36	Test Bench		
	NS37	Tooling		
	NS38	Track Machine		
	NS39	Track Shovel		
	NS40	Vacuum		
	NS41	Welding (Welder, Welding Machine)		
	NS42			
Q_OtherNoiseNote		Text type variable	Note related to the other noise source	
PQ_DirectForm1Note		Text type variable	Other Notes and Comments (on bottom of Direct Observation Form #1)	

Direct Observation Form 2A Variable	Code	Format / Values	Definition	Comments or Instructions
R_TaskCodeSLM	Task Code for each job at each plant is in a separate table in this Appendix	Text type variable	Task Name or Description	
R_LocationCodeSLM	Location Codes for each plant is in a separate table in this Appendix	Text type variable	Location information from the Task Name Column	The location information is entered on the task column most of the time, but is sometimes entered on the other comments column of the direct observation form
R_MachineCodeSLM	Machine Codes for each job in each plant is in a separate table in this Appendix	Text type variable	Machine or Tool from the Task Name column	
R_TaskNoteSLM		Text type variable	Additional information about the task or conditions when SLM reading was taken.	This information is recorded by the technicians in the task name column
R_TimeSLM		Time type variable	Time of SLM Reading	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
R_DurationSLM		Text type variable	Duration of measurement	Enter in min:sec format, for example enter 56 seconds as 0:56, enter 1 minute 19 seconds as 1:19, enter 75 seconds as 1:15
R_Dose1		Numeric (decimal)	Dose 1 SLM reading (80 dB threshold, 5 dB exchange)	Enter whole number in decimal format (one decimal place), for example, enter 93 as 93.0. If SLM reading was not entered on field data collection form, do not enter anything on Access entry form.
R_Dose2		Numeric (decimal)	Dose 2 SLM reading (0 dB threshold, 5 dB exchange)	Enter whole number in decimal format (one decimal place), for example, enter 93 as 93.0. If SLM reading was not entered on field data collection form, do not enter anything on Access entry form.
R_Dose3		Numeric (decimal)	Dose 3 SLM reading (80 dB threshold, 3 dB exchange)	Enter whole number in decimal format (one decimal place), for example, enter 93 as 93.0. If SLM reading was not entered on field data collection form, do not enter anything on Access entry form.
R_Dose4		Numeric (decimal)	Dose 4 SLM reading (0 dB threshold, 3 dB exchange)	Enter whole number in decimal format (one decimal place), for example, enter 93 as 93.0. If SLM reading was not entered on field data collection form, do not enter anything on Access entry form.
R_Lmax		Numeric (decimal)	Lmax reading	Enter whole number in decimal format (one decimal place), for example, enter 93 as 93.0. If SLM reading was not entered on field data collection form, do not enter anything on Access entry form.
R_Lpeak		Numeric (decimal)	Lpeak reading	Enter whole number in decimal format (one decimal place), for example, enter 93 as 93.0. If SLM reading was not entered on field data collection form, do not enter anything on Access entry form.
R_DirectForm2ANote		Text type variable	Other Notes	

Direct Observation Form 2B Variable	Code	Format / Values	Definition	Comments or Instructions
S_TaskCodeSLM	Task Code for each job at each plant is in a separate table in this Appendix	Text type variable	Task Name or Description	
S_MachineCodeSLM	Machine Code for each job at each plant is in a separate table in this Appendix	Text type variable	Machine or Tool from the Task Name column	
S_TaskNoteSLM		Text type variable	Additional information about the task or conditions when SLM reading was taken.	This information is recorded by the technicians in the task name column
S_LocationCodeSLM	Location Codes for each plant is in a separate table in this Appendix	Text type variable	Location of task when SLM reading was taken	Ask Lian to allow entry of multiple codes separated by commas
S_Impulse	1	Yes	Impulse Noise	
	0	No		
	9	Unknown (not entered)		
S_NoisePosition	B	back	Noise from left/right/front/back	Order of combinations is not relevant. For example, F/B is the same as B/F. If "All," "All over," or "everywhere" was entered on data collection form, enter BFLR in Access entry form. If "none" or "-----" was entered on form, enter NA in Access entry form. If no entry (entry left blank) was made on form enter U on Access entry form.
	F	front		
	L	left		
	R	right		
	BF	back/front		
	BL	back/left		
	BR	back/right		
	FL	front/left		
	FR	front/right		
	LR	left/right		
	BFL	back/front/left		
	BFR	back/front/right		
	BLR	back/left/right		
	FLR	front/left/right		
BFLR	back/front/left/right			
NA	not applicable			
U	unknown			
S_HandToolCode	HM	Hammering (manual)	Hand Tool Used	Enter NA if nothing was entered on field data collection form Note to Lian: The drop down list should have the codes instead of the code descriptions.
	HT	Hand tools (manual)		
	HTP	Hand Tools (pneumatic)		
	AG	Air Gun		
	NA	Not Applicable		

Direct Observation Form 2B Variable	Code	Format / Values	Definition	Comments or Instructions		
S_ProdSourceCode	AB	Air Blow-Off (cleaning with compressed air)				
	AE	Air Exhaust (from machine or process)				
	AL	Air Leak (from machine or process)				
	BL	Blower (part of production)				
	CB	Combustion (burning from production)				
	CN	Conveyor				
	EN	Engine (gasoline, diesel, etc.)				
	HD	Hydraulics				
	MI	Machine Impact				
	MM	Machine Noise - Mechanical				
	MTE	Material Transport Equipment (trucks, fork lifts, etc.)				
	ME	Motor - Electric	Main Production Noise Sources	Enter NA if nothing was entered on field data collection form. Note to Lian: The drop down list should have the codes instead of the code descriptions. Ask Lian to allow entry of multiple codes separated by commas		
	MP	Motor - Pneumatic				
	PCI	Part to Chute Impact				
	PI	Part Impact				
	PJC	Paint Jet (Spray Paint Gun)				
	PFI	Part to Fixture Impact				
	PPI	Part to Part Impact				
	PT	Power Transmission Devices - Mechanical				
	SB	Sand Blast				
	SL	Steam Leak				
TI	Tooling Impact (presses)					
TO	Torch					
TM	Tooling - Material Removal (grinding, cutting, lathes)					
VE	Vibrating Elements					
WD	Welding					
WJC	Water Jet					
NA	Not Applicable					
S_MachineAge		Numeric type variable (whole number or decimal)			Age of Machine (in years)	If dashed line, question mark, or nothing was entered on field data collection form, do not enter anything on Access Entry Form
S_DistanceSource		Numeric type variable (whole number or decimal)			Distance to Main Production Source (feet)	If dashed line or nothing was entered on field data collection form, do not enter anything on Access Entry Form. If "All Over" was entered on the field data collection form, enter "99" on Access Entry Form. In some instances distance may have been entered in meters instead of feet, convert the distance to feet before entering data. (1 meter = 3.3 feet)

Direct Observation Form 2B Variable	Code	Format / Values	Definition	Comments or Instructions
S_Density		Numeric type variable (integer)	Production Source Density (number within 15 feet)	If dashed line or nothing was entered on field data collection form, do not enter anything on Access Entry Form
S_NonProdSourceCode	FF	Floor Fans	Main Non-Production Noise Sources	Enter NA if nothing was entered on field data collection form Note to Lian: The drop down list should have the codes instead of the code descriptions. Allow for entry of multiple non-production sources separated by a comma.
	PED	Personal Entertainment Device (radio/headphones)		
	PW	Plant Warning/Communication Systems		
	R	Radio (for communication)		
	VM	Ventilation Exhaust - Movable - Man Coolers		
	VP	Ventilation Exhaust - Permanent Installation		
	NA	Not Applicable		
S_DirectForm2BNote		Text type variable	Other Notes (on bottom of Direct Observation Form #2B)	

Employee Actual Workday Variable	Code	Format / Values	Definition	Comments or Instructions
TU_TaskCodeWorkDay	Task Code for each job at each plant is in a separate table in this Appendix	Text type variable	Work tasks or activities conducted on the day of the survey	
TU_MachineCodeWorkDay	Machine Code for each job at each plant is in a separate table in this Appendix	Text type variable	Machine or tool that was noted in the task column	
TU_DurationTask		Text type variable	Number of hours and minutes spent at each task	Enter as XX:YY, where "XX" is number of hours and "YY" is number of minutes. For example if employee conducted task for 1 hour 25 minutes, enter 01:25
U_StartWork		Time type variable	Time employee started working	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
U_EndWork		Time type variable	Time employee finished working	Enter in 24 hour time, for example 6:30 PM would be entered as 18:30
U_DurationWork		Text type variable	Total number of hours and minutes worked on day of monitoring.	Enter as XX:YY, where "XX" is number of hours and "YY" is number of minutes. For example if employee wore hearing protection for 9 hours 30 minutes, enter 09:30
TU_EmpWorkDayNote		Text type variable	Other Notes (on bottom of Employee Actual Workday Time-at-Task Assessment Form)	

Additional Notes Variable	Code	Format / Values	Definition	Comments or Instructions
V_TaskNote1		Text type variable	Note related to work tasks	
V_TaskNote2		Text type variable	Note related to work tasks	
V_JobNote1		Text type variable	Note related to the job	Continue comment to job note 2 if there is not enough space
V_JobNote2		Text type variable	Note related to the job	Continuation of job note 1
V_MachineNote		Text type variable	Note related to the machines or tools	
V_HPDPNote		Text type variable	Note related to hearing protection	

Supervisor Typical Workday Variable	Code	Format / Values	Definition	Comments or Instructions	
W_SupvCode	20	Daniel Charbonneau	Supervisor Name		
	21	Daniel Fergusson			
	22	Felix Tremblay			
	23	Andre Lebel			
	24	Christian Breton			
	25	Guy Bureau			
	26	Luc Andre Lauzier			
	27	Jean Martin			
	28	Denis Poirier			
	29	Walter Romano			
W_SurveyorCode	01	Melissa	Interviewer Name		
	02	Marc-Antoine			
	03	Michelet			
	04	Jocelyn			
	05	Karine			
	06	Ninon			
	07	Dino			
	08	Eric			
	09	Scott			
	10	Martha			
	11	Susan			
W_SurveyDate		Date type variable	Survey Date	Enter as (Ask Lian about how it should be entered)	
W_TypicalWorkTime		Numeric (whole number or decimal)	Amount of time employees typically work per workday	Enter as either whole number or decimal. For example: enter 8 hours as 8, enter 8 hours 30 minutes as 8.5	
W_JobCode	A1A	Thermoforming Operator	Job Name	Plant A Job Codes	
	A1B	Thermoforming General Aid			
	A1C	Thermoforming Mechanic			
	A2A	Extrusion Operator			
	A2B	Slitter Operator			
	A2C	Weigh Station Operator			
	A2D	Grinder Operator			
	A2E	Pelletizer			
	A3A	Mold Machinist			
	A4A	Maintenance Mechanic			
	A4B	Maintenance Electrician			
	A4C	Building Maintenance			
	A5A	Fork Lift Driver			
	B1A	Decorator			Plant B Job Codes
	B1B	Stretcher Operator			
	B1C	Stretcher Mechanic			
	B1D	General Mechanic			
	B1E	Mechanic - Rear Section			
	B1F	Department Aid			
	B1G	Packaging Operator			
	B2A	Counting Operator			
	B2B	Press Operator 26 mm			
	B2C	Rotary Operator			
	B3A	Printing Press Operator			
	B3B	Varnisher (Coater)			
	B3C	Measurer			
	C1A	Heavy Equipment Repair Technician (Mechanic)		Plant C Job Codes	
	C2A	Motor Rebuilding Technician (Mechanic)			
	C2B	Transmission Rebuilding Technician (Mechanic)			
	C2C	Cylinder Head Rebuilding Technician (Mechanic)			

Supervisor Typical Workday Variable	Code	Format / Values	Definition	Comments or Instructions
	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)		
	C2E	Fuel Injector Rebuilding Technician (Mechanic)		
	C2F	Hydraulic Cylinder Rebuilding Technician (Mechanic)		
	C3A	Machinist - Operations Section		
	C3B	Machinist - Welding Section		
	C3C	Machinist - Bay 56/58		
	C4A	Welder		
	C5A	Track Repair		
	C5B	Painter		
W_SupvWorkDayNote		Text type variable	Other Notes (on bottom of Supervisor On-Average Workday Time-at-Task Assessment Form)	
W_TaskCodeWorkDay	Task Code for each job at each plant is in a separate table in this Appendix	Text type variable	Work tasks or activities conducted, on-average	
W_NRMachines		Numeric (Integer)	Number of machines employee works at during the task, on-average	Note: For some tasks this will not be applicable. Leave blank if no data to enter.
W_MachineCodeWorkDay	Machine Code for each job at each plant is in a separate table in this Appendix	Text type variable	Machine or tool that was noted in the task column	Leave blank if no information to enter., Allow for multiple entry
W_DurationTask		Text type variable	Number of hours and minutes spent at each task	Enter as XX:YY, where "XX" is number of hours and "YY" is number of minutes. For example if employee conducted task for 1 hour 25 minutes, enter 01:25

Task Code	Task Name	Job Code	Job Name
TA1A109	Activities in Thermoforming Department	A1A	Thermoforming Operator
TA1A114	Break	A1A	Thermoforming Operator
TA1A122	Cleaning	A1A	Thermoforming Operator
TA1A125	Compressed Air	A1A	Thermoforming Operator
TA1A155	Lunch	A1A	Thermoforming Operator
TA1A156	Machine Downtime	A1A	Thermoforming Operator
TA1A171	Office Work	A1A	Thermoforming Operator
TA1A217	Set-Up/Repair	A1A	Thermoforming Operator
TA1A232	Unload/Inspect/Package	A1A	Thermoforming Operator
TA1A241	Work Near Machine	A1A	Thermoforming Operator
TA1B102	Activities in Extrusion Department	A1B	Thermoforming General Aid
TA1B109	Activities in Thermoforming Department	A1B	Thermoforming General Aid
TA1B114	Break	A1B	Thermoforming General Aid
TA1B132	Drive Fork Lift	A1B	Thermoforming General Aid
TA1B155	Lunch	A1B	Thermoforming General Aid
TA1B163	Mold Shop	A1B	Thermoforming General Aid
TA1B171	Office Work	A1B	Thermoforming General Aid
TA1B217	Set-Up/Repair	A1B	Thermoforming General Aid
TA1B232	Unload/Inspect/Package	A1B	Thermoforming General Aid
TA1B233	Use Pallet Truck	A1B	Thermoforming General Aid
TA1B237	Warehouse Activities	A1B	Thermoforming General Aid
TA1B241	Work Near Machine	A1B	Thermoforming General Aid
TA1C103	Activities in Lamination	A1C	Thermoforming Mechanic
TA1C104	Activities in Mechanic Department	A1C	Thermoforming Mechanic
TA1C105	Activities in Mold Department	A1C	Thermoforming Mechanic
TA1C108	Activities in Shop	A1C	Thermoforming Mechanic
TA1C109	Activities in Thermoforming Department	A1C	Thermoforming Mechanic
TA1C114	Break	A1C	Thermoforming Mechanic
TA1C126	Compressor Room	A1C	Thermoforming Mechanic
TA1C132	Drive Fork Lift	A1C	Thermoforming Mechanic
TA1C155	Lunch	A1C	Thermoforming Mechanic
TA1C163	Mold Shop	A1C	Thermoforming Mechanic
TA1C171	Office Work	A1C	Thermoforming Mechanic
TA1C217	Set-Up/Repair	A1C	Thermoforming Mechanic
TA1C233	Use Pallet Truck	A1C	Thermoforming Mechanic
TA1C241	Work Near Machine	A1C	Thermoforming Mechanic
TA2A102	Activities in Extrusion Department	A2A	Extrusion Operator
TA2A106	Activities in Pelletizer Area	A2A	Extrusion Operator
TA2A114	Break	A2A	Extrusion Operator
TA2A127	Control Booth	A2A	Extrusion Operator
TA2A142	Emergency Scrap Removal	A2A	Extrusion Operator
TA2A155	Lunch	A2A	Extrusion Operator
TA2A164	Monitor Machine	A2A	Extrusion Operator
TA2A171	Office Work	A2A	Extrusion Operator
TA2A217	Set-Up/Repair	A2A	Extrusion Operator
TA2A218	Slitter Activities	A2A	Extrusion Operator
TA2B106	Activities in Pelletizer Area	A2B	Slitter Operator
TA2B114	Break	A2B	Slitter Operator
TA2B122	Cleaning	A2B	Slitter Operator
TA2B125	Compressed Air	A2B	Slitter Operator
TA2B127	Control Booth	A2B	Slitter Operator
TA2B129	Cut Tube	A2B	Slitter Operator
TA2B131	Drive Electronic Pallet Roll Jack	A2B	Slitter Operator
TA2B132	Drive Fork Lift	A2B	Slitter Operator
TA2B142	Emergency Scrap Removal	A2B	Slitter Operator
TA2B148	Grinder Room	A2B	Slitter Operator
TA2B154	Load/Unload Winder	A2B	Slitter Operator
TA2B155	Lunch	A2B	Slitter Operator
TA2B171	Office Work	A2B	Slitter Operator
TA2B176	Package Plastic Rolls	A2B	Slitter Operator
TA2B218	Slitter Activities	A2B	Slitter Operator
TA2B238	Weigh Station Activities	A2B	Slitter Operator
TA2C102	Activities in Extrusion Department	A2C	Weigh Station Operator

Task Code	Task Name	Job Code	Job Name
TA2C103	Activities in Lamination	A2C	Weigh Station Operator
TA2C106	Activities in Pelletizer Area	A2C	Weigh Station Operator
TA2C114	Break	A2C	Weigh Station Operator
TA2C122	Cleaning	A2C	Weigh Station Operator
TA2C125	Compressed Air	A2C	Weigh Station Operator
TA2C127	Control Booth	A2C	Weigh Station Operator
TA2C129	Cut Tube	A2C	Weigh Station Operator
TA2C132	Drive Fork Lift	A2C	Weigh Station Operator
TA2C142	Emergency Scrap Removal	A2C	Weigh Station Operator
TA2C143	Empty Garbage	A2C	Weigh Station Operator
TA2C148	Grinder Room	A2C	Weigh Station Operator
TA2C154	Load/Unload Winder	A2C	Weigh Station Operator
TA2C155	Lunch	A2C	Weigh Station Operator
TA2C171	Office Work	A2C	Weigh Station Operator
TA2C174	Outside Grinder Room	A2C	Weigh Station Operator
TA2C176	Package Plastic Rolls	A2C	Weigh Station Operator
TA2C218	Slitter Activities	A2C	Weigh Station Operator
TA2C221	Start-Up Machine Line 1	A2C	Weigh Station Operator
TA2C238	Weigh Station Activities	A2C	Weigh Station Operator
TA2D114	Break	A2D	Grinder Operator
TA2D125	Compressed Air	A2D	Grinder Operator
TA2D127	Control Booth	A2D	Grinder Operator
TA2D132	Drive Fork Lift	A2D	Grinder Operator
TA2D148	Grinder Room	A2D	Grinder Operator
TA2D152	Load Grinder	A2D	Grinder Operator
TA2D155	Lunch	A2D	Grinder Operator
TA2D171	Office Work	A2D	Grinder Operator
TA2D174	Outside Grinder Room	A2D	Grinder Operator
TA2E102	Activities in Extrusion Department	A2E	Pelletizer
TA2E107	Activities in Shipping	A2E	Pelletizer
TA2E109	Activities in Thermoforming Department	A2E	Pelletizer
TA2E110	Activities in Warehouse	A2E	Pelletizer
TA2E114	Break	A2E	Pelletizer
TA2E122	Cleaning	A2E	Pelletizer
TA2E125	Compressed Air	A2E	Pelletizer
TA2E127	Control Booth	A2E	Pelletizer
TA2E132	Drive Fork Lift	A2E	Pelletizer
TA2E147	Garbage Disposal Activities	A2E	Pelletizer
TA2E152	Load Grinder	A2E	Pelletizer
TA2E153	Load Pelletizer	A2E	Pelletizer
TA2E155	Lunch	A2E	Pelletizer
TA2E164	Monitor Machine	A2E	Pelletizer
TA2E171	Office Work	A2E	Pelletizer
TA2E189	Repair Fork Lift	A2E	Pelletizer
TA2E231	Unload Pelletizer	A2E	Pelletizer
TA2E235	Using Vacuum	A2E	Pelletizer
TA3A100	Activities Outside Mold Department	A3A	Mold Machinist
TA3A109	Activities in Thermoforming Department	A3A	Mold Machinist
TA3A114	Break	A3A	Mold Machinist
TA3A116	Calibration	A3A	Mold Machinist
TA3A122	Cleaning	A3A	Mold Machinist
TA3A125	Compressed Air	A3A	Mold Machinist
TA3A132	Drive Fork Lift	A3A	Mold Machinist
TA3A150	Hand Tool Use	A3A	Mold Machinist
TA3A155	Lunch	A3A	Mold Machinist
TA3A157	Machine Shop Activities	A3A	Mold Machinist
TA3A158	Machining	A3A	Mold Machinist
TA3A163	Mold Shop	A3A	Mold Machinist
TA3A171	Office Work	A3A	Mold Machinist
TA3A184	Power Tool Use	A3A	Mold Machinist
TA3A236	Using Vacuum Forming Machine	A3A	Mold Machinist
TA3A239	Welding	A3A	Mold Machinist
TA4A102	Activities in Extrusion Department	A4A	Maintenance Mechanic
TA4A103	Activities in Lamination	A4A	Maintenance Mechanic

Task Code	Task Name	Job Code	Job Name
TA4A114	Break	A4A	Maintenance Mechanic
TA4A115	Building Maintenance	A4A	Maintenance Mechanic
TA4A122	Cleaning	A4A	Maintenance Mechanic
TA4A132	Drive Fork Lift	A4A	Maintenance Mechanic
TA4A155	Lunch	A4A	Maintenance Mechanic
TA4A157	Machine Shop Activities	A4A	Maintenance Mechanic
TA4A158	Machining	A4A	Maintenance Mechanic
TA4A171	Office Work	A4A	Maintenance Mechanic
TA4A184	Power Tool Use	A4A	Maintenance Mechanic
TA4A190	Repair/Maintenance	A4A	Maintenance Mechanic
TA4A224	Storage Room	A4A	Maintenance Mechanic
TA4A239	Welding	A4A	Maintenance Mechanic
TA4B114	Break	A4B	Maintenance Electrician
TA4B115	Building Maintenance	A4B	Maintenance Electrician
TA4B122	Cleaning	A4B	Maintenance Electrician
TA4B155	Lunch	A4B	Maintenance Electrician
TA4B157	Machine Shop Activities	A4B	Maintenance Electrician
TA4B158	Machining	A4B	Maintenance Electrician
TA4B171	Office Work	A4B	Maintenance Electrician
TA4B184	Power Tool Use	A4B	Maintenance Electrician
TA4B190	Repair/Maintenance	A4B	Maintenance Electrician
TA4B224	Storage Room	A4B	Maintenance Electrician
TA4B239	Welding	A4B	Maintenance Electrician
TA4C114	Break	A4C	Plant Maintenance
TA4C115	Building Maintenance	A4C	Plant Maintenance
TA4C122	Cleaning	A4C	Plant Maintenance
TA4C132	Drive Fork Lift	A4C	Plant Maintenance
TA4C155	Lunch	A4C	Plant Maintenance
TA4C157	Machine Shop Activities	A4C	Plant Maintenance
TA4C158	Machining	A4C	Plant Maintenance
TA4C184	Power Tool Use	A4C	Plant Maintenance
TA4C190	Repair/Maintenance	A4C	Plant Maintenance
TA4C239	Welding	A4C	Plant Maintenance
TA5A101	Activities Outside Shipping Department	A5A	Fork Lift Driver
TA5A107	Activities in Shipping	A5A	Fork Lift Driver
TA5A110	Activities in Warehouse	A5A	Fork Lift Driver
TA5A114	Break	A5A	Fork Lift Driver
TA5A132	Drive Fork Lift	A5A	Fork Lift Driver
TA5A155	Lunch	A5A	Fork Lift Driver
TA5A171	Office Work	A5A	Fork Lift Driver
TA5A189	Repair Fork Lift	A5A	Fork Lift Driver
TB1A114	Break	B1A	Decorator
TB1A118	Change Decorations	B1A	Decorator
TB1A120	Choosing Ink	B1A	Decorator
TB1A155	Lunch	B1A	Decorator
TB1A156	Machine Downtime	B1A	Decorator
TB1A165	Monitor Operation (Inspection)	B1A	Decorator
TB1A171	Office Work	B1A	Decorator
TB1A187	Quality Control	B1A	Decorator
TB1B112	Aluminum Recycling Area	B1B	Stretcher Operator
TB1B114	Break	B1B	Stretcher Operator
TB1B117	Change Aluminum Roll	B1B	Stretcher Operator
TB1B132	Drive Fork Lift	B1B	Stretcher Operator
TB1B155	Lunch	B1B	Stretcher Operator
TB1B157	Machine Shop Activities	B1B	Stretcher Operator
TB1B171	Office Work	B1B	Stretcher Operator
TB1B185	Printer Area Activities	B1B	Stretcher Operator
TB1B187	Quality Control	B1B	Stretcher Operator
TB1B190	Repair/Maintenance	B1B	Stretcher Operator
TB1B205	Repair/Maintenance (Punch Press)	B1B	Stretcher Operator
TB1B216	Set-Up	B1B	Stretcher Operator
TB1B230	Tool Room	B1B	Stretcher Operator
TB1B237	Warehouse Activities	B1B	Stretcher Operator
TB1B239	Welding	B1B	Stretcher Operator

Task Code	Task Name	Job Code	Job Name
TB1B240	Work Bench	B1B	Stretcher Operator
TB1C112	Aluminum Recycling Area	B1C	Stretcher Mechanic
TB1C114	Break	B1C	Stretcher Mechanic
TB1C117	Change Aluminum Roll	B1C	Stretcher Mechanic
TB1C132	Drive Fork Lift	B1C	Stretcher Mechanic
TB1C155	Lunch	B1C	Stretcher Mechanic
TB1C157	Machine Shop Activities	B1C	Stretcher Mechanic
TB1C171	Office Work	B1C	Stretcher Mechanic
TB1C185	Printer Area Activities	B1C	Stretcher Mechanic
TB1C187	Quality Control	B1C	Stretcher Mechanic
TB1C190	Repair/Maintenance	B1C	Stretcher Mechanic
TB1C205	Repair/Maintenance (Punch Press)	B1C	Stretcher Mechanic
TB1C216	Set-Up	B1C	Stretcher Mechanic
TB1C230	Tool Room	B1C	Stretcher Mechanic
TB1C237	Warehouse Activities	B1C	Stretcher Mechanic
TB1C239	Welding	B1C	Stretcher Mechanic
TB1C240	Work Bench	B1C	Stretcher Mechanic
TB1D114	Break	B1D	Mechanic - Canning Department (General Mechanic)
TB1D121	Clean Tools with Degreaser	B1D	Mechanic - Canning Department (General Mechanic)
TB1D145	Film Preparation	B1D	Mechanic - Canning Department (General Mechanic)
TB1D155	Lunch	B1D	Mechanic - Canning Department (General Mechanic)
TB1D157	Machine Shop Activities	B1D	Mechanic - Canning Department (General Mechanic)
TB1D158	Machining	B1D	Mechanic - Canning Department (General Mechanic)
TB1D171	Office Work	B1D	Mechanic - Canning Department (General Mechanic)
TB1D184	Power Tool Use	B1D	Mechanic - Canning Department (General Mechanic)
TB1D187	Quality Control	B1D	Mechanic - Canning Department (General Mechanic)
TB1D190	Repair/Maintenance	B1D	Mechanic - Canning Department (General Mechanic)
TB1D191	Repair/Maintenance (Aluminum Compactor)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D192	Repair/Maintenance (Anti Pollution Sheet or Anti Pollution Map)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D193	Repair/Maintenance (Body Varnish Machine)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D194	Repair/Maintenance (Coater)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D195	Repair/Maintenance (Conveyor)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D196	Repair/Maintenance (Cyclone)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D197	Repair/Maintenance (Decorator)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D198	Repair/Maintenance (Duster)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D199	Repair/Maintenance (Flanger)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D200	Repair/Maintenance (Incinerator or Damper)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D201	Repair/Maintenance (Light Test Machine)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D202	Repair/Maintenance (Necker)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D203	Repair/Maintenance (Palletizer)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D204	Repair/Maintenance (Press - Canning)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D206	Repair/Maintenance (Recycling Machine)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D207	Repair/Maintenance (Roof)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D208	Repair/Maintenance (Spin Necker Flanger)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D209	Repair/Maintenance (Spray Cleaning Machine)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D210	Repair/Maintenance (Strapping Machine)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D211	Repair/Maintenance (Stretcher)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D212	Repair/Maintenance (Washer/Dryer)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D213	Repair/Maintenance (Waxer Machine)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D214	Repair/Maintenance (Wrapper Machine)	B1D	Mechanic - Canning Department (General Mechanic)
TB1D216	Set-Up	B1D	Mechanic - Canning Department (General Mechanic)
TB1D230	Tool Room	B1D	Mechanic - Canning Department (General Mechanic)
TB1E114	Break	B1E	Mechanic - Rear Section
TB1E121	Clean Tools with Degreaser	B1E	Mechanic - Rear Section
TB1E132	Drive Fork Lift	B1E	Mechanic - Rear Section
TB1E145	Film Preparation	B1E	Mechanic - Rear Section
TB1E155	Lunch	B1E	Mechanic - Rear Section
TB1E157	Machine Shop Activities	B1E	Mechanic - Rear Section
TB1E158	Machining	B1E	Mechanic - Rear Section
TB1E171	Office Work	B1E	Mechanic - Rear Section
TB1E184	Power Tool Use	B1E	Mechanic - Rear Section
TB1E187	Quality Control	B1E	Mechanic - Rear Section
TB1E190	Repair/Maintenance	B1E	Mechanic - Rear Section

Task Code	Task Name	Job Code	Job Name
TB1E191	Repair/Maintenance (Aluminum Compactor)	B1E	Mechanic - Rear Section
TB1E192	Repair/Maintenance (Anti Pollution Sheet or Anti Pollution Map)	B1E	Mechanic - Rear Section
TB1E193	Repair/Maintenance (Body Varnish Machine)	B1E	Mechanic - Rear Section
TB1E194	Repair/Maintenance (Coater)	B1E	Mechanic - Rear Section
TB1E195	Repair/Maintenance (Conveyor)	B1E	Mechanic - Rear Section
TB1E196	Repair/Maintenance (Cyclone)	B1E	Mechanic - Rear Section
TB1E197	Repair/Maintenance (Decorator or Decoration Machine)	B1E	Mechanic - Rear Section
TB1E198	Repair/Maintenance (Duster)	B1E	Mechanic - Rear Section
TB1E199	Repair/Maintenance (Flanger)	B1E	Mechanic - Rear Section
TB1E200	Repair/Maintenance (Incinerator or Damper)	B1E	Mechanic - Rear Section
TB1E201	Repair/Maintenance (Light Test Machine)	B1E	Mechanic - Rear Section
TB1E202	Repair/Maintenance (Necker)	B1E	Mechanic - Rear Section
TB1E203	Repair/Maintenance (Palletizer)	B1E	Mechanic - Rear Section
TB1E204	Repair/Maintenance (Press - Canning)	B1E	Mechanic - Rear Section
TB1E206	Repair/Maintenance (Recycling Machine)	B1E	Mechanic - Rear Section
TB1E207	Repair/Maintenance (Roof)	B1E	Mechanic - Rear Section
TB1E208	Repair/Maintenance (Spin Necker Flanger)	B1E	Mechanic - Rear Section
TB1E209	Repair/Maintenance (Spray Cleaning Machine)	B1E	Mechanic - Rear Section
TB1E210	Repair/Maintenance (Strapping Machine)	B1E	Mechanic - Rear Section
TB1E211	Repair/Maintenance (Stretcher)	B1E	Mechanic - Rear Section
TB1E212	Repair/Maintenance (Washer/Dryer)	B1E	Mechanic - Rear Section
TB1E213	Repair/Maintenance (Waxer Machine)	B1E	Mechanic - Rear Section
TB1E214	Repair/Maintenance (Wrapper Machine)	B1E	Mechanic - Rear Section
TB1E216	Set-Up	B1E	Mechanic - Rear Section
TB1E230	Tool Room	B1E	Mechanic - Rear Section
TB1F114	Break	B1F	Department Aid
TB1F123	Cleaning of Garbage Waste	B1F	Department Aid
TB1F132	Drive Fork Lift	B1F	Department Aid
TB1F133	Drive Lift Truck - Assembly	B1F	Department Aid
TB1F134	Drive Lift Truck - Canning	B1F	Department Aid
TB1F135	Drive Lift Truck - Pallets Area	B1F	Department Aid
TB1F136	Drive Lift Truck - Production	B1F	Department Aid
TB1F137	Drive Lift Truck - Recycling Area	B1F	Department Aid
TB1F138	Drive Lift Truck - Shipping	B1F	Department Aid
TB1F139	Drive Lift Truck - Warehouse	B1F	Department Aid
TB1F140	Drive Lift Truck - Zone 1	B1F	Department Aid
TB1F144	Filling Chemicals	B1F	Department Aid
TB1F146	Finishing Station	B1F	Department Aid
TB1F155	Lunch	B1F	Department Aid
TB1F170	Monitor Spray Machine	B1F	Department Aid
TB1F171	Office Work	B1F	Department Aid
TB1F179	Pallet Area	B1F	Department Aid
TB1F180	Palletizer Area	B1F	Department Aid
TB1F182	Planning Work	B1F	Department Aid
TB1G114	Break	B1G	Packaging Operator
TB1G123	Cleaning of Garbage Waste	B1G	Packaging Operator
TB1G132	Drive Fork Lift	B1G	Packaging Operator
TB1G133	Drive Lift Truck - Assembly	B1G	Packaging Operator
TB1G134	Drive Lift Truck - Canning	B1G	Packaging Operator
TB1G135	Drive Lift Truck - Pallets Area	B1G	Packaging Operator
TB1G136	Drive Lift Truck - Production	B1G	Packaging Operator
TB1G137	Drive Lift Truck - Recycling Area	B1G	Packaging Operator
TB1G138	Drive Lift Truck - Shipping	B1G	Packaging Operator
TB1G139	Drive Lift Truck - Warehouse	B1G	Packaging Operator
TB1G140	Drive Lift Truck - Zone 1	B1G	Packaging Operator
TB1G144	Filling Chemicals	B1G	Packaging Operator
TB1G146	Finishing Station	B1G	Packaging Operator
TB1G155	Lunch	B1G	Packaging Operator
TB1G170	Monitor Spray Machine	B1G	Packaging Operator
TB1G171	Office Work	B1G	Packaging Operator
TB1G179	Pallet Area	B1G	Packaging Operator
TB1G180	Palletizer Area	B1G	Packaging Operator

Task Code	Task Name	Job Code	Job Name
TB1G182	Planning Work	B1G	Packaging Operator
TB2A111	Adjust Machine	B2A	Counting Operator
TB2A114	Break	B2A	Counting Operator
TB2A122	Cleaning	B2A	Counting Operator
TB2A155	Lunch	B2A	Counting Operator
TB2A156	Machine Downtime	B2A	Counting Operator
TB2A168	Monitor Production (close)	B2A	Counting Operator
TB2A169	Monitor Production (distance)	B2A	Counting Operator
TB2A190	Repair/Maintenance	B2A	Counting Operator
TB2A216	Set-Up	B2A	Counting Operator
TB2B111	Adjust Machine	B2B	Press Operator
TB2B114	Break	B2B	Press Operator
TB2B132	Drive Fork Lift	B2B	Press Operator
TB2B155	Lunch	B2B	Press Operator
TB2B164	Monitor Machine	B2B	Press Operator
TB2B187	Quality Control	B2B	Press Operator
TB2B190	Repair/Maintenance	B2B	Press Operator
TB2B215	Replace Aluminum Sheet	B2B	Press Operator
TB2C114	Break	B2C	Rotary Operator
TB2C128	Counter Operation	B2C	Rotary Operator
TB2C155	Lunch	B2C	Rotary Operator
TB2C164	Monitor Machine	B2C	Rotary Operator
TB2C187	Quality Control	B2C	Rotary Operator
TB2C190	Repair/Maintenance	B2C	Rotary Operator
TB2C216	Set-Up	B2C	Rotary Operator
TB3A114	Break	B3A	Printing Press
TB3A124	Closing (Shut Down)	B3A	Printing Press
TB3A155	Lunch	B3A	Printing Press
TB3A159	Maintenance (feeder)	B3A	Printing Press
TB3A160	Maintenance (press)	B3A	Printing Press
TB3A162	Mixing Products	B3A	Printing Press
TB3A166	Monitor Press (along press)	B3A	Printing Press
TB3A167	Monitor Press (infeed)	B3A	Printing Press
TB3A171	Office Work	B3A	Printing Press
TB3A216	Set-Up	B3A	Printing Press
TB3A242	Working at computer	B3A	Printing Press
TB3B114	Break	B3B	Varnisher (Coater)
TB3B124	Closing (Shut Down)	B3B	Varnisher (Coater)
TB3B155	Lunch	B3B	Varnisher (Coater)
TB3B159	Maintenance (feeder)	B3B	Varnisher (Coater)
TB3B160	Maintenance (press)	B3B	Varnisher (Coater)
TB3B162	Mixing Products	B3B	Varnisher (Coater)
TB3B166	Monitor Press (along press)	B3B	Varnisher (Coater)
TB3B167	Monitor Press (infeed)	B3B	Varnisher (Coater)
TB3B171	Office Work	B3B	Varnisher (Coater)
TB3B216	Set-Up	B3B	Varnisher (Coater)
TB3C114	Break	B3C	Measurer
TB3C124	Closing (Shut Down)	B3C	Measurer
TB3C155	Lunch	B3C	Measurer
TB3C159	Maintenance (feeder)	B3C	Measurer
TB3C160	Maintenance (press)	B3C	Measurer
TB3C162	Mixing Products	B3C	Measurer
TB3C166	Monitor Press (along press)	B3C	Measurer
TB3C167	Monitor Press (infeed)	B3C	Measurer
TB3C171	Office Work	B3C	Measurer
TB3C216	Set-Up	B3C	Measurer
TC1A113	Bearing Heating	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A114	Break	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A122	Cleaning	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A125	Compressed Air	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A130	Cutting Torch (acetylene)	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A132	Drive Fork Lift	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A149	Hammer	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A151	Hand Truck	C1A	Heavy Equipment Repair Technician (Mechanic)

Task Code	Task Name	Job Code	Job Name
TC1A155	Lunch	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A171	Office Work	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A172	Open and Close Bay Door	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A173	Operate Heavy Equipment	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A175	Overhead Hoist/Pulley	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A181	Parts Washers	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A182	Planning Work	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A183	Power Hand Tools (pneumatic or electric)	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A186	Pumping Fluids	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A188	Repair	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A220	Spray with high pressure washer	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A223	Stationary Power Tools	C1A	Heavy Equipment Repair Technician (Mechanic)
TC1A239	Welding	C1A	Heavy Equipment Repair Technician (Mechanic)
TC2A114	Break	C2A	Motor Rebuilding Technician (Mechanic)
TC2A119	Chemical Dip Tank	C2A	Motor Rebuilding Technician (Mechanic)
TC2A122	Cleaning	C2A	Motor Rebuilding Technician (Mechanic)
TC2A125	Compressed Air	C2A	Motor Rebuilding Technician (Mechanic)
TC2A127	Control Booth	C2A	Motor Rebuilding Technician (Mechanic)
TC2A130	Cutting Torch (acetylene)	C2A	Motor Rebuilding Technician (Mechanic)
TC2A132	Drive Fork Lift	C2A	Motor Rebuilding Technician (Mechanic)
TC2A149	Hammer	C2A	Motor Rebuilding Technician (Mechanic)
TC2A151	Hand Truck	C2A	Motor Rebuilding Technician (Mechanic)
TC2A155	Lunch	C2A	Motor Rebuilding Technician (Mechanic)
TC2A171	Office Work	C2A	Motor Rebuilding Technician (Mechanic)
TC2A175	Overhead Hoist/Pulley	C2A	Motor Rebuilding Technician (Mechanic)
TC2A181	Parts Washers	C2A	Motor Rebuilding Technician (Mechanic)
TC2A182	Planning Work	C2A	Motor Rebuilding Technician (Mechanic)
TC2A183	Power Hand Tools (pneumatic or electric)	C2A	Motor Rebuilding Technician (Mechanic)
TC2A186	Pumping Fluids	C2A	Motor Rebuilding Technician (Mechanic)
TC2A188	Repair	C2A	Motor Rebuilding Technician (Mechanic)
TC2A220	Spray with high pressure washer	C2A	Motor Rebuilding Technician (Mechanic)
TC2A222	Stationary Machine Use	C2A	Motor Rebuilding Technician (Mechanic)
TC2A223	Stationary Power Tools	C2A	Motor Rebuilding Technician (Mechanic)
TC2A225	Test Engines	C2A	Motor Rebuilding Technician (Mechanic)
TC2A226	Test Fuel Injection Pump	C2A	Motor Rebuilding Technician (Mechanic)
TC2A227	Test Fuel Injector	C2A	Motor Rebuilding Technician (Mechanic)
TC2A228	Test Hydraulic Pump	C2A	Motor Rebuilding Technician (Mechanic)
TC2A229	Test Transmission	C2A	Motor Rebuilding Technician (Mechanic)
TC2A230	Tool Room	C2A	Motor Rebuilding Technician (Mechanic)
TC2A234	Use Press	C2A	Motor Rebuilding Technician (Mechanic)
TC2A239	Welding	C2A	Motor Rebuilding Technician (Mechanic)
TC2B114	Break	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B119	Chemical Dip Tank	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B122	Cleaning	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B125	Compressed Air	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B127	Control Booth	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B130	Cutting Torch (acetylene)	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B132	Drive Fork Lift	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B149	Hammer	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B151	Hand Truck	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B155	Lunch	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B171	Office Work	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B175	Overhead Hoist/Pulley	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B181	Parts Washers	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B182	Planning Work	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B183	Power Hand Tools (pneumatic or electric)	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B186	Pumping Fluids	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B188	Repair	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B220	Spray with high pressure washer	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B222	Stationary Machine Use	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B223	Stationary Power Tools	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B225	Test Engines	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B226	Test Fuel Injection Pump	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B227	Test Fuel Injector	C2B	Transmission Rebuilding Technician (Mechanic)

Task Code	Task Name	Job Code	Job Name
TC2B228	Test Hydraulic Pump	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B229	Test Transmission	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B230	Tool Room	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B234	Use Press	C2B	Transmission Rebuilding Technician (Mechanic)
TC2B239	Welding	C2B	Transmission Rebuilding Technician (Mechanic)
TC2C114	Break	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C119	Chemical Dip Tank	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C122	Cleaning	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C125	Compressed Air	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C127	Control Booth	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C130	Cutting Torch (acetylene)	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C132	Drive Fork Lift	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C149	Hammer	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C151	Hand Truck	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C155	Lunch	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C171	Office Work	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C175	Overhead Hoist/Pulley	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C181	Parts Washers	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C182	Planning Work	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C183	Power Hand Tools (pneumatic or electric)	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C186	Pumping Fluids	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C188	Repair	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C220	Spray with high pressure washer	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C222	Stationary Machine Use	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C223	Stationary Power Tools	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C225	Test Engines	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C226	Test Fuel Injection Pump	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C227	Test Fuel Injector	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C228	Test Hydraulic Pump	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C229	Test Transmission	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C230	Tool Room	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C234	Use Press	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2C239	Welding	C2C	Cylinder Head Rebuilding Technician (Mechanic)
TC2D114	Break	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D119	Chemical Dip Tank	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D122	Cleaning	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D125	Compressed Air	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D127	Control Booth	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D130	Cutting Torch (acetylene)	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D132	Drive Fork Lift	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D149	Hammer	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D151	Hand Truck	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D155	Lunch	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D171	Office Work	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D175	Overhead Hoist/Pulley	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D181	Parts Washers	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D182	Planning Work	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D183	Power Hand Tools (pneumatic or electric)	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D186	Pumping Fluids	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D188	Repair	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D220	Spray with high pressure washer	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D222	Stationary Machine Use	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D223	Stationary Power Tools	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D225	Test Engines	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D226	Test Fuel Injection Pump	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D227	Test Fuel Injector	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D228	Test Hydraulic Pump	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D229	Test Transmission	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D230	Tool Room	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D234	Use Press	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2D239	Welding	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
TC2E114	Break	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E119	Chemical Dip Tank	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E122	Cleaning	C2E	Fuel Injector Rebuilding Technician (Mechanic)

Task Code	Task Name	Job Code	Job Name
TC2E125	Compressed Air	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E127	Control Booth	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E130	Cutting Torch (acetylene)	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E132	Drive Fork Lift	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E149	Hammer	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E151	Hand Truck	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E155	Lunch	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E171	Office Work	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E175	Overhead Hoist/Pulley	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E181	Parts Washers	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E182	Planning Work	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E183	Power Hand Tools (pneumatic or electric)	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E186	Pumping Fluids	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E188	Repair	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E220	Spray with high pressure washer	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E222	Stationary Machine Use	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E223	Stationary Power Tools	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E225	Test Engines	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E226	Test Fuel Injection Pump	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E227	Test Fuel Injector	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E228	Test Hydraulic Pump	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E229	Test Transmission	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E230	Tool Room	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E234	Use Press	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC2E239	Welding	C2E	Fuel Injector Rebuilding Technician (Mechanic)
TC3A114	Break	C3A	Machinist - Operations Section
TC3A122	Cleaning	C3A	Machinist - Operations Section
TC3A125	Compressed Air	C3A	Machinist - Operations Section
TC3A130	Cutting Torch (acetylene)	C3A	Machinist - Operations Section
TC3A132	Drive Fork Lift	C3A	Machinist - Operations Section
TC3A141	Driving Service Car	C3A	Machinist - Operations Section
TC3A149	Hammer	C3A	Machinist - Operations Section
TC3A151	Hand Truck	C3A	Machinist - Operations Section
TC3A155	Lunch	C3A	Machinist - Operations Section
TC3A161	Metalizing	C3A	Machinist - Operations Section
TC3A171	Office Work	C3A	Machinist - Operations Section
TC3A175	Overhead Hoist/Pulley	C3A	Machinist - Operations Section
TC3A181	Parts Washers	C3A	Machinist - Operations Section
TC3A182	Planning Work	C3A	Machinist - Operations Section
TC3A183	Power Hand Tools (pneumatic or electric)	C3A	Machinist - Operations Section
TC3A188	Repair	C3A	Machinist - Operations Section
TC3A222	Stationary Machine Use	C3A	Machinist - Operations Section
TC3A223	Stationary Power Tools	C3A	Machinist - Operations Section
TC3A239	Welding	C3A	Machinist - Operations Section
TC3B114	Break	C3B	Machinist - Welding Section
TC3B122	Cleaning	C3B	Machinist - Welding Section
TC3B125	Compressed Air	C3B	Machinist - Welding Section
TC3B130	Cutting Torch (acetylene)	C3B	Machinist - Welding Section
TC3B132	Drive Fork Lift	C3B	Machinist - Welding Section
TC3B141	Driving Service Car	C3B	Machinist - Welding Section
TC3B149	Hammer	C3B	Machinist - Welding Section
TC3B151	Hand Truck	C3B	Machinist - Welding Section
TC3B155	Lunch	C3B	Machinist - Welding Section
TC3B161	Metalizing	C3B	Machinist - Welding Section
TC3B171	Office Work	C3B	Machinist - Welding Section
TC3B175	Overhead Hoist/Pulley	C3B	Machinist - Welding Section
TC3B181	Parts Washers	C3B	Machinist - Welding Section
TC3B182	Planning Work	C3B	Machinist - Welding Section
TC3B183	Power Hand Tools (pneumatic or electric)	C3B	Machinist - Welding Section
TC3B188	Repair	C3B	Machinist - Welding Section
TC3B222	Stationary Machine Use	C3B	Machinist - Welding Section
TC3B223	Stationary Power Tools	C3B	Machinist - Welding Section
TC3B239	Welding	C3B	Machinist - Welding Section
TC3C114	Break	C3C	Machinist - Bay 56/58

Task Code	Task Name	Job Code	Job Name
TC3C122	Cleaning	C3C	Machinist - Bay 56/58
TC3C125	Compressed Air	C3C	Machinist - Bay 56/58
TC3C130	Cutting Torch (acetylene)	C3C	Machinist - Bay 56/58
TC3C132	Drive Fork Lift	C3C	Machinist - Bay 56/58
TC3C141	Driving Service Car	C3C	Machinist - Bay 56/58
TC3C149	Hammer	C3C	Machinist - Bay 56/58
TC3C151	Hand Truck	C3C	Machinist - Bay 56/58
TC3C155	Lunch	C3C	Machinist - Bay 56/58
TC3C161	Metalizing	C3C	Machinist - Bay 56/58
TC3C171	Office Work	C3C	Machinist - Bay 56/58
TC3C175	Overhead Hoist/Pulley	C3C	Machinist - Bay 56/58
TC3C181	Parts Washers	C3C	Machinist - Bay 56/58
TC3C182	Planning Work	C3C	Machinist - Bay 56/58
TC3C183	Power Hand Tools (pneumatic or electric)	C3C	Machinist - Bay 56/58
TC3C188	Repair	C3C	Machinist - Bay 56/58
TC3C222	Stationary Machine Use	C3C	Machinist - Bay 56/58
TC3C223	Stationary Power Tools	C3C	Machinist - Bay 56/58
TC3C239	Welding	C3C	Machinist - Bay 56/58
TC4A114	Break	C4A	Welder
TC4A122	Cleaning	C4A	Welder
TC4A125	Compressed Air	C4A	Welder
TC4A130	Cutting Torch (acetylene)	C4A	Welder
TC4A132	Drive Fork Lift	C4A	Welder
TC4A149	Hammer	C4A	Welder
TC4A151	Hand Truck	C4A	Welder
TC4A155	Lunch	C4A	Welder
TC4A171	Office Work	C4A	Welder
TC4A175	Overhead Hoist/Pulley	C4A	Welder
TC4A182	Planning Work	C4A	Welder
TC4A183	Power Hand Tools (pneumatic or electric)	C4A	Welder
TC4A188	Repair	C4A	Welder
TC4A222	Stationary Machine Use	C4A	Welder
TC4A223	Stationary Power Tools	C4A	Welder
TC4A239	Welding	C4A	Welder
TC5A114	Break	C5A	Track Repair
TC5A122	Cleaning	C5A	Track Repair
TC5A125	Compressed Air	C5A	Track Repair
TC5A130	Cutting Torch (acetylene)	C5A	Track Repair
TC5A132	Drive Fork Lift	C5A	Track Repair
TC5A149	Hammer	C5A	Track Repair
TC5A151	Hand Truck	C5A	Track Repair
TC5A155	Lunch	C5A	Track Repair
TC5A171	Office Work	C5A	Track Repair
TC5A175	Overhead Hoist/Pulley	C5A	Track Repair
TC5A182	Planning Work	C5A	Track Repair
TC5A183	Power Hand Tools (pneumatic or electric)	C5A	Track Repair
TC5A188	Repair	C5A	Track Repair
TC5A220	Spray with high pressure washer	C5A	Track Repair
TC5A222	Stationary Machine Use	C5A	Track Repair
TC5A223	Stationary Power Tools	C5A	Track Repair
TC5B114	Break	C5B	Painter
TC5B122	Cleaning	C5B	Painter
TC5B125	Compressed Air	C5B	Painter
TC5B155	Lunch	C5B	Painter
TC5B171	Office Work	C5B	Painter
TC5B177	Paint Storage Room	C5B	Painter
TC5B178	Painting Activities	C5B	Painter
TC5B182	Planning Work	C5B	Painter
TC5B183	Power Hand Tools (pneumatic or electric)	C5B	Painter
TC5B219	Spray Painting	C5B	Painter
TC5B222	Stationary Machine Use	C5B	Painter

Machine Code	Machine Name	Job Code	Job Name
MA1A145	GN1	A1A	Thermoforming Operator
MA1A146	GN2	A1A	Thermoforming Operator
MA1A147	GN3	A1A	Thermoforming Operator
MA1A148	GN4	A1A	Thermoforming Operator
MA1A149	GN5	A1A	Thermoforming Operator
MA1A150	GN6	A1A	Thermoforming Operator
MA1A151	GN7	A1A	Thermoforming Operator
MA1A152	GN8	A1A	Thermoforming Operator
MA1A153	GN9	A1A	Thermoforming Operator
MA1A170	KK10	A1A	Thermoforming Operator
MA1A171	KK11	A1A	Thermoforming Operator
MA1A172	LG-23	A1A	Thermoforming Operator
MA1A173	LY-22	A1A	Thermoforming Operator
MA1A201	PI-21	A1A	Thermoforming Operator
MA1A202	PI-24	A1A	Thermoforming Operator
MA1A203	PI-25	A1A	Thermoforming Operator
MA1A204	PI-26	A1A	Thermoforming Operator
MA1A205	PI-27	A1A	Thermoforming Operator
MA1B145	GN1	A1B	Thermoforming General Aid
MA1B146	GN2	A1B	Thermoforming General Aid
MA1B147	GN3	A1B	Thermoforming General Aid
MA1B148	GN4	A1B	Thermoforming General Aid
MA1B149	GN5	A1B	Thermoforming General Aid
MA1B150	GN6	A1B	Thermoforming General Aid
MA1B151	GN7	A1B	Thermoforming General Aid
MA1B152	GN8	A1B	Thermoforming General Aid
MA1B153	GN9	A1B	Thermoforming General Aid
MA1B155	Grinder	A1B	Thermoforming General Aid
MA1B170	KK10	A1B	Thermoforming General Aid
MA1B171	KK11	A1B	Thermoforming General Aid
MA1B172	LG-23	A1B	Thermoforming General Aid
MA1B173	LY-22	A1B	Thermoforming General Aid
MA1B201	PI-21	A1B	Thermoforming General Aid
MA1B202	PI-24	A1B	Thermoforming General Aid
MA1B203	PI-25	A1B	Thermoforming General Aid
MA1B204	PI-26	A1B	Thermoforming General Aid
MA1B205	PI-27	A1B	Thermoforming General Aid
MA1C105	Air Gun	A1C	Thermoforming Mechanic
MA1C135	Drill	A1C	Thermoforming Mechanic
MA1C142	File	A1C	Thermoforming Mechanic
MA1C144	GN Location	A1C	Thermoforming Mechanic
MA1C145	GN1	A1C	Thermoforming Mechanic
MA1C146	GN2	A1C	Thermoforming Mechanic
MA1C147	GN3	A1C	Thermoforming Mechanic
MA1C148	GN4	A1C	Thermoforming Mechanic
MA1C149	GN5	A1C	Thermoforming Mechanic
MA1C150	GN6	A1C	Thermoforming Mechanic
MA1C151	GN7	A1C	Thermoforming Mechanic
MA1C152	GN8	A1C	Thermoforming Mechanic
MA1C153	GN9	A1C	Thermoforming Mechanic
MA1C162	Hammer	A1C	Thermoforming Mechanic
MA1C170	KK10	A1C	Thermoforming Mechanic
MA1C171	KK11	A1C	Thermoforming Mechanic
MA1C172	LG-23	A1C	Thermoforming Mechanic
MA1C173	LY-22	A1C	Thermoforming Mechanic
MA1C201	PI-21	A1C	Thermoforming Mechanic
MA1C202	PI-24	A1C	Thermoforming Mechanic
MA1C203	PI-25	A1C	Thermoforming Mechanic
MA1C204	PI-26	A1C	Thermoforming Mechanic
MA1C205	PI-27	A1C	Thermoforming Mechanic
MA1C210	Pneumatic Screwdriver	A1C	Thermoforming Mechanic
MA2A197	OPS #1	A2A	Extrusion Operator
MA2A198	OPS #2	A2A	Extrusion Operator

Machine Code	Machine Name	Job Code	Job Name
MA2A241	Slitter #1	A2A	Extrusion Operator
MA2A242	Slitter #2	A2A	Extrusion Operator
MA2B241	Slitter #1	A2B	Slitter Operator
MA2B242	Slitter #2	A2B	Slitter Operator
MA2B243	Slitter #3	A2B	Slitter Operator
MA2B244	Slitter #4	A2B	Slitter Operator
MA2B266	Tube Cutter #1	A2B	Slitter Operator
MA2B267	Tube Cutter #2	A2B	Slitter Operator
MA2B275	Winder #1	A2B	Slitter Operator
MA2B276	Winder #2	A2B	Slitter Operator
MA2B277	Winder #3	A2B	Slitter Operator
MA2C241	Slitter #1	A2C	Weigh Station Operator
MA2C242	Slitter #2	A2C	Weigh Station Operator
MA2C243	Slitter #3	A2C	Weigh Station Operator
MA2C244	Slitter #4	A2C	Weigh Station Operator
MA2C275	Winder #1	A2C	Weigh Station Operator
MA2C276	Winder #2	A2C	Weigh Station Operator
MA2C277	Winder #3	A2C	Weigh Station Operator
MA2D156	Grinder #1	A2D	Grinder Operator
MA2D157	Grinder #2	A2D	Grinder Operator
MA2D158	Grinder #3	A2D	Grinder Operator
MA2D159	Grinder #4	A2D	Grinder Operator
MA2E101	#1	A2E	Pelletizer
MA2E102	#2	A2E	Pelletizer
MA2E156	Grinder #1	A2E	Pelletizer
MA3A111	Bench Mold Lathe T1 (LAV-MOU-TOU-1)	A3A	Mold Machinist
MA3A118	CNC Machine (LAV-MOU-CNC-1)	A3A	Mold Machinist
MA3A121	Compressed Air	A3A	Mold Machinist
MA3A135	Drill	A3A	Mold Machinist
MA3A136	Drill Press	A3A	Mold Machinist
MA3A137	Drill Press (LAV-MOU-DRI-1)	A3A	Mold Machinist
MA3A138	Drill Press (LAV-MOU-DRI-2)	A3A	Mold Machinist
MA3A139	Drill Press (LAV-MOU-DRI-3)	A3A	Mold Machinist
MA3A141	Elevator Hand Truck (LAV-MOU-ELE-4)	A3A	Mold Machinist
MA3A155	Grinder	A3A	Mold Machinist
MA3A160	Grinder (LAV-MOU-GRI-1)	A3A	Mold Machinist
MA3A161	Grinder (LAV-MOU-GRI-2)	A3A	Mold Machinist
MA3A162	Hammer	A3A	Mold Machinist
MA3A175	Lathe (LAV-MAI-TOU-2)	A3A	Mold Machinist
MA3A192	Milling F1 Mold (LAV-MOU-MIL-1)	A3A	Mold Machinist
MA3A193	Milling F2 Mold (LAV-MOU-MIL-2)	A3A	Mold Machinist
MA3A194	Milling F3 Mold (LAV-MOU-MIL-3)	A3A	Mold Machinist
MA3A195	Milling Machine	A3A	Mold Machinist
MA3A211	Pneumatic Tools - Band Polisher	A3A	Mold Machinist
MA3A212	Pneumatic Tools - Band Polisher #1	A3A	Mold Machinist
MA3A213	Pneumatic Tools - Band Polisher #2	A3A	Mold Machinist
MA3A214	Pneumatic Tools - Band Polisher #3	A3A	Mold Machinist
MA3A215	Pneumatic Tools - Disc Polisher	A3A	Mold Machinist
MA3A216	Pneumatic Tools - Drill to Drill Vacuum Holes	A3A	Mold Machinist
MA3A233	Sander	A3A	Mold Machinist
MA3A238	Scouring Pad	A3A	Mold Machinist
MA3A260	Taroder Drill (LAV-MOU-TAR-1)	A3A	Mold Machinist
MA3A265	Transfer Point	A3A	Mold Machinist
MA3A269	Vacuum Former	A3A	Mold Machinist
MA3A271	Vertical Band Saw (LAV-MOU-VBS-1)	A3A	Mold Machinist
MA3A274	Welder	A3A	Mold Machinist
MA4A122	Compressor #2	A4A	Maintenance Mechanic
MA4A123	Compressor #3	A4A	Maintenance Mechanic
MA4A124	Compressor #5	A4A	Maintenance Mechanic
MA4A162	Hammer	A4A	Maintenance Mechanic
MA4A198	OPS #2	A4A	Maintenance Mechanic
MA4A237	Saw	A4A	Maintenance Mechanic
MA4B125	Condensateur (extrusion)	A4B	Maintenance Electrician
MA4B198	OPS #2	A4B	Maintenance Electrician

Machine Code	Machine Name	Job Code	Job Name
MA4C268	Vacuum Cleaner	A4C	Plant Maintenance
		A5A	Fork Lift Driver
		B1A	Decorator
MB1B106	Air Wrench	B1B	Stretcher Operator
MB1B107	Aluminum Compactor	B1B	Stretcher Operator
MB1B119	Can Washer	B1B	Stretcher Operator
MB1B155	Grinder	B1B	Stretcher Operator
MB1B195	Milling Machine	B1B	Stretcher Operator
MB1B217	Polisher	B1B	Stretcher Operator
MB1B220	Press	B1B	Stretcher Operator
MB1B233	Sander	B1B	Stretcher Operator
MB1B255	Stretcher	B1B	Stretcher Operator
MB1C106	Air Wrench	B1C	Stretcher Mechanic
MB1C107	Aluminum Compactor	B1C	Stretcher Mechanic
MB1C119	Can Washer	B1C	Stretcher Mechanic
MB1C155	Grinder	B1C	Stretcher Mechanic
MB1C195	Milling Machine	B1C	Stretcher Mechanic
MB1C217	Polisher	B1C	Stretcher Mechanic
MB1C220	Press	B1C	Stretcher Mechanic
MB1C233	Sander	B1C	Stretcher Mechanic
MB1C255	Stretcher	B1C	Stretcher Mechanic
MB1D107	Aluminum Compactor	B1D	Mechanic - Canning Department (General Mechanic)
MB1D108	Anti Pollution Sheet	B1D	Mechanic - Canning Department (General Mechanic)
MB1D112	Body Varnish Machine	B1D	Mechanic - Canning Department (General Mechanic)
MB1D120	Coater	B1D	Mechanic - Canning Department (General Mechanic)
MB1D121	Compressed Air	B1D	Mechanic - Canning Department (General Mechanic)
MB1D126	Conveyor	B1D	Mechanic - Canning Department (General Mechanic)
MB1D132	Cyclone	B1D	Mechanic - Canning Department (General Mechanic)
MB1D134	Decorator	B1D	Mechanic - Canning Department (General Mechanic)
MB1D135	Drill	B1D	Mechanic - Canning Department (General Mechanic)
MB1D136	Drill Press	B1D	Mechanic - Canning Department (General Mechanic)
MB1D140	Duster	B1D	Mechanic - Canning Department (General Mechanic)
MB1D143	Flanger	B1D	Mechanic - Canning Department (General Mechanic)
MB1D155	Grinder	B1D	Mechanic - Canning Department (General Mechanic)
MB1D162	Hammer	B1D	Mechanic - Canning Department (General Mechanic)
MB1D169	Incinerator (Damper)	B1D	Mechanic - Canning Department (General Mechanic)
MB1D174	Lathe	B1D	Mechanic - Canning Department (General Mechanic)
MB1D182	Light Test Machine	B1D	Mechanic - Canning Department (General Mechanic)
MB1D195	Milling Machine	B1D	Mechanic - Canning Department (General Mechanic)
MB1D196	Necker	B1D	Mechanic - Canning Department (General Mechanic)
MB1D206	Palletizer	B1D	Mechanic - Canning Department (General Mechanic)
MB1D226	Press (Canning)	B1D	Mechanic - Canning Department (General Mechanic)
MB1D230	Recycling Machine	B1D	Mechanic - Canning Department (General Mechanic)
MB1D233	Sander	B1D	Mechanic - Canning Department (General Mechanic)
MB1D237	Saw	B1D	Mechanic - Canning Department (General Mechanic)
MB1D240	Shear Press	B1D	Mechanic - Canning Department (General Mechanic)
MB1D245	Spin Necker Flanger	B1D	Mechanic - Canning Department (General Mechanic)
MB1D246	Spray Cleaning Machine	B1D	Mechanic - Canning Department (General Mechanic)
MB1D254	Strapping Machine	B1D	Mechanic - Canning Department (General Mechanic)
MB1D255	Stretcher	B1D	Mechanic - Canning Department (General Mechanic)
MB1D272	Washer/Dryer	B1D	Mechanic - Canning Department (General Mechanic)
MB1D273	Waxer	B1D	Mechanic - Canning Department (General Mechanic)
MB1D274	Welder	B1D	Mechanic - Canning Department (General Mechanic)
MB1D278	Wrapper	B1D	Mechanic - Canning Department (General Mechanic)
MB1E107	Aluminum Compactor	B1E	Mechanic - Rear Section
MB1E108	Anti Pollution Sheet	B1E	Mechanic - Rear Section
MB1E112	Body Varnish Machine	B1E	Mechanic - Rear Section
MB1E120	Coater	B1E	Mechanic - Rear Section
MB1E121	Compressed Air	B1E	Mechanic - Rear Section
MB1E126	Conveyor	B1E	Mechanic - Rear Section
MB1E132	Cyclone	B1E	Mechanic - Rear Section
MB1E134	Decorator	B1E	Mechanic - Rear Section
MB1E135	Drill	B1E	Mechanic - Rear Section
MB1E136	Drill Press	B1E	Mechanic - Rear Section

Machine Code	Machine Name	Job Code	Job Name
MB1E140	Duster	B1E	Mechanic - Rear Section
MB1E143	Flanger	B1E	Mechanic - Rear Section
MB1E155	Grinder	B1E	Mechanic - Rear Section
MB1E162	Hammer	B1E	Mechanic - Rear Section
MB1E169	Incinerator (Damper)	B1E	Mechanic - Rear Section
MB1E174	Lathe	B1E	Mechanic - Rear Section
MB1E182	Light Test Machine	B1E	Mechanic - Rear Section
MB1E195	Milling Machine	B1E	Mechanic - Rear Section
MB1E196	Necker	B1E	Mechanic - Rear Section
MB1E206	Palletizer	B1E	Mechanic - Rear Section
MB1E226	Press (Canning)	B1E	Mechanic - Rear Section
MB1E230	Recycling Machine	B1E	Mechanic - Rear Section
MB1E233	Sander	B1E	Mechanic - Rear Section
MB1E237	Saw	B1E	Mechanic - Rear Section
MB1E240	Shear Press	B1E	Mechanic - Rear Section
MB1E245	Spin Necker Flanger	B1E	Mechanic - Rear Section
MB1E246	Spray Cleaning Machine	B1E	Mechanic - Rear Section
MB1E254	Strapping Machine	B1E	Mechanic - Rear Section
MB1E255	Stretchers	B1E	Mechanic - Rear Section
MB1E272	Washer/Dryer	B1E	Mechanic - Rear Section
MB1E273	Waxer	B1E	Mechanic - Rear Section
MB1E274	Welder	B1E	Mechanic - Rear Section
MB1E278	Wrapper	B1E	Mechanic - Rear Section
		B1F	Department Aid
		B1G	Packaging Operator
MB2A127	Counter #1	B2A	Counting Operator
MB2A128	Counter #2	B2A	Counting Operator
MB2A129	Counter #3	B2A	Counting Operator
MB2A130	Counter #4	B2A	Counting Operator
MB2B221	Press #1	B2B	Press Operator
MB2B222	Press #2	B2B	Press Operator
MB2B223	Press #3	B2B	Press Operator
MB2B224	Press #4	B2B	Press Operator
MB2B225	Press #5	B2B	Press Operator
		B2C	Rotary Operator
		B3A	Printing Press
		B3B	Varnisher (Coater)
		B3C	Measurer
MC1A104	Air Drill	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A106	Air Wrench	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A117	Buffing Machine	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A121	Compressed Air	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A133	Deboring	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A136	Drill Press	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A154	Grease Pump	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A155	Grinder	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A162	Hammer	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A167	Hydraulic Press	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A199	Oil Pump	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A200	Overhead Hoist/Pulley	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A208	Pedestal Grinder	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A217	Polisher	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A229	Pressure Washer	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A232	Sandblast Box	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A233	Sander	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A237	Saw	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A248	Stationary Grinder	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A250	Stationary Saw	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A261	Torch	C1A	Heavy Equipment Repair Technician (Mechanic)
MC1A264	Track Welding Machine	C1A	Heavy Equipment Repair Technician (Mechanic)
MC2A106	Air Wrench	C2A	Motor Rebuilding Technician (Mechanic)
MC2A110	Bearing Heater	C2A	Motor Rebuilding Technician (Mechanic)
MC2A117	Buffing Machine	C2A	Motor Rebuilding Technician (Mechanic)
MC2A121	Compressed Air	C2A	Motor Rebuilding Technician (Mechanic)

Machine Code	Machine Name	Job Code	Job Name
MC2A136	Drill Press	C2A	Motor Rebuilding Technician (Mechanic)
MC2A154	Grease Pump	C2A	Motor Rebuilding Technician (Mechanic)
MC2A155	Grinder	C2A	Motor Rebuilding Technician (Mechanic)
MC2A162	Hammer	C2A	Motor Rebuilding Technician (Mechanic)
MC2A163	Hand Truck	C2A	Motor Rebuilding Technician (Mechanic)
MC2A166	Hydraulic Cylinder Activator	C2A	Motor Rebuilding Technician (Mechanic)
MC2A167	Hydraulic Press	C2A	Motor Rebuilding Technician (Mechanic)
MC2A200	Overhead Hoist/Pulley	C2A	Motor Rebuilding Technician (Mechanic)
MC2A207	Parts Washer	C2A	Motor Rebuilding Technician (Mechanic)
MC2A217	Polisher	C2A	Motor Rebuilding Technician (Mechanic)
MC2A229	Pressure Washer	C2A	Motor Rebuilding Technician (Mechanic)
MC2A231	Rotary File	C2A	Motor Rebuilding Technician (Mechanic)
MC2A232	Sandblast Box	C2A	Motor Rebuilding Technician (Mechanic)
MC2A233	Sander	C2A	Motor Rebuilding Technician (Mechanic)
MC2A248	Stationary Grinder	C2A	Motor Rebuilding Technician (Mechanic)
MC2A250	Stationary Saw	C2A	Motor Rebuilding Technician (Mechanic)
MC2A253	Stone Resurfacer	C2A	Motor Rebuilding Technician (Mechanic)
MC2A259	Surfacer	C2A	Motor Rebuilding Technician (Mechanic)
MC2A261	Torch	C2A	Motor Rebuilding Technician (Mechanic)
MC2A270	Valve Grinder	C2A	Motor Rebuilding Technician (Mechanic)
MC2B106	Air Wrench	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B110	Bearing Heater	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B117	Buffing Machine	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B121	Compressed Air	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B136	Drill Press	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B154	Grease Pump	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B155	Grinder	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B162	Hammer	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B163	Hand Truck	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B166	Hydraulic Cylinder Activator	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B167	Hydraulic Press	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B200	Overhead Hoist/Pulley	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B207	Parts Washer	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B217	Polisher	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B229	Pressure Washer	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B231	Rotary File	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B232	Sandblast Box	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B233	Sander	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B248	Stationary Grinder	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B250	Stationary Saw	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B253	Stone Resurfacer	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B259	Surfacer	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B261	Torch	C2B	Transmission Rebuilding Technician (Mechanic)
MC2B270	Valve Grinder	C2B	Transmission Rebuilding Technician (Mechanic)
MC2C106	Air Wrench	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C110	Bearing Heater	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C117	Buffing Machine	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C121	Compressed Air	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C135	Drill	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C136	Drill Press	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C154	Grease Pump	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C155	Grinder	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C162	Hammer	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C163	Hand Truck	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C166	Hydraulic Cylinder Activator	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C167	Hydraulic Press	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C200	Overhead Hoist/Pulley	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C207	Parts Washer	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C217	Polisher	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C229	Pressure Washer	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C231	Rotary File	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C232	Sandblast Box	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C233	Sander	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C248	Stationary Grinder	C2C	Cylinder Head Rebuilding Technician (Mechanic)

Machine Code	Machine Name	Job Code	Job Name
MC2C250	Stationary Saw	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C253	Stone Resurfacer	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C259	Surfacer	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C261	Torch	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2C270	Valve Grinder	C2C	Cylinder Head Rebuilding Technician (Mechanic)
MC2D106	Air Wrench	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D110	Bearing Heater	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D117	Buffing Machine	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D121	Compressed Air	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D136	Drill Press	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D154	Grease Pump	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D155	Grinder	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D162	Hammer	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D163	Hand Truck	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D166	Hydraulic Cylinder Activator	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D167	Hydraulic Press	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D200	Overhead Hoist/Pulley	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D207	Parts Washer	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D217	Polisher	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D229	Pressure Washer	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D231	Rotary File	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D232	Sandblast Box	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D233	Sander	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D248	Stationary Grinder	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D250	Stationary Saw	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D253	Stone Resurfacer	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D259	Surfacer	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D261	Torch	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2D270	Valve Grinder	C2D	Hydraulic Pump Rebuilding Technician (Mechanic)
MC2E106	Air Wrench	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E110	Bearing Heater	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E117	Buffing Machine	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E121	Compressed Air	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E136	Drill Press	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E154	Grease Pump	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E155	Grinder	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E162	Hammer	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E163	Hand Truck	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E166	Hydraulic Cylinder Activator	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E167	Hydraulic Press	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E200	Overhead Hoist/Pulley	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E207	Parts Washer	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E217	Polisher	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E229	Pressure Washer	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E231	Rotary File	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E232	Sandblast Box	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E233	Sander	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E248	Stationary Grinder	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E250	Stationary Saw	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E253	Stone Resurfacer	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E259	Surfacer	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E261	Torch	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC2E270	Valve Grinder	C2E	Fuel Injector Rebuilding Technician (Mechanic)
MC3A106	Air Wrench	C3A	Machinist - Operations Section
MC3A110	Bearing Heater	C3A	Machinist - Operations Section
MC3A114	Boring Machine	C3A	Machinist - Operations Section
MC3A115	Boring Mill 73-1	C3A	Machinist - Operations Section
MC3A116	Boring Mill 73-2	C3A	Machinist - Operations Section
MC3A117	Buffing Machine	C3A	Machinist - Operations Section
MC3A121	Compressed Air	C3A	Machinist - Operations Section
MC3A135	Drill	C3A	Machinist - Operations Section
MC3A136	Drill Press	C3A	Machinist - Operations Section
MC3A155	Grinder	C3A	Machinist - Operations Section
MC3A164	Honing Machine	C3A	Machinist - Operations Section

Machine Code	Machine Name	Job Code	Job Name
MC3A165	Honing Machine 56-12	C3A	Machinist - Operations Section
MC3A166	Hydraulic Cylinder Activator	C3A	Machinist - Operations Section
MC3A167	Hydraulic Press	C3A	Machinist - Operations Section
MC3A174	Lathe	C3A	Machinist - Operations Section
MC3A176	Lathe (Tour 50-1)	C3A	Machinist - Operations Section
MC3A177	Lathe (Tour 50-3)	C3A	Machinist - Operations Section
MC3A178	Lathe (Tour 50-4)	C3A	Machinist - Operations Section
MC3A179	Lathe (Tour 50-5)	C3A	Machinist - Operations Section
MC3A180	Lathe (Tour 50-6)	C3A	Machinist - Operations Section
MC3A181	Lathe 73-8	C3A	Machinist - Operations Section
MC3A184	Machining Drill	C3A	Machinist - Operations Section
MC3A185	Machining Drill 50-7	C3A	Machinist - Operations Section
MC3A186	MagnaFlux 56-10	C3A	Machinist - Operations Section
MC3A187	Metal Enlarger Machine	C3A	Machinist - Operations Section
MC3A188	Metalizing Gun	C3A	Machinist - Operations Section
MC3A189	Milling 50-10	C3A	Machinist - Operations Section
MC3A190	Milling 50-11	C3A	Machinist - Operations Section
MC3A191	Milling 50-9	C3A	Machinist - Operations Section
MC3A195	Milling Machine	C3A	Machinist - Operations Section
MC3A200	Overhead Hoist/Pulley	C3A	Machinist - Operations Section
MC3A218	Polisher 56-8	C3A	Machinist - Operations Section
MC3A219	Polisher/Sander	C3A	Machinist - Operations Section
MC3A232	Sandblast Box	C3A	Machinist - Operations Section
MC3A233	Sander	C3A	Machinist - Operations Section
MC3A234	Sander #1 (hand held)	C3A	Machinist - Operations Section
MC3A235	Sander #2 (hand held)	C3A	Machinist - Operations Section
MC3A247	Stationary Circular Saw	C3A	Machinist - Operations Section
MC3A248	Stationary Grinder	C3A	Machinist - Operations Section
MC3A250	Stationary Saw	C3A	Machinist - Operations Section
MC3A251	Stationary Saw 73-3	C3A	Machinist - Operations Section
MC3A256	Surface Grinder	C3A	Machinist - Operations Section
MC3A257	Surface Grinder 50-8	C3A	Machinist - Operations Section
MC3A258	Surface Grinder 56-1	C3A	Machinist - Operations Section
MC3B106	Air Wrench	C3B	Machinist - Welding Section
MC3B110	Bearing Heater	C3B	Machinist - Welding Section
MC3B114	Boring Machine	C3B	Machinist - Welding Section
MC3B115	Boring Mill 73-1	C3B	Machinist - Welding Section
MC3B116	Boring Mill 73-2	C3B	Machinist - Welding Section
MC3B117	Buffing Machine	C3B	Machinist - Welding Section
MC3B121	Compressed Air	C3B	Machinist - Welding Section
MC3B135	Drill	C3B	Machinist - Welding Section
MC3B136	Drill Press	C3B	Machinist - Welding Section
MC3B155	Grinder	C3B	Machinist - Welding Section
MC3B164	Honing Machine	C3B	Machinist - Welding Section
MC3B165	Honing Machine 56-12	C3B	Machinist - Welding Section
MC3B166	Hydraulic Cylinder Activator	C3B	Machinist - Welding Section
MC3B167	Hydraulic Press	C3B	Machinist - Welding Section
MC3B174	Lathe	C3B	Machinist - Welding Section
MC3B176	Lathe (Tour 50-1)	C3B	Machinist - Welding Section
MC3B177	Lathe (Tour 50-3)	C3B	Machinist - Welding Section
MC3B178	Lathe (Tour 50-4)	C3B	Machinist - Welding Section
MC3B179	Lathe (Tour 50-5)	C3B	Machinist - Welding Section
MC3B180	Lathe (Tour 50-6)	C3B	Machinist - Welding Section
MC3B181	Lathe 73-8	C3B	Machinist - Welding Section
MC3B184	Machining Drill	C3B	Machinist - Welding Section
MC3B185	Machining Drill 50-7	C3B	Machinist - Welding Section
MC3B186	MagnaFlux 56-10	C3B	Machinist - Welding Section
MC3B187	Metal Enlarger Machine	C3B	Machinist - Welding Section
MC3B188	Metalizing Gun	C3B	Machinist - Welding Section
MC3B189	Milling 50-10	C3B	Machinist - Welding Section
MC3B190	Milling 50-11	C3B	Machinist - Welding Section
MC3B191	Milling 50-9	C3B	Machinist - Welding Section
MC3B195	Milling Machine	C3B	Machinist - Welding Section
MC3B200	Overhead Hoist/Pulley	C3B	Machinist - Welding Section

Machine Code	Machine Name	Job Code	Job Name
MC3B218	Polisher 56-8	C3B	Machinist - Welding Section
MC3B219	Polisher/Sander	C3B	Machinist - Welding Section
MC3B232	Sandblast Box	C3B	Machinist - Welding Section
MC3B233	Sander	C3B	Machinist - Welding Section
MC3B234	Sander #1 (hand held)	C3B	Machinist - Welding Section
MC3B235	Sander #2 (hand held)	C3B	Machinist - Welding Section
MC3B247	Stationary Circular Saw	C3B	Machinist - Welding Section
MC3B248	Stationary Grinder	C3B	Machinist - Welding Section
MC3B250	Stationary Saw	C3B	Machinist - Welding Section
MC3B251	Stationary Saw 73-3	C3B	Machinist - Welding Section
MC3B256	Surface Grinder	C3B	Machinist - Welding Section
MC3B257	Surface Grinder 50-8	C3B	Machinist - Welding Section
MC3B258	Surface Grinder 56-1	C3B	Machinist - Welding Section
MC3C106	Air Wrench	C3C	Machinist - Bay 56/58
MC3C110	Bearing Heater	C3C	Machinist - Bay 56/58
MC3C114	Boring Machine	C3C	Machinist - Bay 56/58
MC3C115	Boring Mill 73-1	C3C	Machinist - Bay 56/58
MC3C116	Boring Mill 73-2	C3C	Machinist - Bay 56/58
MC3C117	Buffing Machine	C3C	Machinist - Bay 56/58
MC3C121	Compressed Air	C3C	Machinist - Bay 56/58
MC3C135	Drill	C3C	Machinist - Bay 56/58
MC3C136	Drill Press	C3C	Machinist - Bay 56/58
MC3C155	Grinder	C3C	Machinist - Bay 56/58
MC3C164	Honing Machine	C3C	Machinist - Bay 56/58
MC3C165	Honing Machine 56-12	C3C	Machinist - Bay 56/58
MC3C166	Hydraulic Cylinder Activator	C3C	Machinist - Bay 56/58
MC3C167	Hydraulic Press	C3C	Machinist - Bay 56/58
MC3C174	Lathe	C3C	Machinist - Bay 56/58
MC3C176	Lathe (Tour 50-1)	C3C	Machinist - Bay 56/58
MC3C177	Lathe (Tour 50-3)	C3C	Machinist - Bay 56/58
MC3C178	Lathe (Tour 50-4)	C3C	Machinist - Bay 56/58
MC3C179	Lathe (Tour 50-5)	C3C	Machinist - Bay 56/58
MC3C180	Lathe (Tour 50-6)	C3C	Machinist - Bay 56/58
MC3C181	Lathe 73-8	C3C	Machinist - Bay 56/58
MC3C184	Machining Drill	C3C	Machinist - Bay 56/58
MC3C185	Machining Drill 50-7	C3C	Machinist - Bay 56/58
MC3C186	MagnaFlux 56-10	C3C	Machinist - Bay 56/58
MC3C187	Metal Enlarger Machine	C3C	Machinist - Bay 56/58
MC3C188	Metalizing Gun	C3C	Machinist - Bay 56/58
MC3C189	Milling 50-10	C3C	Machinist - Bay 56/58
MC3C190	Milling 50-11	C3C	Machinist - Bay 56/58
MC3C191	Milling 50-9	C3C	Machinist - Bay 56/58
MC3C195	Milling Machine	C3C	Machinist - Bay 56/58
MC3C200	Overhead Hoist/Pulley	C3C	Machinist - Bay 56/58
MC3C218	Polisher 56-8	C3C	Machinist - Bay 56/58
MC3C219	Polisher/Sander	C3C	Machinist - Bay 56/58
MC3C232	Sandblast Box	C3C	Machinist - Bay 56/58
MC3C233	Sander	C3C	Machinist - Bay 56/58
MC3C234	Sander #1 (hand held)	C3C	Machinist - Bay 56/58
MC3C235	Sander #2 (hand held)	C3C	Machinist - Bay 56/58
MC3C247	Stationary Circular Saw	C3C	Machinist - Bay 56/58
MC3C248	Stationary Grinder	C3C	Machinist - Bay 56/58
MC3C250	Stationary Saw	C3C	Machinist - Bay 56/58
MC3C251	Stationary Saw 73-3	C3C	Machinist - Bay 56/58
MC3C256	Surface Grinder	C3C	Machinist - Bay 56/58
MC3C257	Surface Grinder 50-8	C3C	Machinist - Bay 56/58
MC3C258	Surface Grinder 56-1	C3C	Machinist - Bay 56/58
MC3C261	Torch	C3C	Machinist - Bay 56/58
MC4A103	Air Chipper	C4A	Welder
MC4A106	Air Wrench	C4A	Welder
MC4A109	Arc-Air Welder	C4A	Welder
MC4A121	Compressed Air	C4A	Welder
MC4A131	Cutting Torch	C4A	Welder
MC4A136	Drill Press	C4A	Welder

Machine Code	Machine Name	Job Code	Job Name
MC4A155	Grinder	C4A	Welder
MC4A162	Hammer	C4A	Welder
MC4A167	Hydraulic Press	C4A	Welder
MC4A168	Hydraulic Pump	C4A	Welder
MC4A183	MIG Welder	C4A	Welder
MC4A200	Overhead Hoist/Pulley	C4A	Welder
MC4A219	Polisher/Sander	C4A	Welder
MC4A231	Rotary File	C4A	Welder
MC4A232	Sandblast Box	C4A	Welder
MC4A233	Sander	C4A	Welder
MC4A236	Sander - Belt Sander	C4A	Welder
MC4A237	Saw	C4A	Welder
MC4A239	Semi-Automatic Welder	C4A	Welder
MC4A249	Stationary Sander 73-4	C4A	Welder
MC4A252	Stationary Saw 73-6	C4A	Welder
MC4A262	Torch Cutting Machine 75-2 (Bay 75)	C4A	Welder
MC4A274	Welder	C4A	Welder
MC5A106	Air Wrench	C5A	Track Repair
MC5A113	Bolt Wrench 72-1	C5A	Track Repair
MC5A155	Grinder	C5A	Track Repair
MC5A162	Hammer	C5A	Track Repair
MC5A200	Overhead Hoist/Pulley	C5A	Track Repair
MC5A209	Pin Press 72-2	C5A	Track Repair
MC5A227	Press 72-5	C5A	Track Repair
MC5A228	Press Roller 70-3	C5A	Track Repair
MC5A232	Sandblast Box	C5A	Track Repair
MC5A233	Sander	C5A	Track Repair
MC5A279	Track Press	C5A	Track Repair
MC5A280	Centurian Idler	C5A	Track Repair
MC5B121	Compressed Air	C5B	Painter
MC5B167	Hydraulic Press	C5B	Painter
MC5B184	Machining Drill	C5B	Painter
MC5B195	Milling Machine	C5B	Painter
MC5B219	Polisher/Sander	C5B	Painter
MC5B233	Sander	C5B	Painter
MC5B263	Track Roller Machine	C5B	Painter

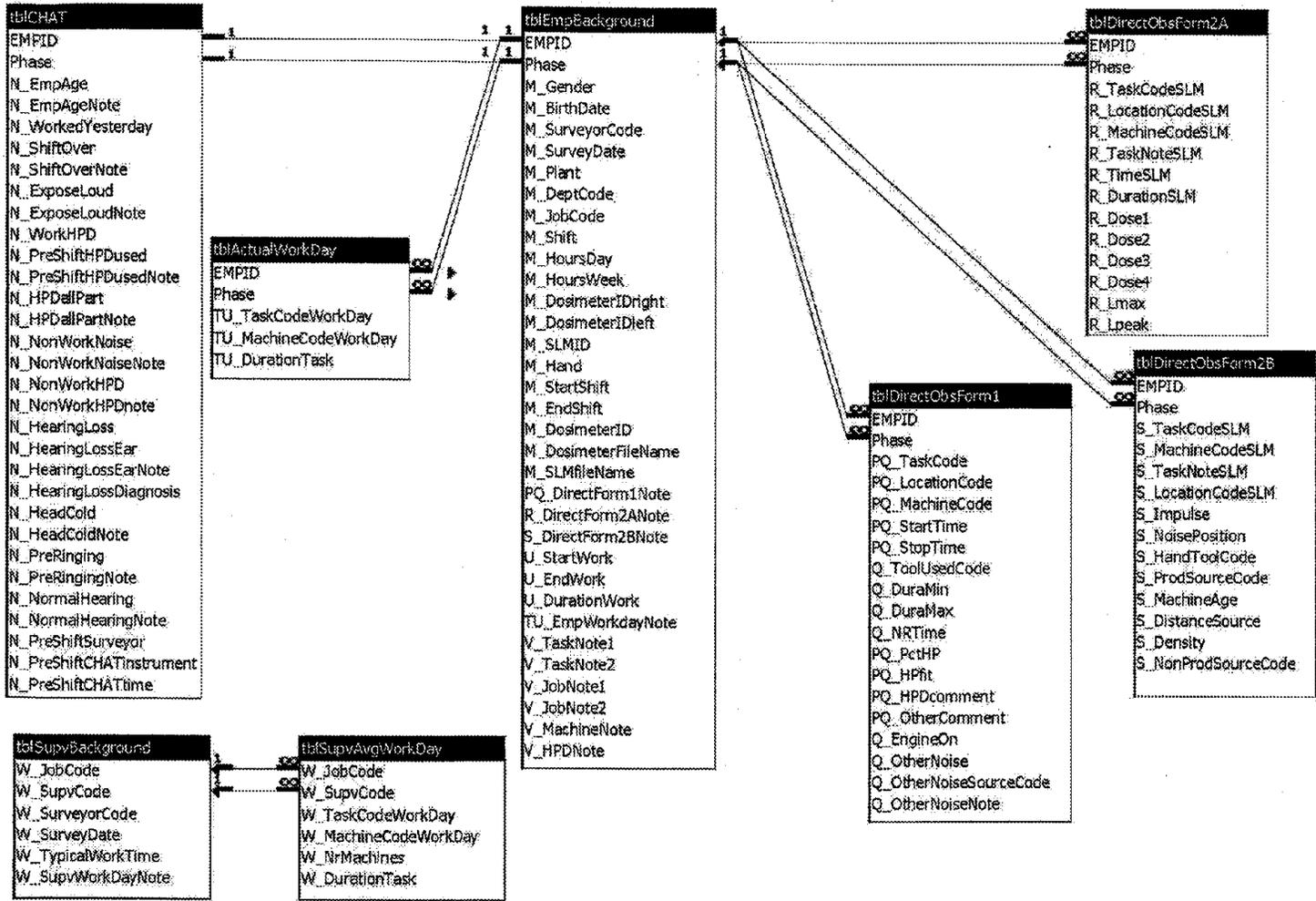
Plant	Plant	Plant	Code	Hearing Protection
A	B		HP01	3M 1100 (orange) (NRR29)
A			HP02	Bilsom Perfit (green with cord) (NRR26)
		C	HP03	Bilsom Viking (ear muff) (NRR29)
		C	HP04	Bilsom Warrior (ear muff) (NRR23)
		C	HP05	Brown Earmuffs (unknown type) (NRR?)
		C	HP06	CaboFlex Model:600 (NRR20)
A	B	C	HP07	EAR Classic (NRR29)
A			HP08	EAR EZ Fit (NRR28)
A	B	C	HP09	Ear Muff (unknown type) (NRR?)
A			HP10	Ear Plug (unknown type) (NRR29)
A	B	C	HP11	Ear Plug (unknown type) (NRR?)
A			HP12	EAR Taperfit 2 (yellow) (NRR32)
A		C	HP13	EAR Ultrafit (NRR25)
A			HP14	EAR Ultralite (NRR?)
A			HP15	EasyFit (NRR22)
A			HP16	Howard Leight Max Lite (NRR30)
A	B	C	HP17	Molded Ear Plug (custom molded) (NRR?)
A	B	C	HP18	Peltor (green or yellow ear muff) (NRR22)
		C	HP19	Peltor (H7 ear muff) (NRR22)

Plant	Code	Location
A	LA01	2nd Floor Extrusion
A	LA02	Cafeteria
A	LA03	Compressor Room
A	LA04	Cooling Towers
A	LA05	Electric Room
A	LA06	Electrician Department
A	LA07	Expedition
A	LA08	Extrusion
A	LA09	Extrusion Cafeteria
A	LA10	Grinder Room in Extrusion
A	LA11	Grinder Room in Thermoforming
A	LA12	Inside
A	LA13	Lamination
A	LA14	Lamination Cafeteria
A	LA15	Mechanic Department
A	LA16	Mechanic Room Near Electrician Office
A	LA17	Mechanic Room Near Thermo
A	LA18	Mold Department
A	LA19	Mold Room (Mold Shop in Thermoforming Dept)
A	LA20	Near the Entrance of the Van Container
A	LA21	Near the Grinder
A	LA22	Office (Supervisor Office 102A, 1st Floor)
A	LA23	Outside
A	LA24	Pelletizer
A	LA25	Roof
A	LA26	Shipping
A	LA27	Stairwell
A	LA28	Storage Room
A	LA29	Thermo Cafeteria
A	LA30	Thermo Shop
A	LA31	Thermoforming (Thermo)
A	LA32	Warehouse
A	LA33	Restroom
B	LB01	Assembly
B	LB02	Cafeteria
B	LB03	Canning (Test Room)
B	LB04	Canning (Warehouse)
B	LB05	Canning Break Room
B	LB06	Canning (Cannette)
B	LB07	Car
B	LB08	Change Room
B	LB09	Chemical Storage Room
B	LB10	Decorator (Decoration)
B	LB11	Inside
B	LB12	Mechanic Shop (Machine Shop)

Plant	Code	Location
B	LB13	Office (Canning Office)
B	LB14	Outside
B	LB15	Outside Assembly Area
B	LB16	Outside Bench by Door
B	LB17	Outside Picnic Table
B	LB18	Palletizer
B	LB19	Pallets Area
B	LB20	Parts Storing Room
B	LB21	Production Area
B	LB22	Quality Control Office (Quality Control Room)
B	LB23	Recycling Area
B	LB24	Restaurant
B	LB25	Restroom
B	LB26	Roof
B	LB27	Shipping
B	LB28	Shower
B	LB29	Smoking Room
B	LB30	Stairs (Hall by Stairs)
B	LB31	Storage
B	LB32	Tin Room (Tin Smith)
B	LB33	Tool Room or Canning (Tool Room)
B	LB34	Women's Locker Room
B	LB35	Workstation (Rotary Computer Station)
B	LB36	Lithography
B	LB37	Lithography
C	LC01	Cyclone Room
C	LC02	Across from Bay 60
C	LC03	Bay 1-2
C	LC04	Bay 29
C	LC05	Bay 31
C	LC06	Bay 50 (Machine Shop)
C	LC07	Bay 51
C	LC08	Bay 52
C	LC09	Bay 53
C	LC10	Bay 54
C	LC11	Bay 55
C	LC12	Bay 56
C	LC13	Bay 58
C	LC14	Bay 60
C	LC15	Bay 61
C	LC16	Bay 62
C	LC17	Bay 63
C	LC18	Bay 64
C	LC19	Bay 65
C	LC20	Bay 66
C	LC21	Bay 67

Plant	Code	Location
C	LC22	Bay 68
C	LC23	Bay 69
C	LC24	Bay 70
C	LC25	Bay 71
C	LC26	Bay 72
C	LC27	Bay 73
C	LC28	Bay 74-1
C	LC29	Bay 75
C	LC30	Break Room (Microfish Room, CC12)
C	LC31	Break Table (in Bay 73)
C	LC32	Cafeteria
C	LC33	Calibration Lab (Calibration Room)
C	LC34	Control Room
C	LC35	Fuel Injection Room (Injection, Injection Lab, Injection Department)
C	LC36	Hydraulic Room (Hydraulic, Hydro-Pump Room)
C	LC37	Mechanic Section
C	LC38	Motor Rebuilding Section
C	LC39	Office (Service Office)
C	LC40	Outside
C	LC41	Outside Hydraulic Room
C	LC42	Outside Injection Room
C	LC43	Paint Shop
C	LC44	Test Room (Engine Test Room)
C	LC45	Tool Counter
C	LC46	Used Parts Department
C	LC47	Welding Section (Welding Area)
C	LC48	Work Bench
C	LC49	Inside
C	LC50	Restroom

Tool (Noise Source) Code	Tool (Noise Source) Name
NS01	Air Drill (Drill)
NS02	Air Fuel Pump
NS03	Air Grinder (Grinder, Hand Grinder)
NS04	Air Wrench (Impact Wrench)
NS05	Arc-Air
NS06	Backup Alarm
NS07	Boring Machine
NS08	Buzzer (Truck Buzzer)
NS09	Chemical Dip Tank (Metalizing, Metalizing Machine)
NS10	Compressed Air (Air Pressure)
NS11	Cutting Torch or Torch
NS12	Engine or Truck Engine
NS13	Engine Test (Engine in Test, Engine Test Room, Test Engine)
NS14	Fork Lift
NS15	Fuel Injection Pump (Fuel Injector Pump)
NS16	Generator
NS17	Hammer
NS18	Heater
NS19	Heavy Drill (Stationary Drill)
NS20	Honing Machine Bay 58
NS21	Lathe
NS22	Lathe 50-2
NS23	Lathe 50-5
NS24	Load Bench
NS25	Moving Equipment (Pulling Out Other Equipment, Operation of Other Equipment)
NS26	Oil Pump
NS27	Part Impact
NS28	Parts Washer (Washer Machine, Typhoon, Magnus)
NS29	Pressure Washer (High Pressure Washer, Spray with Pressure Washer, Water Jet, Power Washing)
NS30	Pump Fuel
NS31	Radio
NS32	Roof Work (From Roof)
NS33	Sand Blast
NS34	Saw 73-6 (Stationary Saw)
NS35	Surface Grinder 50-8
NS36	Surface Grinder 56-1
NS37	Test Bench
NS38	Tooling
NS39	Track Machine
NS40	Track Shovel
NS41	Vacuum
NS42	Welding (Welder, Welding Machine)



APPENDIX O: POST DATA ENTRY QUALITY CONTROL DOCUMENTATION

Field Data Collection Form	Variables Checked	Action
Background	EMPID	Checked if there are any missing values
	Phase	Checked if there are any missing values
	M_Gender	Updated the missing values based on the gender values specified in other phases (eg gender missing in phase I, but specified in phase II and III). In five instances gender updated based on employee ID from preliminary list of employees at plants A and B
	M_Birthdate	Checked three birth dates with suspicious year values (too large or too small)
	M_SurveyorCode	Updated a missing value
	M_SurveyDate	Updated a missing value
	M_Shift	Updated eight missing values
	M_HoursDay	Updated some suspicious values. Checked the values in relation to the hours worked per week and the job codes and updated the incorrect values
	M_HoursWeek	Updated some suspicious values. Checked the values in relation to the hours worked per day and the job codes and updated the incorrect values
	M_DosimeterFileName	Updated some incorrect values
	M_SLMfileName	Updated some incorrect values
	M_DosimeterIDleft	Checked the missing values in Phase I
CHAT	EMPID	Checked if there are any missing values
	Phase	Checked if there are any missing values
	N_WorkedYesterday	Checked if there are any missing values in Phase I
	N_ShiftOver	Checked if there are any missing values in Phase I
	N_ShiftOverNote	Checked the values. Updated some incorrect values
	N_ExposeLoud	Checked if there are any missing values in Phase I
	N_ExposeLoudNote	Checked the values
	N_WorkHPD	Checked if there are any missing values in Phase I. Updated some incorrect or missing values
	N_PreShiftHPDused	Checked the values
	N_PreShiftHPDusedNote	Checked the values. Updated some redundant values
	N_HPDAIIPart	Checked if there are any missing values in Phase I
	N_HPDAIIPartNote	Checked the values. Updated a redundant value
	N_NonWorkNoise	Checked if there are any missing values in Phase I
	N_NonWorkNoiseNote	Checked the values
	N_NonWorkHPD	Checked if there are any missing values in Phase I
	N_NonWorkHPDnote	Checked the values
	N_HeadCold	Checked if there are any missing values in Phase I
	N_HeadColdNote	Checked the values
	N_PreRinging	Checked if there are any missing values in Phase I
	N_PreRingingNote	Checked the values
	N_PreShiftSurveyor	Checked the values
	N_PreShiftCHATinstrument	Checked the values
	N_PreShiftCHATtime	Checked the values
N_PreShiftTone	Checked the values	
N_PreShiftOutputLevel	Checked the values	

Field Data Collection Form	Variables Checked	Action
	N_PreShift2KTest1R, ..., N_PreShift4KTest3L	Checked the values
	N_PreShiftDBA	Checked the values
	N_PreShiftOBA125, ..., N_PreShiftOBA8000	Checked the values
	N_PreShiftDBAnote	Checked the values
	N_PreShiftOBAnote	Checked the values
	OM_TodayHPD	Checked the values. Updated some missing values
	OM_DurationHPD	Checked the values. Updated some missing values
	OM_DurationHPDnote	Checked the values
	OM_PostShiftHPDused	Checked the values. Updated several missing, incorrect or redundant values
	OM_PostShiftHPDusedNote	Checked the values. Updated several incorrect or redundant values
	OM_FitsHPD	Checked the values. Updated a missing value
	OM_FitsHPDnote	Checked the values
	OM_TodayExposure	Checked the values. Updated a missing value
	OM_TodayExposureNote	Checked the values. Updated an incorrect value
	OM_PostRinging	Checked the values. Updated a missing value
	OM_PostRingingNote	Checked the values
	OM_Smoking	Checked the values. Updated a missing value. Checked if the OM_NRsmoking value is yes and either OM_NRsmokingDayCig or OM_NRsmokingDayCigar or OM_NRsmokingDayPipe is non-missing
	OM_NRsmokingDayCig	Checked the values. Checked if the OM_NRsmokingDayCig value is non-missing if OM_NRsmokingDayCig is yes. Updated some incorrect values
	OM_NRsmokingDayCigar	Checked the values. Checked if the OM_NRsmokingDayCigar value is non-missing if OM_NRsmokingDayCig is yes. Updated some incorrect values
	OM_NRsmokingDayPipe	Checked the values. Checked if the OM_NRsmokingDayPipe value is non-missing if OM_NRsmokingDayCig is yes. Updated some incorrect values
	OM_ProdRate	Checked the values. Updated a missing value
	OM_ProdRateNote	Checked the values
	O_Parts	Checked the values
	O_PartsNote	Checked the values
	O_PostShiftSurveyor	Checked the values
	O_PostShiftCHATinstrument	Checked the values
	O_PostShiftCHATtime	Checked the values
	O_PostShiftTone	Checked the values
	O_PostShiftOutputLevel	Checked the values
	O_PostShift2KTest1R, ..., O_PostShift4KTest3L	Checked the values
	O_PostShiftDBA	Checked the values
	O_PostShiftOBA125, ..., O_PostShiftOBA8000	Checked the values
	O_PostShiftDBAnote	Checked the values
	O_PostShiftOBAnote	Checked the values
	M_Remove	Checked the values
	M_RemoveBegin1	Checked the values

Field Data Collection Form	Variables Checked	Action
	M_RemoveEnd1	Checked the values
	M_RemoveBegin2	Checked the values
	M_RemoveEnd2	Checked the values
Direct Observation Form 1	PQ_TaskCode	Added new codes for the missing values and updated the values on the corresponding forms
	PQ_LocationCode	Added new codes for the missing values and updated the values on the corresponding forms
	PQ_MachineCode	Added new codes for the missing values and updated the values on the corresponding forms
	PQ_StartTime	Checked if there are any missing values. Checked if the PQ_StartTime value is smaller than the corresponding PQ_StopTime value
	PQ_StopTime	Checked if there are any missing values. Updated one missing value
	Q_ToolUsedCode	Checked if the Q_ToolUsedCode is non-missing and either Q_DuraMin, Q_DuraMax or Q_NRTTime is missing
	Q_DuraMin	Checked if the Q_DuraMin value is smaller than the corresponding Q_DuraMax value. Updated one missing value
	Q_DuraMax	Checked if the Q_DuraMax value is greater than the corresponding Q_DuraMin value. Updated one missing value
	PQ_PctHP	Checked if PQ_PctHP is 0 and PQ_HPfit is different than NA. Updated the incorrect values for PQ_PctHP
	PQ_HPfit	Checked if PQ_PctHP is 0 and PQ_HPfit is different than NA. Updated the incorrect values for PQ_HPfit
	PQ_OtherComment	Checked for some incorrect values, containing the 'additional location:' and 'additional machine:' phrases. Corrected a few other incorrect comments
	Q_OtherNoise	Checked (if the Q_OtherNoise value is Yes and the corresponding Q_OtherNoiseSourceCode value is missing) or (if the Q_OtherNoise value is No or Unknown and the corresponding Q_OtherNoiseSourceCode value is non-missing). Updated the incorrect values for Q_OtherNoise
	Q_OtherNoiseSourceCode	Checked if (the Q_OtherNoise value is Yes and the corresponding Q_OtherNoiseSourceCode value is missing) or (if the Q_OtherNoise value is No or Unknown and the corresponding Q_OtherNoiseSourceCode value is non-missing). Updated the incorrect values for Q_OtherNoiseSourceCode
	Q_OtherNoise	Updated a few incorrect comments
Direct Observation Form 2A	R_TaskCodeSLM	Added new codes for the missing values and updated the values on the corresponding forms
	R_LocationCodeSLM	Added new codes for the missing values and updated the values on the corresponding forms
	R_MachineCodeSLM	Added new codes for the missing values and updated the values on the corresponding forms
	R_TaskNoteSLM	Checked for some incorrect values, containing the 'additional location:' and 'additional machine:' phrases. Corrected a few other incorrect comments
	R_TimeSLM	Checked if there are any missing values
	R_DurationSLM	Checked if there are any missing values. Updated one missing value. Checked some suspicious values. Updated one incorrect value.
	R_Dose1	Checked if the R_Dose1 value is smaller or equal than the R_Dose2 value. Checked if the R_Dose1 value is smaller or equal than the R_Dose3 value. Updated some incorrect values

Field Data Collection Form	Variables Checked	Action
	R_Dose2	Checked if the R_Dose1 value is smaller or equal than the R_Dose2 value. Checked if the R_Dose2 value is smaller or equal than the R_Dose4 value. Updated one missing value and some incorrect values
	R_Dose3	Checked if the R_Dose1 value is smaller or equal than the R_Dose3 value. Checked if the R_Dose3 value is smaller or equal than the R_Dose4 value. Updated some incorrect values
	R_Dose4	Checked if the R_Dose3 value is smaller or equal than the R_Dose4 value. Checked if the R_Dose2 value is smaller or equal than the R_Dose4 value. Updated two missing values and some incorrect values
	R_Lmax	Checked if the R_Dose4 value is smaller than the R_LMax value. Updated two missing values and some incorrect values
	R_Lpeak	Checked if the R_LMax value is smaller than the R_LPpeak value. Updated two missing values and some incorrect values
Direct Observation Form 2B	S_TaskCodeSLM	Added new codes for the missing values and updated the values on the corresponding forms
	S_MachineCodeSLM	Added new codes for the missing values and updated the values on the corresponding forms
	S_TaskNoteSLM	Checked for some incorrect values, containing the 'additional location:' and 'additional machine:' phrases. Corrected a few other incorrect comments
	S_LocationCodeSLM	Added new codes for the missing values and updated the values on the corresponding forms. Updated some missing values.
	S_Impulse	Checked if there are any missing values
	S_NoisePosition	Checked if there are any missing values
	S_HandToolCode	Checked if there are any missing values. Updated two incorrect values
	S_ProdSourceCode	Checked if there are any missing values
	S_MachineAge	Checked the values
	S_DistanceSource	Updated some incorrect values
S_Density	Checked the values	
S_NonProdSourceCode	Checked if there are any missing values	
Actual Workday Form	TU_TaskCodeWorkDay	Added new codes for the missing values and updated the values on the corresponding forms
	TU_MachineCodeWorkDay	Added new codes for the missing values and updated the values on the corresponding forms. Checked for duplicate machine codes for the same task code; combined the duplicate rows into one row, for each task and machine, and summed up the times spent at that task and machine.
	TU_MachineCodeWorkDay	Checked if there are any missing values. Checked for suspicious values
Supervisor Background Form	W_JobCode	Checked if there are any missing values
	W_SupvCode	Checked if there are any missing values
	W_SurveyorCode	Checked if there are any missing values
	W_SurveyDate	Checked the values
	W_TypicalWorkTime	Checked if there are any missing values. Updated one missing value
	W_SupvWorkDayNote	Checked the values
Supervisor Average WorkDay Form	W_JobCode	Checked if there are any missing values
	W_SupvCode	Checked if there are any missing values
	W_TaskCodeWorkDay	Added new codes for the missing values and updated the values on the corresponding forms

Field Data Collection Form	Variables Checked	Action
	W_MachineCodeWorkDay	Added new codes for the missing values and updated the values on the corresponding forms. Checked for duplicate machine codes for the same task code
	W_NrMachines	Checked the values
	W_DurationTask	Checked if there are any missing values. Checked for suspicious values

APPENDIX P: COMPUTATION OF BLAZE DATA FOR SAS

Computation of Blaze Summary Results in SAS

This document describes the formulas used in the SAS program "Blaze_compute_results1.sas" in order to compute the Summary Results outputted by the Blaze software.

After exporting the Time History data from Blaze software into .csv format, and importing it into a SAS data set, the following are the names of the numeric variables from the SAS data set that will be used in the computations: LEQ, MAX, MIN, PEAK, TWA1, TWA2, TWA3 and TWA4; the values for these variables are usually recorded every second.

Based on the values of these variables, the Blaze software computes the following Summary Results: Dose, Projected Dose, LEQ, TWA, TWA (8), Lmax, Max Lpeak, Lmin, Lep (8), SE, for each of the four doses (Dose1, Dose2, Dose 3 and Dose 4).

The next table gives the settings for the four types of doses:

	Dose 1	Dose 2	Dose 3	Dose 4
Exchange Rate	5	5	3	3
Threshold (dBA)	80	0	80	0
Criterion Level (dBA)	85	85	85	85
Criterion Duration (hours)	8	8	8	8

Next are given the formulas used to compute the Summary Results, using SAS:

1. Lmax = Maximum value of all MAX values for all records (times) in the data set ;
2. Max Lpeak = Maximum value of all PEAK values for all records (times) in the data set ;
3. Lmin = Minimum value of all MIN values for all records (times) in the data set ;
4. $TWA = q * \log_{10}(\text{sumpow10} / \text{timesec}),$

where:

q = exchange rate constant ($q=10$ if exchange rate=3 and $q=16.61$ if exchange rate=5),

$\text{sumpow10} = \sum 10^{(TWA_{\text{no}}/q)}$ (the sum being after all records in the data set),

timesec = number of records (seconds) in the data set,

TWA_{no} is one of the variables TWA1, TWA2, TWA3 or TWA4, depending on the type of dose considered (Dose 1, Dose 2, Dose 3 or Dose 4) ;

$$5. \text{ TWA (8)} = \text{TWA} + q * \log_{10}(\text{timehr} / 8),$$

where:

$$\text{timehr} = \text{timesec} / 3600 ;$$

$$6. \text{ Projected Dose} = 100 * 10^{((\text{TWA}_{\text{AISO}} - 85) / q)} ;$$

$$7. \text{ Dose} = (\text{timehr} / 8) * \text{Projected Dose} ;$$

$$8. \text{ LEQ} = 10 * \log_{10}(\text{sump2} / (\text{timesec} * 400)),$$

where:

$$\text{sump2} = \sum p * p \text{ (the sum being after all records in the data set),}$$

$$p = 20 * 10^{(\text{LEQ} / 20)} \text{ (the sound pressure in micropascals) ;}$$

$$9. \text{ Lep (8)} = \text{LEQ} + 10 * \log_{10}(\text{timehr} / 8) ;$$

$$10. \text{ SE} = \text{sump2} / (3600 * 10^{12}) \text{ (expressed in Pascals}^2\text{*hr) .}$$

The Lmax, Max Lpeak, Lmin, LEQ, Lep (8) and SE statistics have the same values for all four types of doses (Dose1 – Dose 4).

The Dose, Projected Dose, TWA and TWA (8) statistics have usually different values for the four types of doses (Dose 1 – Dose 4).

Computation of the TWA values, based on the Blaze time history data

This document describes the computation of the TWA values based on the Blaze time history data; the SAS program used is called "Blaze_compute1.sas."

- 1) For each ID, from each plant, in each phase, prepare the time history data (in phase I, also for each microphone position: Right and Left);
- 2) Delete the records corresponding to the incorrect dates (markers inserted in the time history data by Blaze): delete all records with values of the Date variable smaller than June 1, 2003 or greater than January 31, 2004.
- 3) Assign some computation values to the TWA variables when the microphone was disconnected: if the value of the variable Mic_Disc is 'Yes', then assign 0 as the value of the variables TWA1 and TWA3, and 30 as the value of the variables TWA2 and TWA4 in the Blaze time history data set.
- 4) Compute the summary TWA values for each of the four doses, based on the following formula:

$$TWA = q * \log_{10}(\text{sumpow10} / \text{timesec}),$$

where:

q = exchange rate constant (q=10 if exchange rate=3 and q=16.61 if exchange rate=5),

sumpow10 = $\sum 10^{(TWA_{no} / q)}$ (the sum being after all records in the data set),

timesec = number of records (seconds) in the data set,

TWAno is one of the variables TWA1, TWA2, TWA3, or TWA4, depending on the type of dose considered (Dose 1, Dose 2, Dose 3, or Dose 4).

- 5) Combine all the computed TWA values (TWA1, TWA2, TWA3, TWA4), and additional info for that ID (Dept_Name, Job_Name, Date, Type, ID) into one record, for each ID, in each phase and plant (create separate records for each microphone position, in Phase I).
- 6) Combine all the records obtained in step 5, for all the ID's at the specified phase and plant.
- 7) The SAS data sets obtained are called:
 - i_a_twa1.sas7bdat, ii_a_twa1.sas7bdat, iii_a_twa1.sas7bdat,
 - i_b_twa1.sas7bdat, ii_b_twa1.sas7bdat, iii_b_twa1.sas7bdat,
 - i_c_twa1.sas7bdat, ii_c_twa1.sas7bdat, iii_c_twa1.sas7bdat.

**Computation of the TWA values,
based on the Blaze time history data and the start and stop times**

This document describes the computation of the TWA values based on the Blaze time history data and the start and stop times obtained from the ID Tracking files; the SAS program used is called "Blaze_compute2.sas."

- 1) For each ID, from each plant, in each phase, prepare the time history data (in phase I, also for each microphone position: Right and Left);
- 2) Delete the records corresponding to the incorrect dates (markers inserted in the time history data by Blaze): delete all records with values of the Date variable smaller than June 1, 2003 or greater than January 31, 2004.
- 3) Assign some computation values to the TWA variables when the microphone was disconnected: if the value of the variable Mic_Disc is 'Yes', then assign 70 as the value of the variables TWA1, TWA2, TWA3, and TWA4 in the Blaze time history data set.
- 4) Subtract some hours from each record in the Blaze time history data set, when the time in the Blaze time history data was determined to be incorrect:
 - subtract 3 hours from each value of the Time variable, for ID's 900016, 900062, 900520, 900522, 900537, 900546, 900578, 900640, and 900753 in Phase I at Plant A;
 - subtract 1 hour from each value of the Time variable, for ID 900520 in Phase II at Plant A;
 - subtract 1 hour from each value of the Time variable, for ID's 900014, and 900363 in Phase III at Plant A;
 - subtract 3 hours from each value of the Time variable, for ID's 88, 111, 292, 296, 297, and 5670 in Phase I at Plant B;
 - subtract 3 hours from each value of the Time variable, for ID 216, in Phase II at Plant B;
 - subtract 3 hours from each value of the Time variable, for ID's 57, 106, 108, 226, 246, 289, and 302 in Phase III at Plant B;
 - subtract 2 hours from each value of the Time variable, for ID 9693, in Phase I at Plant C.
- 5) Compute the minimum and maximum Time values, based on the Blaze time history data (denoted as OrigMinTime and OrigMaxTime).
- 6) Create a data set with the start and stop times obtained from the ID Tracking data sets for the ID of interest in the specified phase at the specified plant; the new start and stop times computed (in the datetime format) are denoted as start_time1 and stop_time1, and are computed based on the values of the Date, Start_Time and Stop_Time variables.
- 7) Merge the Blaze time history data set with start and stop times computed in step 6.
- 8) Create a new time variable, denoted as time1 (in the datetime format) in the Blaze time history data set, computed based on the values of the Date and Time variables.

- 9) Subset the Blaze time history data set to the actual start and stop times (delete all the records for which the time1 values are smaller than the start_time1 value for that ID, and delete all the records for which the time1 values are greater than the stop_time1 value for that ID).
- 10) Compute the maximum value of the Lpeak variable, and compute the minimum and maximum values of the time1 variable, denoted as MinTime and MaxTime (these values are the actual start and stop times that are going to be used in the TWA computations).
- 11) Compute the summary TWA values for each of the four doses, based on the following formula:

$$TWA = q * \log_{10}(\text{sumpow10} / \text{timesec}),$$

where:

q = exchange rate constant (q=10 if exchange rate=3 and q=16.61 if exchange rate=5),

sumpow10 = $\sum 10^{(TWA_{\text{ano}}/q)}$ (the sum being after all records in the data set),

timesec = number of records (seconds) in the data set,

TWAno is one of the variables TWA1, TWA2, TWA3, or TWA4, depending on the type of dose considered (Dose 1, Dose 2, Dose 3, or Dose 4).

- 12) Combine all the computed TWA values (TWA1, TWA2, TWA3, TWA4), the start and stop times (OrigMintime, OrigMaxTime, Start_Time, Stop_Time, Min_Time, Max_Time) and additional info for that ID (Dept_Name, Job_Name, Date, Dominant_Hand, Type, ID, Lpeak) into one record, for each ID, in each phase and plant (create separate records for each microphone position, in Phase I).
- 13) Combine all the records obtained in step 12, for all the ID's at the specified phase and plant.
- 14) The SAS data sets obtained are called:
 - i_a_twa2.sas7bdat, ii_a_twa2.sas7bdat, iii_a_twa2.sas7bdat,
 - i_b_twa2.sas7bdat, ii_b_twa2.sas7bdat, iii_b_twa2.sas7bdat,
 - i_c_twa2.sas7bdat, ii_c_twa2.sas7bdat, iii_c_twa2.sas7bdat.

APPENDIX Q: PROCEDURES FOR IMPORTING ACCESS DATA, PREPARING DATA FOR SAS ANALYSIS, AND TABLES OF VARIABLES IN SAS DATA SETS

Noise Sampling Strategies Study: Access → SAS Data Import

The following steps were taken to import the Noise Sampling Strategies Study data, from the Access database into SAS data sets:

11. Imported the Employee Background Form data:

- imported the Access data into a SAS data set;
- sorted the data, by EMPID and Phase;
- kept only the date part for two date/time variables;
- reordered the variables and change the attributes for some variables;
- assigned labels to all the variables.

The SAS data set obtained is called “EmpBackground” and the SAS program used is called “Access_import1.”

12. Imported the CHAT Form data:

- imported the Access data into a SAS data set;
- sorted the data, by EMPID and Phase;
- change the attributes for some variables;
- assigned labels to all the variables.

The SAS data set obtained is called “CHAT” and the SAS program used is called “Access_import2.”

13. Imported the Direct Observation Form 1 data:

- imported the Access data into a SAS data set;
- sorted the data, by EMPID, Phase, PQ_StartTime and PQ_MachineCode;
- change the attributes for some variables;
- assigned labels to all the variables.

The SAS data set obtained is called “DirectObsForm1” and the SAS program used is called “Access_import3.”

14. Imported the Direct Observation Form 2A data:

- imported the Access data into a SAS data set;
- sorted the data, by EMPID, Phase, and R_TimeSLM;
- change the attributes for some variables;
- assigned labels to all the variables.

The SAS data set obtained is called “DirectObsForm2A” and the SAS program used is called “Access_import4.”

15. Imported the Direct Observation Form 2B data:

- imported the Access data into a SAS data set;
- change the attributes for some variables;

- assigned labels to all the variables.

The SAS data set obtained is called “DirectObsForm2B” and the SAS program used is called “Access_import5.”

16. Imported the Actual WorkDay Form data:

- imported the Access data into a SAS data set;
- change the attributes for some variables;
- assigned labels to all the variables.

The SAS data set obtained is called “ActualWorkDay” and the SAS program used is called “Access_import6.”

17. Imported the Supervisor Background Form data:

- imported the Access data into a SAS data set;
- sorted the data, by W_JobCode and W_SupvCode;
- kept only the date part for one date/time variable;
- reordered the variables and change the attributes for some variables;
- assigned labels to all the variables.

The SAS data set obtained is called “SupvBackground” and the SAS program used is called “Access_import7.”

18. Imported the Supervisor Average WorkDay Form data:

- imported the Access data into a SAS data set;
- change the attributes for some variables;
- assigned labels to all the variables.

The SAS data set obtained is called “SupvAvgWorkDay” and the SAS program used is called “Access_import8.”

19. Imported the tables with the codes from the Access database into SAS data sets:

- Code_DeptName;
- Code_Dosimeter;
- Code_Hand;
- Code_HandTools;
- Code_HearingLossEar;
- Code_HPDAIIPart;
- Code_HPDUSED;
- Code_HPfit;
- Code_JobNames;
- Code_LocationNames;
- Code_MachineToolNames;
- Code_NoisePosition;
- Code_NonProdSourceCode;

- Code_OtherNoiseSource;
- Code_Plant;
- Code_ProdRate_TodayExposure;
- Code_ProdSourceCode;
- Code_Shift;
- Code_ShiftOutputLevel;
- Code_ShiftTone;
- Code_SLMID;
- Code_Supervisor;
- Code_Surveyor;
- Code_TaskNames;
- Code_YesNoUnknown;
- Code_YesNoUnknownNA;

The SAS program used is called "Access_import9."

Noise Sampling Strategies Study: SAS Data Update (Part 1)

The following steps were followed to prepare for analysis the Noise Sampling Strategies Study data, imported from the Access database into SAS data sets:

1. Updated the CHAT data set:

- i. *Dropped some variables:*
 - dropped some variables having empty values: N_EmpAge, N_EmpAgeNote, N_HearingLoss, N_HearingLossEar, N_HearingLossNote, N_HearingLossDiagnosis, N_NormalHearing, N_NormalHearingNote;
- i. *Created new variables for the HPD codes:*
 - extracted the pre-shift HPD codes from the variable N_PreShiftHPDused into two separate variables (the new variables are called N_PreShiftHPDused1 and N_PreShiftHPDused2);
 - extracted the post-shift HPD codes from the variable OM_PostShiftHPDused into two separate variables (the new variables are called OM_PostShiftHPDused1 and OM_PostShiftHPDused2);
 - checked to see if there are any redundant pre-shift HPD types codes (variables N_PreShiftHPDused1 and N_PreShiftHPDused2);
 - checked to see if there are any redundant post-shift HPD types codes (variables OM_PostShiftHPDused1 and OM_PostShiftHPDused2);
 - dropped the original HPD variables: N_PreShiftHPDused and OM_PostShiftHPDused;
- i. *Reordered the variables and change the attributes for some variables;*
- ii. *Assigned labels for the new variables created.*

The SAS data set obtained is called "CHAT_1" and the SAS program used is called "Access_dataupdate1."

2. Updated the DirectObsForm1 data set:

- iii. *Created new variables for the additional machines:*
 - renamed the original machine variable PQ_MachineCode to PQ_MachineCode1;
 - extracted the additional machine names (denoted as machine1 – machine7) from the other comments variable PQ_OtherComment;
 - merged the Direct Observation Form 1 data with the Employee Background data, by EMPID and Phase, in order to add the JobCode variable to the data;
 - merged the Direct Observation Form 1 data with the MachineToolNames data, by JobCode and machine1, in order to add the machine codes associated with the machine1 variable to the data (the new variable added is called PQ_MachineCode2);
 - merged the Direct Observation Form 1 data with the MachineToolNames data, by JobCode and machine2, in order to add the machine codes associated with the machine2 variable to the data (the new variable added is called PQ_MachineCode3);

- merged the Direct Observation Form 1 data with the MachineToolNames data, by JobCode and machine3, in order to add the machine codes associated with the machine3 variable to the data (the new variable added is called PQ_MachineCode4);
 - merged the Direct Observation Form 1 data with the MachineToolNames data, by JobCode and machine4, in order to add the machine codes associated with the machine4 variable to the data (the new variable added is called PQ_MachineCode5);
 - merged the Direct Observation Form 1 data with the MachineToolNames data, by JobCode and machine5, in order to add the machine codes associated with the machine5 variable to the data (the new variable added is called PQ_MachineCode6);
 - merged the Direct Observation Form 1 data with the MachineToolNames data, by JobCode and machine6, in order to add the machine codes associated with the machine6 variable to the data (the new variable added is called PQ_MachineCode7);
 - merged the Direct Observation Form 1 data with the MachineToolNames data, by JobCode and machine7, in order to add the machine codes associated with the machine7 variable to the data (the new variable added is called PQ_MachineCode8);
 - kept just the remaining comments, without the additional machine info from the PQ_OtherComment variable;
 - checked to see if there are any redundant machine codes (variables PQ_MachineCode1 - PQ_MachineCode8);
- i. *Created new variables for the additional locations:*
- renamed the original location variable PQ_LocationCode to PQ_LocationCode1;
 - extracted the additional location names (denoted as location1) from the other comments variable PQ_OtherComment;
 - merged the Direct Observation Form 1 data with the Employee Background data, by EMPID and Phase, in order to add the Plant variable to the data;
 - merged the Direct Observation Form 1 data with the LocationNames data, by Plant and location1, in order to add the location codes associated with the location1 variable to the data (the new variable added is called PQ_LocationCode2);
 - merged the Direct Observation Form 1 data with the LocationNames data, by Plant and location2, in order to add the location codes associated with the location2 variable to the data (the new variable added is called PQ_LocationCode3);
 - merged the Direct Observation Form 1 data with the LocationNames data, by Plant and location3, in order to add the location codes associated with the location3 variable to the data (the new variable added is called PQ_LocationCode4);
 - kept just the remaining comments, without the additional location info from the PQ_OtherComment variable;

- checked to see if there are any redundant location codes (variables PQ_LocationCode1 - PQ_LocationCode4);
- i. *Created new variables for the HPD codes:*
 - extracted the HPD codes from the variable PQ_HPDCOMMENT into two separate variables (the new variables are called PQ_HPDTYPE1 and PQ_HPDTYPE2);
 - dropped the original HPD variable PQ_HPDCOMMENT;
 - checked to see if there are any redundant HPD types codes (variables PQ_HPDTYPE1 and PQ_HPDTYPE2);
- i. *Created new variables for the other noise source codes:*
 - extracted the noise source codes values from the Q_OTHERNOISESOURCECODE variable (the new variables created are called Q_OTHERNOISESOURCECODE1, Q_OTHERNOISESOURCECODE2, Q_OTHERNOISESOURCECODE3, and Q_OTHERNOISESOURCECODE4);
 - dropped the original noise source code variable Q_OTHERNOISESOURCECODE;
 - checked to see if there are any redundant noise source codes (variables Q_OTHERNOISESOURCECODE1 - Q_OTHERNOISESOURCECODE4);
- i. *Reordered the variables and change the attributes for some variables;*
- ii. *Assigned labels for the new variables created.*

The SAS data set obtained is called "DirectObsForm1 _1" and the SAS program used is called "Access_dataupdate2."

3. Updated the DirectObsForm2A data set:

- iii. *Created new variables for the additional machines:*
 - renamed the original machine variable R_MACHINECODESLM to R_MACHINECODESLM1;
 - extracted the additional machine names (denoted as machine1 and machine2) from the task note variable R_TaskNoteSLM;
 - merged the Direct Observation Form 2A data with the Employee Background data, by EMPID and Phase, in order to add the JobCode variable to the data;
 - merged the Direct Observation Form 2A data with the MachineToolNames data, by JobCode and machine1, in order to add the machine codes associated with the machine1 variable to the data (the new variable added is called R_MACHINECODESLM2);
 - merged the Direct Observation Form 2A data with the MachineToolNames data, by JobCode and machine2, in order to add the machine codes associated with the machine2 variable to the data (the new variable added is called R_MACHINECODESLM3);
 - kept just the remaining note, without the additional machine info from the R_TaskNoteSLM variable;
 - checked to see if there are any redundant machine codes (variables R_MACHINECODESLM1 - R_MACHINECODESLM3)
- i. *Created new variables for the additional locations:*

- renamed the original location variable R_LocationCodeSLM to R_LocationCodeSLM1;
 - extracted the additional location names (denoted as location1) from the task note variable R_TaskNoteSLM;
 - merged the Direct Observation Form 2A data with the Employee Background data, by EMPID and Phase, in order to add the Plant variable to the data;
 - merged the Direct Observation Form 2A data with the LocationNames data, by Plant and location1, in order to add the location codes associated with the location1 variable to the data (the new variable added is called R_LocationCodeSLM2);
 - kept just the remaining note, without the additional location info from the R_TaskNoteSLM variable;
 - checked to see if there are any redundant location codes (variables R_LocationCodeSLM1, R_LocationCodeSLM2);
- i. *Reordered the variables and change the attributes for some variables;*
 - ii. *Assigned labels for the new variables created.*

The SAS data set obtained is called "DirectObsForm2A _1" and the SAS program used is called "Access_dataupdate3."

4. Updated the DirectObsForm2B data set:

- iii. *Created new variables for the additional machines:*
 - renamed the original machine variable S_MachineCodeSLM to S_MachineCodeSLM1;
 - extracted the additional machine names (denoted as machine1 and machine2) from the task note variable S_TaskNoteSLM;
 - merged the Direct Observation Form 2B data with the Employee Background data, by EMPID and Phase, in order to add the JobCode variable to the data;
 - merged the Direct Observation Form 2B data with the MachineToolNames data, by JobCode and machine1, in order to add the machine codes associated with the machine1 variable to the data (the new variable added is called S_MachineCodeSLM2);
 - merged the Direct Observation Form 2A data with the MachineToolNames data, by JobCode and machine2, in order to add the machine codes associated with the machine2 variable to the data (the new variable added is called S_MachineCodeSLM3);
 - kept just the remaining note, without the additional machine info from the S_TaskNoteSLM variable;
 - checked to see if there are any redundant machine codes (variables S_MachineCodeSLM1 - S_MachineCodeSLM3);
- i. *Created new variables for the additional locations:*
 - renamed the original location variable S_LocationCodeSLM to S_LocationCodeSLM1;

- extracted the additional location names (denoted as location1, location2, and location3) from the task note variable S_TaskNoteSLM;
 - merged the Direct Observation Form 2B data with the Employee Background data, by EMPID and Phase, in order to add the Plant variable to the data;
 - merged the Direct Observation Form 2B data with the LocationNames data, by Plant and location1, in order to add the location codes associated with the location1 variable to the data (the new variable added is called S_LocationCodeSLM2);
 - merged the Direct Observation Form 2B data with the LocationNames data, by Plant and location2, in order to add the location codes associated with the location2 variable to the data (the new variable added is called S_LocationCodeSLM3);
 - merged the Direct Observation Form 2B data with the LocationNames data, by Plant and location3, in order to add the location codes associated with the location3 variable to the data (the new variable added is called S_LocationCodeSLM4);
 - kept just the remaining note, without the additional location info from the S_TaskNoteSLM variable;
 - checked to see if there are any redundant location codes (variables S_LocationCodeSLM1 - S_LocationCodeSLM4);
- i. *Created new variables for the noise position codes:*
- extracted the noise positions values from the S_NoisePosition variable (the new variables created are called S_NoisePosition1, S_NoisePosition2, S_NoisePosition3, and S_NoisePosition4);
 - dropped the original noise position variable S_NoisePosition;
- i. *Created new variables for the hand tool codes:*
- extracted the hand tool codes values from the S_HandToolCode variable (the new variables created are called S_HandToolCode1 and S_HandToolCode2);
 - dropped the original hand tool code variable S_HandToolCode;
 - checked to see if there are any redundant hand tool codes (variables S_HandToolCode1, S_HandToolCode2);
- i. *Created new variables for the production source codes:*
- extracted the production source codes values from the S_ProdSourceCode variable (the new variables created are called S_ProdSourceCode1 and S_ProdSourceCode2);
 - dropped the original production source code variable S_ProdSourceCode;
 - checked to see if there are any redundant production source codes (variables S_ProdSourceCode1 - S_ProdSourceCode4);
- i. *Created new variables for the non-production source codes:*
- extracted the non-production source codes values from the S_NonProdSourceCode variable (the new variables created are called

S_NonProdSourceCode1, S_NonProdSourceCode2, and S_NonProdSourceCode3);

- dropped the original non-production source code variable S_NonProdSourceCode;
- checked to see if there are any redundant non-production source codes (variables S_NonProdSourceCode1 - S_NonProdSourceCode3);
 - i. *Reordered the variables and change the attributes for some variables;*
 - ii. *Assigned labels for the new variables created.*

The SAS data set obtained is called "DirectObsForm2B_1" and the SAS program used is called "Access_dataupdate4."

Variables in the EmpBackground SAS Data Set (Variables in Creation Order)

#	Variable	Type	Len	Format	Informat	Label
1	EMPID	Num	8	8.	8.	Employee ID Number
2	Phase	Char	1	\$1.	\$1.	Survey Number
3	M_Gender	Char	1	\$1.	\$1.	Gender of the employee
4	M_BirthDate	Num	8	MMDDYY10.	MMDDYY10.	Birth date of the employee
5	M_SurveyorCode	Char	2	\$2.	\$2.	Surveyor Code
6	M_SurveyDate	Num	8	MMDDYY10.	MMDDYY10.	Date of Survey
7	M_Plant	Char	1	\$1.	\$1.	Facility Code Name
8	M_DeptCode	Char	2	\$2.	\$2.	Department Code
9	M_JobCode	Char	3	\$3.	\$3.	Job Code
10	M_Shift	Char	1	\$1.	\$1.	Shift Number
11	M_HoursDay	Num	8	4.1	4.1	Typical Hours/Day
12	M_HoursWeek	Num	8	4.1	4.1	Typical Hours/Week
13	M_DosimeterIDright	Char	1	\$1.	\$1.	Dosimeter ID Number (Right)
14	M_DosimeterIDleft	Char	1	\$1.	\$1.	Dosimeter ID Number (Left)
15	M_SLMID	Char	1	\$1.	\$1.	Sound Level Meter ID Number
16	M_Hand	Char	1	\$1.	\$1.	Dominant Hand
17	M_StartShift	Num	8	TIME5.	TIME5.	Start Time of Workshift
18	M_EndShift	Num	8	TIME5.	TIME5.	End Time of Workshift
19	M_DosimeterID	Char	1	\$1.	\$1.	Dosimeter ID Number (Phase II and III)
20	M_DosimeterFileName	Char	20	\$20.	\$20.	Name of Dosimeter Data Download File
21	M_SLMfileName	Char	20	\$20.	\$20.	Name of SLM Data Download File
22	PQ_DirectForm1Note	Char	255	\$255.	\$255.	Other Notes and Comments from the bottom of the Direct Observation Form 1
23	R_DirectForm2ANote	Char	255	\$255.	\$255.	Other Notes and Comments from the bottom of the Direct Observation Form 2A
24	S_DirectForm2BNote	Char	255	\$255.	\$255.	Other Notes and Comments from the bottom of the Direct Observation Form 2B
25	U_StartWork	Num	8	TIME5.	TIME5.	Time Employee Started Working

Variables in the EmpBackground SAS Data Set (Variables in Creation Order)

#	Variable	Type	Len	Format	Informat	Label
26	U_EndWork	Num	8	TIME5.	TIME5.	Time Employee Finished Working
27	U_DurationWork	Char	5	\$5.	\$5.	Total amount of time worked on day of noise monitoring
28	TU_EmpWorkdayNote	Char	255	\$255.	\$255.	Other Notes and Comments from the bottom of the Actual Workday Form
29	V_TaskNote1	Char	255	\$255.	\$255.	Task Related Notes (Part 1)
30	V_TaskNote2	Char	255	\$255.	\$255.	Task Related Notes (Part 2)
31	V_JobNote1	Char	255	\$255.	\$255.	Job Related Notes (Part 1)
32	V_JobNote2	Char	255	\$255.	\$255.	Job Related Notes (Part 2)
33	V_MachineNote	Char	255	\$255.	\$255.	Machine Related Notes
34	V_HPDPNote	Char	255	\$255.	\$255.	HPD Related Notes

Variables in the CHAT SAS Data Set (Variables in Creation Order)

#	Variable	Type	Len	Format	Informat	Label
1	EMPID	Num	8	8.	8.	Employee ID Number
2	Phase	Char	1	\$1.	\$1.	Survey Number
3	N_EmpAge	Num	8	6.	6.	Age of employee
4	N_EmpAgeNote	Char	50	\$50.	\$50.	Additional comments about the age of employee
5	N_WorkedYesterday	Char	1	\$1.	\$1.	Did the employee work at the company during the last 24 hours
6	N_ShiftOver	Num	8	TIME5.	TIME5.	What time was the work shift over
7	N_ShiftOverNote	Char	100	\$100.	\$100.	Additional comments about the time the work shift was over
8	N_ExposeLoud	Char	1	\$1.	\$1.	Does the employee think that he/she was exposed to loud noise during the most recent work shift
9	N_ExposeLoudNote	Char	100	\$100.	\$100.	Additional comments about the exposure to loud noise during the most recent work shift
10	N_WorkHPD	Char	1	\$1.	\$1.	Did the employee wear HPD during the most recent work shift
11	N_PreShiftHPDused	Char	15	\$15.	\$15.	The kind and NRR of HPD used
12	N_PreShiftHPDusedNote	Char	100	\$100.	\$100.	Additional comments about the kind and NRR of HPD used
13	N_HPDAIIPart	Char	1	\$1.	\$1.	Indicate whether the HPD was used for all or part of work shift
14	N_HPDAIIPartNote	Char	100	\$100.	\$100.	Additional comments about whether the HPD was used for all or part of work shift
15	N_NonWorkNoise	Char	1	\$1.	\$1.	Was employee exposed to loud noise outside of work during the last 24 hours
16	N_NonWorkNoiseNote	Char	100	\$100.	\$100.	Additional comments about whether the employee was exposed to loud noise outside of work during the last 24 hours
17	N_NonWorkHPD	Char	1	\$1.	\$1.	Indicate whether HPD were used during the exposure to loud noise outside of work during the last 24 hours
18	N_NonWorkHPDnote	Char	100	\$100.	\$100.	Additional comments about whether HPD were used during the exposure to loud noise outside of work during the last 24 hours
19	N_HearingLoss	Char	1	\$1.	\$1.	Has the employee ever had hearing loss diagnosed by a doctor
20	N_HearingLossEar	Char	1	\$1.	\$1.	Indicate which was ear affected
21	N_HearingLossEarNote	Char	100	\$100.	\$100.	Additional comments about which ear was affected
22	N_HearingLossDiagnosis	Char	100	\$100.	\$100.	Indicate the hearing loss diagnosis
23	N_HeadCold	Char	1	\$1.	\$1.	Does the employee currently have head cold or ear ache
24	N_HeadColdNote	Char	100	\$100.	\$100.	Additional comments about whether the employee have currently head cold or ear ache

Variables in the CHAT SAS Data Set (Variables in Creation Order)

#	Variable	Type	Len	Format	Informat	Label
25	N_PreRinging	Char	1	\$1.	\$1.	Does the employee currently have ringing in the ears
26	N_PreRingingNote	Char	100	\$100.	\$100.	Additional comments about whether the employee have currently ringing in the ears
27	N_NormalHearing	Char	1	\$1.	\$1.	At the time of the last audiogram, was the employee told that his/her hearing was normal
28	N_NormalHearingNote	Char	100	\$100.	\$100.	Additional comments about whether at the time of the last audiogram, the employee was told that his/her hearing was normal
29	N_PreShiftSurveyor	Char	2	\$2.	\$2.	Pre-Shift Industrial Hygienist
30	N_PreShiftCHATInstrument	Num	8	11.	11.	Pre-Shift CHAT Instrument Number
31	N_PreShiftCHATtime	Num	8	TIME5.	TIME5.	Pre-Shift Time CHAT Test Started
32	N_PreShiftTone	Char	1	\$1.	\$1.	Pre-Shift Tone Output Pattern
33	N_PreShiftOutputLevel	Char	1	\$1.	\$1.	Pre-Shift Output Level Setting
34	N_PreShift2KTest1R	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Right Ear at 2000 Hz (Test 1)
35	N_PreShift2KTest2R	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Right Ear at 2000 Hz (Test 2)
36	N_PreShift2KTest3R	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Right Ear at 2000 Hz (Test 3)
37	N_PreShift3KTest1R	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Right Ear at 3000 Hz (Test 1)
38	N_PreShift3KTest2R	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Right Ear at 3000 Hz (Test 2)
39	N_PreShift3KTest3R	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Right Ear at 3000 Hz (Test 3)
40	N_PreShift4KTest1R	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Right Ear at 4000 Hz (Test 1)
41	N_PreShift4KTest2R	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Right Ear at 4000 Hz (Test 2)
42	N_PreShift4KTest3R	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Right Ear at 4000 Hz (Test 3)
43	N_PreShift2KTest1L	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Left Ear at 2000 Hz (Test 1)
44	N_PreShift2KTest2L	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Left Ear at 2000 Hz (Test 2)
45	N_PreShift2KTest3L	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Left Ear at 2000 Hz (Test 3)
46	N_PreShift3KTest1L	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Left Ear at 3000 Hz (Test 1)
47	N_PreShift3KTest2L	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Left Ear at 3000 Hz (Test 2)
48	N_PreShift3KTest3L	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Left Ear at 3000 Hz (Test 3)
49	N_PreShift4KTest1L	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Left Ear at 4000 Hz (Test 1)

Variables in the CHAT SAS Data Set (Variables in Creation Order)

#	Variable	Type	Len	Format	Informat	Label
50	N_PreShift4KTest2L	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Left Ear at 4000 Hz (Test 2)
51	N_PreShift4KTest3L	Num	8	6.	6.	Pre-Shift Number of Sound Tones Heard for Left Ear at 4000 Hz (Test 3)
52	N_PreShiftDBA	Num	8	4.1	4.1	Pre-Shift Test Room Background Sound Level (dBA)
53	N_PreShiftOBA125	Num	8	4.1	4.1	Pre-Shift Test Room Background Octave Band Analysis 125 Hz (dB)
54	N_PreShiftOBA250	Num	8	4.1	4.1	Pre-Shift Test Room Background Octave Band Analysis 250 Hz (dB)
55	N_PreShiftOBA500	Num	8	4.1	4.1	Pre-Shift Test Room Background Octave Band Analysis 500 Hz (dB)
56	N_PreShiftOBA1000	Num	8	4.1	4.1	Pre-Shift Test Room Background Octave Band Analysis 1 kHz (dB)
57	N_PreShiftOBA2000	Num	8	4.1	4.1	Pre-Shift Test Room Background Octave Band Analysis 2 kHz (dB)
58	N_PreShiftOBA4000	Num	8	4.1	4.1	Pre-Shift Test Room Background Octave Band Analysis 4 kHz (dB)
59	N_PreShiftOBA8000	Num	8	4.1	4.1	Pre-Shift Test Room Background Octave Band Analysis 8 kHz (dB)
60	N_PreShiftDBAnote	Char	100	\$100.	\$100.	Pre-Shift Notes for the dBA section
61	N_PreShiftOBAnote	Char	100	\$100.	\$100.	Pre-Shift Notes for the OBA section
62	OM_TodayHPD	Char	1	\$1.	\$1.	Were HPD worn at any time today
63	OM_DurationHPD	Char	5	\$5.	\$5.	Indicate the number of hours HPD were used today
64	OM_DurationHPDnote	Char	100	\$100.	\$100.	Additional comments about the number of hours HPD were used today
65	OM_PostShiftHPDused	Char	15	\$15.	\$15.	The kind and NRR of HPD used
66	OM_PostShiftHPDusedNote	Char	100	\$100.	\$100.	Additional comments about the kind and NRR of HPD used
67	OM_FitsHPD	Char	1	\$1.	\$1.	Indicate whether employee thinks HPD fits correctly
68	OM_FitsHPDnote	Char	100	\$100.	\$100.	Additional comments about whether the employee thinks HPD fits correctly
69	OM_TodayExposure	Char	1	\$1.	\$1.	Does the employee feel that his/her noise exposure today was more/less/same as a typical work shift
70	OM_TodayExposureNote	Char	100	\$100.	\$100.	Additional comments about how the employee feels that his/her noise exposure today was more/less/same as a typical work shift
71	OM_PostRinging	Char	1	\$1.	\$1.	Did the employee have ringing in his/her ears when the work shift ended
72	OM_PostRingingNote	Char	100	\$100.	\$100.	Additional comments about whether the employee had ringing in his/her ears when the work shift ended
73	OM_Smoking	Char	1	\$1.	\$1.	Does the employee currently smoke cigarettes, pipes, and/or cigars
74	OM_NRsmokingDayCig	Num	8	4.1	4.1	How many cigarettes were smoked per day

Variables in the CHAT SAS Data Set (Variables in Creation Order)

#	Variable	Type	Len	Format	Informat	Label
75	OM_NRsmokingDayCigar	Num	8	4.1	4.1	How many cigars were smoked per day
76	OM_NRsmokingDayPipe	Num	8	4.1	4.1	How many pipes were smoked per day
77	OM_ProdRate	Char	1	\$1.	\$1.	Does the employee feel that the production rate was more/less/same as normal
78	OM_ProdRateNote	Char	100	\$100.	\$100.	Additional comments about how the employee feels that the production rate was more/less/same as normal
79	O_Parts	Num	8	11.	11.	How many parts does the employee estimate were manufactured today
80	O_PartsNote	Char	100	\$100.	\$100.	Additional comments about how many parts the employee estimates were manufactured today
81	O_PostShiftSurveyor	Char	2	\$2.	\$2.	Post-Shift Industrial Hygienist
82	O_PostShiftCHATInstrument	Num	8	11.	11.	Post-Shift CHAT Instrument Number
83	O_PostShiftCHATtime	Num	8	TIME5.	TIME5.	Post-Shift Time CHAT Test Started
84	O_PostShiftTone	Char	1	\$1.	\$1.	Post-Shift Tone Output Pattern
85	O_PostShiftOutputLevel	Char	1	\$1.	\$1.	Post-Shift Output Level Setting
86	O_PostShift2KTest1R	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Right Ear at 2000 Hz (Test 1)
87	O_PostShift2KTest2R	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Right Ear at 2000 Hz (Test 2)
88	O_PostShift2KTest3R	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Right Ear at 2000 Hz (Test 3)
89	O_PostShift3KTest1R	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Right Ear at 3000 Hz (Test 1)
90	O_PostShift3KTest2R	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Right Ear at 3000 Hz (Test 2)
91	O_PostShift3KTest3R	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Right Ear at 3000 Hz (Test 3)
92	O_PostShift4KTest1R	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Right Ear at 4000 Hz (Test 1)
93	O_PostShift4KTest2R	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Right Ear at 4000 Hz (Test 2)
94	O_PostShift4KTest3R	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Right Ear at 4000 Hz (Test 3)
95	O_PostShift2KTest1L	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Left Ear at 2000 Hz (Test 1)
96	O_PostShift2KTest2L	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Left Ear at 2000 Hz (Test 2)
97	O_PostShift2KTest3L	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Left Ear at 2000 Hz (Test 3)
98	O_PostShift3KTest1L	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Left Ear at 3000 Hz (Test 1)
99	O_PostShift3KTest2L	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Left Ear at 3000 Hz (Test 2)

Variables in the CHAT SAS Data Set (Variables in Creation Order)

#	Variable	Type	Len	Format	Informat	Label
100	O_PostShift3KTest3L	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Left Ear at 3000 Hz (Test 3)
101	O_PostShift4KTest1L	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Left Ear at 4000 Hz (Test 1)
102	O_PostShift4KTest2L	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Left Ear at 4000 Hz (Test 2)
103	O_PostShift4KTest3L	Num	8	6.	6.	Post-Shift Number of Sound Tones Heard for Left Ear at 4000 Hz (Test 3)
104	O_PostShiftDBA	Num	8	4.1	4.1	Post-Shift Test Room Background Sound Level (dBA)
105	O_PostShiftOBA125	Num	8	4.1	4.1	Post-Shift Test Room Background Octave Band Analysis 125 Hz (dB)
106	O_PostShiftOBA250	Num	8	4.1	4.1	Post-Shift Test Room Background Octave Band Analysis 250 Hz (dB)
107	O_PostShiftOBA500	Num	8	4.1	4.1	Post-Shift Test Room Background Octave Band Analysis 500 Hz (dB)
108	O_PostShiftOBA1000	Num	8	4.1	4.1	Post-Shift Test Room Background Octave Band Analysis 1 kHz (dB)
109	O_PostShiftOBA2000	Num	8	4.1	4.1	Post-Shift Test Room Background Octave Band Analysis 2 kHz (dB)
110	O_PostShiftOBA4000	Num	8	4.1	4.1	Post-Shift Test Room Background Octave Band Analysis 4 kHz (dB)
111	O_PostShiftOBA8000	Num	8	4.1	4.1	Post-Shift Test Room Background Octave Band Analysis 8 kHz (dB)
112	O_PostShiftDBAnote	Char	100	\$100.	\$100.	Post-Shift Notes for the dBA section
113	O_PostShiftOBAnote	Char	100	\$100.	\$100.	Post-Shift Notes for the OBA section
114	M_Remove	Char	1	\$1.	\$1.	Did the employee remove the dosimeter and microphone at any time during the work shift
115	M_RemoveBegin1	Num	8	TIME5.	TIME5.	What was the start time of the first period when the dosimeter was not worn
116	M_RemoveEnd1	Num	8	TIME5.	TIME5.	What was the end time of the first period when the dosimeter was not worn
117	M_RemoveBegin2	Num	8	TIME5.	TIME5.	What was the start time of the second period when the dosimeter was not worn
118	M_RemoveEnd2	Num	8	TIME5.	TIME5.	What was the end time of the second period when the dosimeter was not worn

Variables in the DirectObsForm1 SAS Data Set (Variables in Creation Order)						
#	Variable	Type	Len	Format	Informat	Label
1	EMPID	Num	8	8.	8.	Employee ID Number
2	Phase	Char	1	\$1.	\$1.	Survey Number
3	PQ_TaskCode	Char	7	\$7.	\$7.	Task Code
4	PQ_LocationCode	Char	4	\$4.	\$4.	Location Code
5	PQ_MachineCode	Char	7	\$7.	\$7.	Machine Code
6	PQ_StartTime	Num	8	TIME5.	TIME5.	Start Time
7	PQ_StopTime	Num	8	TIME5.	TIME5.	Stop Time
8	Q_ToolUsedCode	Char	7	\$7.	\$7.	Tool Used Code
9	Q_DuraMin	Num	8	6.	6.	Min Duration of Time
10	Q_DuraMax	Num	8	6.	6.	Max Duration of Time
11	Q_NRTTime	Num	8	6.	6.	# of times used
12	PQ_PctHP	Num	8	6.	6.	% of time HP use
13	PQ_HPfit	Char	1	\$1.	\$1.	HP Fit
14	PQ_HPDCOMMENT	Char	15	\$15.	\$15.	Type of HPD
15	PQ_OtherComment	Char	100	\$100.	\$100.	Other Comments
16	Q_EngineOn	Char	1	\$1.	\$1.	Engine On
17	Q_OtherNoise	Char	1	\$1.	\$1.	Other Loud Noise Source (Y/N)
18	Q_OtherNoiseSourceCode	Char	25	\$25.	\$25.	Other Loud Noise Source Code
19	Q_OtherNoiseNote	Char	100	\$100.	\$100.	Additional comments about Other Loud Noise Sources

Variables in the DirectObsForm2A SAS Data Set (Variables in Creation Order)						
#	Variable	Type	Len	Format	Informat	Label
1	EMPID	Num	8	8.	8.	Employee ID Number
2	Phase	Char	1	\$1.	\$1.	Survey Number
3	R_TaskCodeSLM	Char	7	\$7.	\$7.	Task Code
4	R_LocationCodeSLM	Char	4	\$4.	\$4.	Location Code
5	R_MachineCodeSLM	Char	7	\$7.	\$7.	Machine Code
6	R_TaskNoteSLM	Char	100	\$100.	\$100.	Task Note
7	R_TimeSLM	Num	8	TIME5.	TIME5.	Time of SLM Reading
8	R_DurationSLM	Char	5	\$5.	\$5.	Duration of Measurement
9	R_Dose1	Num	8	5.1	5.1	Dose 1 (80dB Treshold, 5dB Exchange)
10	R_Dose2	Num	8	5.1	5.1	Dose 2 (0dB Treshold, 5dB Exchange)
11	R_Dose3	Num	8	5.1	5.1	Dose 3 (80dB Treshold, 3dB Exchange)
12	R_Dose4	Num	8	5.1	5.1	Dose 4 (0dB Treshold, 3dB Exchange)
13	R_Lmax	Num	8	5.1	5.1	Lmax
14	R_Lpeak	Num	8	5.1	5.1	Lpeak

Variables in the DirectObsForm2A SAS Data Set (Variables in Creation Order)						
#	Variable	Type	Len	Format	Informat	Label
1	EMPID	Num	8	8.	8.	Employee ID Number
2	Phase	Char	1	\$1.	\$1.	Survey Number
3	S_TaskCodeSLM	Char	7	\$7.	\$7.	Task Code
4	S_MachineCodeSLM	Char	7	\$7.	\$7.	Machine Code
5	S_TaskNoteSLM	Char	100	\$100.	\$100.	Task Note
6	S_LocationCodeSLM	Char	4	\$4.	\$4.	Location Code
7	S_Impulse	Char	1	\$1.	\$1.	Impulse Noise
8	S_NoisePosition	Char	4	\$4.	\$4.	Noise from L/R/F/B
9	S_HandToolCode	Char	15	\$15.	\$15.	Hand Tool Code
10	S_ProdSourceCode	Char	15	\$15.	\$15.	Main Production Sources Codes
11	S_MachineAge	Num	8	4.1	4.1	Age of machine (yrs)
12	S_DistanceSource	Num	8	5.1	5.1	Distance to Main Production Source (ft)
13	S_Density	Num	8	2.	2.	Production Source Density (# within 15 ft)
14	S_NonProdSourceCode	Char	15	\$15.	\$15.	Main Non-Production Sources Codes

Variables in the ActualWorkDay SAS Data Set (Variables in Creation Order)						
#	Variable	Type	Len	Format	Informat	Label
1	EMPID	Num	8	8.	8.	Employee ID Number
2	Phase	Char	1	\$1.	\$1.	Survey Number
3	TU_TaskCodeWorkDay	Char	7	\$7.	\$7.	Task Code
4	TU_MachineCodeWorkDay	Char	7	\$7.	\$7.	Machine Code
5	TU_DurationTask	Char	5	\$5.	\$5.	Time spent at Task

Variables in the SupvBackground SAS Data Set (Variables in Creation Order)						
#	Variable	Type	Len	Format	Informat	Label
1	W_JobCode	Char	3	\$3.	\$3.	Job Code
2	W_SupvCode	Char	2	\$2.	\$2.	Supervisor Code
3	W_SurveyorCode	Char	2	\$2.	\$2.	Surveyor Code
4	W_SurveyDate	Num	8	MMDDYY10.	MMDDYY10.	Date of Survey
5	W_TypicalWorkTime	Num	8	4.1	4.1	Amount of Time Typically Worked
6	W_SupvWorkDayNote	Char	255	\$255.	\$255.	Other Notes from the bottom of the Supervisor Form

Variables in the SupvAvgWorkDay SAS Data Set (Variables in Creation Order)						
#	Variable	Type	Len	Format	Informat	Label
1	W_JobCode	Char	3	\$3.	\$3.	Job Code
2	W_SupvCode	Char	2	\$2.	\$2.	Supervisor Code
3	W_TaskCodeWorkDay	Char	7	\$7.	\$7.	Task Code
4	W_MachineCodeWorkDay	Char	7	\$7.	\$7.	Machine Code
5	W_NrMachines	Num	8	2.	2.	# of Machines
6	W_DurationTask	Char	5	\$5.	\$5.	Time Spent at Task

**APPENDIX R: INDIVIDUAL EMPLOYEE FULL-SHIFT TIME-WEIGHTED AVERAGE NOISE MONITORING RESULTS
DURING EACH NOISE MONITORING SURVEY**

Plant A individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey																	
Department	Job	Survey 1								Survey 2				Survey 3			
		Left Side				Right Side				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
		Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Extrusion	Extrusion Operator	88	88.4	89.5	89.6	88.5	88.8	90.2	90.3	86.2	86.7	88.4	88.5	No Sample in Survey 3			
Extrusion	Extrusion Operator	87.8	88.1	89.5	89.5	87.8	88.1	89.5	89.5	84.5	85.4	87.8	87.9	88.8	89.1	90.8	90.8
Extrusion	Extrusion Operator	85.8	86.4	88.1	88.2	86.4	86.9	89.2	89.2	84.9	85.8	89.3	89.4	81.5	82.9	85.3	85.5
Extrusion	Extrusion Operator	84.9	85.5	87.3	87.4	84.2	84.8	86.6	86.7	79.7	81.5	84.5	84.7	85.3	85.8	87.6	87.7
Extrusion	Extrusion Operator	83.7	84.6	87.1	87.2	83.4	84.4	86.6	86.8	88.2	88.4	89.6	89.6	No Sample in Survey 3			
Extrusion	Extrusion Operator	80.8	82.1	84.8	85	80.9	82.1	85	85.2	82.5	83.8	86.3	86.4	84.2	85	87.3	87.4
Extrusion	Extrusion Operator	79.1	80.6	82.9	83.1	80.6	81.9	83.8	84	86.1	86.7	88.4	88.5	86.2	86.8	93	93
Extrusion	Extrusion Operator	In Slitter Operator Job											83.8	84.6	86.3	86.4	
Extrusion	Grinder Operator	97.5	97.6	101.3	101.3	98.1	98.2	102.4	102.4	In Weigh Station Operator Job				89.2	89.2	90.9	90.9
Extrusion	Grinder Operator	95.6	95.7	98.9	98.9	93.7	93.9	97.7	97.7	87.3	87.8	91.2	91.3	100.4	100.4	103.5	103.5
Extrusion	Grinder Operator	93.1	93.3	99.2	99.2	95.7	95.8	99.9	99.9	99.1	99.1	103.4	103.4	No Sample in Survey 3			

Plant A individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey																	
Department	Job	Survey 1								Survey 2				Survey 3			
		Left Side				Right Side				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
		Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Extrusion	Grinder Operator	91.7	91.8	94	94.1	90.6	90.7	92.8	92.8	82.7	83.1	86.6	86.7	99.2	99.2	103.3	103.3
Extrusion	Grinder Operator	90.4	90.5	92.4	92.4	89.6	89.7	91.7	91.7	91	91.2	93.4	93.4	88.9	89.1	90.9	91
Extrusion	Grinder Operator	89.3	89.4	90.6	90.6	89.8	89.9	91.2	91.3	89	89.3	91.8	91.8	90.3	90.4	91.9	91.9
Extrusion	Grinder Operator	88.8	89	90.4	90.4	87.5	87.8	89.2	89.2	96.6	96.7	99.2	99.2	93.5	93.6	98	98
Extrusion	Grinder Operator	In Weigh Station Operator Job								93.3	93.3	95.2	95.2	In Weigh Station Operator Job			
Extrusion	Pelletizer	87	87.3	90.3	90.4	86.6	87	89.5	89.6	No Samples in Survey 2 or Survey 3							
Extrusion	Pelletizer	86.7	87	88.4	88.4	87	87.3	88.7	88.8	No Samples in Survey 2 or Survey 3							
Extrusion	Pelletizer	85.3	85.5	86.4	86.4	86.7	86.8	87.9	88	No Samples in Survey 2 or Survey 3							
Extrusion	Pelletizer	85	85.4	86.8	86.8	85.4	85.8	87.3	87.4	No Samples in Survey 2 or Survey 3							
Extrusion	Pelletizer	84.5	85.1	87.1	87.2	85.1	85.7	87.8	87.9	No Samples in Survey 2 or Survey 3							
Extrusion	Pelletizer	83.9	84.6	86.6	86.7	83.9	84.8	86.8	87	No Samples in Survey 2 or Survey 3							
Extrusion	Pelletizer	No left side sample				84.3	85.1	87.3	87.4	No Samples in Survey 2 or Survey 3							
Extrusion	Slitter Operator	88.4	88.6	90.2	90.2	88.9	89.1	92.3	92.4	No Samples in Survey 2 or Survey 3							

Plant A individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey																	
Department	Job	Survey 1								Survey 2				Survey 3			
		Left Side				Right Side				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
		Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Extrusion	Slitter Operator	87.6	87.7	88.9	88.9	No right side sample				85.8	86.1	87.7	87.7	No Sample in Survey 3			
Extrusion	Slitter Operator	87.1	87.3	88.8	88.8	87	87.4	88.5	88.6	87.2	87.5	89.9	89.9	90.4	90.6	92.1	92.2
Extrusion	Slitter Operator	84.3	84.6	86.2	86.2	84	84.5	86	86.1	91.6	91.7	92.8	92.8	In Extrusion Operator Job			
Extrusion	Slitter Operator	83.9	84.2	85.9	86	82.9	83.4	84.6	84.7	76.1	80.1	85.9	86.3	82.7	83.1	86	86
Extrusion	Slitter Operator	83.5	83.8	85.1	85.2	83.8	84	85.5	85.5	88.6	88.7	90.6	90.6	In Weigh Station Operator Job			
Extrusion	Slitter Operator	82.8	83.2	84.6	84.7	83	83.4	84.7	84.8	83.9	84.7	86	86.2	No Sample in Survey 3			
Extrusion	Weigh Station Operator	88.3	88.5	90	90.1	89.6	89.7	96.7	96.7	86.7	86.8	88.1	88.1	89.2	89.4	91	91
Extrusion	Weigh Station Operator	87.2	87.3	88.2	88.2	87.6	87.8	88.9	88.9	88.8	88.9	90.7	90.7	86.3	86.5	87.8	87.9
Extrusion	Weigh Station Operator	87.1	87.3	88.8	88.8	86.6	86.8	88.1	88.1	87.1	87.4	91.1	91.1	86.9	87	89.6	89.6
Extrusion	Weigh Station Operator	86.9	87.2	88.2	88.2	87.1	87.3	88.5	88.5	86.5	86.7	88.2	88.2	87.6	87.8	89.1	89.1
Extrusion	Weigh Station Operator	86.2	86.4	89.2	89.2	85.1	85.3	88	88	In Grinder Operator Job				88.5	88.6	91.4	91.4
Extrusion	Weigh Station Operator	85	85.4	87.2	87.3	85.5	85.9	87.8	87.8	85.3	85.5	87.1	87.2	87.9	88.2	97.4	97.4
Extrusion	Weigh Station Operator	80.7	82	85.8	86	76.4	79.4	82	82.5	87.2	87.6	89.1	89.1	88.2	88.4	94.5	94.5

Plant A Individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey																	
Department	Job	Survey 1								Survey 2				Survey 3			
		Left Side				Right Side				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
		Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Extrusion	Weigh Station Operator	In Slitter Operator Job												78.7	81.3	83	83.6
Extrusion	Weigh Station Operator	In Grinder Operator Job								89.5	89.6	92.2	92.2	In Grinder Operator Job			
Thermoforming	Thermoforming General Aid	86.5	86.7	88.9	88.9	85.8	85.9	88	88.1	85.7	85.9	87.8	87.8	85.9	86.1	88.2	88.3
Thermoforming	Thermoforming General Aid	86.3	86.5	88.4	88.4	85.5	85.7	94.8	94.8	No Samples in Survey 2 or Survey 3							
Thermoforming	Thermoforming General Aid	82.9	83.1	84.6	84.7	82.4	82.7	84	84.1	84.2	84.5	85.8	85.9	No Sample in Survey 3			
Thermoforming	Thermoforming General Aid	82.2	82.8	83.9	84	83.7	84.1	85.5	85.6	84.8	85	86.1	86.1	87.3	87.5	89.4	89.4
Thermoforming	Thermoforming General Aid	82	82.7	84.5	84.7	82.9	83.5	85.6	85.7	No Samples in Survey 2 or Survey 3							
Thermoforming	Thermoforming General Aid	81.6	82.4	83.3	83.5	82.4	82.9	83.9	84	82.7	83.1	84.1	84.2	84.7	85	86.1	86.2
Thermoforming	Thermoforming General Aid	81.1	81.8	83.1	83.2	81.3	81.9	83.3	83.4	No Samples in Survey 2 or Survey 3							
Thermoforming	Thermoforming Mechanic	85	85.3	86.6	86.7	85.4	85.7	87.7	87.7	85.3	85.5	86.7	86.8	88.2	88.3	89.9	89.9
Thermoforming	Thermoforming Mechanic	84.4	84.7	86.4	86.4	83.8	84.1	85.7	85.7	85.5	85.6	87.2	87.2	87.5	87.6	88.9	88.9
Thermoforming	Thermoforming Mechanic	83	83.4	84.5	84.6	82.8	83.3	84.6	84.6	82.3	82.9	84.7	84.8	80.6	81.3	82.5	82.7
Thermoforming	Thermoforming Mechanic	82.1	82.6	84.4	84.5	81.5	82.1	84.1	84.2	83.8	84.1	86.1	86.1	84	84.3	85.5	85.5

Plant A individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey																	
Department	Job	Survey 1								Survey 2				Survey 3			
		Left Side				Right Side				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
		Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Thermoforming	Thermoforming Mechanic	81.4	82.2	84.1	84.3	80.2	81.4	82.9	83.2	83.3	83.7	85	85.1	83.5	83.9	85.7	85.8
Thermoforming	Thermoforming Mechanic	80.9	81.4	83.1	83.2	81.1	81.6	83.2	83.3	86.4	86.7	88.5	88.6	82.8	83.3	85.7	85.8
Thermoforming	Thermoforming Mechanic	76.2	78.2	80.1	80.6	77.7	79.8	81.8	82.2	84.4	84.9	87.6	87.6	85.5	85.8	87.9	87.9
Thermoforming	Thermoforming Operator	89.7	89.8	91.5	91.5	86	86.1	87.6	87.6	87.6	87.7	89.7	89.7	84.8	85	86.3	86.3
Thermoforming	Thermoforming Operator	84.7	84.8	85.5	85.5	85.7	85.8	86.7	86.7	85.3	85.5	86.2	86.2	84	84.1	84.7	84.7
Thermoforming	Thermoforming Operator	83.7	84.1	85.1	85.2	83.4	84	84.7	84.9	83.1	83.5	84.1	84.2	82.6	83	83.6	83.7
Thermoforming	Thermoforming Operator	82.5	82.9	84.1	84.2	84.7	85.1	86.7	86.7	No Samples in Survey 2 or Survey 3							
Thermoforming	Thermoforming Operator	81.7	82.1	83.5	83.6	81.3	82	83.2	83.3	84.4	84.5	85.2	85.2	82.8	83.4	84.8	84.9
Thermoforming	Thermoforming Operator	81.4	81.9	82.8	82.9	81.1	81.6	82.6	82.8	85.2	85.3	85.9	85.9	No Sample in Survey 3			
Thermoforming	Thermoforming Operator	81.3	81.8	83.4	83.5	81.9	82.4	84.2	84.3	84.9	85.1	85.9	85.9	86.9	87	88.4	88.4
Mold	Mold Machinist	80.7	82	86	86.2	79.8	81.5	85.5	85.7	80.9	82.5	85.8	86	78.5	81	84.5	84.8
Mold	Mold Machinist	80.6	82.1	84.6	84.8	80.7	82.1	85.1	85.3	80.2	82.1	85.2	85.4	80	81.5	83.8	84.1
Mold	Mold Machinist	76.6	79.7	80.9	81.7	79.1	81.8	83.6	84.1	73.3	77.5	79.2	80.1	83.5	84.5	88.5	88.6

Plant A individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey																	
Department	Job	Survey 1								Survey 2				Survey 3			
		Left Side				Right Side				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
		Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Mold	Mold Machinist	75.9	79.1	82	82.6	74.1	77.9	80.4	81.1	74.4	78.3	81	81.7	74.9	78.5	80.8	81.5
Mold	Mold Machinist	75.5	79	80.5	81.3	76.5	80.3	81.4	82.3	81.5	82.6	86.6	86.7	80.6	82.2	87.2	87.3
Mold	Mold Machinist	74.1	77.6	79.1	79.9	76.1	79	80.8	81.4	74.4	78.4	80.8	81.5	70.9	76	78.1	79.2
Maintenance	Building Maintenance	78.3	79.8	81.8	82.1	79.4	80.6	83	83.2	No Samples in Survey 2 or Survey 3							
Maintenance	Building Maintenance	69.4	74.6	76	77.4	70.5	75.2	79.4	80.1	No Samples in Survey 2 or Survey 3							
Maintenance	Maintenance Electrician	80.3	81.5	84.3	84.5	75.7	78.3	80.4	80.9	No Samples in Survey 2 or Survey 3							
Maintenance	Maintenance Electrician	78.7	80.2	82.2	82.4	79.5	80.8	83	83.3	No Samples in Survey 2 or Survey 3							
Maintenance	Maintenance Mechanic	88.4	88.6	91.6	91.7	90.1	90.2	93.3	93.3	No Samples in Survey 2 or Survey 3							
Maintenance	Maintenance Mechanic	80.6	82.1	84.1	84.4	81.8	83.4	85.2	85.5	No Samples in Survey 2 or Survey 3							
Expedition	Fork Lift Driver	80	81.6	85.2	85.4	77.7	80	83.3	83.6	No Samples in Survey 2 or Survey 3							

Plant B individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey																	
Department	Job	Survey 1								Survey 2				Survey 3			
		Left				Right				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
		Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Canning	Decorator	98.4	98.4	100	100	97.7	97.8	99.3	99.3	96.9	97	98.6	98.6	95.8	95.9	97.9	97.9
Canning	Decorator	98.1	98.1	99.6	99.6	97.9	97.9	99.4	99.4	97.1	97.2	99	99	96.6	96.7	99.4	99.4
Canning	Decorator	98	98.1	99.8	99.8	97.4	97.5	99.3	99.3	98.5	98.6	99.9	100	98.2	98.2	99.6	99.6
Canning	Decorator	97.4	97.5	99.9	99.9	97.7	97.7	99.5	99.5	95.4	95.4	99.1	99.1	96.4	96.5	98.2	98.2
Canning	Decorator	97.1	97.2	99.3	99.3	96.5	96.6	98.5	98.5	95.8	95.9	98.1	98.1	96.6	96.7	98.6	98.6
Canning	Decorator	96.7	96.8	98.6	98.6	96.9	97	98.8	98.8	No Samples in Survey 2 or Survey 3							
Canning	Decorator	96.2	96.3	98.3	98.3	96	96.1	98.2	98.2	96.8	96.9	98.7	98.7	96.1	96.1	98.1	98.1
Canning	Stretcher Operator	95.8	95.9	97.3	97.3	95.5	95.6	97.4	97.4	95.1	95.2	96.7	96.7	95.2	95.3	96.7	96.7
Canning	Stretcher Operator	95.6	95.7	97.3	97.3	95.1	95.2	96.7	96.7	94.7	94.9	96.7	96.7	95.3	95.3	97	97
Canning	Stretcher Operator	94.3	94.5	97.4	97.4	94.1	94.2	97.1	97.1	96.1	96.2	97.6	97.6	95.6	95.7	97.4	97.4
Canning	Stretcher Operator	92.3	92.5	94.7	94.7	93.1	93.3	95.6	95.6	No Samples in Survey 2 or Survey 3							
Canning	Stretcher Mechanic	95.8	95.9	96.9	96.9	96.1	96.1	97.2	97.2	95.3	95.4	96.5	96.5	91.5	91.8	94.6	94.6
Canning	Stretcher Mechanic	94	94.2	96	96	93.3	93.5	95.3	95.4	93	93.2	95.1	95.2	94	94.2	96	96
Canning	Stretcher Mechanic	92.3	92.6	95.3	95.4	91.4	91.6	94.3	94.4	96.3	96.4	98	98	92.8	93	95.1	95.1
Canning	Stretcher Mechanic	91.1	91.5	94.3	94.3	91.1	91.5	94.2	94.2	93.9	94	96	96	92.9	93.1	95.5	95.5
Canning	Stretcher Mechanic	In General Mechanic Job												88.7	89.3	94.3	94.4
Canning	General Mechanic	94.1	94.2	96.2	96.2	93.9	94.1	95.9	95.9	93.6	93.8	95.9	95.9	91.3	91.5	94.1	94.1
Canning	General Mechanic	88.1	88.6	92	92	88.8	89.2	92.7	92.7	94.3	94.4	100.1	100.1	In Stretcher Mechanic Job			

Plant B individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey																	
Department	Job	Survey 1								Survey 2				Survey 3			
		Left				Right				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
		Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Canning	Mechanic - Rear Section	93.3	93.3	95	95	93	93.1	94.8	94.8	92.3	92.5	95.6	95.6	92.1	92.3	95.3	95.3
Canning	Mechanic - Rear Section	93	93.2	96	96	93.2	93.4	96.3	96.3	No Samples in Survey 2 or Survey 3							
Canning	Mechanic - Rear Section	92.9	93.1	97.2	97.2	92.9	93.1	97.1	97.1	83.2	84.1	88.2	88.3	91.3	91.6	95.2	95.2
Canning	Mechanic - Rear Section	92.9	93.1	95.5	95.5	92.6	92.8	96.5	96.5	92.1	92.4	95.7	95.7	87.7	88.4	92.7	92.7
Canning	Mechanic - Rear Section	Dosimeter Problem - No Data				90.7	91	94.2	94.3	91.1	91.3	94.5	94.5	No Sample in Survey 3			
Assembly	Counting Operator	97.9	97.9	98.8	98.8	97.6	97.6	98.4	98.4	No Samples in Survey 2 or Survey 3							
Assembly	Counting Operator	97.6	97.6	98.4	98.4	97	97	97.8	97.8	97.7	97.7	98.5	98.5	No Sample in Survey 3			
Assembly	Counting Operator	97.5	97.6	98.5	98.5	97	97	98	98	95.8	95.8	96.7	96.7	No Sample in Survey 3			
Assembly	Counting Operator	97.4	97.4	98.3	98.3	97.2	97.2	98.1	98.1	97	97	99.1	99.1	No Sample in Survey 3			
Assembly	Counting Operator	96.9	96.9	98.1	98.1	96.7	96.8	97.9	97.9	No Samples in Survey 2 or Survey 3							
Assembly	Counting Operator	In Measurer Job								97.5	97.5	98.2	98.2	In Measurer Job			
Assembly	Counting Operator	Dosimeter Problem - No Data				98.3	98.4	99.2	99.2	No Samples in Survey 2 or Survey 3							
Canning	Department Aid	93.8	93.9	95.5	95.6	93.6	93.7	95.8	95.8	No Samples in Survey 2 or Survey 3							
Canning	Department Aid	93.7	93.8	96	96	92.8	92.9	95	95	92.7	92.8	94.6	94.6	91.8	91.9	94	94
Canning	Department Aid	91.9	92.1	94.9	94.9	91.7	91.9	94.3	94.4	93.2	93.4	95.8	95.8	91.5	91.7	94.1	94.1
Canning	Department Aid	91.2	91.5	94.2	94.2	90.9	91.1	93.9	93.9	93.1	93.3	95.7	95.8	90.8	90.9	93.4	93.4
Canning	Packaging Operator	89.7	89.9	91.6	91.6	89.7	89.9	91.6	91.7	89	89.2	91	91	89.7	89.8	91.6	91.6
Canning	Packaging Operator	89.2	89.3	90.9	90.9	89.6	89.7	91.3	91.3	No Samples in Survey 2 or Survey 3							

Plant B individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey																	
Department	Job	Survey 1								Survey 2				Survey 3			
		Left				Right				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
		Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Canning	Packaging Operator	88.9	89.1	90.9	90.9	88.8	89	90.9	90.9	90.2	90.3	91.9	91.9	88.3	88.5	90.6	90.6
Assembly	Press Operator 26 mm	97.5	97.5	98.8	98.8	93.6	93.7	95	95	No Samples in Survey 2 or Survey 3							
Assembly	Press Operator 26 mm	96.2	96.2	97.8	97.8	96.2	96.2	97.7	97.7	93.9	94	95.6	95.6	No Sample in Survey 3			
Assembly	Press Operator 26 mm	96.1	96.1	97.6	97.6	96.9	97	98.6	98.6	No Samples in Survey 2 or Survey 3							
Assembly	Press Operator 26 mm	95.9	96	97.7	97.7	95.7	95.8	97.5	97.5	94.9	95	96.6	96.6	No Sample in Survey 3			
Assembly	Rotary Operator	97.1	97.2	98.8	98.8	97.1	97.2	98.9	98.9	96.2	96.2	97.7	97.7	96.3	96.4	98	98
Assembly	Rotary Operator	96.8	96.9	98.5	98.5	Dosimeter Problem - No Data				96	96.1	97.7	97.7	95.5	95.6	97.3	97.3
Assembly	Rotary Operator	96.6	96.7	98.4	98.4	96.5	96.6	98.4	98.4	95.2	95.3	97.2	97.2	No Sample in Survey 3			
Assembly	Rotary Operator	Dosimeter Problem - No Data								95.3	95.4	97.1	97.1	95.8	95.9	97.5	97.5
Lithography	Printing Press Operator	90.9	90.9	91.5	91.5	90	90.1	90.7	90.7	91	91	92	92	91	91	91.8	91.8
Lithography	Printing Press Operator	90.7	90.8	91.9	91.9	90.5	90.6	91.9	91.9	No Samples in Survey 2 or Survey 3							
Lithography	Varnisher (Coater)	90.7	90.8	91.7	91.8	90.8	90.8	91.8	91.8	No Samples in Survey 2 or Survey 3							
Lithography	Varnisher (Coater)	90.4	90.6	92.5	92.6	90.3	90.5	94	94	No Samples in Survey 2 or Survey 3							
Lithography	Varnisher (Coater)	88.7	88.8	89.8	89.8	88.8	88.9	89.7	89.7	89.4	89.6	93.6	93.6	88.3	88.5	89.5	89.5
Lithography	Measurer	91.1	91.2	91.8	91.8	91.4	91.4	92	92	89.8	89.9	90.9	90.9	88.7	88.8	89.6	89.6
Lithography	Measurer	90.7	90.7	91.2	91.2	91.1	91.2	91.8	91.8	In Counting Operator Job				89.5	89.6	90.3	90.3

Plant C individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey																
Job	Survey 1								Survey 2				Survey 3			
	Left				Right				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Heavy Equipment Repair Technician (Mechanic)	79.9	81.8	87.6	87.7	79.4	81.6	87.4	87.6	77.7	80.1	84.0	84.3	82.2	83.5	90.4	90.5
Heavy Equipment Repair Technician (Mechanic)	77.9	80.2	85.3	85.5	80.0	81.7	84.3	84.5	79.9	81.9	86.0	86.2	76.8	79.6	82.3	82.7
Heavy Equipment Repair Technician (Mechanic)	77.1	79.9	81.7	82.3	76.9	79.5	81.3	81.9	75.5	78.3	81.2	81.7	75.1	78.3	80.3	81.0
Heavy Equipment Repair Technician (Mechanic)	76.9	79.6	84.6	84.8	76.4	79.1	83.5	83.8	83.2	84.4	89.8	89.9	77.5	80.4	83.3	83.8
Heavy Equipment Repair Technician (Mechanic)	75.5	78.8	84.0	84.3	75.9	79.0	83.9	84.2	78.1	80.6	84.2	84.5	71.3	75.7	79.2	79.9
Heavy Equipment Repair Technician (Mechanic)	73.5	77.4	79.5	80.4	73.4	77.3	79.7	80.5	74.0	78.0	82.2	82.7	72.5	76.8	82.0	82.4
Heavy Equipment Repair Technician (Mechanic)	70.3	74.5	79.1	79.6	70.3	75.1	78.3	79.0	71.9	76.1	79.4	80.1	75.9	78.5	83.3	83.6
Heavy Equipment Repair Technician (Mechanic)	65.4	70.8	73.9	75.1	66.0	71.4	74.4	75.5	73.0	76.3	85.9	86.1	73.4	76.4	80.3	80.7
Heavy Equipment Repair Technician (Mechanic)	No Left Side Measurement				67.0	73.8	75.4	76.9	No Noise Measurements in Surveys 2 and 3							
Cylinder Head Rebuilding Technician (Mechanic)	75.7	78.9	82.3	82.7	75.1	78.3	82.7	83.0	73.4	77.6	79.8	80.6	79.9	81.5	85.1	85.3
Fuel Injector Rebuilding Technician (Mechanic)	72.3	76.9	79.9	80.6	72.7	77.3	80.1	80.8	72.2	76.4	78.8	79.6	75.0	78.2	81.7	82.2

Plant C Individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey

Job	Survey 1								Survey 2				Survey 3			
	Left				Right				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Hydraulic Pump Rebuilding Technician (Mechanic)	76.3	78.8	83.3	83.6	75.8	78.7	83.1	83.4	73.0	76.4	81.4	81.8	74.5	78.1	80.7	81.4
Motor Rebuilding Technician (Mechanic)	86.5	87.5	94.9	95.0	86.9	87.7	95.2	95.2	74.4	78.4	80.7	81.4	74.8	78.9	81.2	81.9
Motor Rebuilding Technician (Mechanic)	84.9	85.7	94.0	94.0	85.8	86.6	95.0	95.1	72.1	76.9	78.3	79.5	75.7	79.3	83.0	83.5
Motor Rebuilding Technician (Mechanic)	71.3	76.5	78.4	79.5	72.3	76.9	79.6	80.4	71.5	76.6	78.2	79.3	77.1	80.0	82.4	83.0
Motor Rebuilding Technician (Mechanic)	70.5	76.8	80.0	80.9	70.3	76.6	78.6	79.8	No Noise Measurements in Surveys 2 and 3							
Transmission Rebuilding Technician (Mechanic)	80.7	82.3	87.8	87.9	80.4	82.1	86.5	86.7	83.8	84.8	87.8	87.9	81.4	83.0	86.1	86.3
Machinist - Bay 56/58	70.5	76.2	79.1	80.0	70.2	76.1	78.6	79.7	70.9	76.3	77.7	78.9	65.0	75.6	72.9	76.8
Machinist - Bay 56/58	61.8	73.8	71.6	75.5	62.7	74.3	72.4	76.0	74.4	78.6	83.0	83.5	72.6	77.4	80.0	80.8
Machinist - Operations Section	76.5	79.6	81.2	81.9	76.2	79.5	81.1	81.8	77.1	79.9	82.0	82.6	76.0	79.4	82.7	83.2
Machinist - Operations Section	74.6	78.7	80.9	81.7	75.8	79.2	81.7	82.4	81.1	82.7	86.4	86.6	73.3	77.8	79.7	80.6
Machinist - Operations Section	No Left Side Measurement				70.1	76.7	78.3	79.6	72.5	77.8	80.5	81.4	69.7	76.5	78.0	79.4
Machinist - Welding Section	76.7	79.7	81.1	81.8	77.5	80.2	81.8	82.4	80.7	82.4	85.3	85.6	81.2	82.5	83.9	84.2

Plant C individual employee full-shift time-weighted average noise monitoring results during each noise monitoring survey

Job	Survey 1								Survey 2				Survey 3			
	Left				Right				Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)
	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)	Dose 1 (dBA)	Dose 2 (dBA)	Dose 3 (dBA)	Dose 4 (dBA)								
Machinist - Welding Section	No Left Side Measurement				70.0	76.6	78.2	79.5	78.9	81.4	84.9	85.2	80.8	82.6	86.3	86.5
Welder	93.5	93.8	99.1	99.1	93.7	94.0	99.3	99.3	101.4	101.5	105.7	105.7	90.5	90.9	97.7	97.7
Welder	89.2	89.7	95.8	95.8	85.5	86.5	91.5	91.6	84.7	85.5	88.6	88.7	91.2	91.5	95.5	95.5
Welder	85.2	86.1	93.8	93.9	87.3	87.9	97.3	97.3	84.0	85.1	88.2	88.4	79.9	81.6	84.1	84.4
Welder	82.1	83.4	86.1	86.3	82.9	84.1	87.3	87.5	92.3	92.6	99.8	99.8	82.3	83.7	88.3	88.4
Track Repair	83.0	84.1	89.1	89.2	83.4	84.5	89.1	89.2	No Noise Measurements in Surveys 2 and 3							
Painter	78.6	80.3	81.9	82.3	80.1	81.6	84.0	84.3	83.1	84.4	89.5	89.6	No Noise Measurement in Surveys 3			

APPENDIX S: AVERAGE SOUND LEVEL MEASUREMENTS BY JOB FOR EACH TASK CONDUCTED BY EMPLOYEES DURING NOISE MONITORING SURVEYS

Plant A: Average sound level measurements by job for each task conducted by employees during noise monitoring surveys														
Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Extrusion Operator	Emergency Scrap Removal	15	87.6	94.9	91.3	87.6	94.9	91.3	88.5	95.4	91.8	88.5	95.4	91.8
Extrusion Operator	Monitor Machine	27	82.4	96.7	91.2	82.4	96.7	91.2	82.5	96.7	91.9	82.5	96.7	91.9
Extrusion Operator	Activities in Extrusion Department	16	83	97.6	90.7	83	97.6	90.7	83.3	97.8	91.7	83.3	97.8	91.7
Extrusion Operator	Activities in Pelletizer Area	4	85.6	90.2	87.5	85.7	90.2	87.7	85.9	90.5	88.3	85.9	90.5	88.3
Extrusion Operator	Slitter Activities	3	82.7	90.5	87.3	82.7	90.5	87.3	82.8	90.5	87.8	82.8	90.5	87.8
Extrusion Operator	Set-Up/Repair	8	55.6	89.9	84.5	71.1	89.9	85.1	65.5	89.9	86.1	72.4	89.9	86.2
Extrusion Operator	Control Booth	25	42.2	84.8	70.9	67.7	84.8	74.6	57.3	84.8	76.2	67.7	84.8	76.4
Extrusion Operator	Break	25	48.4	79.5	69	64.6	80.8	73.9	61.2	82.1	75.1	65.8	82.4	75.7
Extrusion Operator	Lunch	15	44.3	74	64.3	65.1	77.1	71.8	58.6	80.4	73.7	65.8	80.8	73.8
Extrusion Operator	Office Work	1				64.3	64.3	64.3				64.5	64.5	64.5
Grinder Operator	Compressed Air	5	87.2	108.2	101	87.8	108.3	101.1	90.4	108.3	102.8	90.4	108.3	102.8
Grinder Operator	Load Grinder	17	91.8	103.7	97.8	64.6	103.7	97	91.8	105.1	99.1	65	105.1	98.5
Grinder Operator	Outside Grinder Room	17	53.9	90.6	86.3	74.4	90.6	86.2	65.9	91.6	87.5	74.5	91.6	87.3
Grinder Operator	Grinder Room	15	67.3	89.8	85	75.5	90	85.2	73.7	93.5	87.3	75.5	93.5	87.1
Grinder Operator	Drive Fork Lift	1	84.3	84.3	84.3	84.3	84.3	84.3	84.7	84.7	84.7	84.7	84.7	84.7
Grinder Operator	Break	10	45	70.5	63.7	68.3	79.3	74	59	75	71.2	68.7	79.4	75.1
Grinder Operator	Lunch	6	59	59	59	65.3	74	69.8	68.2	68.2	68.2	65.8	74.9	71
Grinder Operator	Office Work	1	46.2	46.2	46.2	74.6	74.6	74.6	59.7	59.7	59.7	75.2	75.2	75.2
Grinder Operator	Control Booth	2				67.4	72.8	70.6				67.5	73.2	71.2
Pelletizer	Load Grinder	1	104	104	104	104	104	104	104.1	104.1	104.1	104.1	104.1	104.1
Pelletizer	Compressed Air	5	94.4	97.3	95.9	94.4	97.3	95.9	94.8	97.5	96.2	94.8	97.5	96.3
Pelletizer	Cleaning	3	81.8	95	92.3	83.3	95	92.4	85.1	95.2	93.3	85.4	95.2	93.3
Pelletizer	Unload Pelletizer	2	90.9	92.7	91.9	90.9	92.8	91.9	91.9	94.2	93.2	91.9	94.2	93.2
Pelletizer	Activities in Thermoforming Dept.	1	91.2	91.2	91.2	91.6	91.6	91.6	94	94	94	94	94	94
Pelletizer	Repair Fork Lift	5	58.8	96.8	89.7	68.5	96.8	88.3	68.8	97.7	92.3	69.4	97.7	91.4
Pelletizer	Using Vacuum	1	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
Pelletizer	Activities in Extrusion Department	2	85.5	90.2	88.2	86.1	90.2	88.4	87.5	90.7	89.4	87.6	90.7	89.4
Pelletizer	Drive Fork Lift	22	62.6	95.1	88.2	76.2	95.1	88.4	70	97.5	90.8	76.7	97.5	90.8
Pelletizer	Monitor Machine	12	68	89.7	86.7	78.4	89.7	86.9	73.4	89.8	87.3	78.5	89.8	87.4
Pelletizer	Load Pelletizer	6	82.5	88.1	86	82.5	88.1	86	82.6	88.2	86.2	82.6	88.2	86.2

Plant A: Average sound level measurements by job for each task conducted by employees during noise monitoring surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Pelletizer	Activities in Shipping	2	81.4	85	83.4	83.8	85	84.4	85	86.7	85.9	85	87	86.1
Pelletizer	Garbage Disposal Activities	1	82.2	82.2	82.2	83.9	83.9	83.9	85.3	85.3	85.3	85.7	85.7	85.7
Pelletizer	Control Booth	3	71.9	75.3	73.8	72.7	79.1	77.3	75.9	78.6	77.5	73.1	79.9	78.1
Pelletizer	Office Work	5	61.9	74.2	70.4	68.8	77.5	73.8	70.3	77.6	75.3	69.3	78.6	75
Pelletizer	Break	11	41.7	76.7	69.2	65	79.8	73.5	57.1	80.2	75.4	65.3	81.1	75.2
Pelletizer	Activities in Warehouse	2	61.4	66.4	64.3	73.7	74.3	74	69.1	73.6	71.9	74.8	76	75.4
Pelletizer	Lunch	7	56.9	56.9	56.9	65.2	73.1	68.4	66.4	66.4	66.4	65.2	73.9	69.3
Slitter Operator	Activities in Pelletizer Area	2	91.2	94.9	93.3	91.2	94.9	93.3	91.5	94.9	93.5	91.5	94.9	93.5
Slitter Operator	Emergency Scrap Removal	9	89.5	94.7	92.8	89.5	94.7	92.8	89.6	95.3	93.4	89.6	95.3	93.4
Slitter Operator	Cleaning	3	82.4	97.2	92.1	82.4	97.2	92.1	82.5	97.7	93.7	82.5	97.7	93.7
Slitter Operator	Load/Unload Winder	13	84.5	93	89.2	84.5	93	89.2	84.6	94.4	89.9	84.6	94.4	89.9
Slitter Operator	Slitter Activities	37	54.2	94.7	85.6	74.8	94.7	85.8	65	94.8	87	75.2	94.8	87.1
Slitter Operator	Package Plastic Rolls	3	80.1	87.3	85.1	82.5	87.3	85.6	82.1	87.3	85.7	83	87.3	85.8
Slitter Operator	Weigh Station Activities	10	60.3	90	84.5	76.4	90	84.8	69.1	90.6	85.4	76.6	90.6	85.5
Slitter Operator	Drive Fork Lift	5	60.1	90	84	77.1	90	85.4	68.7	91.2	87.7	77.2	91.2	87.9
Slitter Operator	Cut Tube	16	78.4	86.5	83.5	81.1	86.5	83.7	80.9	88.2	84.1	81.8	88.2	84.1
Slitter Operator	Drive Electronic Pallet Roll Jack	2	66.1	80.2	76.2	76.1	81	79	73.5	80.5	78.3	76.9	81	79.4
Slitter Operator	Lunch	8	47.3	78.2	71.3	66.6	81	74.9	60.5	80.8	76.7	67.2	81.8	77
Slitter Operator	Control Booth	10	60.7	75.2	69.9	69.7	79.5	75.4	69	78	75	70.2	79.9	76.4
Slitter Operator	Break	22	47.4	72.6	64.7	66.3	78	73.3	61.3	76.8	72	66.7	78.8	74.6
Slitter Operator	Office Work	2				60.1	64.9	62.9				62.4	65.8	64.4
Thermoforming General Aid	Use Pallet Truck	4	77.8	94.2	87.6	81.2	94.2	87.9	80.4	96.4	91.1	81.7	96.4	91.1
Thermoforming General Aid	Drive Fork Lift	5	82.2	89.3	86	75.4	89.3	84.9	83.4	89.7	87.5	75.5	89.7	86.6
Thermoforming General Aid	Work Near Machine	45	79.9	90.1	85.6	81	90.1	85.7	80.8	90.6	86.1	81.1	90.6	86.1
Thermoforming General Aid	Set-Up/Repair	19	73.2	90.6	84.5	79.9	90.6	84.8	78.3	93	85.8	80.7	93	85.9
Thermoforming General Aid	Unload/Inspect/Package	1	84.1	84.1	84.1	84.1	84.1	84.1	84.4	84.4	84.4	84.4	84.4	84.4
Thermoforming General Aid	Activities in Extrusion Department	1	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3
Thermoforming General Aid	Activities in Thermoforming Dept.	13	59.5	83.7	79.3	75.3	83.7	81	68.3	83.7	80.9	75.9	83.7	81.5
Thermoforming General Aid	Mold Shop	3	63.7	73.7	70.4	69.7	79.9	77.1	71.4	78.6	76	72.9	80.7	78.4
Thermoforming General Aid	Lunch	10	51.8	64.9	59.2	63	72.7	67.7	63.3	72.6	68.8	63.2	74.7	69.5
Thermoforming General Aid	Break	7	57.9	57.9	57.9	62.9	72.2	67.6	67.5	67.5	67.5	64.2	72.7	69.2
Thermoforming General Aid	Office Work	6	50.1	50.1	50.1	59.6	68.6	65.3	62.3	62.3	62.3	61.5	69.6	66.8
Thermoforming General Aid	Warehouse Activities	1				67.8	67.8	67.8				68.8	68.8	68.8

Plant A. Average sound level measurements by job for each task conducted by employees during noise monitoring surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Thermoforming Mechanic	Compressor Room	1	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5
Thermoforming Mechanic	Work Near Machine	15	81.7	92	86	82.6	92	86	83.3	92.1	86.5	83.6	92.1	86.6
Thermoforming Mechanic	Use Pallet Truck	1	84.3	84.3	84.3	84.3	84.3	84.3	84.5	84.5	84.5	84.5	84.5	84.5
Thermoforming Mechanic	Set-Up/Repair	48	55.8	88.2	84	76.8	88.2	84.3	65.5	88.5	84.7	76.9	88.5	84.8
Thermoforming Mechanic	Activities in Thermoforming Dept.	4	81.6	83.4	82.7	61.9	83.9	81.1	81.7	85	83.6	62	85.2	82.4
Thermoforming Mechanic	Drive Fork Lift	3	52.8	86.9	79.3	75.9	86.9	82	64	87.3	82.6	76	87.3	83.4
Thermoforming Mechanic	Mold Shop	6	61.5	85.8	77.1	64.1	86.2	76.8	70.2	86.8	81.4	65.9	86.9	80.1
Thermoforming Mechanic	Activities in Mechanic Department	1	75.2	75.2	75.2	79.5	79.5	79.5	78	78	78	79.9	79.9	79.9
Thermoforming Mechanic	Office Work	9	62.7	74.9	72.6	63.7	79.9	72.5	70.4	82.2	79.2	64.2	82.7	76.1
Thermoforming Mechanic	Lunch	12	60.4	63.4	62.1	62.8	71.5	68	68.9	71.8	70.6	63.3	73.9	69.6
Thermoforming Mechanic	Activities in Mold Department	3	48.2	65.6	60.3	70.6	74.3	72.6	61	72.6	69.2	71.8	75.6	73.9
Thermoforming Mechanic	Break	8	53.6	58.9	56.7	60.8	68.7	66	64.4	68.7	67.1	61.2	71.8	68
Thermoforming Mechanic	Activities in Lamination	1	44.3	44.3	44.3	75.4	75.4	75.4	58.6	58.6	58.6	75.6	75.6	75.6
Thermoforming Mechanic	Activities in Shop	1				70.1	70.1	70.1				70.2	70.2	70.2
Thermoforming Operator	Compressed Air	4	86.4	99	94.9	86.7	99	94.9	87.2	99.3	96.1	87.3	99.3	96.1
Thermoforming Operator	Unload/Inspect/Package	101	68.6	90.1	84.3	79.3	90.1	84.5	73.3	90.4	84.9	79.4	90.4	85
Thermoforming Operator	Cleaning	10	73	90.3	84.2	79.7	90.3	84.8	76.6	90.5	85.4	79.8	90.5	85.6
Thermoforming Operator	Machine Downtime	22	46.8	88.3	82.4	76.4	88.3	83.1	60	88.3	83.3	76.6	88.3	83.5
Thermoforming Operator	Set-Up/Repair	5	42.5	83.2	79.9	77.2	83.2	81.4	57.5	83.3	81.1	77.3	83.3	81.7
Thermoforming Operator	Work Near Machine	4	67.1	82.2	77.6	79.2	82.3	80.6	73.2	82.3	79.3	79.3	82.4	80.8
Thermoforming Operator	Lunch	16	66.4	66.4	66.4	60.8	73.3	69.1	74.9	74.9	74.9	61.4	76.2	70.5
Thermoforming Operator	Break	17	51.2	67.3	60.8	61.1	77.1	68.9	63	73.1	69.2	61.6	77.6	70.4
Thermoforming Operator	Office Work	2	59.5	59.5	59.5	68.7	70.3	69.5	68.7	68.7	68.7	70.3	72.5	71.5
Weigh Station Operator	Start-Up Machine Line 1	1	99.1	99.1	99.1	99.1	99.1	99.1	99.2	99.2	99.2	99.2	99.2	99.2
Weigh Station Operator	Emergency Scrap Removal	6	81.7	97.4	93.1	83.1	97.4	93.2	83.6	97.9	94.2	84	97.9	94.2
Weigh Station Operator	Cleaning	11	68.7	97.6	89.8	77.1	97.6	90	74.8	97.9	91.6	78	97.9	91.6
Weigh Station Operator	Load/Unload Winder	9	78.4	95.5	89.6	81.4	95.5	89.7	81	96	90.6	82.1	96	90.6
Weigh Station Operator	Drive Fork Lift	2	79.6	91.9	88.1	81.7	91.9	88.5	81	94	91.2	81.9	94	91.3
Weigh Station Operator	Package Plastic Rolls	9	71.7	89.3	86.8	75.5	89.3	86.4	75.9	89.3	87.2	75.6	89.3	86.8
Weigh Station Operator	Cut Tube	1	86.6	86.6	86.6	86.6	86.6	86.6	87.5	87.5	87.5	87.5	87.5	87.5
Weigh Station Operator	Slitter Activities	20	62.8	90.8	85.5	75.2	90.8	85.7	70.3	90.8	86.5	75.7	90.8	86.6
Weigh Station Operator	Weigh Station Activities	10	70.2	89.1	85.3	74.2	89.1	85	74.5	89.1	86.1	74.3	89.1	85.8
Weigh Station Operator	Activities in Extrusion Department	1	82.4	82.4	82.4	82.4	82.4	82.4	82.5	82.5	82.5	82.5	82.5	82.5

Plant A: Average sound level measurements by job for each task conducted by employees during noise monitoring surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Weigh Station Operator	Empty Garbage	1	81.2	81.2	81.2	82.6	82.6	82.6	83.6	83.6	83.6	83.9	83.9	83.9
Weigh Station Operator	Outside Grinder Room	1	74.8	74.8	74.8	78.3	78.3	78.3	79.3	79.3	79.3	80.1	80.1	80.1
Weigh Station Operator	Lunch	8	74.6	74.6	74.6	65.4	79.1	72.4	78.7	78.8	78.8	65.7	80.2	74.8
Weigh Station Operator	Control Booth	6	59.5	79.6	70.2	67.7	81.7	75.9	68	82.3	76.3	68.1	82.9	77.7
Weigh Station Operator	Break	13	42.7	68.7	64.7	66.6	77	72.2	57.6	74.2	71.7	66.9	77.6	73.4
Weigh Station Operator	Activities in Lamination	1				74	74	74				74.1	74.1	74.1
Mold Machinist	Compressed Air	4	89.9	102.1	96.1	90	102.1	96.2	90.4	102.3	97.5	90.4	102.3	97.5
Mold Machinist	Hand Tool Use	4	83.1	94.7	91.4	69.9	94.7	89.5	83.7	95.7	92.8	70.4	95.7	91.6
Mold Machinist	Power Tool Use	11	59.8	91	85.1	73.4	91.1	85.5	68.3	91.9	86.5	74.2	91.9	86.6
Mold Machinist	Machining	21	70.3	91.6	85	74.7	91.6	85.1	74.4	92.1	87.1	74.7	92.1	86.8
Mold Machinist	Drive Fork Lift	1	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5	83.5
Mold Machinist	Cleaning	5	54.2	87.8	80.8	68.8	88.3	80.3	65	90.3	85.8	69.2	90.4	84
Mold Machinist	Activities in Thermoforming Dept.	1	80.1	80.1	80.1	81.1	81.1	81.1	80.6	80.6	80.6	81.1	81.1	81.1
Mold Machinist	Activities Outside Mold Dept.	4	74.4	81.9	79.5	78.9	82.9	81.3	77.5	83.1	81.7	79.4	83.4	82.2
Mold Machinist	Mold Shop	3	63.9	81.1	76.7	67.5	81.8	76.1	73.4	81.6	79.2	68.3	82	78.1
Mold Machinist	Machine Shop Activities	9	62.3	83.1	74.7	65.8	83.4	75.3	71	83.5	78.4	65.9	83.7	77.3
Mold Machinist	Break	7	42.4	74.4	67.2	59.1	78.5	71.8	57.5	78.2	73.8	59.6	79.6	73.7
Mold Machinist	Lunch	6	43.1	52.1	48.9	66.4	75.7	70.5	57.9	63.5	61.5	67	75.9	71.6
Maintenance Mechanic	Repair/Maintenance	8	82.7	94.5	89.2	82.7	94.5	89.2	82.8	94.7	90.1	82.8	94.7	90.1
Maintenance Mechanic	Activities in Extrusion Department	1	86.3	86.3	86.3	86.6	86.6	86.6	86.9	86.9	86.9	86.9	86.9	86.9
Maintenance Mechanic	Power Tool Use	2	80	84.2	82.4	80.9	84.2	82.7	81.2	84.2	83	81.4	84.2	83
Maintenance Mechanic	Drive Fork Lift	1	81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8
Maintenance Mechanic	Break	4	67.6	67.6	67.6	67.7	74.8	71.5	74.3	74.3	74.3	68.1	76.4	72.8
Maintenance Mechanic	Activities in Lamination	1	54	54	54	69.7	69.7	69.7	65.2	65.2	65.2	71.3	71.3	71.3
Maintenance Mechanic	Lunch	2	40.3	40.3	40.3	66.9	71.4	69.5	56.1	56.1	56.1	67.3	72.1	70.3
Maintenance Mechanic	Machine Shop Activities	1				73	73	73				73.1	73.1	73.1
Maintenance Electrician	Repair/Maintenance	8	43	89.5	82.8	65.4	89.5	80.4	57.9	89.5	84.6	66.2	89.5	82.7
Maintenance Electrician	Break	1	60.9	60.9	60.9	71.8	71.8	71.8	69.2	69.2	69.2	73.3	73.3	73.3
Maintenance Electrician	Lunch	1	48.1	48.1	48.1	69.6	69.6	69.6	61.4	61.4	61.4	70.2	70.2	70.2
Maintenance Electrician	Office Work	2	35.3	35.3	35.3	67.7	67.8	67.8	53.1	53.1	53.1	68.8	69.3	69.1
Maintenance Electrician	Storage Room	1				64.7	64.7	64.7				65.6	65.6	65.6
Building Maintenance	Cleaning	25	43.9	94.9	80.7	68	94.9	80	58.4	96.1	85.6	68	96.1	84
Building Maintenance	Drive Fork Lift	1	76.1	76.1	76.1	79.3	79.3	79.3	80.8	80.8	80.8	81.5	81.5	81.5

Plant A: Average sound level measurements by job for each task conducted by employees during noise monitoring surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Building Maintenance	Break	2	57.4	57.4	57.4	63.4	67.8	65.9	67.3	67.3	67.3	64.2	70.3	68.2
Building Maintenance	Lunch	2	48.5	48.5	48.5	66.9	68.1	67.5	61.2	61.2	61.2	68.6	68.6	68.6
Fork Lift Driver	Drive Fork Lift	5	82.9	93	90.5	83.4	93	90.5	83.9	95.8	92.9	84.1	95.8	92.9
Fork Lift Driver	Activities Outside Shipping Dept.	1	76.2	76.2	76.2	79.5	79.5	79.5	79.7	79.7	79.7	80.7	80.7	80.7
Fork Lift Driver	Activities in Warehouse	1	58	58	58	72.5	72.5	72.5	67	67	67	73.5	73.5	73.5
Fork Lift Driver	Break	2				65.5	65.8	65.7				65.8	66.9	66.4
Fork Lift Driver	Lunch	1				64.5	64.5	64.5				64.9	64.9	64.9
Fork Lift Driver	Office Work	2				64.7	72.5	69.6				66.1	72.8	70.6

Plant B: Average sound level measurements by job for each task conducted by employees during noise monitoring surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Decorator	Monitor Operation (Inspection)	14	97.4	103.2	100.8	97.4	103.2	100.8	97.4	103.2	101	97.4	103.2	101
Decorator	Choosing Ink	1	100.1	100.1	100.1	100.1	100.1	100.1	100.2	100.2	100.2	100.2	100.2	100.2
Decorator	Quality Control	6	93.5	101.1	98.6	98.5	101.1	99.2	98.5	101.1	99.2	98.5	101.1	99.2
Decorator	Change Decorations	9	90.8	103.7	96.3	90.8	103.7	96.3	90.8	104	97.5	90.8	104	97.5
Decorator	Machine Downtime	1	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9
Decorator	Break	14	42.3	72.6	60.9	65.6	78.5	73.4	57.4	76.9	69.5	68	78.8	74.6
Decorator	Office Work	6	43.6	70.1	60.9	69.7	78.7	74.4	58.2	74.8	69.2	70.6	78.9	75.2
Decorator	Lunch	5	43.1	60.5	56.3	66.9	73.7	71.3	57.9	68.9	66.3	68.2	74.5	72.6
Stretcher Operator	Repair/Maintenance	21	87.9	101.1	98.9	87.9	101.1	98.9	87.9	101.1	99.1	87.9	101.1	99.1
Stretcher Operator	Work Bench	5	95.6	97.2	96.7	95.6	97.2	96.7	95.6	97.2	96.8	95.6	97.2	96.8
Stretcher Operator	Set-Up	1	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
Stretcher Operator	Change Aluminum Roll	13	85.3	98	93.7	85.3	98	93.7	85.5	98	94.4	85.5	98	94.4
Stretcher Operator	Drive Fork Lift	2	90.9	94.3	92.8	90.9	94.3	92.8	91.2	94.9	93.4	91.2	94.9	93.4
Stretcher Operator	Tool Room	2	70.3	70.3	70.3	75.9	78	77	75.3	75.3	75.3	75.9	78.5	77.4
Stretcher Operator	Break	7	60.6	74	69	65.1	77.2	73.4	68.8	79.5	75.4	66.9	80.1	75.5
Stretcher Operator	Lunch	1				67.3	67.3	67.3				69.3	69.3	69.3
Stretcher Mechanic	Repair/Maintenance	15	82.1	104.9	98.4	82.1	104.9	98.4	82.1	104.9	99	82.1	104.9	99
Stretcher Mechanic	Set-Up	1	97.1	97.1	97.1	97.1	97.1	97.1	97.2	97.2	97.2	97.2	97.2	97.2
Stretcher Mechanic	Change Aluminum Roll	2	90.3	93.3	92	90.3	93.3	92	90.5	94.1	92.7	90.5	94.1	92.7
Stretcher Mechanic	Work Bench	1	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3
Stretcher Mechanic	Machine Shop Activities	8	78	97.7	90.8	65.3	97.7	84.9	79.3	97.7	93.1	65.9	97.7	89
Stretcher Mechanic	Aluminum Recycling Area	1	85.6	85.6	85.6	85.6	85.6	85.6	85.8	85.8	85.8	85.8	85.8	85.8
Stretcher Mechanic	Break	10	63.9	94.3	83.6	67.2	94.5	80.6	71.3	99.7	92.8	67.5	99.8	90
Stretcher Mechanic	Lunch	1	77.3	77.3	77.3	79.6	79.6	79.6	81.8	81.8	81.8	82.2	82.2	82.2
Stretcher Mechanic	Office Work	6	67.2	81.8	76.1	64.8	83	77.3	72.5	83.3	79.5	65.7	83.7	78.7
Stretcher Mechanic	Quality Control	5	70.9	81.8	75.6	77.2	83.2	79.9	75.6	83.5	79.2	78.4	83.9	80.7
Stretcher Mechanic	Tool Room	2	63.5	65.3	64.5	77	77.3	77.2	70.5	72.5	71.6	77.5	77.5	77.5
General Mechanic	Repair/Maintenance (Stretcher)	4	96.7	102.3	99.2	96.7	102.3	99.2	96.7	103.1	99.8	96.7	103.1	99.8
General Mechanic	Clean Tools with Degreaser	1	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5
General Mechanic	Repair/Maintenance (Aluminum Compactor)	1	96.7	96.7	96.7	96.7	96.7	96.7	97.7	97.7	97.7	97.7	97.7	97.7
General Mechanic	Set-Up	1	95.8	95.8	95.8	95.8	95.8	95.8	95.9	95.9	95.9	95.9	95.9	95.9

Plant B: Average sound level measurements by job for each task conducted by employees during noise monitoring surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
General Mechanic	Repair/Maintenance (Cyclone)	1	95.4	95.4	95.4	95.4	95.4	95.4	96.6	96.6	96.6	96.6	96.6	96.6
General Mechanic	Power Tool Use	3	89	94.8	91.7	89.5	94.8	91.9	92	95.3	93.9	92.1	95.3	93.9
General Mechanic	Break	2	63.5	92.6	87.7	74.7	92.8	88.4	70.6	95.6	92.6	75.5	95.6	92.6
General Mechanic	Repair/Maintenance (Roof)	3	71.4	93.2	86.1	77.5	93.2	86.8	75.6	93.4	88.9	78.9	93.4	89
General Mechanic	Office Work	3	78.8	82.3	80.2	80.5	83.2	81.6	79.7	83.4	82	80.6	83.7	82.5
General Mechanic	Machine Shop Activities	3	48.8	84.9	79.4	70.2	84.9	80.7	61.4	85.1	82.4	71.2	85.1	82.6
General Mechanic	Machining	2	43.6	79.3	74.4	75.9	81.3	79.1	58.1	81.4	78.4	76.4	82	80
General Mechanic	Tool Room	1	67	67	67	77.9	77.9	77.9	73.3	73.3	73.3	78.2	78.2	78.2
General Mechanic	Lunch	1	66.2	66.2	66.2	74.7	74.7	74.7	73.8	73.8	73.8	76.3	76.3	76.3
General Mechanic	Quality Control	1				74.2	74.2	74.2				74.2	74.2	74.2
Mechanic - Rear Section	Repair/Maintenance (Body Varnish Machine)	1	109.4	109.4	109.4	109.4	109.4	109.4	109.4	109.4	109.4	109.4	109.4	109.4
Mechanic - Rear Section	Repair/Maintenance	1	102.4	102.4	102.4	102.4	102.4	102.4	102.4	102.4	102.4	102.4	102.4	102.4
Mechanic - Rear Section	Repair/Maintenance (Decorator or Decoration Machine)	5	98	103.8	101	98	103.8	101	98	103.8	101.2	98	103.8	101.2
Mechanic - Rear Section	Repair/Maintenance (Flanger)	1	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2
Mechanic - Rear Section	Repair/Maintenance (Necker)	5	92.7	101.6	99	92.7	101.6	99	92.7	101.6	99.3	92.7	101.6	99.3
Mechanic - Rear Section	Repair/Maintenance (Waxer Machine)	3	96.8	99.6	98.5	96.8	99.6	98.5	96.8	99.6	98.6	96.8	99.6	98.6
Mechanic - Rear Section	Repair/Maintenance (Spray Cleaning Machine)	1	98.4	98.4	98.4	98.4	98.4	98.4	98.5	98.5	98.5	98.5	98.5	98.5
Mechanic - Rear Section	Repair/Maintenance (Recycling Machine)	2	96.5	98.6	97.6	96.5	98.6	97.6	96.5	98.7	97.7	96.5	98.7	97.7
Mechanic - Rear Section	Repair/Maintenance (Spin Necker Flanger)	1	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3
Mechanic - Rear Section	Repair/Maintenance (Conveyor)	4	95.6	98	96.8	95.6	98	96.8	95.7	98	96.8	95.7	98	96.8
Mechanic - Rear Section	Repair/Maintenance (Coater)	1	96.7	96.7	96.7	96.7	96.7	96.7	96.7	96.7	96.7	96.7	96.7	96.7
Mechanic - Rear Section	Drive Fork Lift	1	96.4	96.4	96.4	96.4	96.4	96.4	96.9	96.9	96.9	96.9	96.9	96.9
Mechanic - Rear Section	Repair/Maintenance (Washer/Dryer)	4	91.3	98	96.1	91.3	98	96.1	91.3	98.2	96.5	91.3	98.2	96.5
Mechanic - Rear Section	Repair/Maintenance (Anti Pollution Sheet or Anti Pollution Map)	4	92.6	98.7	95.7	92.6	98.7	95.7	92.7	98.8	96	92.7	98.8	96
Mechanic - Rear Section	Repair/Maintenance (Light Test Machine)	1	94	94	94	94	94	94	94	94	94	94	94	94
Mechanic - Rear Section	Repair/Maintenance (Palletizer)	1	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5
Mechanic - Rear Section	Repair/Maintenance (Incinerator or Damper)	7	84	95.6	91	84.7	95.6	91	84.8	95.6	91.9	85	95.6	91.9
Mechanic - Rear Section	Repair/Maintenance (Wrapper)	1	89.1	89.1	89.1	89.1	89.1	89.1	89.1	89.1	89.1	89.1	89.1	89.1

Plant B: Average sound level measurements by job for each task conducted by employees during noise monitoring surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Mechanic - Rear Section	Power Tool Use	2	83.1	89	86.6	83.1	89.1	86.7	83.1	90.4	88.1	83.1	90.4	88.1
Mechanic - Rear Section	Repair/Maintenance (Cyclone)	1	80.8	80.8	80.8	81.7	81.7	81.7	83.9	83.9	83.9	84.1	84.1	84.1
Mechanic - Rear Section	Quality Control	10	37.1	92.1	79.2	66.1	92.1	79.5	54.2	92.1	83.9	66.8	92.1	82.9
Mechanic - Rear Section	Office Work	8	55.4	84.9	77.1	65	85.8	79.4	65.4	86.4	80.8	66.2	86.6	81.1
Mechanic - Rear Section	Machine Shop Activities	7	43.8	83.2	76.8	69.8	83.2	78.8	58.2	83.3	79.2	70.4	83.3	79.7
Mechanic - Rear Section	Repair/Maintenance (Duster)	1	75.3	75.3	75.3	80	80	80	77.5	77.5	77.5	80	80	80
Mechanic - Rear Section	Machining	3	64.4	71.9	69.1	71.8	77.2	75.5	71.5	75.8	74.2	71.9	77.9	76.2
Mechanic - Rear Section	Break	7	48.9	69.7	65.1	68.2	76.3	72.2	61.5	75.2	72.4	68.9	77.4	73.2
Mechanic - Rear Section	Lunch	2	58.2	59.4	58.8	71.3	74	72.8	67.7	67.9	67.8	72.5	74.7	73.7
Mechanic - Rear Section	Tool Room	1	57.1	57.1	57.1	76.1	76.1	76.1	66.9	66.9	66.9	76.3	76.3	76.3
Department Aid	Monitor Spray Machine	1	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
Department Aid	Finishing Station	3	96.9	99.8	98.8	96.9	99.8	98.8	96.9	99.8	98.9	96.9	99.8	98.9
Department Aid	Palletizer Area	1	95.7	95.7	95.7	95.7	95.7	95.7	95.8	95.8	95.8	95.8	95.8	95.8
Department Aid	Cleaning of Garbage Waste	1	94.3	94.3	94.3	94.3	94.3	94.3	96.8	96.8	96.8	96.8	96.8	96.8
Department Aid	Drive Fork Lift	8	82.1	98.8	94.2	82.1	98.8	94.2	82.2	98.8	95.2	82.2	98.8	95.2
Department Aid	Pallet Area	1	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6	83.6
Department Aid	Office Work	1	79.2	79.2	79.2	81.5	81.5	81.5	82.6	82.6	82.6	83.1	83.1	83.1
Department Aid	Break	10	40.2	82	75.2	66.7	83	76.5	56.1	83.1	78.4	68.1	83.5	78.2
Department Aid	Lunch	3	48	63	56.8	67.3	76.9	72.4	61	70.4	66.6	68.8	77.2	73.8
Department Aid	Filling Chemicals	1	51.7	51.7	51.7	67	67	67	63.4	63.4	63.4	69	69	69
Packaging Operator	Palletizer Area	2	92.8	94.4	93.6	92.8	94.4	93.6	92.8	94.5	93.7	92.8	94.5	93.7
Packaging Operator	Drive Fork Lift	2	83.1	85.3	84.3	83.1	85.3	84.3	83.1	85.3	84.3	83.1	85.3	84.3
Packaging Operator	Break	4	47.4	52.9	50.7	64.7	73	70.3	60.5	63.9	62.5	66.5	73.7	71.4
Press Operator 26 mm	Monitor Machine	10	94.7	101	99.4	94.7	101	99.4	94.8	101	99.5	94.8	101	99.5
Press Operator 26 mm	Quality Control	1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1
Press Operator 26 mm	Adjust Machine	1	95.8	95.8	95.8	95.8	95.8	95.8	95.9	95.9	95.9	95.9	95.9	95.9
Press Operator 26 mm	Replace Aluminum Sheet	3	94.8	96.9	95.7	94.8	96.9	95.7	94.8	96.9	95.7	94.8	96.9	95.7
Press Operator 26 mm	Drive Fork Lift	1	91.5	91.5	91.5	91.5	91.5	91.5	91.8	91.8	91.8	91.8	91.8	91.8
Press Operator 26 mm	Lunch	2	62.3	62.3	62.3	67.4	72.4	70.3	70.3	70.3	70.3	67.4	73.7	71.6
Press Operator 26 mm	Break	6	58.6	58.6	58.6	66.8	72.2	70.3	68.1	68.1	68.1	66.8	73.3	71.4
Rotary Operator	Monitor Machine	4	99.2	103.1	101.1	99.2	103.1	101.1	99.2	103.1	101.2	99.2	103.1	101.2
Rotary Operator	Set-Up	1	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5	100.5
Rotary Operator	Quality Control	6	99.2	102.1	100.1	99.2	102.1	100.1	99.2	102.3	100.2	99.2	102.3	100.2

Plant B: Average sound level measurements by job for each task conducted by employees during noise monitoring surveys														
Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Rotary Operator	Repair/Maintenance	6	98.6	101	99.6	98.6	101	99.6	98.7	101	99.6	98.7	101	99.6
Rotary Operator	Lunch	1	80.2	80.2	80.2	82.1	82.1	82.1	82.5	82.5	82.5	83	83	83
Rotary Operator	Break	5	46	53.6	50.9	65.5	68.6	67.1	59.6	64.6	62.9	66.1	70.3	68.5
Counting Operator	Adjust Machine	15	97.3	102.8	100.7	97.3	102.8	100.7	97.3	102.8	100.8	97.3	102.8	100.8
Counting Operator	Repair/Maintenance	4	98.6	101.8	100.4	98.6	101.8	100.4	98.8	101.8	100.5	98.8	101.8	100.6
Counting Operator	Cleaning	6	98.1	102.3	100.3	98.1	102.3	100.3	98.1	102.3	100.4	98.1	102.3	100.4
Counting Operator	Set-Up	1	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3
Counting Operator	Monitor Production (close)	11	96.5	101.6	99	96.5	101.6	99	96.5	101.6	99.1	96.5	101.6	99.1
Counting Operator	Monitor Production (distance)	4	95.7	99	97.4	95.7	99	97.4	95.7	99	97.4	95.7	99	97.4
Counting Operator	Machine Downtime	1	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2
Counting Operator	Break	10	50.3	89.5	78.2	66.7	89.5	76.2	62.3	89.6	82.7	66.9	89.6	80.1
Printing Press Operator	Closing (Shut Down)	1	91.7	91.7	91.7	91.7	91.7	91.7	91.7	91.7	91.7	91.7	91.7	91.7
Printing Press Operator	Monitor Press (along press)	2	91.4	91.8	91.6	91.4	91.8	91.6	91.5	91.8	91.7	91.5	91.8	91.7
Printing Press Operator	Set-Up	3	87.3	89.2	88.3	87.3	89.2	88.3	87.4	89.2	88.4	87.4	89.2	88.4
Printing Press Operator	Working at computer	1	86	86	86	86	86	86	86	86	86	86	86	86
Printing Press Operator	Break	3	58.9	64.1	61.9	72	77.1	74.3	67.8	72.4	70.3	73.6	77.3	75.4
Printing Press Operator	Lunch	2				67.2	69.2	68.3				67.5	70	68.9
Varnisher (Coater)	Monitor Press (along press)	2	89.4	90.1	89.8	89.4	90.1	89.8	89.4	90.1	89.8	89.4	90.1	89.8
Varnisher (Coater)	Set-Up	5	87.1	91.3	89.1	87.1	91.3	89.1	87.3	91.9	89.4	87.3	91.9	89.4
Varnisher (Coater)	Closing (Shut Down)	1	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8
Varnisher (Coater)	Mixing Products	2	83.1	86	84.7	83.6	86	84.9	83.7	86	85	83.8	86	85
Varnisher (Coater)	Office Work	1	78.3	78.3	78.3	80.6	80.6	80.6	80.4	80.4	80.4	81.3	81.3	81.3
Varnisher (Coater)	Break	3	53.8	59.9	57.5	66.6	77.3	72.4	64.8	68.5	67	69	77.4	73.8
Varnisher (Coater)	Lunch	2	54.4	58.6	56.8	70.7	72.3	71.5	64.9	68.1	66.8	72.2	73.2	72.7
Measurer	Monitor Press (along press)	1	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6
Measurer	Monitor Press (infeed)	2	92	92.7	92.4	92	92.7	92.4	92	92.7	92.4	92	92.7	92.4
Measurer	Maintenance (feeder)	4	88.3	93.9	91.7	88.3	93.9	91.7	88.4	94	91.9	88.4	94	91.9
Measurer	Set-Up	1	88.9	88.9	88.9	88.9	88.9	88.9	89.1	89.1	89.1	89.1	89.1	89.1
Measurer	Break	1	53.7	53.7	53.7	73.7	73.7	73.7	64.4	64.4	64.4	74.2	74.2	74.2
Measurer	Lunch	2	49.7	52.1	51	67.5	68.6	68.1	62	63.6	62.9	69.3	69.7	69.5
Measurer	Office Work	1	47.9	47.9	47.9	73.9	73.9	73.9	60.9	60.9	60.9	74.3	74.3	74.3

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys														
Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Cylinder Head Rebuilding Technician (Mechanic)	Compressed Air	2	96.2	97.8	97	96.2	97.8	97	96.4	97.8	97.2	96.4	97.8	97.2
	Power Hand Tools (pneumatic or electric)	7	81.3	98.8	92.7	82.1	98.8	92.7	82.9	99.3	94.1	83	99.3	94.1
	Spray with high pressure washer	3	89.2	93.1	91.8	89.2	93.1	91.8	89.3	93.3	92.1	89.3	93.3	92.1
	Hammer	2	87.1	89.9	88.6	87.3	90	88.8	87.6	90.3	89.2	87.7	90.3	89.2
	Hand Truck	1	82.9	82.9	82.9	84	84	84	85.3	85.3	85.3	85.5	85.5	85.5
	Chemical Dip Tank	1	82.1	82.1	82.1	82.6	82.6	82.6	82.5	82.5	82.5	82.7	82.7	82.7
	Stationary Power Tools	7	51.6	84.4	76	73.1	84.4	78.7	63	84.5	79.2	73.5	84.5	79.8
	Repair	4	61.3	83.8	75	75.7	84.1	79.6	69.4	84.6	79.1	76.2	84.7	80.6
	Lunch	1	73.4	73.4	73.4	77.5	77.5	77.5	78	78	78	79.1	79.1	79.1
	Break	3	53.5	71.7	67.3	69	77.6	74	64.5	76.4	73.7	69.6	78.5	75.4
	Planning Work	2	41.4	69.8	64.9	73.1	77.5	75.6	56.8	74.7	71.8	73.7	78.1	76.4
	Overhead Hoist/Pulley	2	52.8	67.5	63.4	76.2	76.6	76.4	63.7	73.7	71.1	76.5	77.3	76.9
	Office Work	2	55.5	55.5	55.5	67.6	69.1	68.4	65.9	65.9	65.9	67.6	70.5	69.3
	Parts Washers	1				74.5	74.5	74.5				74.6	74.6	74.6

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Fuel Injector Rebuilding Technician (Mechanic)	Spray with high pressure washer	1	92.5	92.5	92.5	92.5	92.5	92.5	92.5	92.5	92.5	92.5	92.5	92.5
	Compressed Air	3	76.4	92.1	88	79.5	92.2	88.4	79	93.2	89.9	80.2	93.2	90
	Test Fuel Injector	2	83.1	86.7	85.1	83.1	86.7	85.1	83.2	87	85.5	83.2	87	85.5
	Power Hand Tools (pneumatic or electric)	5	70.6	88.1	84.8	77.4	88.3	85.3	75.4	89.5	86.4	78.2	89.6	86.5
	Parts Washers	2	83	83	83	73.4	83	79.7	83.1	83.1	83.1	73.4	83.1	80.5
	Test Fuel Injection Pump	3	50.1	87.6	82.9	75.5	87.6	84	62.4	87.6	84.5	75.7	87.6	84.8
	Hammer	1	81.3	81.3	81.3	83	83	83	84.6	84.6	84.6	84.9	84.9	84.9
	Planning Work	4	44	78.1	73.2	63.9	80.9	73.7	58.4	80.6	77.6	65	81.6	76.2
	Lunch	4	58.5	58.5	58.5	68.7	73	70.7	67.7	67.7	67.7	69.6	73.8	71.4
	Repair	3	51.8	62.1	57.4	65.6	72.6	69.7	63.3	72.7	69	68.1	75	72.3
	Break	2	55.4	55.4	55.4	71.3	73.5	72.5	65.5	65.5	65.5	71.5	74.1	73
	Office Work	4	48.4	54.1	51.8	60.5	70.4	66.6	61.2	64.8	63.4	61.9	71.2	69.8
	Overhead Hoist/Pulley	1				75.5	75.5	75.5				75.6	75.6	75.6
	Stationary Power Tools	2				75.4	75.9	75.7				75.5	76.1	75.8

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys														
Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Heavy Equipment Repair Technician (Mechanic)	Compressed Air	7	87.2	107.7	98.1	87.2	107.7	98.1	87.4	108.1	100.8	87.4	108.1	100.8
	Power Hand Tools (pneumatic or electric)	23	81.3	100.5	94.1	82	100.5	94.4	82	100.8	95.8	82.2	100.8	95.9
	Drive Fork Lift	2	86.5	97.5	93.9	86.6	97.5	93.9	87	98	95.3	87	98	95.3
	Hammer	9	80.6	99.8	93	82.2	99.8	93.1	82.9	100.4	95.1	83.4	100.4	95.1
	Repair	39	43.1	99.2	86.2	67.1	99.2	86.2	57.8	99.7	89.9	68.2	99.7	89.6
	Stationary Power Tools	8	53.8	94	85.5	78	94	86.2	64.3	94.3	87.7	78.1	94.3	87.8
	Operate Heavy Equipment	18	53.7	93.6	85.3	75.5	93.6	86.1	64.5	93.8	87.8	75.7	93.8	87.9
	Open and Close Bay Door	2	82.3	86.4	84.6	83.2	86.5	85	83.8	87	85.7	84.8	87	86
	Pumping Fluids	3	69	90.9	83.7	77.2	90.9	85	74.1	90.9	86.4	78.2	90.9	86.6
	Spray with high pressure washer	2	80.4	80.4	80.4	58.2	81.7	77	81.4	81.4	81.4	58.2	81.9	78.9
	Cutting Torch (acetylene)	3	76	80.1	78.4	79.9	81.8	80.9	77.8	83.1	81.4	79.9	83.5	81.9
	Cleaning	8	61.3	87.7	78	57.9	88.4	77.6	69.6	89.2	82.8	57.9	89.3	81.2
	Overhead Hoist/Pulley	8	49.2	89.4	76.5	70.6	89.5	79.6	61.7	90.2	81.9	73.9	90.2	82.4
	Planning Work	31	33	86.8	76	65.5	87.2	78.7	51.7	88	80.4	66.3	88.1	80.8
	Bearing Heating	2	69.4	75.3	72.9	78.7	80	79.4	74.3	77.8	76.4	78.9	80.1	79.5
	Hand Truck	2	68.4	72.9	71	72.9	75.1	74.1	75.1	77.5	76.5	76.9	79.1	78.1
	Lunch	21	30.9	84.2	68.1	64.6	84.2	74.6	50.5	84.3	74.3	65.5	84.3	76.1
	Break	29	45.2	81.6	65.9	58.3	82.9	71.3	59.1	83.3	73.6	59.2	83.7	73.4
	Welding	2	56.2	68.6	64.8	75	78.1	76.7	66.4	74.6	72.2	76.6	78.2	77.5
	Parts Washers	1	64.4	64.4	64.4	77	77	77	73.5	73.5	73.5	77.8	77.8	77.8
Office Work	24	53.4	69.3	62.3	61.2	77.2	69.2	64.1	74.1	70.4	61.9	77.8	70.8	

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys														
Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Hydraulic Pump Rebuilding Technician (Mechanic)	Test Hydraulic Pump	2	87.7	96.7	93.5	87.7	96.7	93.5	87.8	96.8	94.3	87.8	96.8	94.3
	Hammer	4	71.1	94.5	90.4	57.8	94.5	88.7	77.3	94.8	91.8	57.8	94.8	90.6
	Power Hand Tools (pneumatic or electric)	5	58	97.7	88.7	73.7	97.7	89.1	67.9	98.2	91.8	74.2	98.2	91.9
	Spray with high pressure washer	1	86.5	86.5	86.5	86.5	86.5	86.5	86.6	86.6	86.6	86.6	86.6	86.6
	Compressed Air	2	83.1	84.8	84	83.7	84.9	84.3	83.8	84.9	84.4	84	84.9	84.5
	Use Press	1	83.8	83.8	83.8	84.5	84.5	84.5	85.9	85.9	85.9	86	86	86
	Overhead Hoist/Pulley	1	75.9	75.9	75.9	80.1	80.1	80.1	78.4	78.4	78.4	80.4	80.4	80.4
	Planning Work	4	64.2	75.2	71	67.8	79.1	75.9	71.5	78.2	75.6	68.4	79.8	77.2
	Repair	5	61.3	75.7	70.6	58.1	78	74.7	69.5	79.7	76.2	58.1	80.2	76.9
	Parts Washers	1	67.5	67.5	67.5	74.8	74.8	74.8	73.5	73.5	73.5	76.1	76.1	76.1
	Lunch	3	56.5	57.7	57.1	71.2	72.5	71.9	66.4	67.5	67	72	73.3	72.5
	Office Work	1	54.8	54.8	54.8	65.1	65.1	65.1	65.4	65.4	65.4	68.9	68.9	68.9
	Break	3	51	51	51	58.4	69.6	66.4	62.9	62.9	62.9	58.4	70.4	67.8
	Cleaning	2				68.3	69.7	69				68.7	70	69.4

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys														
Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Machinist - Bay 56/58	Power Hand Tools (pneumatic or electric)	5	88.6	93.4	90.8	88.8	93.4	90.8	89.3	93.7	91.4	89.4	93.7	91.4
	Hammer	3	82.7	94.9	89.8	83.8	95	90.1	84	95.6	91.6	84.3	95.6	91.6
	Compressed Air	2	85.1	86	85.6	85.9	86.2	86.1	86.3	86.8	86.6	86.4	86.9	86.7
	Cutting Torch (acetylene)	1	82.9	82.9	82.9	83.3	83.3	83.3	83.4	83.4	83.4	83.5	83.5	83.5
	Stationary Power Tools	2	73.1	84.2	80.6	79.6	84.2	82.3	76	84.2	81.8	79.7	84.2	82.5
	Planning Work	6	63.5	77.3	73.4	71.6	80.2	77.5	70.8	82.1	78.9	71.8	82.6	79.1
	Stationary Machine Use	10	58.8	79.9	72.9	75.7	81.3	79	67.6	81	77.3	75.9	82.1	79.4
	Repair	4	24.2	77	69.8	69.4	79.8	75	46.4	79.5	75.1	69.8	80.5	76.3
	Break	6	62.8	71.4	68.3	63.7	75.9	70.7	70.6	77.3	75.1	65.1	78.3	73.1
	Office Work	5	62.8	62.8	62.8	61.1	72.2	66.7	71.4	71.4	71.4	64.2	74.2	69.2
	Lunch	5	43.1	64.4	59.8	69	73.3	71.4	57.9	72.6	69.7	69.3	75.1	72.4
	Overhead Hoist/Pulley	5	58.6	60.3	59.5	71.7	75.6	73.8	68.3	68.8	68.6	73	75.7	74.4

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Machinist - Operations Section	Hammer	1	93.8	93.8	93.8	94.1	94.1	94.1	97.9	97.9	97.9	97.9	97.9	97.9
	Compressed Air	7	66.7	94.2	89.8	77.9	94.2	90	72.6	95.1	91.1	78	95.1	91.2
	Metalizing	4	83.1	85.3	84.5	83.1	85.5	84.7	83.2	85.9	84.9	83.2	86	84.9
	Power Hand Tools (pneumatic or electric)	1	84.5	84.5	84.5	84.5	84.5	84.5	84.6	84.6	84.6	84.6	84.6	84.6
	Driving Service Car	1	77.2	77.2	77.2	80.1	80.1	80.1	80.7	80.7	80.7	81.5	81.5	81.5
	Stationary Machine Use	21	52.9	83.3	75	71.6	83.3	78.5	64	83.4	78.3	71.9	83.4	79.2
	Drive Fork Lift	1	70.1	70.1	70.1	78.5	78.5	78.5	74.9	74.9	74.9	78.8	78.8	78.8
	Planning Work	17	52.9	79.4	67.7	68.3	80.8	74.3	63.7	81.3	73.9	68.5	81.7	75.5
	Stationary Power Tools	1	67.7	67.7	67.7	77.7	77.7	77.7	74	74	74	78.1	78.1	78.1
	Break	8	56.7	74.7	67.1	64.9	79.4	73	66.6	78.8	74.1	65.6	80.4	74.7
	Overhead Hoist/Pulley	7	49	68.8	63	72.4	77.6	75.5	61.5	75	70.9	73.1	77.7	76.2
	Repair	1	62.8	62.8	62.8	71.5	71.5	71.5	71.3	71.3	71.3	73.5	73.5	73.5
	Lunch	9	39.9	74.3	62.6	69.8	78.4	73.2	55.9	77.2	70.8	70.2	79.7	75.4
	Cleaning	4	40.1	64.3	58.2	72.2	76.3	74.8	56	71.9	68	72.5	76.7	75.2
	Office Work	5	47.1	63.2	57.9	64.3	72.8	70.7	60.3	71.6	67.7	67.2	73.9	72.3
Parts Washers	1				77.1	77.1	77.1				77.2	77.2	77.2	

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Machinist - Welding Section	Hammer	1	95.5	95.5	95.5	95.5	95.5	95.5	95.9	95.9	95.9	95.9	95.9	95.9
	Compressed Air	3	92.6	95.3	93.9	92.6	95.3	93.9	92.8	95.6	94.2	92.8	95.6	94.2
	Power Hand Tools (pneumatic or electric)	8	75	96.7	89.9	79.6	96.7	90.1	77.9	96.8	91.7	80	96.8	91.7
	Stationary Power Tools	7	65.1	91.2	85.7	76.4	91.2	86.1	71.5	91.3	87.1	76.9	91.3	87.2
	Drive Fork Lift	3	72.8	91.8	85.5	78.5	91.8	86.3	77.2	93.5	89.1	79.3	93.5	89.2
	Welding	2	69.8	84.9	80.7	78.9	85.3	82.8	74.1	85.5	82.8	79	85.7	83.5
	Parts Washers	1	80	80	80	81.7	81.7	81.7	81.9	81.9	81.9	82.4	82.4	82.4
	Planning Work	8	57.8	85.1	80	73.4	85.1	80.9	67.4	85.7	81.9	74.3	85.7	81.9
	Repair	2	78.6	80.4	79.6	80.6	81.9	81.3	81.4	82.5	82	81.9	82.9	82.4
	Stationary Machine Use	15	55	86.3	79.4	74.9	86.3	81	65.1	86.6	81.7	75.3	86.6	81.9
	Break	7	54.8	80.6	74.8	69.7	82.9	76.8	65.5	85.2	81	70.2	85.6	79.8
	Cutting Torch (acetylene)	1	74.3	74.3	74.3	79.9	79.9	79.9	78.2	78.2	78.2	80.4	80.4	80.4
	Overhead Hoist/Pulley	4	52.7	74.5	66.6	74.8	79.5	77.2	63.6	77.2	72.5	75	79.7	77.7
	Office Work	4	45.3	70.6	66.3	67.8	75.8	72.4	59.2	76.3	73.8	68.3	77.4	74.7
	Lunch	6	57.3	68.5	63.6	71.6	76.4	74	67.2	73.9	70.8	72.5	77.2	75
Cleaning	1	54.8	54.8	54.8	68.9	68.9	68.9	65.5	65.5	65.5	70.5	70.5	70.5	

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys															
Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4			
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	
Motor Rebuilding Technician (Mechanic)	Test Engines	4	91	109.5	104.3	91	109.5	104.3	91.1	109.5	105.7	91.1	109.5	105.7	
	Chemical Dip Tank	1	89.4	89.4	89.4	89.5	89.5	89.5	90.2	90.2	90.2	90.3	90.3	90.3	
	Power Hand Tools (pneumatic or electric)	10	83.9	92.3	89.3	77.6	92.6	89	85.2	94.6	91.3	77.7	94.6	90.9	
	Spray with high pressure washer	5	80.3	94	88.1	81.4	94	88.3	80.9	94.5	89.5	81.4	94.5	89.5	
	Compressed Air	4	79.5	88	85.5	81.2	88.1	85.8	81.6	89	86.7	82.1	89.1	86.7	
	Stationary Machine Use	1	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9
	Hammer	5	40	93.4	83.5	72.3	93.5	84.8	56	94.1	87.5	72.6	94.1	87.7	
	Parts Washers	3	60.5	84.3	77.4	76.1	84.3	80.5	69.2	84.7	80.4	76.5	84.7	81.4	
	Pumping Fluids	2	75.6	75.6	75.6	70.3	80.5	77.1	78.8	78.8	78.8	70.4	80.9	78.3	
	Repair	16	48.4	90.4	74.6	68.7	90.5	77.9	61.1	91.5	81.2	69.5	91.5	81.1	
	Hand Truck	4	69.9	75.2	72.3	70.8	79.7	77	74.9	77.8	76.6	70.9	80	77.9	
	Overhead Hoist/Pulley	3	68.8	68.8	68.8	72.2	77.8	75.2	73.8	73.8	73.8	72.5	78.1	75.7	
	Cleaning	2	68.1	68.1	68.1	71	76.9	74.5	74	74	74	71.1	77.6	75.5	
	Lunch	10	41.2	76.5	67.7	67.8	80.2	72.8	56.7	80.2	74.5	68.3	81.3	74.6	
	Break	10	45.3	75.6	66.1	63.4	78.7	71.6	59.3	80.1	74	63.8	80.9	73.8	
	Planning Work	12	55.4	70.8	64.1	56.8	79.1	73.4	65.6	76.8	71.8	56.9	79.3	75	
	Tool Room	1	58.8	58.8	58.8	70.4	70.4	70.4	67.8	67.8	67.8	72	72	72	
	Control Booth	3	56.8	59.8	58.5	70.9	77.4	74.9	66.7	68.5	67.7	72	77.5	75.4	
Office Work	7	45.3	56.8	51.8	62.9	70.5	67.9	59.3	66.8	63.7	62.9	71.7	69.3		

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys														
Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Painter	Compressed Air	1	96.4	96.4	96.4	96.4	96.4	96.4	96.9	96.9	96.9	96.9	96.9	96.9
	Power Hand Tools (pneumatic or electric)	1	87.4	87.4	87.4	87.4	87.4	87.4	87.4	87.4	87.4	87.4	87.4	87.4
	Spray Painting	1	83.5	83.5	83.5	83.5	83.5	83.5	83.6	83.6	83.6	83.6	83.6	83.6
	Paint Storage Room	1	82.5	82.5	82.5	83.4	83.4	83.4	83.5	83.5	83.5	83.8	83.8	83.8
	Planning Work	1	77.5	77.5	77.5	80.3	80.3	80.3	79.3	79.3	79.3	80.6	80.6	80.6
	Painting Activities	2	57.4	67.8	64.3	77.2	78.8	78	66.5	74	71.7	77.8	78.8	78.3
	Cleaning	2	57.6	64.2	61.6	74.4	75.7	75.1	67	71.5	69.8	74.8	76.2	75.6
	Lunch	1	51.7	51.7	51.7	71.6	71.6	71.6	63.2	63.2	63.2	72.3	72.3	72.3
	Break	1				70.2	70.2	70.2				70.5	70.5	70.5
	Office Work	1				69.3	69.3	69.3				69.5	69.5	69.5

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys														
Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Track Repair	Repair	1	100.3	100.3	100.3	100.3	100.3	100.3	101.7	101.7	101.7	101.7	101.7	101.7
	Stationary Power Tools	1	91.6	91.6	91.6	91.6	91.6	91.6	91.6	91.6	91.6	91.6	91.6	91.6
	Stationary Machine Use	5	77	98.7	91.2	80.2	98.7	91.5	81	99.6	94.2	81.8	99.6	94.2
	Hammer	1	90.8	90.8	90.8	90.8	90.8	90.8	91.6	91.6	91.6	91.6	91.6	91.6
	Spray with high pressure washer	1	87.7	87.7	87.7	87.7	87.7	87.7	87.8	87.8	87.8	87.8	87.8	87.8
	Cleaning	1	83.6	83.6	83.6	83.6	83.6	83.6	83.7	83.7	83.7	83.7	83.7	83.7
	Power Hand Tools (pneumatic or electric)	1	79.9	79.9	79.9	81.7	81.7	81.7	82.2	82.2	82.2	82.7	82.7	82.7
	Drive Fork Lift	1	63.1	63.1	63.1	75.2	75.2	75.2	71.1	71.1	71.1	76.1	76.1	76.1
	Overhead Hoist/Pulley	1	62.3	62.3	62.3	73.8	73.8	73.8	70.7	70.7	70.7	74.8	74.8	74.8
	Planning Work	1	54.7	54.7	54.7	74.8	74.8	74.8	65.1	65.1	65.1	75.2	75.2	75.2
	Office Work	1	44.6	44.6	44.6	69.9	69.9	69.9	58.8	58.8	58.8	70.6	70.6	70.6
	Break	2				66.6	67.5	67.1				66.8	68.2	67.6

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)	min. (dBA)	max. (dBA)	Average (dBA)
Transmission Rebuilding Technician (Mechanic)	Spray with high pressure washer	1	101.5	101.5	101.5	101.5	101.5	101.5	102.7	102.7	102.7	102.7	102.7	102.7
	Compressed Air	4	93	106.7	99.9	93	106.7	99.9	93.6	107	101.8	93.6	107	101.8
	Hammer	2	88.1	97	93.8	88.3	97	93.9	89.1	99	96.4	89.1	99	96.4
	Pumping Fluids	1	91.9	91.9	91.9	92.2	92.2	92.2	93.2	93.2	93.2	93.3	93.3	93.3
	Cutting Torch (acetylene)	1	89.4	89.4	89.4	89.4	89.4	89.4	89.5	89.5	89.5	89.5	89.5	89.5
	Power Hand Tools (pneumatic or electric)	7	77.2	91.1	87.3	80.2	91.2	87.5	79.1	91.9	88.6	80.5	91.9	88.7
	Chemical Dip Tank	1	84.3	84.3	84.3	84.5	84.5	84.5	84.5	84.5	84.5	84.6	84.6	84.6
	Stationary Power Tools	5	52.2	85.3	79.1	73.7	85.3	81.2	63.6	86	82	74	86	82.5
	Parts Washers	4	42.7	80	74.7	73.9	82.1	79.4	57.8	82.2	79	74.1	83.1	80.5
	Break	3	59.6	78.6	73.8	76.5	81	78.9	68.3	83.5	79.8	76.9	84	81.1
	Overhead Hoist/Pulley	2	70.6	73.6	72.3	77.3	79.2	78.3	75.4	77.4	76.5	78.1	79.7	79
	Planning Work	3	61.2	72.3	68.4	77.3	79	78.2	69.2	79.9	76.3	77.7	80.9	79.2
	Lunch	2	65.2	70.5	68.3	73.8	74.1	74	72	75.5	74.1	74.9	76.5	75.8
	Office Work	2	55.9	72	67.7	70	76	73.6	66.2	77	74.3	71.6	77.9	75.8
	Repair	2	52.4	63.4	59.8	71.4	77.3	74.9	63.5	64.1	63.8	72.3	77.4	75.6

Plant C: Average Sound Level Measurements by Job for each Task Conducted by Employees during Noise Monitoring Surveys

Job	Task/Tool	Number of measures	Dose 1			Dose 2			Dose 3			Dose 4		
			min (dBA)	max (dBA)	Average (dBA)	min (dBA)	max (dBA)	Average (dBA)	min (dBA)	max (dBA)	Average (dBA)	min (dBA)	max (dBA)	Average (dBA)
Welder	Hammer	3	97.5	102.4	99.6	97.5	102.4	99.6	97.7	102.8	100.2	97.7	102.8	100.2
	Welding	8	71.2	111.4	97.3	78.1	111.4	97.4	75.4	112	103.1	78.4	112	103.1
	Power Hand Tools (pneumatic or electric)	10	82.8	103.3	95.4	82.8	103.3	95.4	82.9	103.3	96.8	82.9	103.3	96.8
	Cutting Torch (acetylene)	3	65.8	99.6	92.7	77.7	99.6	92.9	72.8	100.2	95.6	78	100.2	95.6
	Drive Fork Lift	5	73.3	94.9	87.6	79.2	95.1	88.4	77.7	97.4	92	80	97.4	92
	Stationary Power Tools	4	84.4	87.7	85.9	84.4	87.7	86	84.5	87.7	86.2	84.5	87.7	86.3
	Stationary Machine Use	1	85.1	85.1	85.1	85.9	85.9	85.9	88.1	88.1	88.1	88.2	88.2	88.2
	Cleaning	2	82.5	86	84.5	83.6	86	84.9	85.1	86.6	85.9	85.3	86.6	86
	Overhead Hoist/Pulley	4	69.1	87.1	83	76.1	87.1	83.7	75.2	87.3	84.4	77.4	87.3	84.5
	Planning Work	5	77.9	81.7	80.2	70.5	83.5	79.5	79.7	85.9	83.4	70.9	86.2	81.9
	Repair	2	69.9	83.4	79.4	77.6	84.4	81.8	75.5	86.9	84.2	78.4	87.1	84.6
	Break	5	74.1	82.2	79.2	68.2	83.3	76.4	78.5	84.4	82.4	68.3	84.7	79.2
	Office Work	3	48.8	60	56.3	70.4	72.3	71.2	61.5	69.1	66.7	71.5	73.5	72.4
	Lunch	4	55.1	55.1	55.1	67.3	70.1	69.2	65.4	65.7	65.6	68.3	71.4	70.2

APPENDIX T: AVERAGE PERCENT TIME HPD WORN BY MONITORED WORKERS FOR EACH TASK DURING SURVEY 1

Job Group (Plant A)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Thermoforming General Aid Group	1	Activities in Extrusion Department	100
Thermoforming General Aid Group	6	Set-Up/Repair	100
Thermoforming General Aid Group	2	Unload/Inspect/Package	100
Thermoforming General Aid Group	2	Warehouse Activities	100
Thermoforming General Aid Group	4	Drive Fork Lift	99.9
Thermoforming General Aid Group	7	Work Near Machine	99.6
Thermoforming General Aid Group	5	Use Pallet Truck	95.6
Thermoforming General Aid Group	7	Activities in Thermoforming Department	90.8
Thermoforming General Aid Group	4	Office Work	63.8
Thermoforming General Aid Group	3	Mold Shop	56.5
Thermoforming General Aid Group	7	Break	32.5
Thermoforming General Aid Group	7	Lunch	7.8
Thermoforming Mechanic Group	1	Activities in Shop	100
Thermoforming Mechanic Group	1	Use Pallet Truck	100
Thermoforming Mechanic Group	5	Mold Shop	99.2
Thermoforming Mechanic Group	7	Set-Up/Repair	95.7
Thermoforming Mechanic Group	3	Drive Fork Lift	82.6
Thermoforming Mechanic Group	7	Work Near Machine	73.8
Thermoforming Mechanic Group	4	Activities in Thermoforming Department	62.2
Thermoforming Mechanic Group	4	Activities in Mold Department	50.9
Thermoforming Mechanic Group	1	Activities in Mechanic Department	50
Thermoforming Mechanic Group	6	Office Work	25.4
Thermoforming Mechanic Group	7	Break	6.3
Thermoforming Mechanic Group	1	Activities in Lamination	0
Thermoforming Mechanic Group	1	Compressor Room	0
Thermoforming Mechanic Group	7	Lunch	0
Thermoforming Operator Group	5	Cleaning	100
Thermoforming Operator Group	1	Compressed Air	100
Thermoforming Operator Group	4	Machine Downtime	100
Thermoforming Operator Group	3	Set-Up/Repair	100
Thermoforming Operator Group	7	Unload/Inspect/Package	99.6
Thermoforming Operator Group	2	Activities in Thermoforming Department	81.4
Thermoforming Operator Group	7	Break	5.4
Thermoforming Operator Group	7	Lunch	0
Thermoforming Operator Group	2	Office Work	0

**APPENDIX T: AVERAGE PERCENT TIME HPD WORN BY MONITORED
WORKERS FOR EACH TASK DURING SURVEY 1 (CONTINUED)**

Job Group (Plant A)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Extrusion Operator Group	2	Activities in Extrusion Department	100
Extrusion Operator Group	2	Activities in Pelletizer Area	100
Extrusion Operator Group	1	Office Work	100
Extrusion Operator Group	2	Set-Up/Repair	100
Extrusion Operator Group	7	Monitor Machine	99.7
Extrusion Operator Group	4	Emergency Scrap Removal	70.8
Extrusion Operator Group	7	Control Booth	64
Extrusion Operator Group	7	Break	39.7
Extrusion Operator Group	6	Lunch	17.9
Slitter Operator Group	1	Activities in Pelletizer Area	100
Slitter Operator Group	7	Control Booth	100
Slitter Operator Group	6	Cut Tube	100
Slitter Operator Group	1	Drive Electronic Pallet Roll Jack	100
Slitter Operator Group	1	Drive Fork Lift	100
Slitter Operator Group	5	Emergency Scrap Removal	100
Slitter Operator Group	1	Grinder Room	100
Slitter Operator Group	5	Load/Unload Winder	100
Slitter Operator Group	1	Office Work	100
Slitter Operator Group	7	Slitter Activities	100
Slitter Operator Group	4	Weigh Station Activities	100
Slitter Operator Group	7	Break	33.5
Slitter Operator Group	2	Cleaning	21.1
Slitter Operator Group	5	Lunch	16.2
Weigh Station Operator Group	1	Activities in Extrusion Department	100
Weigh Station Operator Group	1	Activities in Lamination	100
Weigh Station Operator Group	5	Cleaning	100
Weigh Station Operator Group	1	Cut Tube	100
Weigh Station Operator Group	1	Drive Fork Lift	100
Weigh Station Operator Group	1	Empty Garbage	100
Weigh Station Operator Group	6	Load/Unload Winder	100
Weigh Station Operator Group	1	Outside Grinder Room	100
Weigh Station Operator Group	7	Package Plastic Rolls	100
Weigh Station Operator Group	1	Start-Up Extruder Line 1	100
Weigh Station Operator Group	7	Weigh Station Activities	100
Weigh Station Operator Group	7	Slitter Activities	99.4
Weigh Station Operator Group	7	Emergency Scrap Removal	99
Weigh Station Operator Group	5	Control Booth	47.6
Weigh Station Operator Group	7	Break	19.6
Weigh Station Operator Group	7	Lunch	0

**APPENDIX T: AVERAGE PERCENT TIME HPD WORN BY MONITORED
WORKERS FOR EACH TASK DURING SURVEY 1 (CONTINUED)**

Job Group (Plant A)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Grinder Operator Group	3	Compressed Air	100
Grinder Operator Group	1	Drive Fork Lift	100
Grinder Operator Group	7	Grinder Room	100
Grinder Operator Group	7	Load Grinder	100
Grinder Operator Group	1	Office Work	100
Grinder Operator Group	7	Outside Grinder Room	100
Grinder Operator Group	2	Control Booth	50
Grinder Operator Group	7	Lunch	30.2
Grinder Operator Group	7	Break	28.2
Pelletizer Group	3	Activities in Extrusion Department	100
Pelletizer Group	2	Activities in Shipping	100
Pelletizer Group	1	Activities in Thermoforming Department	100
Pelletizer Group	2	Activities in Warehouse	100
Pelletizer Group	5	Cleaning	100
Pelletizer Group	3	Compressed Air	100
Pelletizer Group	7	Drive Fork Lift	100
Pelletizer Group	2	Garbage Disposal Activities	100
Pelletizer Group	1	Load Grinder	100
Pelletizer Group	5	Load Pelletizer	100
Pelletizer Group	6	Monitor Machine	100
Pelletizer Group	4	Repair Fork Lift	100
Pelletizer Group	3	Unload Pelletizer	100
Pelletizer Group	1	Using Vacuum	100
Pelletizer Group	7	Break	24.9
Pelletizer Group	5	Control Booth	24
Pelletizer Group	4	Office Work	10
Pelletizer Group	6	Lunch	0

**APPENDIX T: AVERAGE PERCENT TIME HPD WORN BY MONITORED
WORKERS FOR EACH TASK DURING SURVEY 1 (CONTINUED)**

Job Group (Plant A)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Mold Machinist Group	1	Drive Fork Lift	100
Mold Machinist Group	1	Welding	100
Mold Machinist Group	2	Office Work	88.9
Mold Machinist Group	4	Power Tool Use	81.3
Mold Machinist Group	4	Activities Outside Mold Department	65.6
Mold Machinist Group	3	Compressed Air	63.3
Mold Machinist Group	6	Machining	53.5
Mold Machinist Group	6	Machine Shop Activities	45.9
Mold Machinist Group	3	Mold Shop	41.3
Mold Machinist Group	3	Hand Tool Use	35.3
Mold Machinist Group	4	Cleaning	24.4
Mold Machinist Group	1	Activities in Thermoforming Department	17.9
Mold Machinist Group	6	Break	12.9
Mold Machinist Group	6	Lunch	1.7
Maintenance Group	1	Activities in Extrusion Department	100
Maintenance Group	1	Activities in Lamination	100
Maintenance Group	2	Power Tool Use	100
Maintenance Group	3	Repair/Maintenance	96.3
Maintenance Group	2	Storage Room	75
Maintenance Group	2	Machine Shop Activities	71.7
Maintenance Group	2	Cleaning	55
Maintenance Group	3	Drive Fork Lift	54.7
Maintenance Group	1	Office Work	29.7
Maintenance Group	5	Break	3.8
Maintenance Group	5	Lunch	0
Fork Lift Driver Group	1	Activities Outside Shipping Department	100
Fork Lift Driver Group	1	Drive Fork Lift	100
Fork Lift Driver Group	1	Activities in Shipping	66.9
Fork Lift Driver Group	1	Activities in Warehouse	58.6
Fork Lift Driver Group	1	Break	37.5
Fork Lift Driver Group	1	Office Work	5.6
Fork Lift Driver Group	1	Lunch	0

**APPENDIX T: AVERAGE PERCENT TIME HPD WORN BY MONITORED
WORKERS FOR EACH TASK DURING SURVEY 1 (CONTINUED)**

Job Group (Plant B)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Decorator Group	7	Change Decorations	100
	1	Choosing Ink	100
	6	Quality Control	100
	7	Monitor Operation (Inspection)	97
	5	Office Work	84.5
	1	Machine Downtime	72
	7	Lunch	11.4
7	Break	4	

Job Group (Plant B)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Stretcher Group (Stretcher Operator and Stretcher Mechanic)	1	Aluminum Recycling Area	100
	6	Change Aluminum Roll	100
	1	Drive Fork Lift	100
	3	Quality Control	100
	8	Repair/Maintenance	100
	4	Set-Up	100
	4	Tool Room	100
	5	Work Bench	100
	4	Office Work	89.5
	3	Machine Shop Activities	63.2
	8	Break	5.5
8	Lunch	0	

Job Group (Plant B)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Department Aid and Packaging Group	1	Cleaning of Garbage Waste	100
	1	Filling Chemicals	100
	3	Finishing Station	100
	1	Monitor Spray Machine	100
	2	Pallet Area	100
	4	Palletizer Area	100
	1	Planning Work	100
	7	Drive Fork Lift	97.4
	2	Office Work	42.9
	7	Break	4.6
7	Lunch	0	

**APPENDIX T: AVERAGE PERCENT TIME HPD WORN BY MONITORED
WORKERS FOR EACH TASK DURING SURVEY 1 (CONTINUED)**

Job Group (Plant B)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Mechanic Group (General Mechanic and Mechanic - Rear Section)	1	Clean Tools with Degreaser	100
	1	Drive Fork Lift	100
	2	Machining	100
	3	Power Tool Use	100
	3	Repair/Maintenance	100
	1	Repair/Maintenance (Aluminum Compactor)	100
	3	Repair/Maintenance (Anti Pollution Sheet)	100
	1	Repair/Maintenance (Body Varnish Machine)	100
	1	Repair/Maintenance (Coater)	100
	2	Repair/Maintenance (Conveyor)	100
	2	Repair/Maintenance (Cyclone)	100
	4	Repair/Maintenance (Decorator)	100
	1	Repair/Maintenance (Duster)	100
	1	Repair/Maintenance (Flanger)	100
	4	Repair/Maintenance (Incinerator or Damper)	100
	1	Repair/Maintenance (Light Test Machine)	100
	2	Repair/Maintenance (Palletizer)	100
	2	Repair/Maintenance (Recycling Machine)	100
	2	Repair/Maintenance (Roof)	100
	1	Repair/Maintenance (Spin Necker Flanger)	100
	1	Repair/Maintenance (Spray Cleaning Machine)	100
	2	Repair/Maintenance (Stretcher)	100
	2	Repair/Maintenance (Washer/Dryer)	100
	3	Repair/Maintenance (Waxer Machine)	100
	1	Repair/Maintenance (Wrapper Machine)	100
	1	Set-Up	100
	4	Repair/Maintenance (Necker)	99.2
	6	Machine Shop Activities	96.4
	2	Tool Room	95.5
	7	Office Work	93.9
5	Quality Control	29	
7	Break	16.2	
7	Lunch	9.8	

Job Group (Plant B)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Rotary Operator Group	4	Monitor Machine	100
	4	Quality Control	100
	4	Repair/Maintenance	100
	1	Set-Up	100
	4	Break	0
	2	Lunch	0

**APPENDIX T: AVERAGE PERCENT TIME HPD WORN BY MONITORED
WORKERS FOR EACH TASK DURING SURVEY 1 (CONTINUED)**

Job Group (Plant B)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Counting Operator Group	5	Adjust Machine	100
	3	Cleaning	100
	1	Machine Downtime	100
	6	Monitor Production (close)	100
	4	Monitor Production (distance)	100
	2	Repair/Maintenance	100
	1	Set-Up	100
	6	Break	6.8
5	Lunch	0	

Job Group (Plant B)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Press Operator Group	1	Adjust Machine	100
	1	Drive Fork Lift	100
	4	Monitor Machine	100
	1	Quality Control	100
	2	Replace Aluminum Sheet	100
	4	Break	2.2
	4	Lunch	0

Job Group (Plant B)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Printing Area Group (Printing Press Operator, Varnisher, and Measurer)	2	Closing (Shut Down)	100
	1	Maintenance (feeder)	100
	2	Mixing Products	100
	6	Monitor Press (along press)	100
	1	Monitor Press (infeed)	100
	6	Set-Up	100
	1	Working at computer	100
	6	Break	37.5
	2	Office Work	18.9
7	Lunch	0	

**APPENDIX T: AVERAGE PERCENT TIME HPD WORN BY MONITORED
WORKERS FOR EACH TASK DURING SURVEY 1 (CONTINUED)**

Job Group (Plant C)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Heavy Equipment Repair Technician (Mechanic) Group	8	Break	0
	5	Cleaning	0
	4	Compressed Air	11.1
	1	Hand Truck	0
	8	Lunch	0
	7	Office Work	0
	1	Open and Close Bay Door	0
	4	Operate Heavy Equipment	7.1
	3	Overhead Hoist/Pulley	19
	1	Parts Washers	0
	8	Planning Work	4.5
	1	Power Hand Tools (pneumatic or electric)	0
	8	Repair	10.4
Rebuilding (Mechanic) Group	8	Break	0
	2	Cleaning	0
	4	Compressed Air	18.8
	2	Control Booth	96.6
	1	Drive Fork Lift	0
	2	Hammer	0
	8	Lunch	0
	6	Office Work	0
	4	Overhead Hoist/Pulley	5.9
	4	Parts Washers	4.7
	8	Planning Work	1.7
	4	Power Hand Tools (pneumatic or electric)	51.4
	2	Pumping Fluids	0
	8	Repair	4
	4	Spray with high pressure washer	15.4
	3	Stationary Power Tools	0
	2	Test Engines	100
1	Test Fuel Injector	96	
1	Test Hydraulic Pump	81.6	
1	Tool Room	0	
1	Use Press	0	
Machinist Group	7	Break	0
	4	Cleaning	0
	1	Cutting Torch (acetylene)	100
	2	Drive Fork Lift	11.1
	1	Driving Service Car	0
	1	Hand Truck	0
	7	Lunch	0
	1	Metalizing	55.5
	5	Office Work	4.8
	6	Overhead Hoist/Pulley	43.9
	2	Parts Washers	66.7
	7	Planning Work	17.8
	2	Power Hand Tools (pneumatic or electric)	37.5
	5	Repair	37.3
7	Stationary Machine Use	36.8	
2	Stationary Power Tools	32	

**APPENDIX T: AVERAGE PERCENT TIME HPD WORN BY MONITORED
WORKERS FOR EACH TASK DURING SURVEY 1 (CONTINUED)**

Job Group (Plant C)	Number of Workers Conducting Task	Task	Average Percent Time HPD Used
Welder Group	4	Break	29.3
	2	Cleaning	76.5
	2	Cutting Torch (acetylene)	100
	4	Drive Fork Lift	70
	2	Hammer	33.3
	4	Lunch	0
	2	Office Work	100
	3	Overhead Hoist/Pulley	91
	4	Planning Work	82.1
	4	Power Hand Tools (pneumatic or electric)	89.3
	2	Repair	14.1
	2	Stationary Power Tools	18.2
	4	Welding	86.4

NOTE: Data for Track Repair and Painter from Plant C were not included in table because only 1 worker was in each job group.

APPENDIX U: TOTAL TIME-AT-TASK AT THE END OF THE WORK SHIFT

Job Group (Plant A)	Total Number of Workers in Study	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Thermoforming General Aid Group	7	7.9 (1.07)	7	Work Near Machine	215.6	40	419
			4	Drive Fork Lift	185.9	15	289
			7	Activities in Thermoforming Department	129.4	18	396
			6	Set-Up/Repair	64	17	140
			4	Office Work	35.3	2	82
			5	Use Pallet Truck	27	7	60
			1	Activities in Extrusion Department	9	9	9
			3	Mold Shop	7.7	6	10
			2	Warehouse Activities	5.5	2	9
			2	Unload/Inspect/Package	2	1	3
Thermoforming Mechanic Group	7	7.9 (1.46)	7	Set-Up/Repair	322.4	96	505
			3	Drive Fork Lift	101.3	2	249
			7	Work Near Machine	54	9	98
			5	Mold Shop	50.3	14	129
			6	Office Work	42	14	74
			4	Activities in Thermoforming Department	27.8	12	37
			1	Activities in Shop	22	22	22
			4	Activities in Mold Department	13.8	3	23
			1	Use Pallet Truck	9	9	9
			1	Activities in Lamination	6	6	6
			1	Activities in Mechanic Department	3	3	3
			1	Compressor Room	3	3	3
Thermoforming Operator Group	7	4.7 (1.02)	7	Unload/Inspect/Package	474.5	313	601
			2	Work Near Machine	118	15	221
			7	Machine Downtime	79.7	18	184
			2	Office Work	40.7	13	90
			5	Cleaning	32.4	3	64
			3	Set-Up/Repair	16.3	7	24
			2	Activities in Thermoforming Department	14	2	26
			1	Compressed Air	8	8	8

* Time at task for break and lunch not included

**APPENDIX U: TOTAL TIME-AT-TASK AT THE END OF THE WORK SHIFT
(CONTINUED)**

Job Group (Plant A)	Total Number of Workers in Study	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Extrusion Operator Group	8	5.7 (1.10)	8	Control Booth	168.9	42	277
			8	Monitor Machine	143.6	12	276
			6	Activities in Extrusion Department	69.4	4	221
			2	Slitter Activities	66	30	102
			5	Set-Up/Repair	58	6	165
			8	Emergency Scrap Removal	5.9	2	14
			3	Activities in Pelletizer Area	5	2	8
			2	Office Work	5	3	7
Slitter Operator Group	7	6.8 (1.66)	7	Slitter Activities	281.5	167	414
			2	Drive Fork Lift	54	45	61
			5	Load/Unload Winder	32	6	58
			7	Cut Tube	22.3	3	67
			5	Emergency Scrap Removal	19.1	3	42
			5	Weigh Station Activities	18.6	1	50
			1	Activities in Pelletizer Area	18	18	18
			1	Office Work	15	11	19
			3	Cleaning	14.7	4	25
			2	Drive Electronic Pallet Roll Jack	12	2	22
			3	Package Plastic Rolls	10.7	2	24
			7	Control Booth	10.1	1	30
			1	Grinder Room	3	3	3
Weigh Station Operator Group	8	9.0 (1.20)	8	Slitter Activities	101.5	20	212
			8	Weigh Station Activities	84.3	26	166
			1	Cut Tube	60	60	60
			8	Package Plastic Rolls	57.5	10	108
			7	Load/Unload Winder	37.5	12	99
			1	Activities in Extrusion Department	34	34	34
			1	Activities in Lamination	20	20	20
			5	Cleaning	17.2	7	35
			7	Emergency Scrap Removal	14.4	4	29
			6	Control Booth	12.3	5	27
			1	Empty Garbage	11	11	11
			1	Start-Up Extruder Line 1	10	10	10
			1	Drive Fork Lift	7	7	7
			1	Outside Grinder Room	4	4	4

* Time at task for break and lunch not included

**APPENDIX U: TOTAL TIME-AT-TASK AT THE END OF THE WORK SHIFT
(CONTINUED)**

Job Group (Plant A)	Total Number of Workers in Study	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Grinder Operator Group	7	6 (1.00)	7	Load Grinder	172.4	82	266
			7	Grinder Room	85.9	72	104
			7	Outside Grinder Room	68.7	7	116.5
			1	Drive Fork Lift	58	58	58
			3	Compressed Air	31	8	75
			2	Control Booth	7	7	7
			1	Office Work	5	5	5
Pelletizer Group	7	9.6 (2.37)	6	Monitor Machine	160.3	37	232
			7	Drive Fork Lift	129.3	4	325
			2	Garbage Disposal Activities	44	8	80
			5	Load Pelletizer	38.8	12	101
			4	Office Work	22.5	2	68
			1	Activities in Thermoforming Department	22	22	22
			5	Cleaning	19.9	6	37
			1	Using Vacuum	16.5	16.5	16.5
			4	Repair Fork Lift	13	6	23
			2	Activities in Shipping	12	1	23
			3	Activities in Extrusion Department	11.3	3	26
			3	Unload Pelletizer	8.7	8	10
			3	Compressed Air	6	4	7
			5	Control Booth	6	2	8
			2	Activities in Warehouse	3.5	2	5
1	Load Grinder	3	3	3			

* Time at task for break and lunch not included

**APPENDIX U: TOTAL TIME-AT-TASK AT THE END OF THE WORK SHIFT
(CONTINUED)**

Job Group (Plant A)	Total Number of Workers in Study	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Mold Machinist Group	6	8.3 (1.86)	6	Machine Shop Activities	155.5	82	211
			6	Machining	118.3	49	273
			1	Welding	97	97	97
			4	Power Tool Use	66.8	9	220
			1	Activities in Thermoforming Department	28	28	28
			4	Cleaning	22.5	10	35
			3	Compressed Air	21.3	2.5	40.5
			3	Mold Shop	15.3	6	27
			1	Drive Fork Lift	12	12	12
			2	Office Work	9	8	10
			4	Activities Outside Mold Department	6.3	4	10
3	Hand Tool Use	5.7	4	8			
Maintenance Group	6	5.4 (1.95)	2	Cleaning	366	349	383
			3	Repair/Maintenance	257.3	129	374
			2	Machine Shop Activities	115	15	215
			1	Office Work	64	64	64
			3	Drive Fork Lift	17.7	7	24
			2	Storage Room	13.5	7	20
			1	Activities in Lamination	9	9	9
			1	Activities in Extrusion Department	2	2	2
			2	Power Tool Use	2	1	3
Fork Lift Driver Group	1	7 (NA)	1	Drive Fork Lift	167	167	167
			1	Office Work	133	133	133
			1	Activities in Shipping	72.5	72.5	72.5
			1	Activities in Warehouse	29	29	29
			1	Activities Outside Shipping Department	16	16	16

* Time at task for break and lunch not included

**APPENDIX U: TOTAL TIME-AT-TASK AT THE END OF THE WORK SHIFT
(CONTINUED)**

Job Group (Plant B)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Decorator Group	7	5.9 (0.69)	7	Monitor Operation (Inspection)	344.4	273	415
			7	Change Decorations	27.1	15	46
			1	Machine Downtime	25	25	25
			6	Quality Control	13.5	4	23
			5	Office Work	11.6	4	25
			1	Choosing Ink	5	5	5

* Time at task for break and lunch not included

Job Group (Plant B)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Stretcher Group (Stretcher Operator and Stretcher Mechanic)	8	6.9 (1.13)	8	Repair/Maintenance	330.1	224	425
			3	Machine Shop Activities	103.7	48	167
			4	Office Work	55	9	93
			3	Quality Control	36.3	13	65
			1	Drive Fork Lift	35	35	35
			4	Tool Room	29.5	6	55
			6	Change Aluminum Roll	24.7	4	50
			5	Work Bench	23.2	5	64
			1	Aluminum Recycling Area	19	19	19
			4	Set-Up	10.8	3	20

* Time at task for break and lunch not included

Job Group (Plant B)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Department Aid and Packaging Operator Group	7	5.1 (0.90)	7	Drive Fork Lift	261.9	160	361
			3	Finishing Station	189.7	144	222
			4	Palletizer Area	156	29	209
			1	Monitor Spray Machine	111	111	111
			2	Office Work	28	8	48
			1	Planning Work	22	22	22
			1	Cleaning of Garbage Waste	12	12	12
			1	Filling Chemicals	10	10	10
			2	Pallet Area	6.5	6	7

* Time at task for break and lunch not included

**APPENDIX U: TOTAL TIME-AT-TASK AT THE END OF THE WORK SHIFT
(CONTINUED)**

Job Group (Plant B)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Mechanic Group (General Mechanic and Mechanic - Rear Section)	7	12.3 (2.81)	2	Repair/Maintenance (Washer/Dryer)	214.5	4	425
			2	Repair/Maintenance (Stretcher)	174	84	264
			4	Repair/Maintenance (Necker)	98	18	160
			6	Machine Shop Activities	86	12	204
			7	Office Work	70.3	51	95
			2	Repair/Maintenance (Conveyor)	52	2	102
			5	Quality Control	46.8	12	98
			1	Repair/Maintenance (Flanger)	41	41	41
			1	Repair/Maintenance (Light Test Machine)	40	40	40
			2	Repair/Maintenance (Recycling Machine)	36.5	35	38
			4	Repair/Maintenance (Decorator)	33.3	14	65
			2	Tool Room	33	8	58
			2	Repair/Maintenance (Roof)	25	12	38
			3	Power Tool Use	24.3	9	55
			2	Machining	20.5	12	29
			1	Clean Tools with Degreaser	14	14	14
			1	Repair/Maintenance (Wrapper Machine)	14	14	14
			1	Repair/Maintenance (Body Varnish Machine)	12	12	12
			1	Repair/Maintenance (Spin Necker Flanger)	12	12	12
			3	Repair/Maintenance	10.7	8	15
			1	Set-Up	10	10	10
			1	Drive Fork Lift	9	9	9
			3	Repair/Maintenance (Waxer Machine)	7.3	2	17
			1	Repair/Maintenance (Aluminum Compactor)	7	7	7
4	Repair/Maintenance (Incinerator or Damper)	6.8	3	13			
2	Repair/Maintenance (Cyclone)	6	4	8			
1	Repair/Maintenance (Coater)	5	5	5			
3	Repair/Maintenance (Anti Pollution Sheet)	4.3	3	5			
1	Repair/Maintenance (Spray Cleaning Machine)	4	4	4			
1	Repair/Maintenance (Duster)	3	3	3			
2	Repair/Maintenance (Palletizer)	3	2	4			

* Time at task for break and lunch not included

Job Group (Plant B)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Rotary Operator Group	4	4.8 (0.96)	4	Monitor Machine	102.5	40	191
			4	Repair/Maintenance	101.3	34	149
			4	Quality Control	32.5	15	44
			1	Set-Up	5	5	5

* Time at task for break and lunch not included

**APPENDIX U: TOTAL TIME-AT-TASK AT THE END OF THE WORK SHIFT
(CONTINUED)**

Job Group (Plant B)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Counting Operator Group	6	5.5 (1.38)	6	Monitor Production (close)	304.5	268	360
			4	Monitor Production (distance)	32.3	12	83
			5	Adjust Machine	21	5	42
			2	Repair/Maintenance	18	15	21
			1	Set-Up	15	15	15
			1	Machine Downtime	12	12	12
			3	Cleaning	9.3	2	19

* Time at task for break and lunch not included

Job Group (Plant B)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Press Operator Group	4	4.3 (0.69)	4	Monitor Machine	271	249	292
			1	Drive Fork Lift	45	45	45
			1	Quality Control	28	28	28
			2	Replace Aluminum Sheet	3.5	3	4
			1	Adjust Machine	2	2	2

* Time at task for break and lunch not included

Job Group (Plant B)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (minutes)		
					Mean	Minimum	Maximum
Printing Area Group (Printing Press Operator, Varnisher, and Measurer)	7	4.9 (1.07)	1	Monitor Press (infeed)	263	263	263
			6	Monitor Press (along press)	213.3	62	319
			6	Set-Up	134.7	23	283
			1	Maintenance (feeder)	131	131	131
			2	Closing (Shut Down)	36	32	40
			2	Office Work	18.5	5	32
			1	Working at computer	9	9	9
2	Mixing Products	6	2	10			

* Time at task for break and lunch not included

**APPENDIX U: TOTAL TIME-AT-TASK AT THE END OF THE WORK SHIFT
(CONTINUED)**

Job Group (Plant C)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (Minutes)		
					Mean	Minimum	Maximum
Heavy Equipment Repair Technician (Mechanic) Group	8	7.3 (2.03)	1	Bearing Heating	11.0	11.0	11.0
			6	Cleaning	20.2	2.0	90.0
			4	Compressed Air	2.0	0.5	7.0
			2	Cutting Torch (acetylene)	7.0	4.0	10.0
			1	Drive Fork Lift	17.0	17.0	17.0
			1	Hand Truck	1.5	1.0	2.0
			8	Office Work	83.5	12.0	255.0
			3	Open and Close Bay Door	3.2	1.0	4.5
			8	Operate Heavy Equipment	30.3	5.0	84.5
			4	Overhead Hoist/Pulley	5.7	2.0	13.0
			2	Parts Washers	5.3	5.0	5.5
			8	Planning Work	106.3	22.0	192.0
			2	Power Hand Tools (pneumatic or electric)	6.0	2.0	14.0
			1	Pumping Fluids	26.0	26.0	26.0
			8	Repair	175.7	10.0	360.0
2	Spray with high pressure washer	8.0	5.0	11.0			
3	Stationary Power Tools	7.7	2.0	11.0			
3	Welding	6.7	2.0	13.0			

* Time at task for break and lunch not included

Job Group (Plant C)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (Minutes)		
					Mean	Minimum	Maximum
Machinist Group	7	7.4 (2.04)	5	Cleaning	32.2	1.0	103.0
			2	Compressed Air	0.8	0.5	1.0
			2	Cutting Torch (acetylene)	2.0	1.0	3.0
			4	Drive Fork Lift	4.6	1.0	8.0
			1	Driving Service Car	18.0	5.0	31.0
			1	Hand Truck	7.0	7.0	7.0
			1	Metalizing	49.0	49.0	49.0
			5	Office Work	20.4	2.0	55.0
			6	Overhead Hoist/Pulley	10.0	1.0	25.0
			2	Parts Washers	3.0	2.0	4.0
			7	Planning Work	132.9	32.0	257.0
			3	Power Hand Tools (pneumatic or electric)	6.0	3.0	10.0
			5	Repair	58.1	9.0	144.0
			7	Stationary Machine Use	180.9	36.0	318.0
			4	Stationary Power Tools	25.0	1.0	125.0
1	Welding	13.0	12.0	14.0			

* Time at task for break and lunch not included

**APPENDIX U: TOTAL TIME-AT-TASK AT THE END OF THE WORK SHIFT
(CONTINUED)**

Job Group (Plant C)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (Minutes)		
					Mean	Minimum	Maximum
Rebuilding (Mechanic) Group	8	7.8 (2.52)	3	Chemical Dip Tank	12.0	4.0	17.0
			4	Cleaning	12.0	2.0	39.0
			5	Compressed Air	2.6	1.0	5.0
			3	Control Booth	74.3	19.0	157.0
			1	Drive Fork Lift	7.0	7.0	7.0
			2	Hammer	0.5	0.5	0.5
			2	Hand Truck	5.0	4.0	6.0
			7	Office Work	21.4	2.0	45.0
			6	Overhead Hoist/Pulley	5.1	1.0	10.0
			6	Parts Washers	7.6	0.5	15.0
			8	Planning Work	101.6	19.0	200.0
			4	Power Hand Tools (pneumatic or electric)	5.1	0.5	12.0
			3	Pumping Fluids	1.7	1.0	2.0
			8	Repair	200.5	67.0	338.0
			5	Spray with high pressure washer	11.9	1.0	41.0
			3	Stationary Power Tools	23.5	3.0	70.0
			3	Test Engines	11.3	3.0	18.0
			1	Test Fuel Injection Pump	122.0	122.0	122.0
			1	Test Fuel Injector	49.5	25.0	74.0
1	Test Hydraulic Pump	38.0	38.0	38.0			
1	Tool Room	9.0	9.0	9.0			
1	Use Press	1.0	1.0	1.0			

* Time at task for break and lunch not included

Job Group (Plant C)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Time at Task at End of Work Shift (Minutes)		
					Mean	Minimum	Maximum
Welder Group	4	9.6 (1.14)	2	Cleaning	8.5	4.0	13.0
			3	Cutting Torch (acetylene)	73.3	33.0	100.0
			4	Drive Fork Lift	14.0	2.0	40.0
			2	Hammer	0.8	0.5	1.0
			3	Office Work	10.3	8.0	12.0
			3	Overhead Hoist/Pulley	14.8	4.0	28.5
			4	Planning Work	109.1	48.0	159.0
			4	Power Hand Tools (pneumatic or electric)	36.2	9.0	97.0
			2	Repair	110.0	31.0	189.0
			2	Stationary Power Tools	3.5	1.0	5.0
			4	Welding	88.9	45.0	178.5

* Time at task for break and lunch not included

**APPENDIX U: TOTAL TIME-AT-TASK AT THE END OF THE WORK SHIFT
(CONTINUED)**

Job Group (Plant C)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Task Time at End of Work Shift (Minutes)
					Mean**
Track Repair Group	1	12 (NA)	1	Cleaning	1.0
			1	Drive Fork Lift	3.0
			1	Hammer	0.5
			1	Office Work	26.0
			1	Planning Work	92.0
			1	Power Hand Tools (pneumatic or electric)	1.0
			1	Repair	55.0
			1	Spray with high pressure washer	2.0
			1	Stationary Machine Use	160.0
1	Stationary Power Tools	5.0			

* Time at task for break and lunch not included

**Note: Because only one worker was monitored the minimum and maximum are the same as the mean and were not included on this table

Job Group (Plant C)	Total Number of Workers	Mean Tasks per Worker (Std. Dev.)	Number of Workers Conducting Task	Task*	Total Task Time at End of Work Shift (Minutes)
					Mean**
Painter Group	1	10 (NA)	1	Cleaning	12.0
			1	Compressed Air	1.0
			1	Office Work	16.0
			1	Paint Storage Room	5.0
			1	Painting Activities	143.0
			1	Planning Work	30.0
			1	Power Hand Tools (pneumatic or electric)	69.0
			1	Spray Painting	66.0

* Time at task for break and lunch not included

**Note: Because only one worker was monitored the minimum and maximum are the same as the mean and were not included on this table.