PHASE 1

STUDY DESIGN/PROTOCOL

Based on an understanding of the project objectives, KTA/SET Environmental (KTA/SET) has developed a revised study protocol for the Phase 1 laboratory portion of the project. The protocol is based on the stated research objectives, the pilot industrial hygiene study conducted by NIOSH and KTA/SET during February 1996, and KTA/SET experience in conducting abrasive blast cleaning studies.

The project requires stringent controls over many variables. Exhaustive quality assurance/control measures will be maintained throughout this phase in order to obtain valid meaningful data. Because of these requirements, the study will be under the direct supervision of Daniel P. Adley, a Certified Industrial Hygienist (CIH). The principal investigator will be Kenneth A. Trimber.

It is acknowledged that NIOSH is concerned over the use of human operators to conduct the scope of work described herein. In response to this concern, the use of an "automated operator" was evaluated and considered. KTA/SET concluded that although robotics could be designed for the laboratory study, it would not be representative of the manner in which the majority of blast cleaning operations are conducted in industry, nor is it representative of the nature of operations in the field. In addition, Phase 2 (field study) must be performed using human operators to assess exposures when cleaning various structural configurations and to properly assess productivity and effectiveness. The blast cleaning effort required to achieve the desired level of cleanliness will vary from one point on a structure to the next. The human operator can immediately react to this difference, while a machine will not. Other variables such as operator visibility and its influence on productivity will not be appropriately recognized when using robotics. Finally, for Phase 3 (comparison of Phases 1 and 2) to be meaningful, Phases 1 and 2 need to be conducted in a similar manner, so that appropriate comparisons can be made. In order to gain meaningful data in Phases 1 and 2, it is essential that human operators be used in the study.

Protection of human operators will be a top priority. Operators will be provided with proper training and personal protective equipment to ensure their safety and health. Implementation of project specific training on the hazards associated with the various abrasive blast cleaning media, use of properly maintained ventilation systems during the laboratory phase, observation of work practices including personal hygiene, and adequate respiratory protection (Bullard Series 88 Type CE supplied air respirator with an assigned protection factor of 1,000) will help ensure the safety of human operators. This will be complimented by a medical surveillance program designed to assess worker health status prior to and following the project.

KTA/SET has reviewed the provisions of 45 CFR 46 for the protection of human subjects, and is currently setting up an Institutional Review Board. Applicable requirements of 45 CFR 46 will be addressed and complied with prior to activities involving human subjects in the abrasive testing process.

PHASE 1 (LABORATORY STUDY) PROTOCOL

1. Blast Cleaning Facilities

1.1. KTA/SET will use the blast cleaning room at its corporate facility in Pittsburgh, PA, to conduct Phase 1 of the study. The blast facility will include a clean, enclosed, illuminated 12' x 8' x 8' walk-in blast room equipped with a Torit-Donaldson 5800 CFM dust collection system.

1.2. The blast cleaning equipment will include a production Clemco 600 pound gravity feed abrasive hopper equipped with an abrasive metering valve and a 15 foot length of reinforced air/abrasive hose. A new section of hose will be assembled prior to the initiation of Phase 1. The hose will be flushed, washed, and dried inside and out prior to use with each new abrasive or a new hose will be used. A Boride brand No. 4 (1/4" orifice) nozzle will be used for the laboratory study. The nozzle orifice size will be monitored throughout Phase 1 using a Clemco nozzle orifice gage. The nozzle will be replaced if the orifice diameter increases by one size (to 5/16" or when uneven wear is observed). The metering valve setting will vary, depending upon each abrasive manufacturer's specification. If one is not specified, a 1/2" setting will be used.

1.3. The volume of air supply (cubic feet per minute) will be maintained throughout the project by employing an Atlas Copco 170CFM air compressor. The air supply will be examined for oil and water contamination in accordance with ASTM D4285 (blotter test) prior to each abrasive study.

1.4. Operators will be equipped with a Bullard Series 88 Type CE supplied air respirator (blast helmet), which has an assigned protection factor (APF) of 1,000. The breathing air will be evaluated for Grade D quality prior to initiating Phase 1.

1.5. Blast cleaning air pressure will be maintained at 90-100 psi at the blast nozzle and will be held constant for each abrasive. Actual blast cleaning air pressure will be measured using a hypodermic needle pressure gage and the results documented for each abrasive.

1.6. The blast cleaning study will be performed on 3/16" x 24" x 24" uncoated carbon steel plates containing intact mill scale. Nine panels will be available for each trial run with the capability of both sides being cleaned to an SSPC-SP 10, "Near White Metal" blast condition (for a potential total of 72 square feet). Blasting will be conducted until the entire 72 square feet of panel is blasted, or the blaster utilizes all of the abrasive in the pot, whichever occurs first. The panels will be mounted in a specially designed rotary holder. This mounting fixture will enable the operator to perform blast cleaning operations of all 18 surfaces at a 3'-5' work height. Three panel faces will be presented to the operator at one time. The operator will blast three faces, rotate the mounting fixture 180 degrees to reverse the panels, then clean the back sides of the three panels.

The operator will then rotate the mounting fixture to expose the next group of three panels, and the process will be repeated. The panels will be held in the mounting fixture using clamps located near the middle of two edges. As a result, an area approximately 1/2" by 1-1/2" on two edges of each plate will not be blast cleaned.

1.7. The nozzle to work piece distance will be held at a consistent distance (18 inches) throughout the study. A small wire rod will be mounted on the blast nozzle and extended to the wall behind the operator. The operator will use this rod to maintain the nozzle-to-substrate distance. The operator will be instructed to keep the nozzle perpendicular to the substrate, producing the greatest amount of abrasive ricochet, simulating a worst-case airborne dust condition.

1.8. The blast cleaning room will be ventilated throughout the study. Cross draft ventilation will be used. Target air flow will be 50 to 75 feet per minute (fpm) for each abrasive trial. Actual cross-sectional air flow will be measured and recorded prior to each abrasive trial using a rotating vane anemometer.

1.9. Environmental conditions within the blast room will be recorded prior to each abrasive trial. Environmental conditions will be assessed using a 24-hour recording hygrometer (stationed inside the blast cleaning room), and a digital thermocouple-equipped surface temperature thermometer. Barometric pressure will also be recorded.

1.10. A Lunardini Vac-U-Claimer abrasive media vacuuming/reclaiming system will be used to collect the abrasive debris and to vacuum all blast room surfaces after each abrasive trial.

2. Abrasive Media

2.1. The generic types of abrasives and number of each to be studied are as follows:

Abrasive Type	No. of Abrasives
Silica Sand	7
Silica Sand w/Dust Suppressant	3
Coal Slag (2 w/Dust Suppressant)	9
Copper Slag (1 w/Dust Suppressant)	5
Nickel Slag	2
Garnet	7
Staurolite	2
Steel Grit	2
Specular Hematite	1
Olivine	1
Crushed Glass	1
TOTAL	40

2.2. Abrasive media product brochures and material safety data sheets (MSDS) will be obtained prior to initiating Phase 1.

3. Substrate Material

3.1. All steel panels used for the substrate material will be purchased from the same supplier. Certification stating that the steel is from the same heat or melt will be obtained. The substrate material will also be chosen from the same mill rolling, to ensure that the characteristics of the tightly adhering mill scale is consistent. Ten (10) randomly chosen sample panels will have a 4" by 4" segment removed and submitted to NIOSH for evaluation, to evidence that the same heat of material is used.

3.2. Steel panels will be 3/16" x 24" x 24" in size. Each abrasive trial will include nine (9) panels mounted in a rotating fixture which will provide the operator access to 18 surfaces (72 square feet of surface area).

3.3. 757 steel panels will be used during the Phase I Study. The panels will have any sharp edges ground and will be cleaned per SSPC-SP 1, "Solvent Cleaning". Each panel will be stenciled with a random number from 1 to 757.

3.4. Substrate material usage. The following table presents the usage of the substrate material.

No. of Plates	Usage
225	Operator Variance
234	Cleaning Study
126	Recyclability Testing (Initial)
126	Recyclability Testing (Post)
45	Process Checks
10	NIOSH Elemental Analysis

4. Health Screenings and Training of Human Subjects (Blast Operators)

4.1. Prior to initiating the laboratory study, human subjects will receive the following health screening:

4.1.1. Pulmonary Function Test

4.1.2. Blood Test for Lead, Zinc Protoporphryn (ZPP), and cadmium

4.1.3. Urinalysis for Cadmium

4.1.4. Qualitative Respirator Fit Testing

4.1.5. Other medical screening as deemed necessary by physician (see attached letter)

4.2. Prior to initiating the laboratory study, human subjects will receive training in the following areas:

4.2.1. Health Hazards of Lead, Chromium, Cadmium, Arsenic

4.2.2. Proper Use of Respirators

4.2.3. Hygiene Practices

4.2.4. Review of Project Testing Protocol- Roles/Responsibilities

5. Protocol for Assessment of Operator Variability

5.1. KTA/SET will conduct an initial study to evaluate five (5) operators and subsequently select one operator for the abrasive trials. The blast surfaces will be identical to those targeted for the comprehensive study. Each of the five operators will conduct five separate abrasive blast cleaning trials for a minimum, continuous 30 minute blast sequence, or to clean 72 square feet. If the entire 72 square feet of steel surface is cleaned to an SSPC-SP 10, "Near White Metal" blast condition before the supply of blast media is consumed, then the blasting will end at that point. This will be conducted using one selected coal slag abrasive. Industrial hygiene (air sampling) and productivity data will be collected as outlined in Section 6 and 8 of the Phase 1 Study Design. The 25 trials (five operators at five runs each) will be scheduled on a random basis.

5.2. At the completion of the trials, a single operator will be selected from the five (based on the lowest variability in productivity) to conduct the remaining Phase 1 studies with the candidate abrasives. Repeatability using the selected blast cleaning operator will be verified throughout Phase 1 by rerunning the same brand of coal slag abrasive and documenting the productivity results for comparison with the initial blast cleaning trials of the selected operator.

6. Protocol for Abrasive Trials

6.1. Assessment of Blast Room Conditions

6.1.1. Environmental conditions within the blast room will be assessed prior to each abrasive evaluation. The conditions that will be monitored include air temperature, relative humidity, dew point, surface temperature, and barometric pressure. Data will be acquired using a thermocouple equipped digital surface temperature thermometer, a barometer, and a 24-hour recording hygrometer (stationed inside the blast cleaning room).

6.1.2. The blast cleaning room will be ventilated throughout the study. Cross draft ventilation will be used. A cross-sectional assessment of air flow will be conducted and documented prior to abrasive evaluations using an Alnor Rotating Vane Anemometer. Target ventilation will be 50 to 75 feet per minute.

6.2. Testing Protocol for Each Abrasive Media

6.2.1. Upon receipt of each abrasive shipment, the manufacturer, supplier, trade name, size and grade will be recorded in a log book. Each abrasive media will be assigned a unique number (e.g. J95331-01).

6.2.2. Nine (9) 2’ x 2’ steel plates will be mounted in the rotating fixture. The plate numbers will be documented.

6.2.3. A one hundred pound sample of abrasive, as received, will be riffled to ensure homogeneity, then a one-pound sample will be collected from the homogenous mix for submittal to NIOSH for analysis.

6.2.4. A second 100 gram sample will be collected from the riffled quantity and a sieve analysis conducted in accordance with ASTM C 136 “Standard Test method for Sieve or Screen Analysis of Fine and Coarse Aggregates”.

6.2.4.1. The grit will be tamped and shaked through a series of sieves (screen numbers 10, 12, 16, 20, 30, 40, 50, 60, 70, 100, 140, 200, 270 and a pan at the bottom) for seven minutes. The abrasive collected on each screen will be emptied into numbered and tared sample cups. The underside of each screen will be cleaned with a brass brush to loosen trapped particles which will also be collected into the appropriate sample cups. The contents of each sample cup will be weighed and documented.

6.2.5. The abrasive media will be loaded into the 600 pound Clemco abrasive hopper. A sufficient quantity of media will be loaded to attain a continuous 30 - 40 minute blast sequence or to clean 72 square feet, whichever occurs first.

6.2.6. The air pressure utilization (in psi) at the nozzle will be measured and recorded using a hypodermic needle pressure gage prior to each abrasive trial.

6.2.7. Prior to initiating blast cleaning operations, operator and area sampling pumps will be calibrated and the filter media loaded onto the sample holders, or onto the operator (as required). See Industrial Hygiene Protocol (Section 8.0).

6.2.8. The operator will blast clean both sides of nine 24” by 24” steel panels (72 square feet total surface area), or the surface area when the blast pot is emptied.

6.2.9. Upon completion of the sampling durations described in Section 8, the operator and area sampling pumps will be turned off and the time of day recorded. The sampling media will be removed from the operator and blast room when the blast cleaning is completed, and immediately sealed to prevent contamination.

6.2.10. The quantity of time required to blast clean 72 square feet will be recorded. If less than 72 square feet is cleaned, the actual square footage cleaned will be measured and recorded, along with the total elapsed time.

6.2.11. The sample plates will be removed from the rotating fixture and retained for further analyses.

6.3. Collection of Blast Cleaning Data

6.3.1. Each panel will be inspected to verify the required SSPC SP10 “Near-White Metal” blast condition has been achieved. SSPC VIS1-89 pictorial standards for assessing surface cleanliness (reference Photograph ASP10) will be used.

6.3.2. Surface profile will be measured in accordance with ASTM D 4417-93 “Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel” Method C. Coarse and X-Coarse Testex replica tape and a spring micrometer will be used. Two measurements will be obtained and documented on three randomly selected test plates.

6.3.3. Three of the nine panels will be randomly selected for an assessment of abrasive embedment. Five locations on each plate will be examined using a 10x illuminated magnifier and a 1/2" x 1/2” grid containing 100 squares. The number of squares containing embedded material will be quantified in each of the five areas on each plate, and a total percentage of embedment calculated and documented.

6.3.4. One randomly chosen panel will be sampled by dry cutting a 4” x 4” section from the corner of the plate. The sample will be identified and forwarded to NIOSH.

6.3.5. The abrasive remaining in the blast hose and abrasive hopper will be collected and weighed to calculate the total consumption rate of the abrasive media (by comparison with original weight used to fill the hopper).

6.3.6. A Lunardini Vac-U-Claimer abrasive media vacuuming reclaiming system will be used to collect the abrasive debris after each individual evaluation. Approximately one hundred pounds of spent abrasive and debris, as vacuumed prior to reclaiming, will be riffled (to ensure homogeneity), then a one-pound sample will be collected from the homogenous mix for submittal to NIOSH for analysis.

6.3.7. A 100 gram sample of the riffled spent abrasive and debris will be used for sieve analysis in accordance with ASTM C 136 “Standard Test method for Sieve or Screen Analysis of Fine and Coarse Aggregates”. The sample will be tamped and shaked through a series of sieves (screen numbers 10, 12, 16, 20, 30, 40, 50, 60, 70, 100, 140, 200, 270 and a pan at the bottom) for seven minutes. The material collected on each screen will be emptied into tared, numbered sample cups. The underside of each screen will be cleaned with a brass brush to loosen trapped particles which will also be collected into the appropriate sample cups. The contents of each sample cup will be weighed and documented.

6.4. Cleaning Procedure Between Abrasive Trials

6.4.1. The abrasive hopper, blast hose and nozzle will be cleaned by exhausting clean, dry compressed air through the system for approximately one minute with the ventilation system in operation. The blast hose will be rinsed with fresh water and dried with compressed air. Two blast hoses will be used and alternated to allow thorough drying prior to use.

6.4.2. The walls, floor, and ceiling of the blast room will be thoroughly vacuumed with the Vac-U-Claimer system between abrasive media trials. The worker will also decontaminate the blast helmet, coveralls, gloves and boots after each abrasive trial.

6.4.3. An industrial hygiene technician, under the direction of a Certified Industrial Hygienist (CIH), will witness blast room cleaning procedures and inspect the blast room after each cleaning to ensure prevention of sample cross contamination. The inspection will include visual assessments by running gloved fingers across surfaces at 5 random locations and inspecting the surface for any evidence of a path left by the gloved fingers.

6.4.4. Additional cleaning with damp cloths will be used, as necessary. In addition to the visual inspection, wipe samples will be collected in three locations on every fifth abrasive trial and submitted to NIOSH for analysis .

6.4.5. The Vac-U-Claimer will be wiped clean between abrasive trials to prevent cross contamination. The IH Technician will verify cleanliness of the equipment.

6.5. Photographic/Videographic Documentation

6.5.1. 35mm slide photography and 8mm videography will be employed throughout the testing protocol to record typical operations. Each step of the protocol will be recorded.

7. Recyclable Abrasives Testing Protocol

7.1. Without the use of an operator, the nozzle will be fixed in place and the candidate recyclable abrasive impinged on a clean steel substrate. When the abrasive supply from the hopper is depleted, it will be vacuumed, cleaned, and returned to the hopper for reuse.

7.2. This recycling process will be repeated until the material breaks down to 50% of the original size, or 25 times (which ever is sooner) using steel grit abrasives, and 5 times (maximum) using copper slag and garnet abrasives.

7.3. At the completion of the above blasting cycles, the abrasive media will be returned to the abrasive hopper for a final trial using the protocols outlined in Section 6.0 and 8.0.

8. Industrial Hygiene Monitoring Protocol

8.1. Industrial Hygiene monitoring will be conducted prior to project initiation (background), during the operator variability study, and during each abrasive trial. Monitoring will entail collection of airborne samples for :

8.1.1. Total Airborne Dust

8.1.2. Respirable Crystalline Silica

8.1.3. Respirable Radiochemical Activity

8.1.4. Total Airborne Radiochemical Activity

8.1.5. Total Airborne Elements

8.2. Prior to each abrasive trial, sampling pumps will be calibrated using a Gilian Gilibrator-2 primary calibration precision flow bubble meter equipped with a standard flow cell (20cc-6 lpm). Calibration will be conducted through the representative filter media. The actual flow rates for each pump will be documented on the pump calibration report (attached).

8.3. Verification of flow rates will be conducted upon completion of each abrasive trial. Post trial pump flow rates will be measured and documented on the pump flow verification form (attached).

8.4. Filter media will be positioned in sample holders in three areas within the blast room, and include :

8.4.1. Make-up Air Panel of Blast Room

8.4.2. Operator Area

8.4.3. Exhaust (ventilation) Panel of Blast Room

8.5. Sample bank holders will be mounted 12" from the side wall, at breathing zone height (5-6'). Samples will have a 6" clearance from each other.

8.6. Filter media positioned in the operator's breathing zone will be mounted in a hemisphere 6-9" from the nose/mouth, forward of the shoulders in a downward direction, outside of respiratory protection.

8.7. Sampling for Total Dust

8.7.1. Total airborne dust samples will be collected on 37mm, 0.5 micron pre-weighed PVC filter media. Four-six minute samples will be collected in each of the three areas inside the blast room at a flow rate of 1.0 liter per minute.

8.7.2. Sampling for total dust will commence after three minutes of blast time has elapsed to facilitate equilibrium within the blast room.

8.7.3. After a six minute sampling period, the following sequence will occur: (note that pump identification and hose number will change depending on the area)

8.7.3.1. Simultaneously stop Pump A and start Pump B

8.7.3.2. Disconnect Hose 1 from Pump A

8.7.3.3. Connect Hose 3 to Pump A

8.7.3.4. After 6 minutes has elapsed, simultaneously stop Pump B and restart Pump A

8.7.3.5. Disconnect Hose 2 from Pump B

8.7.3.6. Connect Hose 4 to Pump B

8.7.3.7. After 6 minutes has elapsed, simultaneously stop Pump A and restart Pump B

8.7.3.8. After 6 minutes has elapsed, stop Pump B

8.7.4. Total airborne dust samples will be collected in the operator's breathing zone. One - 24 minute sample will be collected at 1.0 liter per minute. A programmable SKC pump will be used and programmed to begin after 3 minutes of blasting time and to stop after 27 minutes blasting time (24 minute sample).

8.7.5. Analysis for total dust will be conducted by NIOSH laboratories in accordance with the NIOSH Method 0500.

8.7.6. Sampling of respirable airborne dust to obtain freshly fractured samples.

8.7.6.1. Respirable airborne dust samples will be collected in one (1) area (operator area) to obtain freshly fractured samples for in vitro assays and animal pathology studies. All sampling will be performed by NIOSH personnel.

8.7.6.2. Immediately after sampling, the collected samples will be sealed and driven to NIOSH laboratories in Morgantown, West Virginia. The precise times of day (beginning and completion of blast) will be recorded and submitted with the samples.

8.8. Sampling for Respirable Dust and Respirable Crystalline Silica

8.8.1. Respirable crystalline silica samples will be collected in each of the three areas in the blast room and within the breathing zone of the operator using MSA 10mm nylon cyclones equipped with 37mm, 0.5 micron pore pre-weighed PVC filter media, at a flow rate of 1.7 liters per minute. Sampling for crystalline silica will commence after three minutes of blast time has elapsed, to facilitate equilibrium in the blast room. Twenty four (24) minute samples will be obtained.

8.8.2. Samples will be analyzed for respirable dust and silica. Analysis for respirable crystalline silica will be conducted in accordance with NIOSH method 7500 (x-ray diffraction); analysis for respirable dust will be conducted by NIOSH laboratories in accordance with NIOSH Method 0600.

8.9. Sampling for Respirable Radiochemical Activity

8.9.1. Respirable radiochemical activity samples will be collected in each of three areas in the blast room using MSA 10mm nylon cyclones equipped with 37mm,

0.5 micron pore pre-weighed PVC filter media, at a flow rate of 1.7 liters per minute.

8.9.2. Sampling for respirable radiochemical activity will commence after three minutes of blast time has elapsed, to facilitate equilibrium in the blast room. Twenty four (24) minute samples will be obtained.

8.9.3. Analysis for respirable radiochemical activity will be conducted by NIOSH laboratories.

8.10. Sampling for Total Radiochemical Activity

8.10.1. Total radiochemical activity samples will be collected in each of three areas in the blast room using pre-weighed 37mm, 0.5 micron pore PVC filter media at a flow rate of 4.0 liters per minute.

8.10.2. Sampling for total radiochemical activity will commence after 3 minutes of blast time has elapsed, to facilitate equilibrium in the blast room. Twenty-four (24) minute samples will be obtained.

8.10.3. Analysis for total radiochemical activity will be conducted by NIOSH laboratories.

8.11. Sampling for Elements

8.11.1. Elemental samples will be collected in each of the three areas in the blast room and within the breathing zone of the operator using sampling pumps equipped with 37mm, 0.8 micron pore mixed cellulose ester membrane filter media. Sampling will be conducted at a flow rate of 2.0 liters per minute.

8.11.2. Sampling for elements will commence after three minutes of blast time has elapsed, to facilitate equilibrium in the blast room. Twenty-four (24) minute samples will be collected.

8.11.3. Analysis for elements will be conducted by NIOSH laboratories in accordance with NIOSH Method 7300.

8.12. Sampling of Ricochet Abrasive/Debris

8.12.1. For each abrasive trial, two (2) pre-weighed 0.5 micron pore, 37mm diameter filter cassettes will be mounted in the operator area without hose/pump connection. The purpose of the media placement will be to determine if ricochet abrasive/debris can enter the opening of the filter cassette without being drawn in by pump flow.

8.13. Background Monitoring

8.13.1. Prior to initiating the operator variance testing, background monitoring will be conducted for eight (8) hours. Airborne samples for total dust, respirable dust, respirable crystalline silica, respirable radiochemical activity, total radio-chemical activity and elements will be collected in each of three areas in the previously

cleaned blast room, with the ventilation system in operation. The air flow (in fpm) will be measured and documented for the background study. Flow rates will be similar to those targeted during actual blast cleaning operations.

9. Economic Data Analysis

9.1. Economic data for abrasive blast cleaning will be calculated based on work conducted in the following regions:

9.1.1. Portland, Oregon

9.1.2. Los Angeles, California

9.1.3. Houston, Texas

9.1.4. Pittsburgh, Pennsylvania

9.1.5. Baltimore Maryland

9.1.6. Hartford, Connecticut

9.2. Data to be acquired will include:

9.2.1. Abrasive media cost.

9.2.2. Disposal cost (bulk, non-hazardous).

9.2.3. Labor costs (blasters).

9.2.4. Costs of equipment rental and purchase.

10. Technical Method for Total Cost Calculation

10.1. The economic factors described in Section 9.0 and the data collected during the study will be assessed, then the cleaning cost calculated using the mathematical formula below.

Cleaning costs ($/sq.ft.) = (((A(P+D))+E+L)/R)/X)))

A=Abrasive flow rate, ton/hr.
P=Delivered price of abrasive, $/ton.
D=Abrasive disposal cost, $/ton.
E=Equipment costs, $/hr.
L=Labor costs, including cleanup, $/hr.
R=Number of times abrasive is used.
X=Abrasive cleaning rate, sq.ft./hr.

11. Report Format

11.1. Upon completion of all testing procedures and receipt of analytical data from the NIOSH laboratory, a written report will be prepared. The report will be formatted as follows:

11.1.1. Introduction

11.1.2. Executive Summary

11.1.3. Description of Abrasive Media Test Procedures

11.1.4. Description of Industrial Hygiene Monitoring Procedures

11.1.5. Results of Abrasive Media Testing

11.1.6. Results of Industrial Hygiene Analysis

11.1.7. Calculation of Operating Costs based on Economical Factors

11.1.8. Statistical Analysis of Operator and Area Exposure Monitoring Data.

11.1.9. Quality Assurance/Quality Control Procedures Implemented to Ensure Validity of Testing

11.1.10. Testing Errors, Deficiencies or Deviations Encountered

11.1.11. Conclusions and Recommendations

11.1.12. Photographic Documentation