



Mercedes-Benz

Mercedes-Benz U.S. International, Inc.

Safety One Manual

Includes Contractor/Supplier Safety and
Security Guidelines

Regulations and Procedures

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- **Introduction**

Safety is the foundation of Mercedes-Benz U.S. International (MBUSI). Safety is always the first element to consider in every endeavor. Our Team Members are the most valuable resource in our company. Our Safety goal is 100% of our Team Members working safely 100% of the time. It is our goal to provide every Team Member with a safe and healthy work environment through education, training, leadership and Team Member participation.

In safety and health management, we have rolled out activities to promote a safety-oriented culture to prevent accidents and to create a safer, secure, healthy, and positive workplace at Mercedes-Benz U.S. International.

Standards covered in this manual are reflective of applicable Federal and State Regulations. It is the expectation of Mercedes-Benz U.S. International (MBUSI) Safety Department that Team Members (TMs) and onsite contractors, at any MBUSI workplace locations shall follow the standards contained in this manual. These standards will not replace or supersede OSHA legal requirements. Any disagreement between this manual, OSHA standard, a consensus standard, will be resolved by consulting the MBUSI's Safety and Engineering Departments and MBUSI Management.

- **Distribution**

This manual is readily available to all Team Members at Mercedes-Benz U. S. International, Inc. It is also available via the Social Intranet and the Safety Department. Forms can also be found on the Social Intranet or obtained from the Safety Department.

- **Purpose**

This manual contains workplace standards and procedures relevant to working in a safe and sustainable operation at Mercedes-Benz U.S. International, Inc. (MBUSI). Standards and procedures comprised in this manual are to ensure that processes, tools, equipment, machinery, workstations, and facilities are designed for the overall well-being of Team Members' safety, health, effectiveness, and productivity.

This manual is provided to enhance existing federal, state, and local regulatory requirements as well as other applicable consensus standards. It shall not be used to supersede any regulatory requirements. MBUSI follows

OSHA regulatory requirements and perform compliance audits to ensure that the organization is complying with all relevant legal requirements.

- **Scope**

This manual applies to all of Mercedes-Benz U.S. International, Inc.'s Team Members, contractors, and visitors regardless of property location, department, building, campus, job site location and/or business unit. Our highest priority is placed on establishing and maintaining a safe and healthy workplace, for the elimination of work-related injuries, illnesses and for the protection of the environment.

- **Responsibility**

At MBUSI, Safety is regarded as everyone's responsibility irrespective of job function or role. All TMs (including contractors and suppliers) have the responsibility to follow all safety and health procedures and processes, wear appropriate personal protective equipment (PPE), use equipment appropriately per manufacturers' guidelines, and communicate to their supervisor or member of management any conditions believed to be unsafe. Failure to follow safety rules and procedures will result in appropriate disciplinary actions up to termination or ban from site.

MBUSI believes that its TMs are its most valuable resource and will do all that is reasonable to protect them. All TMs with supervisory and management responsibilities must ensure that all safety and health plans, procedures, standards, regulations, policies, practices and processes are fully communicated and implemented in their respective work areas. In so doing, we can achieve our safety objective of 100% of our TMs working safely 100% of the time.

Specific safety, health programs and measures have been implemented in response to workplace hazards and in compliance with federal, state, and local safety regulations and ordinances. Through continual and cooperative improvement processes, it is our practice to implement proactive procedures, systems, equipment, machinery, and processes necessary to control conditions and situations, which could adversely affect a safe work environment. In addition, safety and health considerations are integrated at the highest levels of business planning and focus will always be

fundamentally structured as the only way to conduct our business and perform our duties.

MBUSI also strongly encourages and openly invites TM involvement, participation, and recommendations in planning, developing, implementing, and administering safety and health programs. Mutual cooperation, commitment and consulting with Safety and Engineering Departments in seeking and developing the appropriate human, technical, and training resources necessary will achieve the best and safest working conditions and will serve as the basis for producing world-class premium vehicles in a world-class organization.

Contractors and suppliers are responsible for safety on MBUSI properties. They are also responsible for their Safety Plan and for carrying out the safety plan. The contractor employees shall maintain conformance to the health and safety plan at this worksite.

Contractors/suppliers inspectors shall consider safety a key element of their daily inspections.

Contractors/suppliers are required to cooperate with officials of other agencies (Federal, state and/or local) who are vested with authority to enforce requirements of the Occupational Safety and Health Act. If required, the contractor/supplier will assist in preparing accident and fire reports. The contractor/supplier shall comply with the following NIH Health and Safety Requirements.

- a. At a minimum, the contractor/supplier shall comply with applicable Occupational Safety and Health Administration (OSHA) Regulations. Construction, renovation, alteration and maintenance services must adhere to the provisions of Mercedes-Benz U.S. International, Inc. If there is a conflict between the two, the more strict regulation or provision will be adhered to.
- b. Each contractor/supplier employee is responsible for complying with applicable safety and occupational health requirements, wearing prescribed safety and health equipment, reporting unsafe conditions/activities, and avoiding actions and conditions that may result in an accident.

- c. The contractor/supplier is also responsible for ensuring that all of its subcontractors are compliant with all of the requirements at MBUSI.

MBUSI Commitment to ADA and Equal Employment

1. MBUSI follows a non-discriminating policy with regard to individuals with disabilities, equal employment opportunity laws and wage and hour regulations.
2. It is the policy of MBUSI to fully comply with these laws and to support our Contractors/Suppliers in meeting these laws and establishing similar policies.

HARASSMENT-FREE ENVIRONMENT

A. Overview/Policy Statement

1. MBUSI is committed to maintaining a work environment that is free of discrimination or harassment. Harassment consists of unwelcome conduct, whether verbal, physical or visual, that is based upon a person's sex, race, religion, national origin, age, disability, military or military reserve status, citizenship status or upon any other status protected by applicable federal or state law.
2. There will be no tolerance of any harassment or discrimination by anyone within MBUSI or any visitor either during work hours or at any time when the harassing conduct undermines the working relationship and environment.
3. Harassment should be immediately reported to your supervisor and/or your MBUSI contact person.
4. MBUSI's policy is to investigate all such complaints of harassment thoroughly and promptly and to take the appropriate corrective actions, up to and including site access being denied for the duration of the project.
5. All complaints, investigations, notes and reports of harassment complaints are treated as confidential and in no event will the information concerning a complaint be released by MBUSI to third

parties or to anyone within MBUSI who does not have a business “need to know.”

B. Sexual Harassment Defined

1. Sexual harassment is considered a form of illegal sex discrimination under the Civil Rights Act of 1964 and is therefore expressly prohibited in any form or manner at MBUSI. Sexual harassment is defined as unwelcome sexual advances, requests for sexual favors or other verbal or physical conduct of a sexual nature when:

- a. Submission to such conduct either explicitly or implicitly is made a condition or term of an individual's employment;
- b. Submission to or rejection of such conduct by an individual is used as a basis for employment decisions affecting that individual; or
- c. Such conduct has the purpose or effect of unreasonable interfering with an individual's work performance or creating an intimidating, hostile or offensive work environment.
- d. All sexual harassment must be reported to MBUSI Safety/Security

2. Specific examples of sexual harassment would include but are not limited to the following conduct and actions:

- a. Any sexually-related comments, jokes, noises, gestures to or in the presence of another;
- b. Sexual comments or advances that are unwelcome, deliberate, repeated or unsolicited;
- c. Gestures or physical actions such as touching, patting or pinching of a sexual nature;
- d. Explicit or implied promises of preferential treatment or rewards regarding employment status in return for sexual favors;
- e. Personnel action that is taken, recommended, or refused because of a Team Member's rejection or reporting of sexual advances;
- f. Exercising authority or one's position to control, influence or affect the career, compensation, development, assignments, advancement or other employment status in exchange for sexual favors;

- g. Displaying, storing or transmitting sexually oriented materials using company equipment/facilities; or
- h. Engaging in indecent exposure.

Management Commitment and Team Member (TM) Involvement (SHSPR 01)

A. Safety Program

Mercedes-Benz U.S. International, Inc. (MBUSI) has adopted an operating practice that the highest priority is placed on establishing and maintaining a safe and healthy work environment. Specific safety and health programs and measures have been implemented and will continue to improve in response to workplace hazards, industry trends, changes and requirements in compliance with the federal Occupational Safety and Health Administration (OSHA), state, local safety regulations and ordinances. The OSHA *Job Safety and Health: It's the Law* poster (OSHA 3165-OSHA regulation 29 CFR 1903.2) has been posted in locations around the facility so that Team Members (TMs) are aware of their safety rights and protections.

It is the practice of MBUSI to implement and maintain proactive procedures, systems, equipment, machinery and processes necessary to eliminate or minimize conditions and situations adversely affecting a safe work environment. Safety is the foundation for establishing an environment where TMs, Contractors and Suppliers can make maximum contribution. In addition, TM involvement and participation is integrated into planning, developing and implementing an effective and meaningful safety process. TM participation in the MBUSI safety process will include safety committees, incident investigation teams, area hazard identification and analysis programs and safety processes and procedures audits.

At MBUSI, safety is regarded as everyone's responsibility irrespective of their role or assignment. All TMs have the responsibility to follow all safety and health procedures and processes and communicate to their supervisor and others any conditions believed to be unsafe. Failure to follow safety rules and procedures will result in appropriate disciplinary actions up to termination.

MBUSI believes that its TMs are its most valuable resource and will do all that is reasonable to protect them. In so doing, we can achieve our safety objective of 100% of Team Members working safely 100% of the time.

B. General Safety Rules

The following general safety rules, which are covered during orientation, Toolbox communication, and periodically during start-up meetings, pertain to the entire MBUSI campus and must be followed by all (Team Members, Contractors, and Suppliers). MBUSI Management must approve any exceptions. Failure to follow these safety rules will result in disciplinary actions.

1. MBUSI identification card (badge) must be carried at all times when on MBUSI properties.
2. Follow all safety rules, processes and procedures applicable to the work being performed.

3. Review all job work instructions, inspect tools, machinery and equipment, and perform Total Productive Maintenance (TPMs) before starting work and assure safety guards and devices on machinery and equipment are functioning properly before use. If any doubt exists about job safety, communicate this condition to the supervisor prior to performing the task.
4. Perform only those assignments, and operate only equipment you are trained and authorized to operate.
5. Wear the personal protective equipment (PPE) prescribed by the shop rules and specific job procedures.
6. Promptly report all accidents including injuries and unsafe conditions to your supervisor so prompt action can be taken to provide the necessary medical attention and prevent recurrence.
7. Maintain a clean and orderly workplace by maintaining the Mercedes Production System standard.
8. As per ergonomic guidelines and within your physical limits: lift, push, pull and handle only those tasks you are physically capable of handling safely while following the prescribed procedure.
9. Horseplay often results in injury and will not be tolerated. Appropriate disciplinary action will be taken including up to termination.
10. Lockout/tagout procedures shall be followed by all authorized Team Members to protect themselves from hazardous energy while servicing and maintaining equipment, machines and processes.
11. Know the potential hazards associated with chemical substances and how to protect yourself before handling chemicals, wear all personal protective equipment (PPE) prescribed for handling chemicals.
12. All personnel including contractors and suppliers are not allowed to be in restricted areas unless authorized, and should not be in any areas of the building other than those areas they are specifically assigned to perform work duties.
13. Smoking and other use of tobacco products is permitted only in designated areas (including vaping).

C. Safety and Health Committees

1. Production related groups should attend Safety Committees including but not limited to these events:

- a. Safety activities
- b. Education and training
- c. Inspections and audits

2. The Safety and Health Committees meet and the members report on their audit findings, corrective actions, conclusions and recommendations.

3. MBUSI Safety Representatives are assigned to advise and assist the safety and health committees and committee members. They attend each monthly meeting and serve as a resource for providing and obtaining needed safety, health and environmental information and materials.

II. Worksite Analysis, Accident Investigation, Hazard Prevention and Control

A. Worksite Hazard Identification and Risk Assessment

Procedures must be prepared/provided that specify measures for TMs to continuously monitor at MBUSI to identify and report safety, health and security hazards.

1. Job Hazard Analyses

Functional areas are analyzed utilizing the Job Safety Analysis (JSA) Form, to comprise a comprehensive baseline.

2. Injury, Illness and Near-Miss Incidents Investigation Procedure.

Refer to Incident Investigation Procedure for further information.

3. Hazard Prevention and Control

a. Team Member exposure to potential hazards shall be prevented or controlled by using an “exposure control plan,” wherever feasible, which utilizes:

- 1. Job Safety Analysis
- 2. Elimination or substitution
- 3. Engineering controls: ventilation, process modification and isolation of the source, etc.
- 4. Administrative controls: work procedures/practices, maintenance time scheduling, etc.
- 5. Personal protective equipment (PPE)
- 6. TM education and training
- 7. Health monitoring
- 8. Documentation

b. Safety-related preventative maintenance shall be conducted to provide against safety device failures.

c. Health care professionals:

- Are on-site at all times
- Are involved in hazard identification and training.
- Periodically observe and audit work areas and activities.
- Follow-up on TM treatment protocols.
- Respond to TMs reporting signs/symptoms of job-related injury or illness and document concerns for treatment.

4. Safety Design Reviews

Site-specific procedures must be provided to describe measures to perform safety reviews during the design stage for all projects involving new/modified facilities, processes, machinery, and equipment before project approval.

a. New and/or Modified Machinery/Equipment/Processes

All new and/or modified machinery/equipment and/or processes must be reviewed prior to placing the machinery, equipment or process in service.

1. Responsibilities: The Process Engineer (PE) of the area where the new or modified machinery, equipment or process is responsible for conducting the review by using the equipment **Buy-Off form**. The PE must assure that other designated TMs participate in the review/buy-off process.

2. Review: The PE will conduct the review and record the participants' findings on equipment buy-off forms.

The Safety Representative will consider all potential safety hazards and equipment.

3. Follow-up: The PE responsible for the review must assure that all items requiring attention are resolved before moving the buy-off process to the next step or next colored form. All items should be resolved before placing the equipment or process in active service.

4. Record: The completed review form must be retained according to the Records Retention Schedule.

b. Non-Routine Tasks, Materials or Equipment

All non-routine tasks, materials or equipment must be reviewed/analyzed prior to implementation to determine their impact on safety and health.

5. Inspections, Audits and Reviews (Monitoring)

Inspections, audits and reviews are conducted by TMs in order to detect safety hazards, defects and/or compliance with rules, procedures and regulations.

Prompt corrective action concerning items detected helps achieve a safe and

healthful workplace. Some of the facility safety inspections, audits and reviews include:

a. General Safety Audits

General facility spot check safety inspections and equipment safety checksheets are recorded on the Safety and Ergonomic Audit Form.

b. OSHA Safety (non-environmental) Regulation Audits

The focus of OSHA Regulation Audits is to ensure compliance to applicable OSHA 29CFR1910 & 29CFR1926 Safety (non-environmental) standards relating to MBUSI operations.

1. Responsibility: OSHA safety (non-environmental) regulation audits are performed by MBUSI Safety Representatives.

2. Specific Inspections: Specific safety inspections are conducted on a routine basis.

3. Inspection Procedures: The safety inspection procedures specified by equipment manufacturers or by OSHA's 29CFR1910 and/or 29CFR1926 (where applicable) must be followed.

4. Hazard Tracking: Nimonik system addresses hazards found during audits.

c. Industrial Hygiene Sampling Strategy

1. MBUSI has a documented sampling strategy used to identify health hazards and assess TMs' exposure (including duration, route and frequency of exposure) and the number of exposed TMs. TMs in overexposed areas/positions are placed in conservation programs.

2. Other workplace information such as hazard communication, in the form of labeling and safety data sheets, and the proper use and storage of hazardous materials shall also be audited.

III. Formal Security Program and Emergency Response

All persons and vehicles are subject to a random physical search while entering or exiting any property of MBUSI.

1. Access Control

- a. ID card with scan access rights assigned
- b. Sign-in process for visitors
- c. Approved Vehicle Pass and Liability Insurance Coverage (Contractors)

2. Prohibited Items (Buildings, MBUSI's Property(ies))

MBUSI strictly prohibits the possession or activity of the following on MBUSI property:

- a. Firearms
- b. Ammunition
- c. Explosive devices
- d. Any Weapon
- e. Illegal Drugs or Alcohol (selling or using)
- f. Gambling
- g. Use of photo or imaging devices unless approved by MBUSI using the form titled Camera/Video Authorization Request

3. Asset Protection

- a. Security Patrols
- b. Closed Circuit Television (CCTV)
- c. Managed gates and turnstiles
- d. Exit Interviews by terminating Team Members

IV. Communication, Reporting and Safety/Health Training

A. Communication

1. Procedure for communicating safety, health & security information affecting MBUSI facility TMs and contractors/suppliers.

a. Hot Sheet

Injuries, illnesses, near misses, fires, property damage, etc., facts will be communicated via the morning Daily Safety, Security and Medical Incidents Hot Sheet review.

B. Safety/Health Training

1. Overview

Team Member safety education and training are an important aspect of accident prevention. TMs must be properly trained in:

- a. Safe work procedures concerning safety and health requirements of assigned tasks and hazards in the workplace.
- b. How to recognize and report hazardous conditions.
- c. Signs and symptoms of workplace-related illnesses.
- d. Pertinent emergency procedures.

Safety education and training begin when initially hired and continue throughout employment.

2. Safety Orientation

Safety Orientation must be completed and documented. Team Members, Contractors, Expats and Resident Suppliers must be properly trained to perform assigned tasks safely prior to working on site.

3. Annual Safety and Health Training Needs Assessment
 - a. Responsibility for assessing training needs belongs to the TM's department.
 - b. New Safety Procedures will be communicated to the organization through the Safety Department.
4. Safety and Health Training documentation is retained by Alabama Industrial Department of Training (AIDT), according to the Records Retention Schedule.
5. Continuing Safety Education

Special safety and health education and training programs will be presented on an as-needed basis.

V. Recordkeeping and Program Evaluation

Appropriate documentation should be maintained for accidents involving injury or illness and other unplanned incidents (near-miss) that have the capability of producing injury, illness or property damage. MBUSI will maintain records and statistics referring to health and safety according to the Records Retention Schedule.

A. Maintaining a Safe and Healthy Workplace

A safe and healthy workplace is maintained through the cooperative efforts of all MBUSI TMs. Continuous efforts are necessary to improve safety awareness and assure a safe workplace.

B. Health

1. Providing a Healthy Workplace
 - a. Physical Evaluations
 1. Initial evaluations: In accordance to and in compliance with applicable governmental regulations.
 2. As specified by OSHA standards and other applicable regulations, continuing physical evaluations and/or medical surveillance is conducted.
 - b. Drug Awareness Program

Refer to MBUSI Human Resources Regulation for further information.
2. Medical Treatment
 - a. Consulting Physicians

Consulting physicians advise and direct MBUSI's medical program providing specific standing orders on how medical-related items are handled.
 - b. Emergency Situations
 1. Physician: All work-related injuries requiring medical treatment must be recorded on the OSHA 300 Log of Injuries and Illnesses. Refer to the OSHA injury and illness recordkeeping guidelines for specific details.

2. Workplace Monitoring: Monitoring is performed based on OSHA standards for given exposures.

C. Environment

1. General

MBUSI is concerned with protecting our workplace and community environment. Reasonable efforts are made to comply with governmental environmental regulations. Therefore, MBUSI commits to the integration of the following principles across our business activities: protection of the environment; fulfillment of compliance obligations; continuous improvement of the Environmental Management System; accessibility of information; and the extension of environmental responsibility to all Team Members. See MBUSI Environmental Management System for more information.

2. EPA Compliance Programs

See MBUSI Environmental Management System for information.

Non-Production Property Removal

Procedure

- A. Property removal authorization is required to remove items from MBUSI property(ies). A Non-Production Property Declaration/Removal Form, can be obtained through the MBUSI Security Office.
- B. MBUSI Non-Production Property Declaration/Removal Form must be reviewed and approved by the individual's Management. If item(s) are to be returned, a date of return must be provided on the form. Production parts and equipment may not be removed using the MBUSI Non-Production Property Declaration/Removal Form.
- C. The Individual removing the property will be required to stop at the Security Gate or Turnstile and leave the Authorization Form with the Security Officer for review.

Reporting Missing or Recovered Property

Procedure

- a. Notify Security immediately when property is discovered missing, or if property is found and the owner is unknown.
- b. Missing or Recovered Property Report Form located in the Security Office must be completed by the Team Member or department experiencing the loss.
- c. The completed report should be submitted to MBUSI Security Office for review, follow-up action and to initiate corrective measures as needed.
- d. All property not claimed after 180 days will be disposed of at the discretion of MBUSI Security Office.

Approval for On-Site Camera/Video Recordings

Cameras and video recording devices are not allowed on site as they could compromise proprietary information of MBUSI.

- a. Requester requiring pictures or video recording must complete and submit a Camera/Video Authorization Request form to their department Manager for approval.
- b. After approved by the requester's department management, the form should be submitted to MBUSI Communication Department for approval. After Communication Department's approval, the form should be submitted to the Security Office to obtain a Camera/Video Pass and be retained according to the Record Retention Schedule.
- c. The pass shall accompany the device. The pass shall be returned to Security Office promptly when assignment is complete. Signed authorization form can substitute as the Camera/Video Pass only if pass cannot be made through mechanical means. The approved authorization form or pass shall be available for review upon request by an MBUSI Safety and Security representative.
- d. Media personnel or Visitors shall have an MBUSI escort present at all times during photography or video sessions.
- e. Unauthorized photography or filming may result in seizure of equipment for review of items stored on film, hard drive, or electronic device. Unauthorized images will be deleted and device returned.

Visitor Access

Visitor

Any person entering MBUSI property and has not been issued an ID card by Security, is considered a visitor.

- At point of entry, visitor required to produce photo ID
- At point of entry, visitor's host will receive visitor and escort them during their visit
- Delivery vehicles to the site must access Gate 13 or other designated gate and be approved using contract Security Department's criteria for entry
- Journalist, Government Officials and Community Representative's access must be approved by the Communications and President's Offices.

- For short-term jobs (1-3 days), an MBUSI Safety Representative must pre-approve personnel and tasks to be performed prior to project start. The use of an MBUSI badged individual in 100% attendance of the work force, 100% of the time is required.

Restriction

The Visitor Access Procedure limits the following types of physical work (requires approval from MBUSI Safety);

- Construction
- Electrical
- Mechanical
- Or any other work that may affect the environment, health, safety, physical security or Information Technology (IT)

Visitors to MBUSI for the specific types of physical work assignments must complete Contractor Safety Orientation and submit a negative 5 panel non-DOT drug screen.

Incident Investigation

Procedure for Investigation

A. All accidents/incidents are investigated to determine the root cause(s) so effective control measures can be taken to prevent recurrence of similar incidents.

B. Items considered when conducting an incident investigation include, but are not limited to:

1. The level of medical assistance should be determined and provided, if necessary.
2. Securing/preserving/isolating the scene/area initially until the investigation team is able to evaluate the scene/area to ensure the area is safe for TMs to return.
3. Obtaining incident description.
4. Recording sequence of events.
5. Recording witness interviews.
6. Recreating controlled incident situation.
7. Reviewing engineering controls and safety rules.
8. Reviewing TM training.
9. Reviewing enforcement and supervisory controls.
10. Reviewing job SMP, JES and actual job procedures.
11. Utilizing the 5-Why process to determine the most likely root cause.
12. Developing possible controls.
13. Determining the best control.
14. Assigning responsibility for follow-up.
15. Submitting Accident Investigation Report(s), Incident/Event Reporting Form, and/or Property Damage Form.

16. Communicating investigation report(s) – Daily Hot Sheet
17. Ensuring effective supervisory follow-up.

Follow-Up

- A. Shop/Area Management where incident occurred and the Supervisor preparing the incident report are jointly responsible for ensuring that all incident investigation report countermeasures are complied with and/or otherwise resolved.
- B. Documented analyses by MBUSI Safety are conducted to determine trends and/or risk potential for all injury, illness or property damage accidents and near-miss incidents.
- C. Results of analyses of accident and near-miss incidents are used to design/implement preventive measures as well as to correct deficiencies.
- D. The implemented interim and permanent countermeasures must be documented and communicated to other shops, where applicable, to address system deficiencies and to prevent recurrences via the morning distribution of the Daily Hot Sheet.
- E. All claims involving suspected fraud, horseplay, illegal substance or alcohol are promptly reported to Human Resources.
- F. Consumption, Possession, and Being under the Influence of Alcoholic Beverages and/or Illegal Narcotics
 1. Consumption, possession or being under the influence of alcoholic beverages and/or illegal narcotics is strictly prohibited and is grounds for immediate and permanent dismissal from the site.
 2. Illegal drugs found on any MBUSI property will be turned over to the appropriate law enforcement authorities for final disposition.

TM Disposition for Disciplinary Escalation

- A. Definitions
 1. At Fault Incidents: are those where training and job preparation are present and there occurs: a blatant disregard of safety guidelines, not following the SMP, determined willful or malicious or malevolent intent, gross negligence, repeated offences, etc.
 2. No Fault Incidents: are conditions determined to be outside the control of the Team Member.
- B. For further disciplinary escalation information, consult Human Resources.

2. Occupational Injury/Illness Investigation

2.1 Description

A. The first priority in any incident is for injured parties, if any, to seek and receive medical attention.

1. TMs involved should immediately report any injury to their supervisor. It is the Supervisor's responsibility to contact Safety/Security and/or Medical depending on the severity of the incident. All incidents are to be reported, regardless of the level of the injury sustained.

B. The second priority is:

1. Securing/preserving/isolating the scene/area until the investigation team is able to review the scene/area.

2. To make sure a temporary countermeasure(s) is in place, in order to prevent an injury.

3. Ensuring the area is safe for TMs to return to work.

C. Depending on the severity of the incident, MBUSI Medical may refer TMs to external medical providers for treatment. Visits to outside medical providers for work-related injuries and illnesses must be approved and coordinated by MBUSI Medical Department.

D. MBUSI Medical Department is responsible for notifying the injured TM's Supervisor, if they have not been previously notified.

E. Investigation Team and Report

1. The immediate supervisor of the injured TM or the person responsible for the work area where an incident occurred should complete MPS Problem Solving Form and forward a copy to the Safety Manager.

2. Other: Other relevant TMs may also participate in the incident investigation.

3. Property Damage, Vehicle Damage, Near-Miss Investigation

3.1 Incidents Requiring Investigation include, but are not limited to:

A. Vehicle damage on the property (regardless of ownership by MBUSI or MBUSA).

B. Fires and chemical spills.

C. Property damage not involving injury.

D. Near-miss incidents.

3.2 Investigation Team and Report

A. Security Representative is responsible for completing the Security Incident/Event Report and/or the Safety/Security Property Damage Report and entering incident onto the Hot Sheet.

B. Other: Other relevant TMs may also participate in the investigation.

C. Security /Fire Safety Representative must forward the completed report to the HR Safety/Security Manager.

Helicopter Usage and Acceptance

Description

- A. Medical Emergencies - Any life threatening injury. This includes injuries or illnesses, which may interfere with respiration, cardiac functions, electrical shock, major thermal or chemical burns, inhalation injuries, crush injuries, or shock.
- B. "HOT" Direct Materials Deliveries - Any parts, direct or indirect materials needed that directly affect the production of the vehicle including but not limited to tools, body parts, and chemicals.
- C. Executive Travel - Any helicopter travel to or from Mercedes-Benz U.S. International, Inc., for company-related business that has been approved prior to arrival or departure with proper notification to Security Office.
- D. Authority Having Jurisdiction (AHJ); Authority Having Jurisdiction may approve Safety or Security related request on behalf of MBUSI or its business units in good faith when deemed necessary by the (AHJ).

Decisions made will supplement procedure on a case-by-case basis and will be executed as a last resort when other measures have failed or were granted permission by a higher level of authority.

The officer with contact will document a log entry or written report of action. Some request may only be subject to verbal approval with no record kept.

Persons having authority (AHJ);

MBUSI: E1, E2s

MBUSI Safety and Security Human Resources: E2, E3, E4, and E5 with contract security and safety as primary responsibility

Contract Security: Chief of Security

Contract Safety: Fire Chief

Procedure

A. Medical Emergencies

Helicopter transportation will be contacted for medical emergencies if the injury is classified as “Level 3” (life threatening). For these situations, the following actions are taken:

1. Medical Office will call for air transportation.
2. Medical Office will notify Security of air transportation pending arrival.
3. Security officers will turn on the lights to the helipad and standby for helicopter arrival. Upon arrival, Security officer will log the wing number from the helicopter and escort paramedics to the injured party.

B. “Hot” Direct Material Deliveries

In a situation where production operations would be affected by the absence of direct materials, “Hot” material deliveries may involve helicopter transport. If this situation arises, the proper paper work and notification to Security Office should be made prior to the arrival of the material. Paperwork consists of Bill of Lading, and an approved Helicopter Pad Use Request Authorization Form.

Security officer will turn on the lights to the helipad and standby for helicopter arrival. Upon arrival, Security officer will log the wing number from the helicopter for documentation purposes. While monitoring the importing/exporting of materials, Security officer will contact the party involved of helicopter arrival for acceptance of material.

C. Executive Travel

When Helicopter transport is needed for MBUSI-related business, Team Member should complete a Helicopter Pad Use Request Authorization Form. Included on the document should be arrival and departure times, whether this transportation is for pick-up or drop-off, and whether the helicopter will remain on-site for a layover or immediately depart. The Helicopter Pad Use Request Authorization Form should be forwarded to Security office 24-hours prior arrival of helicopter. At the appropriate time (30 min prior to arrival of helicopter), Security will turn on the lights to the helipad and standby for helicopter arrival. Upon arrival, security will log the wing number from the helicopter for documentation purposes.

Documents/References

- Helicopter Pad Use Request Authorization Form

LOCK REMOVAL

Lock removals are communicated to effected Team Members to ensure legitimate reasons and authorization by completing the Lock Removal form.

For Lockout/Tagout lock removals please see section on Control of Hazardous Energy.

Documents/References

- Lock Removal Form

ERGONOMICS DESIGN

Objectives

- Enhance effectiveness and efficiency (includes such things as increased convenience of use, reduced errors, and increased productivity)
- Improved safety and quality
- Reduced fatigue, stress and medical costs (direct and indirect)
- Increased comfort
- Greater user acceptance
- Increased job satisfaction (reduce absenteeism, turnover/training costs and productivity)
- Reduce design and process changes and their associated cost throughout the lifecycle of the product

Control Forces that Team Members Exert in a Production Process

Basic Guidelines

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| <ol style="list-style-type: none">1. No impact forces such as hammering with the hands. Do not use any body part as a tool.2. Grip and pinch force must be low.3. Use power grips in place of pinching when possible.4. Limit the force of pressing with the fingers and thumb.5. Choose the right tool for the job (see power and non-power hand tools).6. Control power tool reaction (see power tools section).7. Develop and train team members in proper use of power tools, non-power tools and load-assist devices.8. Avoid forceful twisting of the forearms.9. Avoid static (sustained) forceful exertions.10. Avoid contact stress, such as abrupt edges, especially to palm of hand or sides of wrist.11. Design tasks that encourage two-handed lifting, pushing and pulling.12. Avoid two-person lifting, pushing, and pulling.13. Avoid manual lifting and carrying of heavy and/or awkward objects. |
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14. Limit the vertical distance traveled by the hands between the origin and destination of a lift.
15. Limit the weight lifted and/or supported overhead (limit duration).
16. Limit pushing and pulling forces.
17. Limit the horizontal distance of push, pulls, and carries.

Design Targets Considering Cyclic Work –Production Processes- Force and Distances

1. Two-handed lifting and/or carrying of ≤ 20 lb. (9 kg)
2. Two-handed push or pull of ≤ 20 lb. (89 N).
3. One-handed lift and/or carry ≤ 10 lb. (4.5 kg). Use two-handed methods when possible.
4. One-handed push or pull of ≤ 10 lb. (44 N). Use two-handed methods when possible.
5. Avoid the handling of loads > 10 lb. below 20 in. (89 mm) and above 54 in. (240 mm)
6. Limit carry distances to 10 ft (3 m) or less.
7. No palm down lifting of objects greater than 5 lb. (2.3 kg).
8. Grip force ≤ 10 lb. (44 N).
9. Pinch force ≤ 3 lb. (13N).
10. Thumb press ≤ 8 lb. (36 N).
11. Maximal finger press force ≤ 4 lb. (18N).
12. Lateral force applied horizontally with arms extended in front of body ≤ 15 lb. (67N).

Control the Body Positions and Postures in a Production Process

Basic Guidelines

1. Avoid extreme or end range postures of all body parts.
2. Avoid static (sustained) awkward postures.
3. Work should not require the Team Member to work with the elbows out from the side of the body. Shoulder movements should always be with the elbows in front of the body.
4. Keep elbows below shoulder level as much as possible.
5. Avoid work that requires reaching overhead while looking up whenever possible.
6. Avoid work that requires team members to stand on their tiptoes.
7. Position objects within a comfortable reach.

8. No reaching behind the body. Keep work in front of the body.
9. Limit reaching across the front of the body.
10. Limit bending at the waist to less than 30° whenever possible.
11. No bending at the waist greater than 60°.
12. Limit the frequency and degree of twisting.
13. Work should not require repeated squatting.
14. Avoid work while kneeling.
15. Limit the need for Team Members to be inside the vehicle during production tasks.
16. Limit the need for Team Members to perform production tasks in underbody stations.
17. When reaching above head cannot be avoided, target keeping shoulder flexion at or below 135°.

Control the Body Positions and Postures in a Production Process (continued)

Standing Work Envelope Targets:	
Description	Work Envelopes
<ol style="list-style-type: none"> 1. Primary (Target) Work Envelope: <ul style="list-style-type: none"> • Horizontal Reach - 15.5 in. (394 mm) in front of body. • Vertical Reach -between 30 in. (762 mm) and 54 in. (1372 mm) from the floor. Optimal work height 41 in. (1041 mm). 2. Secondary (Acceptable) Work Envelope <ul style="list-style-type: none"> • Horizontal Reach - 22.5 in. (571 mm) in front of body. • Vertical Reach -between 25 in. (571 mm) and 63 in. (1600 mm) from the floor. 3. Maximal Work Envelope - Minimal Weight/Force Zone - <u>Limit work in this zone as much as possible</u>. Excessive reaches and job fit issue will begin to occur in this envelope especially when combining the vertical and horizontal reach components. <ul style="list-style-type: none"> • <u>Maximal Horizontal Reach</u> - 30 in. (762 mm) in front of body. • <u>Maximal Vertical Reach</u> - between 20 in. (508 mm) and 72 in. (1829 mm) from the floor. 	<p>Measurements in Inches</p> <p>Primary Secondary Maximal</p>
Picking parts from line side shelves/racks/totes/bins	

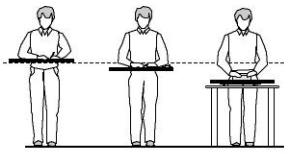
Note: these work envelopes must balance the physical requirements of the production team member picking parts as well as materials handling team members staging parts. All measurements are to the hand position.

1. Primary work envelope – this is the target location for parts in totes, on shelves or in specialty racks. This allows the majority of people to comfortably access the content and in most cases see the content. It is also the target for the staging of parts on shelves or in specialty racks.
2. Secondary work envelope -The lower values in this envelope have Team Members starting to bend to reach parts. In the upper end of this envelope, some Team Members will not be able to see the content in the totes and awkward posture can occur trying to reach and get parts from the container. Part weight, tote weight and frequency of part use must be considered thoroughly when using this work envelope.
3. Maximal work envelope should be reserved for tote returns.

General Guidelines for Seated Work for Production Tasks

1. **Design assembly process to be performed while standing whenever possible.**
2. When working in a seated position with the legs under a surface, a minimum horizontal leg clearance of 26 in. (660 mm) is required and must be maintained at all times during the process.
3. All parts/tools should be located within reach. Parts/tools should not be placed on the floor.
4. Large force should not be required.
5. When using a chair, the chair should offer good support and be adjustable.
6. Casters on chairs should be appropriate for the floor surface.
7. Seats on chairs must be padded with a porous, textured cushion.
8. Reaches above the shoulder level should be limited as much as possible.
9. No twisting of the trunk.
10. Limit horizontal reaches (see horizontal reaches for standing work above).
11. Limit process sitting in the floor of the vehicle. If work must be performed in a seated position in the vehicle, provide a portable seat on an articulating arm.

Control the Body Positions and Postures in a Production Process (continued)

Standing Sub-Assembly/Work Table Height				
Type of Work	Adjustable Work Height	Fixed Standing Work Height		 Precision Light Heavy
		Platform to Raise Person	Cannot Add Platform	
Precision Work	39 in. - 50 in. (762mm-1270mm)	50 in. (1270mm)	44in. (1118 mm)	
Light Assembly	36 in - 47 in. (914mm)-(1194 mm)	47 in. (1194mm)	42 in. (1067 mm)	
Heavy Work	30 in. - 42 in. (762mm-1067mm)	42 in. (1067mm)	36 in. (914mm)	
General Guidelines:				
<ol style="list-style-type: none"> 1. Balance/support tools whenever possible. 2. Provide methods for clamping/holding parts. 				

3. If large forces are required, provide lever arms/presses or tool to assist Team Member. Grip span on handles should be 1.5 to 2.5 inches in diameter.
4. Position objects on the table/bench to discourage leaning forward, leaning to the side or twisting of the body.
5. Pad any edges that may come in contact with the Team Member.
6. Provide anti-fatigue mats, wood flooring or other softeners if standing is required for 2 hours or more.
7. Avoid foot pedals with standing sub-assembly stations.
8. Overhead structures should be at least 80 inches from the floor.
9. If portable platforms are used, they should be light and pose no trip/fall hazard.
10. See work envelopes above.

Hand Tools

Right Angle Tools - General	
1.	Right angle tools should be operated with two hands. When two-handed use is not possible, explore tool balancing, reaction bars, work heights and/or alternative tooling.
2.	Right angle tools with the ability to generate torque values ≥ 40 Nm or greater should be presented for two-handed handling at all times (This includes home position to point of operation).
3.	Right angle tools with torque values ≥ 60 Nm require a reaction bar or load-arm.
4.	Right angle tools with torque values ≥ 100 Nm require a load-arm.
5.	All DC electric tools require soft start and soft stop programming.
Pistol Grip and Straight Tools - General	
1.	Pistol grip tools with torque values > 6 Nm should be a battery tool with a reaction bar, a pulse tool or program controlled electric tool.
2.	Straight power tools with torque values greater than 3 Nm require a reaction bar, pulse pneumatic tool or program controlled electric tool.
3.	No push-to-start tools should be used.
4.	Should be designed to use with either hand.
5.	All DC electric tools require soft start and soft stop programming.

Trigger Force Limits – Tools in Production Processes				
Finger	Single Finger	Two-Finger	Three-Finger	Four-Finger
Thumb	4.4 lb. (19.5 N)			
Index	3.4 lb. (15 N)	9.1 lb. (40.5 N)	13.5 lb. (60 N)	16.5 lb. (73.5 N)
Middle	5.6 lb. (25 N)			
Ring				
Little				

Hand Tools (continued)

Power Tool Handles			
<ol style="list-style-type: none"> 1. Sharp edges on the handle must be avoided. 2. Avoid using form-fitting handles molded to one specific hand. 3. Avoid glossy or highly polished surfaces. 4. Textured rubber handles desired. 5. Handle Circumference: 			
Variables	Optimal	Acceptable	Marginal
Circumference – trigger Activated	110-120 mm	100-110 mm or 120-130mm	95 -100mm or 130-140 mm
Max. Circumference – Open lever Trigger	<160 mm	<170 mm	<180 mm
Max. Circumference – Open finger trigger	<140 mm	<150 mm	<160mm
Length for pistol grip and angle tools	110-130 mm	100-110 mm or 130-145 mm	90-100 mm or 145-160mm
Length for straight tools	>110 mm	100-110 mm	90-100 mm

Other Power Tool Requirements
<ol style="list-style-type: none"> 1. Tool weight - Tools that weigh more than 5.5 lb. (2.5 kg) should be suspended, counterbalanced or have two handles. 2. Always direct air outlets of pneumatic tools away from the operator. The outlet must be diffused. 3. Slip covers must be installed on all rotating shafts > 3 inch. 4. Team Members should be trained in the purpose/performance, proper use and TPM of all powered tools.

Non- Powered Hand Tools
<ol style="list-style-type: none"> 1. Single handle tools for power tasks (examples: screwdrivers and hammers): the handle should be 1.25 in. (32 mm) to 2 in. (51 mm) in diameter and 4 in. (102 mm) to 6 in. (152 mm) in length. 2. Single handle tools for precision tasks: The handle should be 0.25 in. (6 mm) to 0.5 in. (13 mm) in diameter. 3. Double-handled tools for power tasks (examples: Pliers, snips, and cutters): open grip span should not exceed 3.5 in. (89 mm), closed grip span should not be less than 2 in. (51 mm), and the handles should be 4 in. (102 mm) to 6 in. (152 mm) in length. 4. Double-handled tools for precision tasks (examples: Pliers, snips and cutters): open grip span should not exceed 3 ½ in. (89 mm), closed grip span should not be less than 1 in. (25 mm), and the handles should be 4 in. (102 mm) to 6 in. (152 mm) in length.

5. Bent handle tools can also be considered when using two-handled tools to improve working postures.
6. For double-handled pinching, gripping or cutting tools, select tools with handles that are spring-loaded to return the handles to the open position.
7. Choose tool lengths that fit the space available to avoid awkward wrist postures.
8. Select tools without sharp edges or finger grooves on the handles.
9. Select tools that have handles coated with soft non-slip material.
10. Select tools that can be operated with either hand.
11. Avoid tools with small diameters that apply stress to the palm of the hand.
12. Select tools that use a power grip when force is required.
13. T-handle tools should not be used when force is required.
14. Avoid striking hand tools with the hand.

Load-Assist Devices

Load-Assist Devices
<ol style="list-style-type: none"> 1. The MBUSI buy-off process is required on all load-assists. 2. If a load-assist is required for a process, it should be used at all times. 3. Formal PM and TPM processes are required for all assist devices. 4. Assist devices must work with dunnage/racks. 5. Assist devices should be as compact and light weight as possible. Target push/pull forces on page 4 must be met. 6. Assist devices should allow the operator to stand in a neutral position and see all necessary alignment points and critical load and unload points. 7. Assist devices must pick parts, release parts, and move between the home position and point of operation without the Team Member wiggling, snatching, or jerking on the device or part. 8. Distance between handles should be between 18 and 24 in (457 – 610 mm) 9. All potential pinch points below 8 ft (2.4m) must be controlled. 10. Pinch points at the point of operation must be guarded/avoided. 11. Pinch points at swivel joints, pivot joints, cylinders, and any other rotational hazards must be guarded/avoided. 12. Guard or avoid all sharp edges. All tubing must be capped. 13. Use dual anti-tie-down, anti-repeat controls. 14. Controls should be positioned to allow operation with the hand in a neutral position. 15. Clamping and unclamping of parts should be activated by proximity switches rather than manual switches/buttons whenever possible. 16. Handles should be between 1.25 in. (32 mm) to 2 in. (51 mm) in diameter. 17. Vertical heights of handles and controls should fall in the primary work envelope with a target value of 40 in (1016 mm). 18. Safe back-up plan/procedure should be in place in case the assist device is not operational.

General Clearances

1. Overhead structures should be 80 in. (2032 mm) off the floor.
2. Minimum width for clearance in areas where Team Members are required to walk is 28 in. (711 mm)
3. Minimal foot clearance of 4 in. (102 mm) in height and 6 in. (152 mm) in depth.
4. Minimal hand clearance of 3 in. (73 mm) between manually moved objects and fixed structures.

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| 5. Minimal horizontal leg clearance for seated work is 26 in. (660 mm) |
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Materials Handling

Dunnage/Material Racks
<ol style="list-style-type: none"> 1. Design material packaging so parts are easy to grasp and manipulate without the need to flip or rotate. Parts should be oriented in dunnage/racks to match fixture or point of operation. 2. Avoid tight nesting of parts in dunnage/racks. Force or prying of the part should not be required to remove the part. 3. Dunnage/racks should present parts at no more than 22.5 in. (571 mm) in front of the body. 4. Team Members should not be required to step into or on dunnage/racks to obtain parts unless the rack is specifically designed with a safe walking surface and adequate work clearances. 5. Racks should have lightweight returnable dunnage (maximal weight of 20 lb. or 9 kg.) and/or counterweighted dunnage bars requiring no more than 25 lb. (111 N) of force to open/close. 6. Racks/dunnage should secure parts to prevent shifting during transport. 7. Sequencing racks must accommodate all part variances. 8. For dunnage/racks with casters or on dollies, information for push/pull targets.

Materials Handling (continued):

Two-Handed Lifting and Carrying – Material Handling Group
<ol style="list-style-type: none"> 1. Keep load as close to body as possible. 2. Use two hands when possible. 3. Limit handling loads in the primary work envelope ≤ 35 lb. (15.9 kg) 4. Limit handling loads in the secondary work envelope ≤ 25 lb. (11.3 kg) 5. Limit handling loads in the maximal work envelope ≤ 10 lb. (4.5 kg) 6. Avoid manually handling object that extends more than 16 in. in front of the body. 7. Avoid twisting while lifting. 8. Avoid asymmetrical loads (loads should be well balanced). 9. Use mechanical aids to handle heavy loads. 10. Objects lifted should have handles whenever possible. 11. Assure adequate workspace. 12. Avoid materials handling on slippery surfaces. 13. Avoid two-person lifting and carrying. 14. Use smooth, well-controlled movements. 15. No carrying objects on stairs. 16. See work envelopes.

One-Handed Lifting and Carrying
<ol style="list-style-type: none"> 1. Use two-handed lifting and carrying when possible. 2. Keep loads close to the body. 3. Keep arms straight when possible. 4. Avoid unbalanced loads. 5. Avoid carrying objects on stairs. 6. Avoid two-person carries when possible.

7. Minimize twisting.
8. Avoid carrying on slippery surfaces
9. Use carts/dollies/conveyors to reduce or eliminate carrying when possible.

Pushing and Pulling of Carts/Dollies

1. ≤ 40 lb. to initiate movement.
2. ≤ 24 lb. to maintain movement.
3. Keep heights of carts < 55 in. when possible.
4. Horizontal handles 36 in. to 40 in.
5. Vertical handles start at 35 in.
6. Avoid swivel casters on all four wheels.
7. The larger the caster the better. Avoid casters with diameters of less than 6 inches.
8. Avoid uneven or sloped surfaces.
9. Avoid pushing and pulling on slippery surfaces.
10. Use a push rather than a pull whenever possible.

ROBOTIC SAFETY

All new robotic hardware and software systems must meet legal and consensus standards, particular focus should be on the latest requirements of the American National Standards Institute's ANSI/RIA R15.06 Robotic standard and NFPA 79 National Electrical Code. Upgraded, modified, or moved robot systems must be reviewed with MBUSI Safety Department to determine the standard requirements.

Layout Design Hazard Analysis

For Robot Cell approval, a Robot Layout design must be conducted. The designer/supplier must submit a hazard analysis to their companies Safety/Controls Engineer responsible for the Robot Cell. This analysis must be forwarded to MBUSI Safety in conjunction with MBUSI Engineering. MBUSI Safety shall have a minimum of 2 weeks to review the contractors/ supplier's preliminary hazard analysis and comment/ revise as deemed necessary. The revised analysis shall be used to specify the preliminary safety system design of the robot and its components. The layout design hazard analysis must be completed, reviewed, and corrected, before the system is powered on. The design contractor/ supplier shall provide installation drawings for each robot workstation. The drawings shall provide the necessary views, sections and dimensions to install the robot and its associated equipment in the workstation.

At the design review, Annex G of the ANSI/RIA R15.06 sections 5.2 through 5.5 shall be verified, validated, and reviewed with MBUSI Safety and MBUSI Series Planning or MBUSI Engineering. The integrator should be prepared to discuss these sections and have the appropriate paperwork. Any information that is not ready for review shall be noted and a follow up date assigned.

Special attention will be devoted to human machine interaction, insertion point, defining restricted space, perimeter fencing requirements, maintenance access, maintenance repair, and special features of the area.

The integrator will be responsible for capturing the information from this meeting and entering it into the tracking system.

The hazard analysis should be organized by cell and each control zone shall be reviewed individually. The robot layout design hazard analysis shall contain all the requirements below for each control zone:

- The physical limits of the cell will be established in three dimensions in relations to other cells, lines, building structures, etc.
- Identify the workspaces, access, and clearance.
- The maximum space of the robot space, the restricted and operating space, and clearances needed for obstacles such as building trusses or columns.
- Traffic routes from pedestrians, visitor, logistics, outside the perimeter safeguarding of the line.
- Show the safe pathway to utilities and control systems.
- Show safe pathways for troubleshooting, service, cleaning, troubleshooting, and maintenance purpose.
- Show cables, cable trays, hoses, and piping.
- Show safe guarded space.
- Manual intervention – the layout should be designed to allow task requiring manual intervention to be performed outside the safeguarded space. Identify the manual intervention task performed outside the safe guarded space and manual intervention task that will be performed inside the safe guarded space.
- Manual backup stations shall be included in the layout design and their hazards addressed.
- Additionally, all enabling devices will be shown on the drawing. The enabling device functionality will also be listed.
- Ergonomics and human interface with the equipment will be reviewed. All operator and maintenance interfaces shall be listed.
- Visibility of operations, clarity of E-Stops and motion controls will be reviewed in the layout design.
- Position of loading and unloading work pieces relative to position of the operator shall be reviewed. The robot controls shall be placed to reflect the layout of the

robots in the station. This placement shall provide a clear view of the robot while utilizing the controller.

- Foreseeable misuse from operator shall be mentioned in the layout design hazard analysis.
- Environmental conditions will need to be reviewed. Discussion of hazards caused by the robot operations will need to be listed. Environmental concerns can include, but are not limited to: noise hazards, temperature hazards, atmospheric hazards, weld sparks, weld dust, by-products produced by the process, etc.
- Perimeter safeguarding must be discussed. Maximum space of the robot will be shown in a separate drawing along with the restricted space of the robot.
- Emergency E-stops devices and possible zoning of the cell must be reviewed (local stops or full zone stops).
- All robotic systems must be designed and manufactured in accordance with ANSI/RIA 15.06 standard.

Risk Assessment

The integrator of the robot system will perform a risk assessment to determine the risk reduction measures required to adequately reduce the risks presented by the integrated application. The risk assessment must be presented to MBUSI Safety before powering on the system. MBUSI Safety will review the risk assessment. The Safety Engineer that reviews the risk assessment will ensure that it meets standard and sufficiently reduces the risk. The risk assessment will be returned to the integrator for correction.

The risk assessment must be reviewed at each buyoff stage. The integrator will bring a copy to each phase of the buyoff for review.

Risk Assessments must include: Determination of the limits of the robot system, hazard identification, risk estimation, and risk evaluation.

The risk assessment begins with the specification of the robots systems intended use and limits. This specification must include:

Use limits:

- Description of functions, intended use and reasonably foreseeable misuse
- Description of the different user modes
- Analysis of process sequences including manual intervention
- Description of interfaces, tooling and equipment
- Utility connections

- Information supplied by manufacturer including applied measures for risk reduction
- Required power supply and their appliances
- Required or anticipated user skills (competency)

Space limits:

- Required machine movement range
- Required space for installation and maintenance
- Required space for operator tasks and other human intervention
- Reconfiguration capabilities
- Required access
- Foundations
- Required space for supply and disposal devices or equipment

Time limits:

- Intended life limit of the machinery and its components
- Process flow charts and timings
- Recommended service intervals

Other limits:

- Environmental (temperature, use indoors or outdoors, tolerance to dust and moisture, etc.)
- Required cleanliness level for the intended use and environment
- Properties of processed materials
- Hazardous environments
- Lessons learned, i.e. study and comparison, including available accident and incident reports of similar operations and systems

Task Identification shall be identified with their associated hazards and documented by the integrator. The safety engineer, project engineer, and maintenance engineer shall review the integrator-identified task in the robot risk assessment for accuracy.

Task should include:

- Process Control and Monitoring

- Work piece loading
- Programming and verification
- Brief operator intervention not requiring disassembly
- Set-up (e.g. fixture changes, tool change)
- Troubleshooting
- Correction of malfunctions (e.g. equipment jams, dropped parts, event recovery, and abnormal conditions)
- Control of hazardous energy (including fixtures, clamps, turntables, and other equipment)
- Maintenance and repair
- Equipment cleaning

Hazard elimination and risk reduction will need to be determined for each hazard identified. Measures for the reduction of risk are based upon these fundamental principles:

- The elimination of hazards by design or the reduction of their risk by substitution
- Safeguarding to prevent operators coming into contact with hazards or to ensure the hazards are brought to a safe state before the operator can come into contact with them
- The provision of supplementary protective measures such as information for use, training, signs, personal protective equipment, etc.

A task based risk assessment of the specific installation and anticipated tasks shall be performed to determine possible trapping or pinch points within the robot-restricted space.

The design for access inside the safeguarded space shall consider, for example:

- Cable channels, stumble areas, slip areas
- Frequency of the required access for manual loading/unloading
- Physical characteristics of the load
- Conformation and observation areas
- Service positions (e.g. tip change)
- Easily accessible maintenance units

The hazards associated with material handling shall be considered in the risk assessment.

Risk Assessment shall be used to determine the appropriate means for providing access to relevant devices between a height of 400 mm (16 in) and 2000 mm (79 in) from the access level. Any electrical device above 2000 mm (79 in) must be addressed with a means of access to facilitate repairs.

Process observation shall be addressed in the risk assessment. Any observation that cannot occur outside the space will be noted and the means for hazard elimination will be documented.

The risk assessment will address hazards of associated equipment that is not included in the robot's task.

Safety Requirements and Protective Measures

The integrator shall ensure that the risks identified in the **risk assessment** are adequately reduced by applying the safety requirements of this standard and ANSI/RIA R15.06.

The robot system shall be designed to avoid exposing personnel to hazards.

Safety-related control systems shall comply with ANSI/RIA R15.06.

Robot systems operational mode application shall comply with ANSI/RIA 15.06. Any operational control deviation from this standard or ANSI/RIA 15.06 will have to be noted in **bold** or **highlighted** in the Risk assessment. An explanation must be given for the deviation in the risk assessment and the deviation will have to be approved by the Safety Manager and the Maintenance Engineer Manager of the Shop.

The robot system and cell components shall withstand the expected operational and environmental conditions. Temperature, humidity, electro-magnetic disturbances, lighting, wet conditions, weld sparks, chemicals, and any other environmental condition must be addressed.

Operational controls and equipment requiring access during automatic operation shall be located outside the safeguarded space.

Controls and equipment should be placed and constructed so as to allow a clear view of the robot restricted space. If controls and equipment do not have a clear view of the robot space, it should be noted on the risk assessment and the safety control should be noted.

All sources of hazardous energy shall meet the requirements of MBUSI's Control of Hazardous Energy Standard.

A label shall be affixed to identify any stored energy hazard.

Any station that can initiate motion or other hazardous functions shall have a manually initiated emergency stop function.

The emergency stop will stop all robot motion or other hazardous functions in the cell, or at the interface between cells and other areas of the workspace.

The span of control shall be marked in the vicinity of the emergency stop device or the emergency stop device must stop all associated automated equipment in visual range.

If the restricted spaces of two or more robots overlap or if two or more robots are accessible within a common safeguarded space, this space shall be one workspace. All emergency stop devices for a workspace shall have the same span of control.

The robot system shall be installed so that shut-down of associated equipment does not result in a hazard or hazardous condition.

End effectors shall be designed and constructed so that:

- Loss or change of energy supply does not cause release of the load that would result in a hazardous condition
- The static and dynamic forces created by the load and the end-effectors together are within the load capacity and dynamic response of the robot
- Detachable tools are securely attached while in use. Loss of energy will not result in a tool loss
- Release of tools occurs only in designated areas or locations or under specific, controlled conditions, if the release could result in a hazardous situation
- The end effector withstands the anticipated forces for its expected life

The robot risk assessment shall address how many people will need protection in a cell. An enabling device shall be provided for each person in the cell.

The safeguarded space shall be established by perimeter guarding. The perimeter will have a visual cue if hard fencing is not used.

The restricted space of the robot shall be established by means which limit the motion of the robot, end-effector, fixture, and work piece.

All means for limiting the motion of a robot shall comply with ANSI/RIA R15.06.

The restricted space shall be determined based on the robot with actual load. If the speed of the robot is a monitored system satisfying ANSI/RIA 15.06, the restricted space may be based on the configured speed limit. Otherwise, the restricted space shall be based on the maximum speed of the robot.

Using perimeter as guarding requires preapproval from the MBUSI Safety Manager and MBUSI Engineering. If the perimeter guard is designed to be the limiting device, the results of the risk assessment shall be used to determine the requirements for the design,

strength, and deflection for that guard. Using a perimeter guard as a limiting device is normally practicable only when robots cannot cause hazardous deformations of the guard.

Task inside the safe guarded space requiring the use of manual high-speed mode shall provide a minimum clearance of 500 mm (20 inches) from building, structures, perimeter, guarding, utilities, other machines and equipment not specifically supporting the robot function that may create trapping or a pinch.

Robot cells doors shall be mounted so that the doors can be fully opened (90 degrees), have a door opening of at least 36", doors will open out from the cell, and the door will always be considered an escape route from the cell.

Guarding shall be provided to prevent an access between cells or to bring hazards to a safe state before an individual can be affected by the hazard.

Guarding will be provided to protect individuals from the hazards due to the transfer of materials into and out of adjoining cells.

Entrance and exits for material into a robot cell shall be guarded to prevent entry or shall have measures to stop hazards before a person can encounter any hazard.

Any process observation done within the cell shall conform to OSHA 1910.147 Control of Hazardous Energy.

Commissioning Plan (Phase I, Phase II, and Phase III)

Commission Plan General Information

1. Integrator will develop a commissioning plan that will be followed by all contractors and MBUSI TMs. The commissioning plan shall be reviewed and approved by MBUSI Safety and MBUSI Engineering before power will be allowed on any system.
2. Risk Assessment should be complete and address all install hazards in all phases including commissioning. Risk Assessment shall be compliant with ISO 12100.
3. "Information for Use" manual and the initial start-up procedure plan shall be made available to MBUSI Safety and MBUSI Engineering for review prior to commissioning start.
4. ANSI/RIA R15.06 Section 7.2.3 and 7.2.4 information must be in the "Information for Use" manual.
5. Integrator must confirm in written confirmation to MBUSI Safety and MBUSI Engineering that all initial start-up requirements have been verified and have been completed.
6. If risk assessment intended safe guards are not in place, an appropriate means of safeguarding shall be in place before proceeding. This means of safeguarding shall be approved and agreed upon by MBUSI Safety, MBUSI Engineering, and the Integrator.

7. Access control for work area and automated areas will have to be considered.
 - a. Who is allowed in and how are authorized people identified.
 - b. Who has control/responsibility of area and makes decisions regarding activities taking place in commissioning areas.
 - c. Barricade needs to meet ISO and OSHA requirements.
 - d. Pedestrian and vehicle traffic access management
 - e. Training requirements
 - f. Signage and other measures required to communicate procedures and prevent entry into a commissioning cell.
8. Safety Procedures required
 - a. LOTO procedures
 - b. Arc Flash Procedures
 - c. Guarding Requirements
 - d. Job Safety Analysis (JSA)
 - e. Those identified by the risk assessment
9. Training requirements –
 - a. For all people
 - b. Specific training needed for each trade (Electrical, Programmers, mechanical, etc...)
10. PPE requirements beyond the normal site PPE requirements will be posted and communicated by the Integrator.
11. Before applying power, the initial start-up procedure shall be established and verified by the integrator. The start-up procedure should establish that the area is safe for the movement of robots and associated equipment. The following are the basic requirements to be verified that they are installed correctly to prevent an unsafe incident:
 - a. Mechanical mounting and stability
 - b. Electrical connections
 - c. Utility connections
 - d. Communications connections
 - e. Peripheral equipment and systems
 - f. Limiting devices for restricting the maximum space

NOTE: All persons will exit the restricted space prior to applying drive power.

After power is applied, the following functions will be tested:

- a. Emergency stop circuit/devices are functional
- b. Each axis moves and is restricted as intended
- c. Robot responds to basic operating system

Full initial start-up procedures will be found in the Integrator's "Information for Use" manual.

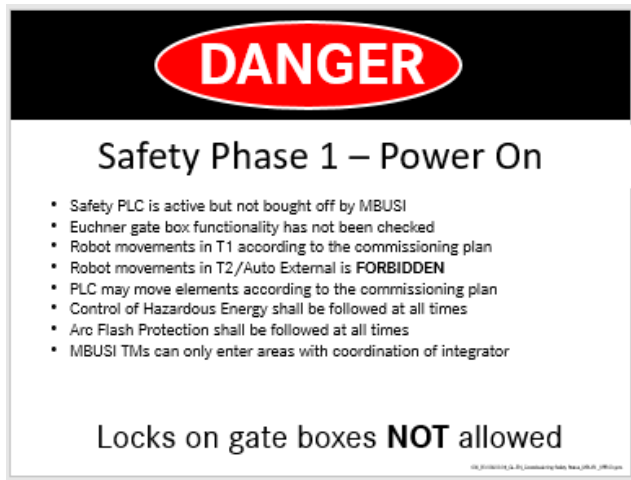
12. Commissioning signage as required

13. Any changes to the commissioning plan will be reviewed with MBUSI Safety and MBUSI Engineering.

14. If the integrator allows MBUSI Team Members (TMs) to work with equipment in a commissioning mode, a risk assessment will have to be developed between MBUSI Safety and the integrator. The results will be reviewed with the management of the TMs wishing to work in the area.

Commissioning will be divide into three phases:

Safety Phase I – Power On



Safety Phase I is preparing the line for commissioning. Robot motion will only be allowed for safe initial set up of robot. All other hazardous motion is not allowed.

Once a panel is energized, work in any section of the panel requires those exposed to follow their company's and MBUSI's electrical safety and control of hazardous energy requirements. Arc Flash PPE must be worn when verifying electrical power above 50v is at a zero energy state. Electricity that is live in an electrical panel/cabinet when the main power is isolated must be identified with

orange coloring.


All energized cabinets shall have the following sign (or similar) placed on the front during the extent of the commissioning phase. All cabinets should be considered live until verified that power is isolated.

- 50V circuits are considered non-hazardous low voltage circuits. Any work performed on a system above 50V requires an electrical work permit approved by MBUSI or a zero energy state.
- LCA openings, load stands, and pullout carts will have to be secured or possible guarded to prevent entry into the station. Information on guarding requirements should be located in the risk assessment and in the commissioning plan.
- A Phase I Commission sign is placed on all entry ways and load stations once Power On Buyoff is achieved.

- Robot movements in T2 and auto external are forbidden except as noted below.

The following measures will be taken to perform a Safe initial setup of robots:

- To be able to perform the initial setup of robots, follow the procedure described in ANSI/RIA R15.6 Part II Chapter 4 (risk assessment) or in DIN EN ISO 10218-2:2012-06.
- During the initial setup the robot will only run in T1 mode. The internal E-Stop of the robot shall be active (teach pendant).
- T2 will only be allowed for the load determination. A separate procedure will detail the process by which T2 will be enabled and disabled during the load determination step of commissioning.
- Only designated access points may be used to enter the robot cell. Crossing of fencing is not permitted. The access point is designated with a warning sign and red tape or snow fencing that blocks access to the area. Red Tape can only be used if the exterior and interior perimeter fencing is complete. **NO ACCESS** is permitted except for individual doing setup. Integrator will be responsible for the documentation of this procedure.
- The commissioner is responsible to make sure that all barricades and signage are in place before and during the job.
- After completing the job in the programming area, the commissioner has to ensure that the robots and surrounding area is left in a safe state.
- No other work may take place in areas where initial robot setup is in progress.


DANGER

Safety Phase 2 - Commissioning

- Safety PLC is active and the checksum is documented
- Euchner gate box functionality has been checked by MBUSI
- Robot movements in T1/T2 according to the commissioning plan
- Robot movements in T2 with all gates closed
- Robot movements in Auto External are **FORBIDDEN**
- PLC may move fixtures (e.g. valves, conveyors) in manual mode
- Control of Hazardous Energy shall be followed at all times
- Arc Flash Protection shall be followed at all times
- MBUSI TMs can only enter areas with coordination of integrator

Locks on gate boxes is **MANDATORY**

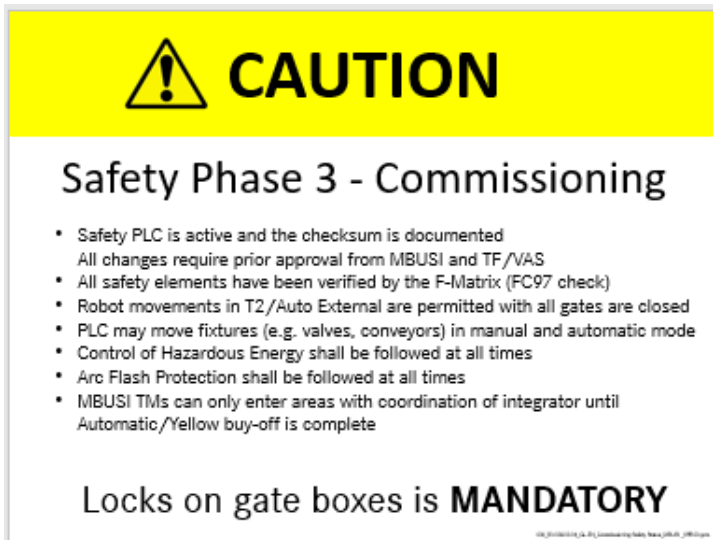
Safety Phase II - Commissioning

Phase II commissioning allows the robot to be run in Manual reduced speed (T1) by an operator with a teach pendant inside the cell and Manual high speed (T2) outside the cell. **Auto-External cannot** be run in Phase II commissioning.

Before Phase II Commissioning can start, the robot cell must be reviewed and approved by MBUSI Safety and MBUSI Engineering.

- To achieve Phase II:
 - All perimeter safeties are functional. Permanent fencing is in place. Any violation of an electronic safety device will place the robot system in an E-Stop condition with all motion stopped in the violated robot area.
 - Functionality of gate box and perimeter protections has been verified by MBUSI Safety and MBUSI Standards and Controls.

- Area is compliant with Integrator's risk assessment plan. Integrator has reviewed area for hazards and corrected deficiencies.
- Integrator has given written notice that start up procedures have been verified to MBUSI Series Planning, MBUSI Safety, and MBUSI Engineering.
- The production area is completely secured by safety gates, scanners and light curtains. Access is not possible without placing the cell into a safe condition or violating a presence-sensing device. Area must be reviewed and approved by MBUSI Safety and MBUSI Engineering.
- LOTO procedure required and locks must be used.
- Safety procedures for robot orbits that can exit the perimeter fencing or strike an overhead conveyor/mezzanine must be listed in the commissioning plan.
- Section 5.10 of Annex G of the ANSI/RIA R15.06 Is completed with MBUSI Safety.



Safety Phase III

Allows the Robots to run in manual high speed and auto with gates closed and no one in the restricted space.

PLC may move fixtures in manual and automatic mode.

All PLC and safety equipment requires approval from MBUSI Safety, MBUSI Engineering, and TF/VAS

- To achieve Phase III:
 - FC97 has been completed and verified by MBUSI.
 - MBUSI Safety and MBUSI Engineering to determine that it is safe for Phase III will review all equipment. Risk assessment will be used to verify the system.
 - Special attention must be paid to Material Handling areas and insertion points.
 - The following standards are critical for Phase III:
 - ISO 9283:1998, Manipulating industrial robots – Performance criteria and related test methods
 - ISO 12100, Safety of machinery – General principles for design – Risk assessment and risk reduction
 - IEC 62061:2005, Safety of machinery – Functional safety of safety-related electrical, electronic
 - ISO 10218-2, Robots and robotic devices – Safety requirements for industrial robots – Part 2: Robot systems and integration

- ISO 13849-1:2006, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- ISO 13850, Safety of machinery – Emergency stop – Principles for design
- IEC 62061:2005, Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems
- RIA TR R15.406-2014 Technical Report for Industrial Robots and Robot Systems – Safety Requirements – Safeguarding
- Annex G of the ANSI/RIA R15.06 sections 5.6 through 5.11 verified, validated, and reviewed with MBUSI Safety and MBUSI Standards and Controls, prior to achieving Phase III.

Automatic Mode

All safety items should be corrected for this phase to be accepted by MBUSI Safety and MBUSI Engineering. If TMs are to work in areas prior to Automatic Mode completion, a review of the area must be conducted with MBUSI.

Robot System Operational Mode

Initiation of automatic operation shall only be possible when all associated safeguards are active.

Robots that are not operated manually shall remain in a safe state, independent of the operational mode selected, and not create a hazard.

Entering the safeguarded space in automatic mode shall lead to a protective stop of all equipment that could present a hazard or hazardous situation.

Selection of automatic mode shall be done outside the safeguarded space. If automatic is selected by using a pendant or teach control, a separate deliberate action outside the cell will be required to initiate automatic operation.

Any safety control function that does not meet requirements of 5.2.2 of the ANSI/RIA R15.06 must be approved by the Manager of Engineering, Manager of Safety, and the Manager of Maintenance. The justification must be **highlighted** or in **bold** typeface in the risk assessment.

A start interlock shall be provided to prevent automatic starting of hazardous operations when the power supply is switched on, or is interrupted and restored. The start interlock shall be reset by a deliberate human action.

Switching from automatic mode shall result in a protective stop or emergency stop.

The starting of the robot system will be easily understood and a simple operation.

A restart interlock shall be provided to prevent automatic restarting of hazardous operation after either an actuation of a safeguarding function and a change in operating mode of the cell.

Start and restart controls shall be manually actuated, located outside the safeguarded space, and shall not be possible to activate from inside the safeguarded space.

The manual reset function shall fulfill all of the following:

- Be a separate and manually operated device within the safety-related control system
- Reset occurs only if all safety functions and safeguards are operative
- Not initiate motion or a hazardous situation by itself
- Be by deliberate action
- Only be accepted by disengaging the actuator from its energized position

A start interlock shall be provided to prevent automatic starting of hazardous operations when the power supply is switched on or is interrupted and restored. The start interlock shall be reset by a deliberate human action.

Switching from automatic mode shall result in a protective stop or emergency stop.

The start and the restart of the robot system will be an easily understood and simple operation.

A restart interlock shall be provided to prevent automatic restarting of hazardous operation after either an actuation of a safeguarding function and a change in operating mode of the cell.

Start and restart controls shall be manually actuated, located outside the safeguarded space, and shall not be possible to activate from inside the safeguarded space.

The manual reset function shall fulfill all of the following:

- Be a separate and manually operated device within the safety-related control system
- Reset occurs only if all safety functions and safeguards are operative
- Not initiate motion or a hazardous situation by itself
- Be by deliberate action
- Only be accepted by disengaging the actuator from its energized position

The risk assessment shall determine if a maximum reduced speed lower than 250mm/s (10 in/s) is required and if other equipment in the robot system needs to be operated at a reduced speed.

Pendants

Cable length of the pendants shall be of sufficient length to allow the teacher to perform expected tasks in a safe manner.

Inactive or detached pendants shall be stored in a manner where an inactive emergency stop will not be mistaken for being active.

All pendants will have an emergency stop and a three position “live man switch”.

Maintenance and Repair

The robot system shall be designed to include procedures for inspection and maintenance; to ensure continued safe operation of the robot and robot system.

The robot system shall be designed and constructed in such a way as to allow safe access to all areas where intervention is necessary during operation, adjustment, and maintenance.

Fixed guards can be used for maintenance task that are infrequent. If the maintenance or servicing task is frequent then the access point should be guarded by protective measures.

Fixed guards that are used for maintenance access for repair must be of sufficient size to allow for easy access for the necessary tools, materials, and personnel.

Fixed guards shall require a tool for removal.

The approach speed and penetration factor used for the calculation of the minimum safe distance shall not deviate from ISO 13855.

Guards and protective devices shall meet the guarding requirements of OSHA 1910.212 and then ISO 12100.

Perimeter safeguarding shall not be installed closer to the hazard than the restricted space unless it is designed to be the limiting device.

The openings in any fixed guard shall not allow a Team Member to reach over, under, around, or through (an opening or gap) the guard and access a hazard.

The height of the guard shall be at least 60 inches (1500mm) from adjacent walking surfaces.

Moveable guards shall open laterally or away from the hazard. Moveable guards shall be positioned in accordance with ISO 13855.

Interlocking guards shall be provided to bring any hazards to a safe state before an operator can gain access to the hazard through the guard.

If it is possible for an operator to open an interlocked moveable guard and reach the hazard area before the hazard is brought to a safe state, guard locking shall be provided.

The guard locking shall comply with the following:

- Only permit the actuation of hazardous machine function as long as the guard is closed and locked.
- Keep the guard in the closed and locked position as long as the risk of harm due to hazardous functions of the machine exist.
- All moveable guards will allow a person to exit from inside the safeguarded space. No person shall be able to be trapped inside the safeguarded space.

Safeguarding Manual Loading, Unloading, or Handling Stations

Measures shall be provided to ensure that operators are not exposed to further hazards due to the operation of the manual production interface station.

Shared workspaces will require a presence-sensing device and a restart interlock.

Openings into the safeguarded space, to allow material entry and exit, shall be the minimum dimensions necessary to allow the material to pass. The openings will be guarded by size, shape, or protective measures to prevent crushing/shearing hazards and hazards from the safeguarded space.

Openings that are guarded by ESPE shall allow the passage of materials by one of the following functions, and access to the safeguarded space shall be prevented by the material itself, or by other means:

- A muting function that temporarily deactivates the ESPE function allowing material to pass through
- A change in protection area that enables materials to pass through; in this case the minimum distance indicated by the manufacturer of the ESPE shall be observed.

Measures shall be provided to ensure that operators in a cell are not exposed to hazards from adjacent cells.

End effectors and tool changing systems shall be selected or designed such that loss or restoration of power/energy does not lead to a hazard. If this is not practicable, other safety measures shall be provided to mitigate hazards.

Collaborative Workspaces

The safeguarding shall be designed to prevent or detect any person from advancing further into the safeguarded space beyond the collaborative workspace. Intrusion into the safeguarded space beyond the collaborative workspace shall cause the robot to stop and all hazards to cease.

The perimeter safeguarding shall prevent or detect any person from entering the non-collaborative portion of the safeguarded space.

The autonomous operation to collaborative operation change point is a critical part of the safe operation of the robot and person. It shall be designed in a way that the robot cannot endanger any personnel when changing from the autonomous operation to the collaborative operation and back to autonomous.

Any detected failure of the safety system will result in a protective stop. Autonomous operation shall not be resumed after such a stop until reset by a deliberate restart action outside the collaborative workspace.

Emergency Stop Device

Every robot shall have an emergency stop device using hardware-based components. The emergency stop device shall override all other robot controls, remove drive power from the robot actuators, and cause all moving parts of the robot to stop.

Each operator control station, including pendants capable of initiating robot motion, shall have an emergency stop device.

Emergency Stop devices must be clearly identified. The technical standards require that emergency stop devices be colored RED with a YELLOW background.

They must be located within easy reach of the operator. This applies to all normal workstations where operators interact with the machine. For maintenance and service activities where workers may be in locations other than normal workstations, a pendant or other portable control must be used to cause machine motion. This device must include an emergency stop control along with other complementary safeguarding devices such as enabling devices and hold-to-run controls. Where access is only allowed under lockout conditions, this is not required [2], [3].

Buttons must be palm or mushroom-shaped devices.

Provision shall be made within the emergency stop circuit to include additional stop devices.

Following the use of the emergency stop device, restarting the robot shall require a deliberate action by the operator to initiate a prescribed start-up procedure. In multiple robot installations, such deliberate action may be accomplished by resetting the individual robot control panels, or resetting the single emergency stop push button (maintained contact lockable type only) which was operated, in addition to resetting a process control panel.

Means of Verification of the Safety Requirements and Measures

Annex G from the latest ANSI/RIA 15.06 shall be used to verify and validate the essential safeties.

The integrator will complete Annex G and document each of the methods used to verify and validate the essential safeties and the findings of the methods.

The integrator will document the safeties meet those proscribed in the approved risk assessments.

MBUSI Safety and MBUSI Engineering will review the robot cell and documentation for compliance to internal standards, legal standards, and latest ANSI/RIA R15.06.

Initial start-up procedure plan

Before initial start-up, an initial start-up plan will be developed by the integrator and reviewed by Safety.

An Initial start-up procedure shall be established and shall include, but not necessarily be limited to the following:

- It shall be verified before applying power, that the following have been installed as intended:
 - Mechanical mounting and stability
 - Electrical connections
 - Utility connections
 - Communications connections
 - Peripheral equipment and systems
 - Limiting devices for restricting the maximum space
- Instructions shall be provided that all persons shall exit the safeguarded space prior to applying drive power.
- After applying power, it shall be verified that:
 - Emergency stop circuit/devices are functional
 - Each axis moves and is restricted as intended
 - Robot responds to basic operating system motion commands as expected
 - Awareness means (audio/visual) function as expected
 - All safeguarding devices or interim safeguards function as expected
 - Reduced speed control is activated and functioning as expected

Verification and Validation of Protective Equipment

It shall be verified whether or not protective equipment installed to mitigate identified hazards is used in a way that is consistent with the manufacturer's instructions and is appropriate for protection from the hazard.

Prevention of access to the hazard shall be achieved by:

- Causing the hazard to cease before access
- Preventing the creation of a hazard by unintended operation
- Containing parts and tooling (e.g. loose objects, flying projectiles)
- Controlling other process hazards (e.g. noise, laser, radiation)

The installed protective equipment shall be verified as to:

- Type of guards, size of openings, placing of guards, correct safety distances, heights
- Reset control not being possible to actuate from inside the safeguarded space
- Types of protective devices, detecting capabilities, placing of protective devices, correct safety distances, sizes, etc.
- Bypass and muting functions

It shall be verified that complementary protective measures are provided:

- Instructions
- Training materials
- Warnings
- Personal protective equipment
- Procedures
- Other appropriate measures

Information for Use

Information for use handbook shall be required for all robot systems. The book will comply with ANSI/RIA R15.06.

CONTRACTOR/SUPPLIER GUIDELINES

All visitors, contractors and suppliers are required to abide by MBUSI's Regulations and Corporate Policies:

- MBUSI's Commitment to Safety
- Harassment and Discrimination Free Environment
- Anti-Bribery and Compliance Obligations and requirements
- Security Rules and Regulations
- Integrity Code
- Code of Conduct
- Confidentiality and Proprietary Rights Agreement
- Whistleblower System BPO
- Alcohol and Drug Free Workplace
- All Federal, State, and Local Laws and Regulations

ANTI-BRIBERY AND COMPLIANCE OBLIGATIONS AND REQUIREMENTS

Within the framework of its business dealings with Mercedes-Benz U.S. International, Inc. ("MBUSI"), the Contractor/Supplier is obligated to abstain from all practices which may lead to liability due to fraud or embezzlement, insolvency crimes, crimes in violation of competition, guaranteeing advantages, bribery, acceptance of bribes or other corruption crimes on the part of persons employed by the Contractor/Supplier or other third parties and their agents.

The above notwithstanding, the Contractor/Supplier is obligated to adhere to all laws and regulations applicable to both itself and the business relationship with MBUSI. The Contractor/Supplier is also required to adhere to the Integrity Code, the Code of Conduct and all MBUSI/Corporate policies that are applicable.

If any violations are known please notify the "Whistle Blowing" contacts listed below so that they can be immediately addressed.

Contact Information

Phone: 1 877 482 5899

Email: BPO.Americas@mercedes-benz.com

Local Contact Information:

Contact: Andrew Boulter – Local Compliance Officer
Tel.: 1 205 507 3409
Fax: 1 205 507 3401
Email: Andrew.Boulter@mercedes-benz.com
Address: Legal & Compliance Department
Mercedes-Benz U.S. International, Inc.
P.O. Box 100
Tuscaloosa, AL 35403-0100

If you require any further information or if you have any questions regarding compliance to MBUSI/Corporate policies, please contact:

Mercedes-Benz U.S. International, Inc.
Legal & Compliance Department
Andrew Boulter – Local Compliance Officer
P.O. Box 100
Tuscaloosa, AL 35403-0100

Confidentiality and Non-Disclosure Agreements

1. MBUSI information regarding personnel, processing equipment, technical data, costs, suppliers, expansion plans, inventories, etc. is confidential and proprietary to MBUSI. Information of this nature may be critical to the success of MBUSI and should be sufficiently safeguarded against unauthorized use, disclosure or theft.
2. Contractors/Suppliers who by business necessity have access to this information will be responsible to store, handle, distribute and destroy this information in a way to protect the interests of MBUSI.
3. Some Contractor/Supplier companies may be required to execute Confidentiality and Non-Disclosure Agreements with the MBUSI Legal Department.

For more details, please see **MBUSI HR One Regulation** for Corporate or MBUSI's regulations and policies, or contact a Team Member of the Human Resources Safety Department or Legal Department.

Contractors/Suppliers Motor Vehicles

1. Vehicles requiring access onto MBUSI's secured property must apply for an approved site pass via the Site Pass Authorization Form. A Vehicle Site Pass Authorization Form must be completed and submitted to MBUSI Security. All golf carts/ other powered personal conveyance devices to be used on MBUSI property must be inspected and approved by MBUSI Safety/Security and the respective shop management. The vehicle must also bear the approved current Mobile Equipment Permit.
2. Site passes must be displayed or access card made available upon request.
3. Site passes are not transferable to other vehicles without prior consent of MBUSI Safety/Security.

4. To identify access privileges of specified groups, color-coded parking permits/forms or other forms of identification may be issued at the discretion of MBUSI Safety/Security.
5. MBUSI reserves the right to inspect/search all personnel and vehicles on MBUSI property.
6. Designated areas will be assigned for vehicles permitted to park on MBUSI's secured property.
7. All Contractors/Suppliers vehicles on MBUSI's property must have the company name on the right and left side front doors. The letters of the company name must be a minimum of 3 inches tall.
8. Inside MBUSI buildings or facilities, the speed limit is **5.8 mph**. Outside of MBUSI facilities, the posted speed limit signs and other traffic control signs (Yield, Stop, etc.) must be obeyed.
9. ATVs without a steering wheel, acceleration and brake pedals and three wheel ATVs are prohibited. Any questions regarding the acceptability of an ATV should be directed to MBUSI Safety prior to mobilizing onsite.
10. Refueling of vehicles must be done outdoors in designated areas or within areas designated by MBUSI Environmental Department.

Non-vehicle mounted refueling tanks:

- a. Must be protected with concrete barriers or equivalent protection.
 - b. Must have a 10B rated fire extinguisher.
 - c. Must have means for grounding the fuel tank to the object being filled.
 - d. "No Smoking and no Cell Phone Usage" signs or decals must be placed on the tank or barricade.
11. It is the Contractor/Supplier's responsibility to assure that occupants will only be permitted as passengers when there is a passenger seat and functional seat belt for each passenger per the manufacturer's specification.
 12. Operators must be trained and have a valid license to operate vehicle (cars, fork trucks, JLG's, etc.). Documentation of such training must be available for inspection by MBUSI Safety at all times.
 13. Vehicles shall not be left unattended with their engine running.
 14. All vehicle traffic must yield the right of way to pedestrians and emergency vehicles.
 15. Powered industrial equipment operating inside the building must have an operable horn and backup alarm.

16. Rated load capacities of vehicles must not be exceeded.
17. Vehicles requiring access on MBUSI's property within secured fenced area will require valid proof of \$1,000,000 liability insurance to be on file with MBUSI.
18. All motor vehicles shall be equipped with the following equipment in good operable condition per the manufacturer's specification:
 1. Adequate brake system
 2. Headlights and tail lights
 3. Brake lights
 4. Horn
 5. Seat belts
 6. Good tires
 7. All vehicles, carts and equipment must have the Contractor's/Supplier's name displayed.
 8. Forklifts may not hoist personnel, unless an approved manufactured work platform is used.
19. No Contractor/Supplier shall use any motor vehicle equipment having an obstructed view to the rear unless the vehicle has a backup alarm audible above the surrounding noise level and a spotter is provided.
20. Contractors/Suppliers shall not be permitted to get on or off vehicles or equipment while the equipment is in motion.
21. All vehicular equipment onsite shall be inspected, tested and certified to be in a safe operating condition by the Contractor/Supplier prior to use.
22. Contractors/Suppliers body appendages are not to be outside the envelope of the vehicle.
23. All vehicles shall be checked at the beginning of each shift to assure equipment and accessories are in safe operating condition and free of apparent damage that could cause failure or harm. Checks must be documented and made available on request.
24. Vehicles not originally equipped with seat belts and are US Department of Transportation exempt from having them are exempt from wearing seat belts (i.e., golf carts, buses).

Contractor/Supplier Motorized Carts

1. All Contractor/Supplier motorized carts must meet the safety criteria specified on the MBUSI Mobile Equipment Authorization form.
2. Only electric carts will be approved for use in enclosed areas.
3. All approved Contractor/Supplier motorized carts shall prominently display a valid MBUSI Mobile Equipment Permit.

Property Removal Authorization

1. Each Contractor/Supplier should submit an inventory of tools and equipment prior to entering MBUSI properties.
2. Contractors/Suppliers must mark, identify, and document tools and equipment by serial numbers or unique identifier to prevent misinterpretations of the ownership of these items.
 - a. A Contractor/Supplier lockable gang box or tool storage area should be supplied and used.
 - b. MBUSI property can only be removed from site with an approved MBUSI Non-Production Property Declaration Removal form, available from Security.

Contractor/Supplier Terminations

1. MBUSI Security is to immediately be notified of any terminated Contractor/Supplier employee regardless of the termination reason.
2. A badge deactivation request checklist form must be completed and provided to MBUSI Security within 24 hours of any employee's discharge.
3. Any Contractor/Supplier employee terminated during working hours must be immediately escorted off the property by the Contractor/Supplier employer's supervisor or designee.
4. It is the Group Leader/Contractor/Supplier's responsibility to retrieve any company property (ID badges, vehicle passes, keys, etc.) issued to the terminated employee.
5. Contractor/Supplier employees denied site access privileges shall be prohibited from the site at the discretion of MBUSI Safety/Security. Any banned employee

shall not be allowed site access even if they become employed with another employer.

FIRST AID

- A.** Except for life threatening medical emergencies where Paramedics and Ambulance Services will be required, transportation to outside medical facilities will be provided by the Contractor/Supplier.
- B.** The Contractor/Supplier Management shall verbally notify MBUSI Safety/Security immediately upon learning of any injury to their employee. The Contractor/Supplier shall provide MBUSI Safety/Security with an incident notification within two hours of an incident occurring and a full written report within 24 hours.
- C.** MBUSI will provide first aid and other emergency response services. The contact number is (205) 507-1111 cellular or ext. 1111 from an in-house phone. This number is monitored 24-hours a day – 7 days a week.

Give your: Name
 Exact Location and Column Number
 Phone Number
 Nature of the Emergency

*Do not hang up until the Dispatcher instructs you to do so.

REPORTING OF MEDICAL AND NON-MEDICAL INCIDENTS

- A.** All injuries, “near miss” and property damages involving Contractor/Supplier employees, work areas or equipment must be reported immediately to MBUSI Safety/Security.
- B.** A written report signed by the supervisor or designee describing who, what, where, when and how must be submitted within 2 hours to MBUSI Safety/Security.
- C.** Corrective actions to prevent recurrence must also be documented on the written report.
- D.** Based upon severity, MBUSI Safety may request incident recovery meetings to be organized by the Contractor’s/Supplier’s Safety Person to review incident and appropriate countermeasures. This review shall include MBUSI Safety, the MBUSI contact person, and the employee’s management.

Drug Screen Testing

- 1. MBUSI reserves the right to require Contractor/Supplier employees to undergo medical or physical examinations or tests at any time, including pre-assignment. As a condition being granted access to MBUSI premises, urine drug tests, breathalyzer tests or other examinations may be used to determine

the use of any illegal or unauthorized drugs or substances prohibited in these Contractor/Supplier Safety & Security Guidelines or to determine the person's satisfactory fitness for duty.

1. All pre-employment drug screening will be conducted by the contracted collection facility as specified by MBUSI Medical.

2. If an employee's test(s) indicate illicit drug use, they will be denied site access.

3. Contractor/Supplier employees who have left employment and wish to return to the job site must have a drug screen prior to returning if they have been off-site for more than 30 days.

- b. All Contractor/Supplier employees shall be required to present the Negative Drug Screen Report to MBUSI Security in order to access the plant. Employees who cannot present this required report will not be given site access privileges.

- c. It is the responsibility of the Contractor/Supplier to implement and maintain a drug abuse-free work environment and screening program to meet MBUSI provisions and legal considerations.

4. There are four general categories of drug testing which a person will be subject to under these Guidelines. Workplace testing may be altered or changed at the discretion of MBUSI. These tests may be utilized under the following circumstances:

- a. Pre-Employment/Pre-Placement Testing. A negative substance abuse test conducted for a project will be required of all persons prior to being approved to work on a project site. Said testing shall have occurred prior to placement or no later than the individual's first day of placement.

- b. For Cause, Reasonable Suspicion Testing will be used when a supervisor or MBUSI has reasonable suspicion that a person shows signs of possible intoxication, is under the influence of drugs or alcohol or other facts that would lead a prudent supervisor to be concerned about the employee's safety or the safety of others due to the person's physical condition or behavior covered under these Guidelines.

- c. Reasonable Suspicion means a suspicion based upon the observation of objective facts or specific behavior (or the report of such facts or behavior by a person believed to be reliable) which would lead a prudent person of ordinary intelligence to conclude that an individual may be using drugs and alcohol or is in some other way unfit to safely perform their duties.

Certainty is not required. The supervisor is entitled to rely on their common sense.

d. Random Testing. MBUSI reserves the right, at its discretion, to include all Contractors/Suppliers and their employees in random testing while working at an MBUSI managed site.

2. All Contractor/Supplier employees must agree to abide by these Guidelines and must consent to drug testing and to the release of test results to the Project Manager and/or MBUSI designated representatives as a condition of continued employment.

3. General Drug Abuse Testing Procedures

a. The drug abuse test will be taken from urine specimens and analyzed by a certified professional laboratory facility.

b. The contracted facility will assure proper handling of the specimens so that the sample results can be traced to the proper individual. A chain-of-custody procedure will be developed to show a paper trail of the custody of samples at all times. The facility will also take necessary steps to avoid any dilution or alteration of specimens. This will be facilitated by using tamper resistant seals on all sample bottles.

c. Confirmation of test results will be reported to MBUSI Medical.

d. Abuse testing will check at a minimum for the following drugs:

Amphetamines/Methamphetamine	Cocaine
Phencyclidine (PCP)	Marijuana (THC)
Opiates (codeine, morphine, heroin)	

e. Any Contractor/Supplier employee who is tested will have the right, if requested by that employee, to see the results of their test.

f. Contractor/Supplier employees who have a positive test result will have a follow-up confirmation drug test.

g. Contractor/Supplier employees whose tests are confirmed positive by the confirmation drug test will be notified by their company. The company supervising the employee must notify MBUSI.

4. Prescription Drugs

a. Contractor/Supplier employees are required to inform their employer of any use of currently prescribed medicine that could affect their job

performance. They may be required to have written statements from their doctor(s) regarding the medicine's effect on the Contractor/Supplier employee's performance of job duties and present the statement to their employer.

b. Contractor/Supplier employees will not be allowed to operate equipment if medication could interfere with safe operation of the equipment.

c. A Contractor/Supplier employee's failure to notify their supervisor with a written statement from a doctor regarding their use of medication that could affect their performance on the job can lead to escalated warnings up to having their site access denied.

Jobsite Safety Procedures

1. Contractors/Suppliers are responsible for providing a safety orientation for all of their employees.

a. All Contractors/Suppliers must attend the appropriate MBUSI Safety/Security orientation.

b. Under special circumstances, MBUSI Safety may permit a Contractor/Supplier to conduct their own orientation in accordance with MBUSI standards.

2. Additionally, the Contractor/Supplier or a member of their staff must document the Safety Orientation given to all Contractor/Supplier employees.

3. Only Contractor/Supplier personnel who have in place a documented, random Substance Abuse Screening Program and have a valid negative 5 panel Non-DOT drug screen completed no more than 30 days prior to site mobilization, will be eligible for obtaining a site access badge after completing MBUSI Safety Orientation.

4. Under special circumstances, with the permission of MBUSI Safety Management and Maintenance Management, MBUSI may allow for a Contractor/Supplier to be badged immediately, provided a Negative "quick cup" drug screen is performed. The Contractor/Supplier is required to follow-up with a 5 Panel Non-DOT drug screen. A positive 5 Panel Non-DOT result will require the employee to be removed from the MBUSI site.

5. The orientation will include, at a minimum, a relevant review of the Contractor/Supplier Safety & Security Guidelines. These orientations will be documented and made available to the Contractors'/Suppliers' representatives.

6. Personnel having left the premises for greater than 30 days or changed Contractors/Suppliers at the MBUSI site must report to the Safety Orientation and resubmit a 5 panel Non-DOT drug screen.

Contractor/Supplier Safety Professional

1. Any Contractor/Supplier whose daily work force exceeds 50 employees or 400 hours per day, including their subcontractors, shall have a full time safety professional on-site. If a subcontractor provides a safety professional, this does not absolve the General Contractor's/Supplier's responsibility to provide a safety professional. The proposed safety professional must be approved by MBUSI Safety and meet one of the following criteria:

- a. Degreed Safety Professional – (Bachelor's or higher)
- b. Certified Safety Professional as recognized by the Board of Certified Safety Professionals
- c. Successfully completed the OSHA 30 hour industrial or construction safety course (depending on jobs) and have a minimum of three years of safety experience

2. Contractors/Suppliers with less than 50 employees and less than 400 hours per day must designate a safety contact person who must meet one of the following criterion:

- a) Be credentialed with a Safety Trained Supervisor (STS) certification. Exception: Safety contacts for companies with less than 10 employees on MBUSI property are not required to obtain this certification.
- b) Successfully completed the OSHA 10 hour industrial or construction safety course (depending on jobs) and have a minimum of one year safety experience.

The following are additional available criteria that one of which should be met for the Construction Safety Professional:

- a) Certified Health and Safety Technician (CHST) with 2 years of construction experience.
- b) Safety Supervisor who has completed the OSHA 500 Basic Instruction Course in Occupational Safety and Health Standards for the Construction Industry. The Safety Supervisor must have performed full-time safety responsibilities for a minimum of 5 years in the construction industry.

Upon award of a contract, and prior to commencing work on site, each Contractor/Supplier and subcontractor must submit to MBUSI Safety the following for review:

1. A copy of their company's safety policy statement.
2. Site-Specific Safety Program, which identifies areas of compliance under the scope of their work.
3. Each Contractor/Supplier will submit a history of experience and qualifications of the person who will manage their safety functions on-site to MBUSI Safety/Security.
 - a. Once approved, Safety representatives will not be changed except with the approval of MBUSI Safety.
 - b. Such approval is not an acceptance of responsibility.
4. Each Contractor/Supplier and subcontractor shall be expected to indoctrinate their employees as to the safety, health and fire prevention requirements and enforce adherence to safe work practices and procedures.
5. Each Contractor/Supplier is responsible for planning and executing work in harmony with stated objectives of the project safety plan.

MBUSI Safety/Security reserves the right to deny Contractor/Supplier personnel access to MBUSI grounds and property for:

1. Failure to comply with MBUSI Security and Safety rules included in these Guidelines.
2. Physical violence – threats or actual acts.
3. Performing any other acts that may endanger MBUSI Team Members or other personnel.
4. Harassment

All Safety and Health training documentation must be available to MBUSI upon demand.

Disciplinary Action Policy Enforcement

1. Contractors/Suppliers and subcontractors will be required, in accordance with federal, state, MBUSI, Construction/Project Manager and contract inclusions, to comply with these Contractor/Supplier Safety & Security Guidelines.

2. MBUSI cannot be held responsible for safety or security related work delays associated with violations of MBUSI policy or federal and/or state regulatory requirements.

3. Should an imminent danger condition be discovered, all work in the area of danger must be stopped, workers cleared of the area and the area taped off until corrective action is taken.

4. It is imperative that employees at every level comply with the provisions and directives of these Contractor/Supplier Safety & Security Guidelines at all times while working.

5. Repeated, flagrant or willful violations by employees of a Contractor/Supplier, subcontractor or any lower-tier subcontractors may indicate non-compliance with the provisions included in the contract documents and may cause site access to be denied.

6. Badge Punches

- a. Upon first offense of a non-life threatening safety violation, a meeting with the supervisor, employee and MBUSI Safety/Security will be called. The employee and Contractor/Supplier may receive documented warnings in the form of marks on their badges, both physically and electronically. The physical mark will be hole punches.
- b. A second "punch" will occur for the second offense as well as a recovery meeting/notification with/to the supervision of the employee and MBUSI.
- c. A third offense will result in the employee's site access being revoked and possible warning actions to the immediate supervisor of the employee.
- d. MBUSI Safety/Security may elect to mark the badge twice, at one time, depending on the violation.
- e. Badge punches/marks will last for one year from the date of the punch.

7. Imminent danger violations, serious or willful safety infractions may result in the employee's site access being revoked for 3-30 days upon the first offense up to banned from the site.

8. Fall Protection or Lock Out/Tag Out violations will likely result in a permanent ban for violators, supervision, and/or the competent person.

9. Supervisors who give direct orders in violation of safety procedures or who are found to be present at the time and who knowingly allow an employee to commit a safety infraction may be denied access to MBUSI property. At a minimum, the supervisor's badge will be marked for the violation.

Contractor/Supplier Management shall document and provide upon request, on a continuous basis, a “Pre-Task” Plan designed for their employees which will include (but not be limited to):

1. For each individual, the hazards present in their work assignment and the general area in which they are working.
2. The methods necessary to mitigate the hazards present.
3. Instructing each employee to report unsafe job conditions and notify them of the proper emergency actions to be taken in the event of an incident.
4. The Pre-Task Plan must have the signatures of the employees, be dated and reviewed by Contractor/Supplier Management.

Worksite Audits and Inspections

1. Audits and Inspections
 - a. The Contractor/Supplier shall be responsible for initiating and conducting daily work site inspections for the purpose of identifying and correcting unsafe working conditions and actions of their respective employees and job-sites.
 - b. MBUSI Safety, Engineering or Production Management may inspect the Contractor/Supplier work site to ensure compliance with safety standards and requirements.
 - c. A copy of all safety inspection/ audits conducted by Contractor/Supplier safety personnel must be forwarded to MBUSI Safety.
 - d. Contractor/Supplier personnel must conduct 1 safety walk through/ audit per shift and/or per 12 hour period of work for all areas within their work scope.
 - e. These audits must be documented using the Corrective Action Tracking Forms (CAT).
 - f. The Contractor/Supplier is responsible for inspecting their equipment and assuring that their subcontractors inspect their equipment to meet applicable OSHA standards.
 - g. All electrical equipment, ladders, rigging, welding equipment, pick platforms and lifts must be marked with the appropriate color code on a monthly basis. See table:

Month	Inspection Tape Color
January, July	Red
February, August	White
March, September	Blue
April, October	Green
May, November	Orange
June, December	Yellow

NOTE: Previous month's tag/label/color coding, etc. must be removed before placing the current month's inspection indicator.

Contractors/Suppliers must use GFCI (ground fault circuit interrupters) during work activities.

h. Contractors/Suppliers shall perform self-audits daily/ per shift using Job Hazard Analysis techniques and submit audit sheets to MBUSI Safety/Security or place them on the shop safety board. All items identified shall be promptly corrected in less than 4 hours. If the correction takes more than 4 hours, the Contractor/Supplier shall contact MBUSI Safety.

2. Findings

- a. If immediately dangerous to life and health conditions are discovered, Contractor/Supplier work shall immediately cease until the necessary corrections have been made.
- b. If non-life threatening inspection findings are not closed within 24 hours, MBUSI reserves the right to stop the Contractor's/Supplier's work activities until the findings are closed.
- c. Any discrepancy as it relates to the Code of Federal Regulations or these MBUSI Contractor/Supplier Safety & Security Guidelines will be noted.
- d. Corrective actions will be documented and the Job Site Plan will be updated as necessary.
- e. All findings shall be posted for Contractors'/Suppliers' and subcontractors' review.
- f. All findings must be signed off on the posted CAT form to be considered closed.

Housekeeping

1. Work areas shall be inspected at the completion of each shift to ensure that the work area is maintained and clean as possible.
2. Trash, scrap and debris shall be cleaned up as the work progresses.
3. Cords and hoses must be secured seven feet overhead in all production areas with forklift or tugger traffic and designated with yellow tape. In areas outside of production and/or areas absent of forklift and tugger traffic, cords and hoses may be secured at floor level but must be protected from possible damage from mobile equipment.
4. Keep all materials, tools and equipment in a stable position (tied, stacked, or choked) to prevent rolling or tolling.

5. Properly store flammable/combustible materials in containers and cabinets designed for that purpose.
6. All barricade tape must be removed after that job is complete. All barricades must have the Contractor/Supplier name, contact person name, contact number and expiration date. For red barricades, information regarding what the hazards are shall also be included.
 - a. Red barricade tape – to be used only for areas where severe injuries may occur or overhead work is performed. Red barricade tape can be used for painted floors and concrete until they dry.
 - b. Yellow barricade tape – to be used for lay down areas and work areas where the hazard is not life threatening and can be readily identified by personnel entering the area.
7. Barricade must be tied off to stanchions or post supplied by the company. Barricade tape cannot be tied off to the columns.
8. Every floor, passageway, workplace, etc. must be kept free from protruding nails, splinters, holes and loose boards.

Hand/Power Tools

1. Tools and equipment must be maintained in good/safe working order and used only for their intended purpose.
2. Tools and equipment should be operated only by those who have been properly trained and authorized.
3. Keep moving parts directed away from the body.
4. Equipment and tools provided with guards and safety systems must not be altered.
5. Use the right tool for the job it was intended to perform.
6. Do not use “mushroomed” or broken tip chisels, punches, bits, etc.
7. Return tools and equipment to their proper storage location after use.
8. Use only grounded or double insulated power tools.
9. Do not use tools with split, broken or loose handles.

10. All electrical equipment and cords must be inspected monthly and provided with positive indication that the inspection has been conducted. Tags, labels, color coding, etc. can be used to meet this requirement.

NOTE: Previous month's tag/label/color coding, etc. must be removed before placing the current month's inspection indicator.

11. Contractors/Suppliers must use GFCI (ground fault circuit interrupters) during work activities.

Air Monitoring:

1. All Contractors/Suppliers utilizing internal combustion powered equipment inside MBUSI buildings/facilities will be required to monitor CO emissions on an ongoing daily basis.

2. MBUSI Safety will determine the frequency of air monitoring to be conducted by the responsible Contractor/Supplier. At a minimum, the CO must be checked every 3 hours and documented on the waiver. If readings exceed 18 ppm, contractor must call MBUSI Security.

3. MBUSI Safety/Security may periodically audit CO emissions to verify Contractor/Supplier compliance with these Guidelines.

4. CO emission levels exceeding regulatory limits or the TLV will be reported to MBUSI Safety/Security immediately.

5. The Contractor/Supplier is required to provide documentation from the equipment supplier, manufacturer or their authorized representative that the scrubber system has been inspected/certified to be in good working condition within 30 days prior to use on MBUSI property. The documentation should include average CO emissions generated when the exhaust scrubber system is functioning properly.

Barricading and Signage

1. Wall & Floor Openings

a. Contractors/Suppliers shall provide and erect barricades around and under elevated materials and overhead work, trenches, excavations or any other work presenting a danger to MBUSI Team Members.

b. Lighting will be required to sufficiently warn approaching vehicular and pedestrian traffic of obstacles, trenches, excavations, etc. devoid of sufficient illumination.

c. Construction work areas that require barricading and/or signage shall be posted and protected using nationally accepted color coding:

1. Red – Do not enter. See Project Manager or Project Safety representative.

2. Yellow – Use caution. Obey all Personal Protection Equipment requirements.

d. The type of barricade will depend on the nature of the hazard. The more severe the hazard, the more substantial the barricade should be (not snow fence). Must be MBUSI Safety approved.

e. Entry into dangerous areas shall be by authorized personnel and only after being advised of the dangerous conditions. There will be disciplinary action up to and including site access denial for the duration of the project if unauthorized entry is attempted.

f. Projects extending over 30 days will require hardened barriers that are not easily removed and must withstand 200 lbs/pressure. Projects less than 30 days must have at a minimum warning tape displayed.

g. The MBUSI Project Manager, in consultation with MBUSI Safety, will assist in specifying signage, barricading and color coding requirements.

h. Barricades must be at least 42 inches high and must be square, level and shall not be expanded beyond the necessary space. Conflicts in the definition of “necessary” shall be decided by MBUSI Safety.

i. All barricade tape must be appropriately removed and discarded upon job completion.

j. Standard guardrails and toe-boards or covers that are secured against accidental displacement shall guard floor openings.

1. Standard covers shall guard manhole and temporary floor openings.

2. When the cover is not in place, a standard guardrail shall protect the opening.

3. Floor hole covers need to be stenciled/written on with the words “Hole Cover Do Not Remove.”

4. All covers must be cleated or fastened to prevent accidental dislodgement.

k. Wall openings, from which there is a drop of more than 4 feet, shall be guarded.

l. A standard railing or the equivalent on all open sides 4 feet or more above the floor or ground level shall guard runways. Whenever tools, machine parts or materials are likely to be used on the runway, a toe-board shall also be provided on each exposed side.

m. Regardless of height, open-side floors, walkways, platforms or runways above or adjacent to dangerous equipment and similar hazards shall be guarded with a standard railing and toe-board.

Cranes and Rigging General Requirements

1. Know the weight of the object to be handled.
2. Know the capacity of the handling device (crane, forklift, chain fall, come-along) that is intended for use.
3. Visually inspect hooks, cranes, wire, slings, etc. for irregularities, damages, weaknesses, etc. before use.
4. Crane operators must be trained and authorized.
5. Use tag lines to control loads.
6. Never raise a load over people.
7. All hooks must have a safety latch.
8. Always place a load in the center of a hook and never on the point.
9. Do not leave an unsecured and/or unattended load hanging on a hoist or a chain fall. The operator must be within 5 feet of the controls.
10. Accessible areas within the swing radius of the rotating superstructure counterweight of cranes must be barricaded to prevent people from being struck or crushed by the counterweight.
11. Crane outriggers must be leveled and fully extended when making a lift.
12. No part of the crane, load, hoist, lines, boom or tag-line shall come within 20 feet of energized electrical lines.

13. All slings, chains and rigging equipment must be inspected monthly and color-coded indicating that an inspection has been conducted.

14. A Critical Lift Plan is required when a lift is 75% or more of the maximum capacity based on load radius and crane configuration. MBUSI requires a Critical Lift Plan whenever 2 pieces of equipment are used to lift materials. This includes cranes and all other powered lifts.

Note: Any deviations from these Guidelines must be approved in advance by MBUSI Safety.

15. The manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks must be complied with. When manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately posted, documented and recorded. Attachments used with cranes shall not exceed the capacity, rating or scope recommended by the manufacturer.

16. Prior to each use, a competent person shall inspect all machinery and equipment. Any deficiencies shall be repaired or defective parts replaced before use.

17. A competent person shall make a thorough annual inspection of the hoisting machinery. A record of the dates and results of the inspections for each hoisting machine and piece of equipment must be maintained and available for review.

18. Wire rope safety factors shall be in accordance with a nationally recognized standard.

19. An accessible fire extinguisher of appropriate size and rating shall be available at all operator stations or cabs of equipment.

20. Certification of an equipment operator's ability to operate safely is required and records of such certifications must be available. The supervisor or foreman is responsible for determining the operator's skill, verifying the certification and maintaining the records.

21. Load Ratings

a. Determination:

1. The weight of all auxiliary handling devices such as hoist blocks, headache balls, hooks and rigging shall be considered as part of the total load.

Note: The headache ball, hook or load shall not be used to transport personnel.

2. Additionally, the weight of all items added to the load at the site must be determined and added to the total weight.

22. Crane Inspection

a. The operator shall be responsible for:

1. Performing a daily inspection of the crane.

2. The proper placement of the crane in relationship to the load to be handled and the landing area so as to obtain the best rated lift capacity.

3. Leveling the crane to within 1 degree of level and rechecking the level, a minimum of three times, during the 8-hour work shift.

4. The proper placement and use of outriggers for all lifts.

5. The determination of stable or unstable ground and the need for additional floats, cribbing, timbers and structural members as may be needed.

6. The installation and maintenance of crane swing radius protection.

b. Cranes shall be inspected:

1. After setup and prior to initial lift.

2. Before each shift.

3. After every malfunction.

c. Daily inspections shall be made of:

1. All control mechanisms for maladjustment interfering with proper operation.

2. All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter.

3. All safety devices for malfunction.

4. Deterioration or leakage in air or hydraulic systems.

5. Crane hooks for deformation or cracks, slings and chokers for broken strands, fraying or linking.

6. Electrical apparatus for malfunctioning, signs of excessive wear, dirt and moisture accumulation.

7. Tires for proper inflation.

d. Recordkeeping:

1. All records pertaining to crane inspections shall be kept on-site with the crane or in the Contractor's/Supplier's site field office.

2. If during any safety inspection, the operator or supervisor cannot produce the required crane inspection sheets, the crane shall be shut down and inspected.

Crane Operator Qualifications and Operating Procedures

1. Operator Qualifications

a. Designated operators must be qualified in adherence to 29 CFR 1926.1427.

b. The Contractor/Supplier is to keep crane operator's qualifications on-site for review.

c. Trainees who are under the direct supervision of the designated operator may operate the crane. Trainees are not allowed to be the designated operator for a critical lift.

d. Inspectors certified for crane inspection may operate the crane.

e. Test and maintenance personnel may operate the crane when necessary.

f. Except for oilers or supervisors whose duties may require their presence, no one other than the above personnel shall be in or on the crane during operations.

2. Operating Procedures

a. The operator shall:

1. Not engage in any practice which may divert their attention while they are engaged in crane operations.

2. Not operate the crane if they or the crane is impaired.

3. Except for a stop signal given by anyone, the operator shall not respond to any signal that is unclear or is given by anyone other than the appointed signalperson.
 - a. Only approved standard hand signals, voice communication, or audible signals for crane, derrick, and boom equipment shall be used.
 - b. A copy of hand signals shall be posted at the operating position of each piece of equipment.
 4. Not permit trainees to make initial lifts. The operator shall perform the first lift to determine lift stability, crane function and safety in general.
 5. Have final responsibility and control over the crane operations.
 6. Whenever there is any doubt as to safety, the operator shall have the authority to stop and refuse to handle loads until safety has been assured.
 7. Be familiar with the crane and its care, the operators' manual and the load charts.
 8. Be responsible for notifying their supervisor of any needed adjustments or repairs and for logging their findings in the crane log.
 9. Shall, upon request, demonstrate their ability to determine total load weight and its relationship to the crane load charts.
3. Attaching the load
 - a. The load shall be attached to the hook by means of slings or other approved devices.
 - b. Hooks used for lifts in excess of two (2) feet shall have hook safety latches.
 4. Moving the load
 - a. The operator shall determine that the crane is level to within one (1) degree and, where necessary, is properly cribbed and blocked.
 - b. The operator shall be responsible for determining that the load is properly secured and balanced before making the hoist.

c. The operator shall position the hook over the load in a manner to prevent load swing.

d. The operator shall determine that the rope is properly seated on the drum and in the sheaves, the load line is not kinked and multiple part lines are not twisted around each other.

5. Safe Operating Practice

a. All rigging equipment shall be inspected prior to each shift and as necessary during the shift to ensure safety. Damaged or defective slings shall be immediately removed from service.

b. All rigging devices, including slings, shall have permanently affixed identification stating size, grade, rated capacity and manufacturer.

c. Rigging not in use shall be removed from the immediate work area.

d. Rigging, including slings, not in use shall be properly hung to prevent bends, kinks or other damage.

e. Wire rope slings shall be lubricated as necessary during use. Wire rope slings shall be lubricated no less than every 4 months when in storage.

f. "Shop-made" grabs, hooks, clamps or other lifting devices shall not be used unless proof-tested to 200 percent of their rated load by an approval-testing agency. Approved devices shall have the capacity permanently affixed.

g. Slings, which are used on-the-job, shall not be left lying on the ground or otherwise exposed to dirt and the elements.

h. Eyes in wire rope bridles, slings or bull wires shall not be formed by wire clips or knots.

i. Protruding ends of strands in splices on sling bridles shall be covered or blunted.

j. All rigging equipment must be used in accordance with the manufacturer's recommendations and shall have a safety factor of five.

k. Slings shall not be shortened by knots, bolts or other make-shift devices.

l. All slings shall be padded with softeners to protect them from damage due to sharp corners.

m. Slings used in a basket hitch shall have the loads balanced to prevent

slippage.

n. Loads handled by slings shall be landed on cribbing or dunnage so that slings need not be pulled from under or be crushed by the load.

o. Slings subjected to shock loading shall be immediately removed from use and destroyed.

p. Slings shall not be made from wire rope and cable clips.

q. The employer must ensure that each signal person meets the qualification requirements prior to giving any signals.

1. Know and understand the type signals used
2. Be competent in application of the type of signals used.
3. Have a basic understanding of equipment operation and limitations, including the crane dynamics involved in swinging and stopping loads and boom deflection from hoisting loads.
4. Know and understand the relevant requirements of OSHA crane standard.
5. Demonstrate that he/she meets the requirements in paragraphs (c) (1) through (4) of this section through an oral or written test and through a practical test.

Steel Erection

Steel erection activities shall comply with all facets of 29CFR1926 Subpart R, except where superseded below:

1. Approval to begin steel erection. Before the commencement of steel erection, the steel erection Contractor/Supplier and MBUSI Facilities must receive written notification that the concrete in the footings, piers, and walls, as well as the mortar in the masonry piers and walls has attained, on the basis of an appropriate ASTM standard test method of field-cured samples, is sufficient strength to support the loads imposed during steel erection.

2. The steel erecting Contractor/project structural engineer of record must ensure that any repairs, replacements or modifications to the anchor bolts are conducted in accordance with CFR 1926.755(b).

3. The steel erecting Contractor/Supplier shall pre-plan all overhead hoisting operations to ensure that they minimize the time the person is required to work directly below a suspended load.

4. Permanent flooring

a. Permanent floors shall be installed as soon as practical following the erection of structural members and shall be posted with the rated loading.

b. At no time shall there be more than four floors or 48 feet of unfinished bolting or welding above the foundation or upper most secured floor.

5. Temporary flooring

a. The erection floor shall be solidly planked over its entire surface except for access openings. Planking shall not be less than 2 inches thick, full size undressed and shall be laid tight and secured against movement.

b. On structures not adaptable to temporary floors or static lines, safety nets shall be installed and maintained whenever the potential fall distance exceeds two stories or 25 feet.

c. Standard handrails, including top rail, mid rail, toe board or equivalent, shall be installed around the periphery of all temporarily planked floors during structural steel erection.

d. The erection contractor shall install turnbuckles no less than every 100 ft. to allow for re-tightening of the cables securing the planking.

e. Covers for the roof or floor openings shall be capable of supporting, without failure, twice the weight of employees, equipment and materials that may be imposed on the covers at any one time.

1. All covers shall be secured to prevent accidental displacement by the wind, equipment or employees.

2. All covers shall be marked/stenciled with high visibility paint and shall be marked with the word "HOLE" or "COVER" to provide a warning of the hazard.

f. Decking gaps around columns shall be protected with wire mesh, exterior plywood or the equivalent to provide protection from objects falling through.

g. Metal decking shall be laid tightly and immediately secured upon placement to prevent accidental movement or displacement.

h. Bundles of decking shall be placed on a minimum of three steel joists.

- i. Bundle packaging and strapping shall not be used for hoisting unless it is designed for that purpose.
- j. Loose items such as dunnage, flashing or other materials, which are placed on the top of metal decking bundles to be hoisted, shall be secured to the bundles.
- k. Openings in metal decking cannot be cut until the equipment installation is ready to commence.
- l. When setting structural steel, each piece shall be secured with not less than two bolts at each connection and drawn up wrench tight before the load is released.
- m. All columns shall be anchored by a minimum of 4 anchor rods (anchor bolts).
 - 1. Anchor rods (anchor bolts) shall not be repaired, replaced or field modified without the approval of the project structural engineer of record.
 - 2. Prior to the erection of a column, the Primary Contractor shall provide written notification to the steel erector if there has been any repair, replacement or modification of the anchor rods (anchor bolts) of that column.
- n. Material should not be hoisted onto a structure unless it is ready to be put into place and secured.
- o. When loads are being hoisted, avoid walking under the lift or permitting a person to be exposed to the swing of the lift.
- p. A tag line shall be used to control all loads.
- q. For the protection of other crafts on the project, signs shall be posted in the lift area which read "Danger Overhead Work."
- r. Secure loose items aloft. All materials, equipment, and tools, which are not in use while aloft, shall be secured against accidental displacement.
- s. The Contractor/Supplier shall bar construction activities below steel erection unless overhead falling object protection for the people below is provided.
- t. Multiple lifts or "Christmas Treeing" is prohibited.

General Building Alteration and Demolition

1. Structures undergoing construction, alteration or demolition operations, including those in underground locations, shall comply with NFPA 241, Standard for Safeguarding Construction, Alteration and Demolition Operations, and OSHA 29CFR1926 Subpart T Demolition, these Guidelines and all Alabama state and local requirements that apply to demolition/alteration work for items not specifically addressed herein.
2. Before beginning any demolition work, a Competent Person is required to conduct an Engineering Survey and Report.
3. The Engineering Survey Report shall be signed and dated by the Competent Person conducting the survey and that report will be retained on-site.
4. The purpose of the Engineering Survey is to thoroughly evaluate the project to identify potential hazards and develop controls to prevent accidents. Potential hazards include:
 - a. Occupational Health Hazards
 - b. Cave-ins
 - c. Explosions
 - d. Premature Collapse
 - e. Fire
5. At a minimum, the Engineering Survey Report must include:
 - a. Building characteristics.
 1. Construction type and structure size
 2. Number of stories or height
 3. Structural hazards
 4. Basements and confined spaces
 5. Party wall locations
 6. Wall tie requirements and number

7. Shoring requirements for adjacent structures

8. Type of shoring and location

b. Protection requirements for adjacent structures.

c. Demolition methods that will be used.

d. Public protection required.

1. Pedestrian walkways or roadways that may need to be relocated.

2. Walkways or roadways should be well lit and kept clear of equipment and debris.

3. Sidewalk sheds may be necessary to protect pedestrians from overhead hazards.

4. Special controls or procedures may be necessary if a portion of the structure is occupied.

5. If the project is entirely protected with security fencing, the gates should be kept closed at all times throughout the demolition work.

e. Overhead and underground utility protection is required.

1. The location of all electric, gas, water, sewer and communications lines should be identified and the lines shut off before work is started.

2. The National Association of Demolition Contractors recommends that utility lines be color-coded:

a. Red, if the lines are to stay.

b. Green, if the lines are to be removed.

c. The local one-call system should be notified.

f. Above and below-ground tanks should be protected.

1. Purging and testing of these tanks should be completed.

2. Locations of pits or open holes should be identified and barricaded.

3. ADEM and EPA requirements must be identified and complied with.

g. Hazardous Materials

1. Contractor/Supplier shall not cause or permit any hazardous materials to be brought upon, stored, manufactured, blended, handled or used in, on or about the work or the site for any purpose except as may be specifically called for in the drawings and specifications and except as specifically identified by the Contractor/Supplier and approved in writing in advance by MBUSI Safety.

2. If hazardous materials are discovered at the site, responsibilities should be assigned to the appropriate Contractors/Suppliers for removal and disposal of the materials.

a. Asbestos and other materials may be in furnaces, reactors, boilers, insulation, other fire protection materials, certain types of floors and ceiling tiles.

b. Lead may be in pipe systems and with lead based paints.

c. Polychlorinated biphenyls may be in electrical systems such as transformers and capacitors.

h. Existing damage to nearby structures.

1. This damage should be documented.

2. Photographs and/or video can be taken to supplement documentation.

3. This documentation should be dated and retained with the Engineering Survey Report.

i. Blasting

1. Contractors/Suppliers must not bring onto MBUSI premises any explosive material or items intended to be used to fabricate an explosive, except when it is necessary to perform the work and MBUSI has given prior written approval. MBUSI reserves the sole discretion to determine whether the Contractor/Supplier may use explosives and, if so, the special safety conditions under which they may be used.

2. If in the event use of explosives is required for the demolition project, the Competent Person must be familiar with the OSHA

standard 29CFR1926, Subpart U Blasting Safety Requirements, be legally licensed to use explosives and possess the required permits.

6. The Contractor/Supplier must survey the area, before the start of operations, to identify potential fire hazards and fire protection systems. All potential sources of ignition should be evaluated and the necessary corrective measures taken:

a. Special precautions should be taken where demolition work is performed in areas where floors are soaked with oil or other flammable liquids.

b. Where dust accumulations are present.

c. Where combustible insulation is present in floors, walls or ceilings/roofs where hot work is being performed.

d. Flammable/combustible liquids shall be drained from tanks and machinery reservoirs in a safe manner and removed from the building immediately.

e. Particular attention should be paid to the removal of residue and sludge accumulations if hot work operations are involved.

7. The Contractor/Supplier must verify the presence of adequate numbers and types of fire protection devices/appliances and for their proper maintenance.

8. Entrances (e.g., doors and windows) to the structure under alteration or demolition shall be secured where required.

9. No unauthorized employees shall be permitted in any area that can be adversely affected when demolition operations are being performed. Only those employees necessary for the performance of the operations shall be permitted in those areas.

10. Work Progression

a. Except for cutting holes in the floors for chutes, holes to drop materials through, preparation of storage space and similar preparatory work, the demolition of floors and exterior walls shall begin at the top of the structure and proceed downward.

b. Each story of exterior wall and floor construction shall be removed and dropped into the storage space before commencing the removal of exterior walls and floors in the next story below.

c. Hazards to anyone from the fragmentation of glass shall be controlled.

- d. Mechanical equipment shall not be used on floors or working surfaces unless such floors or surfaces are of sufficient strength to support the imposed load.
- e. Employee entrances to multistory structures being demolished shall be protected by sidewalk sheds, canopies or both. Protection shall be provided from the face of the building for a minimum of eight (8) feet. All such canopies shall be at least two (2) feet wider than the building entrances or openings and shall be capable of sustaining a load of 150 psi.
- f. Only those stairways, passageways and ladders designated as means of access to the structure shall be used. The designated means of access shall be indicated on the demolition plan. Other access ways shall be indicated as "Not Safe for Access" and closed at ALL times. The stairwell shall be covered at a point no less than two (2) floors below the floor on which work is being performed. Access to a floor where work is in progress shall be through a separate lighted, protected passageway.
- g. During demolition, continuing documented inspections by a competent person shall detect hazards resulting from weakened or deteriorated floors, walls or loosened material. No person shall be permitted to work where such hazards exist until they are corrected by shoring, bracing or other means.

11. Debris Removal

a. Chutes

1. Any chute opening into which debris is dumped shall be protected by a guardrail 42" above the floor or other surface on which personnel stand to dump the material. This also applies to any space between the chute and the edge of openings in the floors through which the debris will pass.

2. When the debris is dropped through openings in the floors without chutes, the openings and the area onto which the material is dropped shall be enclosed with barricades not less than 42" high and not less than six (6) feet back from the projected edge of the opening above.

a. Signs warning of the hazard of falling materials shall be posted at EACH SIDE of the debris opening at each floor.

b. Debris removal shall not be permitted in lower areas until debris handling ceases on the floors above.

3. All material chutes and sections that are at an angle of more than 45 degrees from the horizontal shall be enclosed, except for

openings equipped with closures at or about floor level for the insertion of materials.

a. The openings shall not exceed 48" in height measured along the wall of the chute.

b. Such openings, when not in use, shall be kept closed at all floors below the top floor.

4. A substantial gate shall be installed in each chute at or near the discharge end.

a. A competent employee shall be assigned to control the operation of the gate and the backing/loading of trucks.

5. When operations are not in progress, the area surrounding the discharge end of a chute shall be closed.

6. Trash chutes shall be of noncombustible construction or protected by temporary automatic sprinkler.

7. Chutes shall be designed and constructed of such strength as to eliminate failure due to impact of materials and debris loaded therein.

b. Where material is dumped from mechanical equipment or wheelbarrows, a toeboard or bumper, not less than 4" thick and 6" high, shall be attached at each chute opening.

c. The storage of waste and debris on any floor shall not exceed the allowable floor load.

d. In buildings having wood floor construction, the floor joists may be removed from not more than one floor above grade to provide storage space for debris, provided falling material is not permitted to endanger the stability of the structure.

e. When wood floor beams serve to brace interior walls or free-standing exterior walls, such beams can be left in place until other support can be installed to replace them.

f. Floor arches, to an elevation of not more than 25 feet above grade, may be removed to provide storage area for debris provided such removal does not endanger the stability of the structure.

g. Storage space to which material is dumped shall be blocked off, except for openings for the removal of materials, and such openings shall be kept closed when material is not being removed.

h. Floor openings shall have curbs or stop-logs to prevent equipment from running over the edge.

i. Any opening cut in the floor for the disposal of materials shall be no larger in size than 25% of the aggregate total floor area, unless lateral supports of the removed flooring remain in place.

j. Floors weakened or otherwise made unsafe by demolition shall be shored to carry safely the intended imposed load for demolition.

12. Wall Removal

a. Masonry walls, or sections of masonry, shall not be permitted to fall upon the floors of the building in such masses as to exceed the safe carrying capacities of the floors.

b. No wall section which is more than ten (10) feet in height shall be permitted to stand without lateral bracing, unless such wall was designed and constructed to stand without such lateral support and is in a condition safe enough to be self-supporting.

1. No wall section shall be left standing without lateral bracing any longer than necessary for removal of adjacent debris interfering with demolition of the wall. Exception to this requirement will be allowed for such wall sections which are designed and constructed to stand without lateral support.

c. Contractor/Supplier employees are not permitted to work on top of a wall when weather constitutes a hazard.

d. Structural or load supporting members on any floor will not be cut or removed until all stories above such a floor have been demolished and removed. This does not prohibit the cutting of floor beams for the disposal of materials or for the installation of equipment, providing floor joists removal is not more than one floor above grade to provide storage space for debris, provided falling material is not permitted to endanger the stability of the structure and the requirements for floor removal are met.

e. Floor openings within ten feet of any wall being demolished shall be planked solid, except when employees are kept out of the area below.

f. In buildings of skeletal steel construction, the steel framing may be left in place during the demolition of masonry. Where this is done, all steel beams,

girders and structural supports shall be cleared of all loose material as the masonry demolition progresses.

g. Walls which serve as retaining walls to support earth or adjoining structures shall not be demolished until such earth has been braced or adjoining structures have been underpinned.

h. Walls shall not be used to retain debris unless capable of safely supporting the imposed load.

13. Floor Removal

a. Openings cut in a floor shall extend the full span of the arch between supports. Before demolishing any floor arch, debris and other material shall be removed from such arch and other adjacent floor area.

b. Planks not less than two inches by ten inches in cross section, full sized undressed, shall be provided for and shall be used by Contractors/Suppliers to stand on while breaking down floor arches between beams. (OSHA scaffold grade planks are recommended). Planks shall be so located as to provide a safe support for personnel should the arch between the beams collapse.

c. Straddle space between planks shall not exceed sixteen (16) inches.

d. Safe walkways, not less than eighteen (18) inches wide, formed of wood planks not less than two (2) inches thick or of the equivalent strength, shall be provided and used by personnel when necessary to enable them to reach any point without walking upon exposed beams.

e. Stringers of sufficient strength shall support the flooring planks; the ends of such stringers shall be supported by floor beams or girders and not by floor arches alone.

f. Planks shall be laid together over solid bearings with the ends overlapping at least one foot.

g. When floor arches are being removed, personnel shall not be allowed in the area directly underneath and that area shall be barricaded to prevent access and signed to warn of the hazards.

14. Steel Removal

a. When floor arches have been removed, planking shall be provided for the workers razing the steel framing.

b. Steel construction shall be dismantled column-by-column and tier-by-tier (columns may be in two-story lengths).

- c. Any structural member being dismembered shall not be overstressed.

15. Mechanical Demolition

- a. No person shall be permitted in any area which can be affected by demolition when balling or clamming is being performed. ONLY those persons necessary for the operations shall be permitted in this area at any other time.
- b. The weight of the demolition ball shall not exceed 50% of the crane's rated load, based on the length of the boom and the maximum angle of operation at which the demolition ball will be used, or it shall not exceed 25% of the nominal breaking strength of the line by which it is suspended, whichever is less.
- c. The crane boom and load line shall be as short as possible.
- d. The ball shall be attached to the loadline with a swivel connection to prevent twisting of the loadline and shall be attached by positive means so that the weight cannot accidentally disconnect.
- e. When pulling over walls or portions of walls, all steel members affected shall have been cut free.
- f. All roof cornices or other ornamental stonework shall be removed prior to pulling walls over.

16. Providing temporary weather protection and heat

- a. The Contractor/Supplier shall be responsible for providing weather protection and temporary heat to protect all equipment and all parts of the structure from damage by inclement weather such as wind, water and freezing temperatures.
- b. This protection shall include temporary walls, partitions and protective coverings including complete enclosure of the structure or structures if necessary.
- c. Temporary heating equipment shall be listed and shall be installed, used, secured and maintained at least 18 inches from combustibles.

17. Preservation of Existing Fire Protection Systems during Demolition

- a. Fire Alarm Reporting. Instructions shall be issued for the immediate notification of Security in the case of a fire. Where telephone service is employed, the emergency response number and site address shall be conspicuously posted near each emergency telephone.

b. Standpipes. Where standpipes exist in buildings being altered or demolished, such standpipes shall be maintained in conformity with the progress of building construction in such a manner that they are always ready for use.

c. Fire-Fighting Equipment. The suitability, distribution and maintenance of extinguishers shall be in accordance with NFPA 10, Standard for Portable Fire Extinguishers.

1. Free access to permanent, temporary or portable fire equipment shall be maintained at all times.

2. Sufficient firefighting equipment should be located near any flammable or combustible liquid storage area.

d. Sprinklers. The operation of sprinkler control valves shall be permitted only by properly authorized personnel (MBUSI Facilities) and shall be accompanied by the notification of duly designated parties. Where the sprinkler protection is regularly turned off and on to facilitate connection of newly completed segments, the sprinkler control valves shall be checked at the end of each work shift to ascertain that protection is in service.

e. Hydrants. Free access to fire hydrants and to outside connections for standpipes, sprinklers or other fire extinguishing equipment, whether permanent or temporary, shall be provided and maintained at all times.

18. Protection of existing structures and equipment from exposure fires resulting from alteration and demolition operations.

a. Impairment(s)

1. Protection of existing structures and equipment from exposure fires resulting from alteration and demolition operations are to be carefully followed.

2. Any condition that renders a fire protection or alarm system inoperable (impairment) places the facility at increased risk and requires increased vigilance regarding fire prevention issues. MBUSI Facilities requires that they be notified if impairment occurs.

b. Hot Work/Fire Watch

Responsibility for hot work operations and fire prevention precautions, including permits and fire watches, shall be in accordance with Section K. Hot Work/Permit and MBUSI 1910.252 Hot Work Procedure located in Safety One Manual.

19. Access roadways

a. Every building shall be accessible by fire department apparatus by means of roadways of unobstructed width, having the ability to withstand the live loads of fire apparatus and having a minimum of 162 inches of vertical clearance.

20. At completion of alteration and/or demolition operations MBUSI will ensure that:

a. All fire protection systems have been inspected and maintained in accordance with the MBUSI Impairment Procedure and forms, bi-hourly patrols have been fulfilled and the tags have been properly filed.

b. All Hot Work Permits have been reviewed and properly filed with the appropriate documentation.

Trenching and Excavating

1. All excavation, trenching, and shoring operations must be in strict compliance with all provisions of the OSHA standards.

2. All Contractors/Suppliers performing excavation work must have a designated and trained competent person to assure compliance with all applicable regulations and MBUSI requirements. The credentials of the competent person must be made available to MBUSI Safety upon request.

3. Permission must be obtained from the MBUSI Facilities before excavating or trenching to ensure that underground piping, communication cables and electrical lines are not damaged.

4. An MBUSI Hazard Assessment and Trench Entry/Authorization Form must be completed with signature approval.

5. Bumper guards (chocks, timbers, barricades, etc.) must be used to prevent vehicles and equipment from movement.

6. Spoil dirt must be piled at least three (3) feet from the edge of the excavation.

7. Excavations must be sloped or shored when they are deeper than five (5) feet.

8. Excavations must be provided with a ladder for access and egress at intervals of 25 feet. The ladder must extend three (3) feet above the edge of the excavation and must be secured.

9. Foreign Trade Zone (FTZ) fencing must not be disturbed or removed unless pre-approved by MBUSI Safety/ Security and the MBUSI FTZ Group.

Compressed Air

1. Never crimp, couple or uncouple pressurized hoses.
2. All hose couplings must be provided with a positive locking device (secured together).
3. Compressed air for cleaning purposes must not exceed 30 PSI and safety glasses/goggles are required.
4. Shut off the compressed air source prior to disconnecting it from tools or the supply valve.
5. Inspect all fittings, hoses and nozzles prior to their use.
6. Do not direct the air stream in direction of self or at other people.
7. All tanks, cylinder or receivers used within a compressed air system must be constructed to meet the appropriate pressure vessel regulations.

LASER SAFETY

Laser Classifications

- Class 1 laser
 - Considered to be incapable of producing damaging radiation levels during operation, and
 - Exempt from control measures or other forms of surveillance
- Class 1M laser
 - Considered to be incapable of producing hazardous exposure conditions during normal operation unless the beam is viewed with an optical instrument such as an eye loupe (diverging beam) or a telescope (collimated beam), and
 - Exempt from any control measures other than to prevent potentially hazardous optically aided viewing; and is exempt from other forms of surveillance.
- Class 2 laser
 - Emits in the visible portion of the spectrum, and
 - Eye protection is normally afforded by the aversion response.
- Class 2M laser
 - Emits in the visible portion of the spectrum, and
 - Eye protection is normally afforded by the aversion response for unaided viewing.
 - However, Class 2M is potentially hazardous with certain optical aids.
- Class 3 laser
 - May be hazardous under direct and specular reflection viewing conditions, but is normally not a diffuse reflection or fire hazard.
 - 2 sub-classes of category 3
 - ❖ Class 3R laser – system is potentially hazardous under some direct and specular reflection viewing condition if the eye is appropriately focused and stable, but the probability of an actual injury is small. This laser will not pose either a fire hazard or diffuse-reflection hazard.
 - ❖ Class 3B laser – system may be hazardous under direct and specular reflection viewing conditions, but is normally not a diffuse reflection or fire hazard.
- Class 4 laser
 - Is a hazard to the eye or skin from the direct beam, and
 - May pose a diffuse reflection of fire hazard
 - May also produce laser generated air contaminants (LGAC) and hazardous plasma radiation.

Laser Mediums

- Solid state – have lasing material distributed in a solid matrix, e.g., the ruby or neodymium-YAG.

- Gas – helium and helium-neon have a primary output of a visible red light. CO₂ emit energy in the far infrared and used for cutting hard materials.
- Excimer – use reactive gases such as chlorine and fluorine mixed with inert gases. Produces light in the ultraviolet range.
- Dye lasers – use complex dyes like rhodamine 6G in a liquid solution or suspension as lasing media. They are tunable over a broad range of wavelengths.
- Semiconductor – sometimes called diode lasers, are not solid-state lasers. They are generally very small and use low power such as used in laser printers or compact disk players.
- Blink reflex – human aversion response to bright light.
- Continuous wave (CW) – The output of a laser operated in a continuous rather than a pulsed mode.
- Diffuse reflection – when the laser is reflected into different parts over a wide range of angles. Intensity will fall off with the inverse square of the distance.
- Embedded laser – A high powered laser contained in a system where shielding and interlocks reduce the laser's hazards to lower laser classification.
- Fail-safe interlock- an interlock where the failure of a single electrical or mechanical component will cause the system to go to a “safe” condition.
- Intrabeam viewing- where the eye is exposed to all or part of the direct laser beam or its specular reflection.
- Laser – a device that produces an intense, coherent , directional beam of light by stimulating electronic or molecular transitions to lower energy levels (Light Amplification by Stimulated Emission of Radiation).
- Embedded Laser – an enclosed laser with an assigned class number higher than the inherent capability of the laser system in which it is incorporated.
- Pulsed Laser – a device that delivers its energy in the form of a single pulse or a train of pulses; a single pulse or a train of pulses with a pulse duration of <0.25 second.
- Q-Switched Laser – a laser that emits short (approximately 10 to 20 nanoseconds), high-power pulses by means of a Q-switch.
- Maximum Permissible Exposure (MPE) – the level at which the laser can be viewed without hazardous effect to skin or eye.
- Nominal Hazard Zone (NHZ) – space where the level of the direct, diffuse or scattered light radiation exceeds the applicable MPE. The factors involved in computing the NHZ are:
 - Laser power and energy output
 - Beam diameter
 - Beam divergence
 - Pulse repetition frequency
 - Wavelength
 - Beam optics and beam path and
 - Maximum anticipated exposure duration

- Protective Housing – an enclosure that surrounds the laser or laser system that prevents access to laser radiation above the applicable maximum permissible exposure (MPE) level.
- Pulse – a discontinuous burst of laser light or energy. Can achieve higher power peaks than continuous wave.
- Reflection – return of radiant energy by a surface without change in the wavelength.
- Wave length – the length of the light wave from crest to crest.
- Q switching – oscillating technique that allows the laser to significantly increase power output. The device has very short, intense pulses by enhancing the storage and dumping of electronic energy in and out of the lasing medium.

Responsibilities

Laser Safety Officer (LSO)

- The LSO has the authority to monitor and enforce the control of laser hazards and effect the knowledgeable evaluation and control of laser hazards. The LSO administers the overall laser safety program where the duties include, but are not limited to, items such as confirming the classification of lasers, doing the NHZ evaluation, assuring that the proper control measures are in place and approving substitute controls, approving standard operating procedures (SOP's), recommending and/or approving eye wear and other protective equipment, specifying appropriate signs and labels and approving overall facility controls.
- The LSO should receive detailed training including laser fundamentals, laser bio effects, exposure limits, classifications, NHZ computations, control measures (including area controls, eye wear, barriers, etc.), and medical surveillance requirements.

Engineering

The Engineering Department will notify MBUSI Safety and receive the LSO's approval prior to purchasing a new laser system or altering existing laser systems. The MBUSI Buy-off procedure will be used to provide proper documentation.

Maintenance

All Maintenance groups are required to comply with this procedure and abide by the safety requirements herein. Maintenance is responsible for notifying the LSO of any concerns that may arise with these procedures or the laser equipment. The Maintenance Group Leader shall assure that all personnel assigned to work on lasers/laser equipment are adequately trained and participate in the MBUSI medical surveillance program.

Safety Concerns

Potential for Injuries

- Eye – Acute exposure of the eye to lasers of certain wavelengths and power can cause corneal and/or retinal burns. Chronic exposure to excessive levels may cause cataracts, retinal injury and/or vision loss.
- Skin – Acute exposure to high levels of optical radiation may cause skin burns; cancer may occur for ultraviolet wavelengths (290-320nm).
- A new chemical – Some lasers require hazardous or toxic substances to operate (i.e. chemical dye, Excimer lasers)

Electrical – Most lasers utilize high voltages that can be lethal.

- Metal parts of the laser equipment shall be grounded.
- Laser equipment shall be labeled with electrical rating, frequency and watts.
- Measures shall be in place to prevent/contain explosions in high pressure arc lamps and filament lamps.
- Measures so that contact can be avoided with electrical components, including capacitors, which can contain an electrical charge even after the power is turned off.
- Combustible components of electrical circuits shall be short circuit tested.
- It shall be verified that there is no electromagnetic interference between the laser equipment and other electrical equipment.

Fire

- Dye lasers use solvents that are flammable.
- Laser equipment having oil-cooled components shall employ a nonflammable fluid or a fluid with the highest flash point and ignition temperature that is consistent with the necessary coolant properties.
- High voltage pulse or flash lamps may cause ignition.
- Flammable materials may be ignited by direct beams or specular reflections from high power continuous wave (CW) infrared lasers.
- Pumps, motors and other electrical components in laser equipment that employ ignitable liquids or flammable gases shall be of intrinsically safe design or shall be appropriately rated for the application.
- Metal tubing shall be used for ignitable liquids or flammable gases.

Noise

Some lasers may present a potential noise hazard. In many cases, sound levels will not result in overexposure to noise, but may be a nuisance to be addressed.

Common causes of laser injuries

- Inadequate training of laser personnel
- Alignment performed without adequate procedures
- Failure to block beams or stray reflections

- Failure to wear eye protection in hazardous situations
- Failure to follow approved standard operating procedures or safe work practices

Controls

Engineering Controls (required for 3b and 4)

- Beam Path Controls - The laser beam must be encased by a protective enclosure whenever possible. All access panels must be interlocked with the power source of the beam to shut off all power to the laser in the event the protective closure is breeched.
- Limited Open Beam Path - It is an accepted work practice to build an enclosure that completely surrounds the laser-focusing optics and the immediate area of the workstation. There should be a maximum gap of one quarter of an inch (6.35mm) between the bottom of the enclosure and the top of the material to be laser processed. For limited open beam path, the LSO shall conduct a laser hazard analysis and establish the extent of the NHZ. The LSO may choose to reclassify the system to a Class 1 under the specifications of the ANSI Z 136 standard. Detailed standard methods and procedures are required.
- Totally Unenclosed Beam Path - The use of a totally unenclosed beam path requires that the LSO conduct a hazard analysis and NHZ assessment. Controls will be chosen to reflect the magnitude of hazards associated with the accessible beam. Also, barriers/ partitions and appropriate signage are required as well to ensure that radiation exposures will not exceed the MPE. A "laser-controlled area" is required. During periods of service, a controlled area may be established on a temporary basis. The controlled area will encompass the NHZ.
- Transmission from Indoor Controlled Area - The beams shall not, under any circumstances, be transmitted from an indoor laser-controlled area unless for specific purposes (such as testing). In such cases, the operator and the LSO must assure that the beam path is limited to controlled air space.

Administrative Controls

- Posting with Appropriate Laser Warning Signs. Labeling is required for all Laser classes.
 - Class 1: (beam irradiance $<0.4 \text{ mW/cm}^2$)
Require the ANSI CAUTION format: yellow background, black symbols and letters.
 - Class 2 or Class 3A: (beam irradiance not exceed 2.5 mW/cm^2)
Require the ANSI CAUTION format: yellow background, black symbol and letters.
 - Class 3b and Class 4 laser: (beam irradiance $>2.5 \text{ mW/cm}^2$)
Require the ANSI DANGER format: white background, red laser symbol with black outline and black lettering.

- Temporary laser-controlled area: (class 4)
Requires the ANSI NOTICE sign format: white background, red laser symbol with blue field and black lettering. This sign is posted only during the time when service is in progress.

Note: The label must meet the requirements for each laser class exactly as described.

Note: Operated by Qualified and Authorized Personnel. Training of the individuals in aspects of laser safety is required for Class 3B and Class 4 laser installations.

Personal Protective Equipment

- Laser protective eyewear is to be properly stored (not hung by elastics straps or lying around where they can collect debris or be damaged), available and worn by all personnel within the Nominal Hazard Zone (NHZ) of Class 3b and Class 4 lasers where the exposures above the Maximum Permissible Exposure (MPE) can occur.
- The attenuation factor (optical density) of the laser protective eyewear at each laser wavelength should be specified by the Laser Safety Officer (LSO).
- All laser protective eyewear shall be clearly labeled with the optical density and the wavelength for which protection is afforded. This is especially important in areas where multiple lasers are housed.
- Laser protective eyewear shall be inspected for damage prior to use.
- Protective clothing and gloves may be required for working near a laser. Consult manufacturer's operating procedures and check with the LSO to determine the specific needs for personal protective clothing.

Class 3b and 4 Laser Controls - General Requirements.

- Supervision directly by an individual knowledgeable in laser safety.
- Entry of any noninvolved personnel requires approval from a Maintenance Team Leader.
- A beam stop of an appropriate material must be used to terminate all potentially hazardous beams.
- Diffusely reflecting materials shall be used near the beam, where appropriate.
- Appropriate laser protective eyewear must be provided to all personnel within the laser controlled area.
- The beam path of the laser must be located and secured above or below eye level for any standing or seated position in the work area.
- All windows, doorways, open portals, etc., of an enclosed area should be covered or restricted to reduce any escaping laser beams below the appropriate ocular MPE level.
- The working area must be well lit.

Entryway Control Measures: Class 3b and 4

- All personnel entering a Class 4 area shall be adequately trained and provided proper laser protective eyewear.
- All personnel shall follow all applicable administrative and procedural controls.
- Entry and egress paths shall be kept clear from all obstructions.
- Under conditions where the entire beam path is not completely enclosed, a temporary laser-controlled area shall be established and access limited only to persons wearing proper laser protective eyewear when the laser is capable of emitting a beam. All other optical paths (for example, windows) from the area shall be covered or restricted in such a way as to reduce the transmitted intensity of the laser radiation to levels at or below the MPE for direct irradiation of the eyes.

Temporary Laser-Controlled Area - VIN Laser Alignment - Open Beam

- These procedures outline all safety requirements necessary during such operation.
- Such temporary laser-controlled areas, which by nature will not have the built-in protective features as defined for a laser-controlled area, shall nevertheless provide all of the safety requirements for all personnel, both within and without the temporary laser-controlled area during periods of operation when the interlocks are defeated.
- During maintenance/service activities that require beam operation with the interlocks removed, a temporary Laser controlled area must be established (administrative controls). Laser system interlocks must be designed to prevent access panel replacement with the interlocks by passed.

Laser Welding Hazards

- Some laser light used in laser welding equipment is invisible, so the hazard might not be readily apparent.
- Laser energy can heat metals to very high temperatures.
- Much of the radiation that strikes the work piece is reflected into the environment.
- Reflected hazardous blue or ultraviolet radiation can burn eyes and skin quickly and permanently.
- Reflected radiation could start fires with flammable material: flammables should be kept away from the welding area.
- Vaporized metals can produce fumes and mists which can present a respiratory hazard. Adequate ventilation shall be installed to reduce noxious or potentially hazardous fumes and vapors to levels below the appropriate threshold limit values.
- The optical device on the robotic arm or other beam manipulator can malfunction sending the laser beam in unintended directions. The work cell must be shielded in conformance with the standards for the laser type and class.

- Radiation, other than laser radiation, associated with the operation of the laser or laser system (radio frequency, microwave or x-ray emission) shall be maintained below the applicable protection guides.

Medical Surveillance

All Team Members that work with and around Class 3b and 4 lasers shall participate in the MBUSI Medical Surveillance Program:

- Upon assignment;
- Upon suspecting laser injury;
- When permanently removed from laser activities.

The medical examination must include:

- Visual acuity history;
- Amsler grid;
- Color vision.

Training and Qualification

Education shall be provided for authorized personnel (LSOs, operators, service personnel) in the safe use of lasers and laser systems, and, as applicable, the assessment and control of laser hazards.

The training shall be commensurate to at least the highest class of laser under the jurisdiction of the LSO and include considerations for the evaluation and control of any non-beam hazards associated with the lasers and laser systems.

- Retraining is required, but not limited to, the following situations:
 - Changes in the workplace;
 - Changes in the types of PPE to be used;
 - Inadequacies in an authorized TM's knowledge or use of assigned PPE indicate that the TM has not retained the requisite understanding or skill.

Documents/References

NFPA 115-8 Standard for Laser Fire Protection

OSHA Technical Manual – Section III: Chapter 6

ANSI Z136.1 - American National Standard for Safe Use of Lasers

SAFE HANDLING OF LITHIUM-ION BATTERIES (LIB)

The Mercedes-Benz Guidelines Safe Handling of Lithium-Ion Batteries (LIB) was used in preparing this for MBUSI Safety One. If a conflict arises between the two documents, the MBUSI Safety Manager will make the decision between the method to be followed. Both documents should be referenced when reviewing issues and preparing for the introduction of a new process.

All definitions can be found in the Mercedes-Benz Guidelines Safe Handling of Lithium-Ion Batteries (LIB).

I. Organizational Responsibilities

A. MBUSI

1. Implementation of all applicable provisions of this guideline.
2. Obtain and review the battery manufacturers' Safety Data Sheet (SDS), Technical Specification sheet(s) and/or other available documentation prior to battery arriving on site.
3. Ensure that written standard operating procedures (SOPs) for Lithium-Ion Batteries (LIBs) are developed that include mechanisms to mitigate battery hazards that can occur during assembly, deployment, data acquisition, transportation, storage, and disassembly/disposal.
4. Ensure that acceptance and quality-control procedures include verification of safety design features.

B. Safety Department

1. The Safety Group is responsible for developing and maintaining this procedure.
2. The Safety Department may waive various requirements of this standard. Deviations must be documented in writing to the MBUS Safety Manager with the following information:
 - a. Rational for change
 - b. Conditions under which change was permitted
 - c. Engineering, Production, and Safety consensus.
3. The Safety Department shall work in conjunction with Engineering, Series Planning, and others to assure that the proper procedures and equipment are not finalized until the requirements of this procedure are incorporated as applicable.
4. The Safety Department shall be responsible for interpreting and updating the contents of this standard in accordance with regulatory requirements to meet business needs.
5. Assist in the investigation of incidents involving HV batteries.
6. Assist, as requested, in training and communicating with TMs.

C. HV Organization

1. The HV Organization's Electrical Specialist in Charge (ESC) must be contacted for any HV battery work in their area. If there is not an ESC for the area, the Chief Electrical Specialist in Charge (CESC) must be contacted. The High Voltage Safety Group can be found on the social internet page.
2. The ESC and CESC will ensure that all HV work has been evaluated for risk and that HV procedures are being followed.

D. Team Members

1. All TMs are responsible for adhering to all MBUSI Safety and Health requirements as well as the Standard Method and Procedures (SMP) for their workstations.
2. Any TM performing HV work will follow the HV Organization's work procedures.

II. Training –

- A. Before beginning any work around HV systems or HV batteries, the Team Member must be trained. Training is conducted by the High Voltage Safety group. Training information can be found by contacting this group or by visiting their MB Social Internet page.
- B. All contractors must receive training before beginning work in an area with open Lithium-Ion Batteries. The MBUSI host of the contractor is responsible for ensuring that the training is completed. Training for the battery plant can be found here on the High Voltage Safety group social internet page.
- C. Any contractors performing work on an open battery must get approval from the ESC of the area and the CESC.

III. Personal Protective Equipment (PPE)

- A. HV PPE will be determined by a risk assessment that reviews arc flash exposure, electrical hazards, chemical hazards, electrolyte leakage, and the other physical hazards of the job task. All task that directly involve the battery should be reviewed. Assembly, rework, assessment, and emergency response are some of the task that should be reviewed. Once the hazards and countermeasures are determined for each task, PPE should be recommended for each task by the reviewer. OSHA, NFPA, Mercedes-Benz, and MBUSI PPE requirements must be referenced for each piece of PPE for compliance to these standards.
- B. The CESC is responsible for the risk assessment. PPE will be agreed upon by the E3 of the work group, E3 of Safety, and the CESC. The HV Safety Organization will store the risk assessments.

- C. All PPE will be inspected each time before use.

IV. HV Tools

- A. All tools shall be inspected daily for damage and missing insulation. Damage that makes the tool unsafe must be reported immediately to your supervisor for evaluation and replacement.
- B. Measuring and testing equipment will be calibrated and inspected by a third party on a basis required by the manufacture of the equipment. TMs will do a daily inspection of the equipment and will report damage immediately to their supervisor.
- C. Batteries, modules, and cells can only be moved with equipment and lifting devices that are designed for lifting batteries, cells, and modules.
- D. All vehicles that transport a LIB, cell, or module must have a designated parking location.

V. Electrical Hazards

- A. Cell modules - All cell modules must have their pole caps in place. Only one pole should be exposed at a time. When the pole cap is removed in a process it must be mechanically covered as soon as possible in the process steps. Any cell module found with a missing cap must be reported immediately. When two pole caps are exposed, an electrical flow can happen causing a shock. It is each TMs responsibility to check that cell modules connector locations are covered with pole caps in their process.
- B. Assembly Plants - All HV batteries in the assembly plants must have the physical covers on the contacts. If a cover is missing, it must be replaced. The completed HV battery is considered electrically safe but must be stored and transported properly. Assessment or testing of an HV battery can only be done by a BE or BS. The assessment must take place in a designated area or barricades must be erected three feet (1 meter) in distance around the battery.
- C. Any LIB that loses isolation or insulation must be covered with an insulated HV cover and marked with a red/white danger cone. Each shop must have a documented procedure for handling batteries with an isolation hazard.
- D. Working in the vicinity of live parts- All systems, stations, or production systems where high voltage connections are made shall be identified with a red/white stripped tape on the floor. This stripping also indicates that SH/ES/BS training is required to enter this area. An untrained individual can enter this area provide that an SH or ES places a cover over the battery or removes the battery from the area.

E. Live Work (LW) –

- a. Live Work Areas must have a red/white striped barricade at waist level (36”-42”). Other barricades can be considered but must be approved by the CESC and the safety organization. All live work areas will be a designated area agreed upon by the CESC and Safety.
- b. Any person performing live work on a battery must have a valid live work order from the HV organization. Performing live work without a valid live work order is prohibited and will result in corrective performance review.
- c. Live work should be avoided if possible and exposure to live work should be as brief as possible. An insulated cover or a secure covering shall be over any live work battery that is unattended. These covers should also be used by the LW TM during the process to prevent incidental contact with the live contacts of the battery.

VI. Handling Damaged, Cells, Modules, and LIBs

- A. The protection of TMs from LIB hazards is the top priority when dealing with damaged cells, modules, and LIBs. Any report of damage to the LIB, cell, or module will require a call to the emergency number 205-507-1111 to report the incident and then the notification of the BS/BE responsible for the area. If a BE/BS does not show up within 10 minutes of the red shirt arrival, the battery will be placed in an acute battery container outside of the building.
- B. Contact list will be placed on all columns with a phone in areas where damage is possible. ESC will be responsible for this standard.
- C. The BS/BE will:
 - Ensure Fire Safety is at location. Place a call to 205-507-1111 if Fire Safety is not present.
 - Ask TMs to move at least 1m away from the battery.
 - Follow the HV organization’s assessment procedure.
 - Ensure all cells and batteries that have fallen to the ground will be handled as damaged and will not be used but recycled.

VII. LIB Storage

- A. Before LIB are stored at any MBUSI location, Facilities must be contacted for approval to fire code and fire sprinkler evaluation. Additionally, the MBUSI Safety Manager must be contacted to ensure that emergency response planning can be implemented for the storage location.

- B. LIB can be stored in a number that will allow uninterrupted work progress and meets the fire protection concept of Facilities.
- C. All storage must comply with the Handling Guidelines.
- D. LIBS should be stored in their original containers.
- E. Store the LIBs in a well ventilated, dry area. The temperature should be as cool as possible to maximize shelf-life. Observe the manufacturer's minimum and maximum storage temperatures. Humidity levels must also be considered.
- F. Any Lithium-Ion battery storage area should have immediate access to an ABC fire extinguisher.
- G. Never stack heavy objects on top of boxes containing lithium batteries to preclude crushing or puncturing of the cell case. Severe damage can lead to internal short circuits resulting in a cell venting or explosion.

VIII. Logistics

- A. Blunted forks must be installed on all forklifts that handle LIBs.
- B. All mobile equipment must have designated parking areas in the production area of the Battery Factory.

IX. Charging

- A. TM must receive instruction on charging. Charging inside a building cannot occur without the approval of the CESC and the safety manager.

BADGE ACCESS ISSUANCE AND REMOVAL

MBUSI Team Member ID Badge Issuance and Deactivation

New Hire Team Member badge issued upon presentation of Authorization for Badge Issuance form or email sent /signed by an AIDT Employment Specialist or MBUSI Employment Specialist.

Badge Deactivation electronic notification is acceptable from an MBUSI HR Employment Specialist or HR Team Relations Representative.

Inactive ID Badge Deactivation

After 45 days of inactivity, badges will be disabled for use.

LOCKER ISSUANCE AND RETURN

Locker Issuance

MBUSI Team Members meeting job assignment criteria requiring change of clothes or Company issued tools' storage may be issued a locker. The MBUSI Safety and Security Manager using the Locker Request form must approve additional use or request.

The Security Office will process locker requests. A confirmation e-mail approving or denying requests will be sent to the Group Leader or designee of requestor. Team Members must present their ID badge at the Security Office for locker number and combination. Information regarding lockers will not be issued via telephone or email. *Only* company issued locks are allowed on-site.

Locker Inspection and Cleaning

Lockers are subject to inspection by the MBUSI Security Department. Out of standard items will be removed and a report of content will be provided to the MBUSI Safety and Security Manager.

Locker Return

When locker is no longer required, Team Members are required to complete a Locker Clean-out Form.

If locker is obtained outside of procedure requirement or if Security deems the locker to be abandoned, the following actions will take place:

- **Non-authorized Use**

Security will remove lock (if in use) and record content of locker. Personal property owner, if identified, will be contacted to retrieve personal property. If Security cannot determine the personal property owner, items will be boxed and held for 45 days under Security control. Personal items not claimed within 45 days will be discarded. MBUSI identified property will be returned to the Group Leader or Manager from shop of origin.

- **Abandoned**

Locker content will be inventoried by Security. All personal property will be mailed to owner, if identified. If Security cannot determine the personal property owner, items will be boxed and held for 45 days under Security control. Personal items not claimed within 45 days will be discarded. MBUSI identified property will be returned to the Group Leader or Manager.

Documents / References

Locker Request Form
Locker Cleanout Form

AUTOMATED GUIDED VEHICLES

AGV Training Requirements

General Instructions

Safety One Manual
Uncontrolled Document when printed
Revised January 2024

A. General Training Requirements

Safety and operating instructions shall be provided to the operators and other user personnel as applicable, these include the following:

1. Safeguarding of personnel
2. Passenger riding restrictions
3. Loading of vehicles and trailers
4. Maintaining a safe distance from the edge of ramps, platforms, and other objects
5. Use on trailer(s) or railcar(s)
6. Using vehicles in hazardous locations
7. Reporting of vehicle incidents
8. Keeping vehicles clear of fire aisles, doors, access to stairways, and fire equipment
9. Sequence of operation with interfacing equipment
10. Use of braking system(s)

B. Operator Requirements

An operator training program shall include:

1. The manufacturer documented operating instructions and procedures.
2. The training shall be presented to all operators and not condensed for those claiming previous experience.
3. Oral, written, or operational performance tests and evaluations should be given during and at completion of the course.
4. Additional training for operation may be needed. Tugger AGV will require that TMs have tugger training and forklift AGV will require Forklift, Tugger and Powered Industrial Carts Operating Procedure.
5. TM operator training must be conducted by someone who has the knowledge, training and experience to train AGV operators and evaluate their competence.

C. Maintenance and Support personnel Training

Only authorized persons shall be permitted to control or maintain a vehicle system. Maintenance and support personnel of the system shall be trained by qualified persons. Training may include the following:

1. Operations
2. Electrical maintenance
3. Mechanical/fluidic maintenance
4. Systems level (where applicable)

D. Affected Personnel Training

1. All personnel affected by the AGV route must be trained on the hazards of the AGV.

AGV Operation

AGV operators must be licensed in accordance with the licensing requirements of the Forklift, Tugger, and Powered Industrial Cart Operating Procedures.

Environment

A. Hazardous Locations

1. Vehicles operated in hazardous areas shall be of the type required by NFPA 505 and shall be so identified.

B. Aisles and Doors

1. Restricted areas those with less than 20" (500 mm) of clearance should be avoided. If the area cannot be avoided then approval will be needed from SR. Manager from Safety, Engineering, Logistics, and Production. In restricted areas, the pinch points will be painted with red on floors, walls, and columns up to the width and height of the pinch hazard. In restricted areas the maximum travel speed will be 1 ft./sec. (0.3 m/s).
2. In nonrestricted areas, the floor space boundary required for the vehicle and its load and/or train shall be clearly marked, including the clearance necessary for turns and maneuvering. Floor stripping color is RAL 2005 Luminous Orange. Orange stripe tape maybe used, but try to match the RAL color.
3. Doors subject to automatic actuation and blind corners shall have suitable audible and/or visual alarms to anticipate the approach of the automatic vehicle or door actuation. Passive devices such as mirrors are recommended also.
4. The horn and lights of the AGV will flash at crosswalks, doors, and stairs.

C. Clearances

1. A minimum clearance of 20" (500mm) should be maintained between obstructions and vehicles (including loads).

D. Path

1. Path will cover the width of the AGV and will include additional width to account for the drifting of the carts. The path edges will be marked with Luminous Orange RAL 2005 or a close matching orange tape. AGVs that operate at speeds less than 1ft/sec (0.3 m/s) will not need a painted path.
2. Path shall not include reverse movement, pivoting, or traversing direction at any point in its travel unless a risk assessment has been performed and MBUSI Safety has agreed to the safety solutions.
3. Automatic vehicle guide paths should not be routed through doorways frequented by personnel unless the opening is wide enough for personnel to remain outside the guide path clearance aisle. Also, opening and closing of powered or non-powered doors shall be accomplished in a manner that alerts or restricts personnel near the doorway.
4. In order to minimize the possibility of blocking the complete closing of a fire door, the vehicle will respond to a signal such as an input from a limit switch and/or sensor and stop prior to the fire door.
5. System design should not have a normal stop location where a vehicle or its load would block a fire door closure.

6. Path surface must meet minimum requirements for the vehicles operating surface.
7. Path must be free of interferences of a safe distance of 20" (500mm) from travel path to a height of 7' (2134 mm) along its path of travel.

E. Load Handling Devices

1. Any device that loads or unloads the AGV shall have an emergency stop switch (es) on the **vehicle accessible to operators**, which can be the same as the vehicle emergency stop switches.
2. When the load-handling device is not in a position designated as safe for transport, the vehicle load handling devices shall have an appropriate interlock to restrict vehicle movement to that required for safe positioning.
3. Powered load handling devices shall have an interlock when used in conjunction with powered load handling stands or devices external to the vehicle. Proper vehicle alignment and confirming signal shall be required prior to activation of load transfer mechanism(s). This interlock shall be capable of inhibiting movement of both the vehicle and the fixed equipment, when activated.

Vehicle Requirements

A. Vehicle must comply with ANSI/ITSDF B56.1 and B56.5

B. Vehicle Nameplate Data

On every vehicle, the manufacturer shall install a durable, corrosion-resistant nameplate(s) legibly inscribed with the following:

1. Vehicle model or vehicle serial number or both. The vehicle serial number shall be stamped on the frame of the vehicle.
2. Weight of unloaded vehicle without battery or fuel (empty weight).
3. Designation of compliance with the mandatory requirements.
4. Indication of type if in conformance with or rated per UL 583 or UL 558.
5. Maximum and normal or alternate rated drawbar pull for towing vehicles.
6. Rated load (weight, envelope, and center of gravity) and lift height, if applicable.
7. Identification of battery classification, if applicable, minimum and maximum weight and dimensions of battery(s), rated ampere-hour capacity, and nominal voltage.
8. For towing applications, the coupling height at which capacities were determined.
9. Rated speed (speed of vehicle for purpose of rating).
10. If non-battery powered, identification of fuel requirements.
11. Maximum grade capability at rated load.

C. MBUSI requirements

1. Vehicles will not travel faster than 4 mph (6km/h).

2. Personnel will be protected from moving parts using requirements found in the MBUSI machine guarding standards. This protection will apply to the wheels.
 3. A red banding 2"+ in width will block off the area between carts to remind TMs not to cross between the carts or the carts should be marked with "Do Not Cross" on the top of dolly tongue.
 4. Vehicles will be painted in high visibility yellow or high visibility orange to match existing mobile equipment.
 5. Vehicles will have an audible and visual signal when in motion.
- D. Signage
- All vehicle signs shall be durable. An appropriate symbol may be used in lieu of wording.
1. Vehicles designed for ramp operation shall be labeled **MAXIMUM GRADE CAPABILITY = ____%**, on the vehicle in letters at least 1.5" (38 mm) high.
 2. Vehicles capable of fully automatic operation shall have a label clearly visible that states, **CAUTION: AUTOMATIC VEHICLE**, in letters at least 1.5" (38 mm) high.
 3. Vehicles not designed with specific personnel compartments or platforms incorporating appropriate safety protection shall be labeled **NO RIDING**. Vehicles with specific personnel compartments or platforms incorporating appropriate safety protection shall be labeled **UNAUTHORIZED RIDING PROHIBITED**. The label shall be visible from at least two opposing sides of the vehicle using letters at least 1.5" (38 mm) high.
 4. Vehicles with a nominal voltage of 48 V or more that are designed for opportunity charging should contain a sign, **CAUTION: ____ VOLTS**.
 5. Pendant controls should be labeled **AUTHORIZED OPERATOR ONLY**.
 6. Vehicles should be marked to indicate lift points, if applicable.
- E. Circuit Level Performance
1. Speed Control
 - a. General Speed Control - Category 1
 - b. Where Stability can be affected - Category 2
 - c. Where operation of the personnel detection means can be affected - Category 3
 2. Battery charging control - Category 1
 3. Load Handling
 - a. General - Category 1
 - b. Where stability can be affected - Category 2
 4. Steering
 - a. General - Category 1
 - b. Where stability can be affected - Category 2
 5. Warnings (lamps, alarms, etc...) - Category 1
 6. Emergency Stop - Category 3
 7. Personnel detection means - Category 3
 8. Side protection - Category 3

9. Bypass of personnel detection means - Category 2
10. Stopping the truck from the load end - Category 2

F. Mandatory Emergency Control

Mandatory emergency control functions and devices shall include the following:

1. Emergency stop switches (e.g., red mushroom), located on or off the vehicle and accessible to personnel.
2. Detection of loss of speed control.
3. Detection of unplanned loss of guide path reference or intended path.
4. Processor monitor (watchdog timer), if a processor is used motive power interrupt.
5. Failure detection of power supplies/sources that are critical to vehicle safety aspects.
6. Motive power interrupt.
7. Failure of any presence-sensing device.

The failure of any of these devices or detection of these conditions shall bring the vehicle to an emergency stop, taking into consideration the requirements for load stability and retention.

G. Braking System

The truck shall be equipped with a mechanical braking system which:

1. Operates on interruption of power supply.
2. Stops the truck within the operation range of the personnel detection means taking into account load, speed, friction, gradient, and wear.
3. Maintains the truck and its maximum allowable load stationary on the maximum operational gradient specified by the manufacturer.
4. Operates on loss of control of speed or steering.

H. Rider Operation

Where provision is made for manual operation by riders:

1. Occupation of the operator seat or stand on platform shall stop all automated functions.
2. Manual operation shall be in accordance with applicable companion standard.
3. Dismounting from the operator seat or stand-on platform shall not cause selection of the automatic mode.

I. Warning Devices

A readily visible warning device should be activated when the trucks are ready to move.

1. Before start up an acoustic and a visual signal should be given automatically for at least 2 seconds.
2. Start up speed shall be limited to 1ft. /sec. (0.3 m/s) for the first 5 seconds of travel.

J. Emergency Stop Devices

Emergency Stop devices complying with category 0 of DIN EN ISO 13850 shall be provided on the vehicle. Actuators for emergency stop devices shall be easily visible, identifiable and accessible from both ends and both sides of the truck. Safety related parts of the control system for emergency stop devices shall be in accordance with DIN EN ISO 13849-1.

K. Object Detect Devices

Object Detection Devices and Controls shall meet the requirements in the most recent ANSI/ITSDF B56.5 and also the findings in the risk assessment.

The vehicle action following a safety stop may be reinitiated automatically after a minimum delay of 2 seconds if and when the device or combination of devices no longer detect an object or obstruction to the vehicle and its intended load in the main direction of travel. This reset will only apply to laser scanners. Contact bumpers will require a manual reset by a trained operator.

Commissioning

A. Verification

The manufacturer shall have verification that all safety requirements have been met. Verification shall be done by competent persons and includes the following:

1. Ensure and Document that the vehicle and system have been verified for compliance with all applicable standards including this standard.
2. Routine test that each vehicle is operating properly.
3. Verify that the travel path meets all requirements.

All tests shall be documented and documentation shall be presented before production use of the vehicle.

B. Commissioning Requirements

1. The vehicle and system shall be commissioned by the manufacturer or their authorized representative at the place of use before handover.
2. The manufacturer shall provide a method statement including the necessary information for the commissioning sequence.
3. The manufacturer shall provide the necessary technical information for commissioning the truck.
4. Commissioning shall be performed by personnel who have been specially trained for that purpose and made aware of the hazards involved. The work shall be supervised by a responsible person.
5. The responsible person shall ascertain that the relevant safety devices and systems are fitted and operational before commissioning proceeds.
6. Commissioning of the truck shall be done in accordance with the technical information supplied by the manufacturer.
7. Commissioning of the system shall proceed in accordance with the method statement given by the manufacturer.
8. Commissioner needs to train operators and maintenance

C. Manufacturer Information

The manufacturer shall supply the user with operating and maintenance instructions relevant to safety. The following information shall be included:

1. Description of the system
2. Description of each vehicle type
3. Description of the safety devices and warning labels
4. Training and competence of operation personnel
5. Intended and prohibited uses of the system
6. Intended use of controls
7. Function of operating controls and displays for the vehicle and training
8. Warning of the residual risks for communication to personnel during system operation
9. Training and competence of persons undertaking maintenance
10. Procedure for identification or detection of defects
11. Type and frequency of inspections and maintenance operations
12. Servicing operations for which no particular skills are required
13. Use of approved spare parts
14. Drawings and diagrams considered necessary for servicing and maintenance of the vehicle
15. Continuous presence and legibility of markings
16. Specify requirements for cleaning

VISUAL CONSTRUCTION SAFETY MANAGEMENT

MBUSI ensures construction work is performed in a safe manner that meets MBUSI and OSHA standards. This standard does not absolve the construction contractor from their duties to provide a workplace free of recognizable hazards and to supervise their employees to meet that goal.

- A. Construction - Building, alteration, and/or repair, including painting and decorating. Construction is **not** manufacturing, furnishing of materials, or servicing and general maintenance work.
- B. JSA – Job Safety Analysis must include:
 1. Steps in the task
 2. Hazards of each step
 3. Elimination or control of hazard for each step
 4. Place for employees to sign and record badge number that JSA has been reviewed.
- C. CAT – Corrective Action Tracking must include:
 1. Concerns/Observation/Safety Improvement
 2. Type of Violation

3. Contractor Responsible
4. Target Date
5. Action Taken

Safety Board Requirements

1. The prime or general contractor is responsible for getting a board to their job site.
2. A safety board will be required anytime a construction project or contract is projected to last longer than 15 days.
3. Safety Board will have the following items on the board:
4. Contractor folder pockets for the JSA and CAT Folder.
5. Laminated Shop Layout to document special conditions and work areas for each contract company.
6. Folders for blank forms
7. Open issues
8. Contractor Contact List
9. MBUSI Contact List
10. Emergency Evacuation and Shelter in Place Plan of the prime/general contractor or MBUSI as applicable.
11. First Aid, Recordable, and Lost Time Charts with number of each incident, the incidents per 100 employees (incident rate running monthly total) and total hours worked, charted weekly. This chart will be generated by the prime or general contractor.
12. Safety Violations from CAT tracking – Number of CATs found by category charted weekly.
13. Lessons learned from last incident that includes information on incident and the countermeasure. Company having the incident will produce the lessons learned.
14. Laminated daily safety board reviewed check sheet for MBUSI Safety TMs, MBUSI Engineering, Prime/General Onsite TM responsible for site, and Prime/General TM responsible for Safety of site. This check sheet will be marked to show the board has been reviewed for compliance.
15. Schedule of meeting times and safety forms due times.
16. Monthly Color Code Inspection Visual

Safety Board Training

- A. The MBUSI Project Lead is responsible for arranging a meeting with the prime/general contractor and the MBUSI Safety Representative to discuss site safety requirements. The MBUSI Safety Representative will review the

requirements of the Safety Board with each prime/general contractor with responsibility for area work is being performed prior to work beginning. Three days prior to contractor on-site, the prime/general contractor is responsible for training their sub-contractors on the requirements of the Safety Board.

Safety Board Meetings and Board Management

Safety Board Meeting Schedule

Meetings are to occur at a standard time each day for each shift. Meeting schedule times and requirements will be posted on the Safety Board. Any deviation from the time schedule must be brought to the attention of the MBUSI Safety Department and the Project Lead.

A. Job Safety Analysis (JSA) -

1. Contractor completes the form daily before work starts.
2. Prior to work, contractor reviews JSA with all employees working.
3. Contractor employees sign JSA that it was reviewed with them. Contractor takes the signed JSA's immediately to the Safety Board and places them in the proper folder and puts green dry erase mark by their name on the folder.
4. Within one hour of the general site start time, general or prime contractor foreman and safety person reviews the JSA. Any missing or unacceptable JSA's will be notated on the folder pocket contain the JSA with a red dry erase mark by the contractor's name. Each reviewer will mark the appropriate safety board review check sheet.
5. Within one hour of the general site start time MBUSI Engineering department responsible parties reviews the JSA. Any missing or unacceptable JSA's will be notated on the folder pocket contain the JSA with a red dry erase mark by the contractor's name. Each reviewer will mark the appropriate safety board review check sheet.
6. Within one hour and a half, MBUSI Safety TM will review the JSA. Any missing or unacceptable JSA's will be notated on the folder pocket contain the JSA with a red dry erase mark by the contractor's name. Each reviewer will mark the appropriate safety board review check sheet.
7. At end of the shift, the general/prime contractor will collect all JSA's and deliver them to the MBUSI safety department.

B. CAT – Corrective Action Tracking (CAT)

1. Every Contractor supervisor and every contractor responsible safety person reviews their working areas daily, documents safety findings and post form on shop safety board. The contractors will post the CAT on

the Safety Board at the beginning of their next work shift. Contractor will mark with a green dry erase mark the appropriate location by their name on the folder to show their CAT has been completed.

2. MBUSI Safety, and every Prime/General Contractors Supervisors, and every Prime/General Safety person will review the area and document findings daily. These findings will be discussed with the following work day with the contractors at the Safety Board Meeting.
3. Within one hour of the general site start time, Prime /General Contractor safety personnel reviews the CATs. Any action taken that is not sufficient or open item that is not closed will be notated with a red dry erase mark in the appropriate location by the contractor's name.
4. Within one hour and a half of the general site start time, MBUSI safety personnel review the CATs. Any action taken that is not sufficient or open item that is not closed will be notated with a red dry erase mark in the appropriate location by the contractor's name.

C. Safety Board Meeting –

1. Within 2 hours and a half from startup, a safety board meeting will take place.
2. Each contractor supervisor/foreman and responsible safety person is required to attend the meeting.
3. All MBUSI responsible TMs assigned to the project are required to attend.
4. All the prime/general supervisors and responsible safety personnel are required to attend.
5. Each contractor working on the site will discuss their work and major safety concerns.
6. Each contractor will outline their area with green dry erase on the laminated site map if they have no Immediately Dangerous to Life and Health (IDLH) hazards. The companies name or abbreviation of their name must be written in the outlined area.
7. If they have an IDLH hazard, the contractor will outline the area in red dry erase and write the hazard in the area. The companies name or abbreviation of their name must be written in the outlined area.
8. MBUSI and the Prime/General contractors will discuss issues facing the site for the day, safety issues, general site conditions, and other pertinent information to maintain a clean and safe work site.
9. A Construction Site Activity Report will be completed by the Prime/General contractor lead or by the MBUSI project lead.

Safety Board Management

- A. Failure to have a JSA will result in immediate shutdown of all of the contractors work. Work will not resume until all JSA requirements have been fulfilled and reviews of the JSA have been performed by all responsible parties.
- B. Failure to have a CAT will result in immediate shutdown until the contractor performs a CAT and MBUSI Safety approves that a CAT has been done.
- C. CATS that are insufficient or have open items will have to be corrected within one hour or an agreed upon time. If not corrected or guarded within the specified time, contractors work will be stopped. If the insufficient or open item issue is an IDLH hazard, the contractors work site will be stopped until the issue can be eliminated or properly guarded.
- D. Failure to send a representative to the Safety Board Meeting will result in immediate work stoppage. Work will not resume until MBUSI approves the countermeasure submitted by the contractor to prevent a repeat incident from occurring.

MBUSI Safety Overview Board

MBUSI Safety Overview Board

- A. The MBUSI Safety Overview Board is an information tool that provides a property wide view of all construction areas, the amount of contractors for the day, and the number of High Risk activities occurring at the location.

MBUSI Safety Overview Board Requirements

- A. Board will need to be magnetic and dry erase friendly.
- B. Sheet protector will need magnetic strips attached to them.
- C. A laminated property map with areas clearly visible.
- D. MBUSI Safety Overview Board Instructions
- E. Site Meetings Schedule
- F. Contact List

MBUSI Safety Overview Board Management

MBUSI Engineering Department will determine the location of the MBUSI Safety Overview Board. MBUSI Project leads will report the location of this board to all their prime/general contractors.

- A. The general/prime contractor will bring the Construction Site Activity Report to the MBUSI Safety Overview Board Review at 8:30 am. If there is not a general/prime contractor, the MBUSI project lead will deliver the paperwork to the board. The Construction Site Activity Report(s) will be placed into a sheet protector.
- B. The sheet protector, with the enclosed Contractor Site Activity Report, will be below the laminated MBUSI property map. A corresponding magnetic number

will be placed on the laminated site layout to indicate where site activity is occurring.

- C. Each MBUSI Project Lead will need to review the board by 9:00 a.m. to ensure that it has been updated.

Weekly Safety Meetings

MBUSI Safety/Security may conduct a daily Contractor Safety Meeting. All Contractors will attend and provide updates. Weekly meetings may be required depending upon the work scope.

Pandemic Disease Continuity Plan

1. Business continuity planning in response to a Pandemic event covers the following key business operational risks.
 - a. Human Resource Management
 - b. Processes and business functions
 - c. Supplier and customer management
 - d. Communications, both internal and external

MBUSI planning helps with the following:

- a. Minimize health risk to Team Members
- b. Minimize the risk of premises becoming a node of transmission
- c. Ensure plans are in place should Team Members be quarantined or infected
- d. Ensure alternative arrangements with suppliers and customers so that business operations can continue

What is a Pandemic Event?

1. Pandemic relates to geographic spread of disease. It is used to describe a disease that affects a whole country or the entire world.
2. Most Pandemic diseases have signs and symptoms to include difficulty breathing with exertion; cough; fever; pleuritic chest pain; nasal congestion; muscle aches; shaking chills; sore throat; headache; diarrhea; fatigue; or recent travel to infected regions.

Business Continuity Plans (BCP)

1. Mercedes-Benz AG entities are encouraged to plan and implement business continuity plans to minimize disruption to operations and ensure that business remains viable during the disease outbreak. Entities can take the following steps to ensure adequate preparation for business continuity.

Human Resource Management

- a. Human Resources Management should ensure that Team Members are familiar with the business continuity plans and comply with them during this period.
- b. Develop a plan for the continuity of leadership in the event of absence of key decision makers and executives
- c. Consider flexible work arrangements for the high-risk Team Members, as well as Team Members who need to stay at home due to other reasons relating to a Pandemic Disease, e.g. to take care of family members who have travelled to known affected countries or regions
- d. Review Mercedes-Benz and MBUSI Human Resources management policies and regulations such as absenteeism, sick leave, overseas travel, workplace closure and recall of non-critical Team Members and their families from affected countries
- e. Defer all travel to areas identified as High Risk and eliminate all non-essential business travel. MBUSI will check with all available resources for the latest updates on the Pandemic Disease situation. An informed decision will be made based on this information.
- f. Teleconferencing, video-conferencing and working remotely should be used whenever possible.
- g. A designated email address and voicemail hotline where you can ask additional questions will be provided.
- h. Team Members who have travelled to High Risk regions must notify their supervisor prior to returning to MBUSI.
- i. Team Members who have been quarantined due to exposure must provide a return to work from their personal physician. (See appendix for these disease specific guidelines.)

Process and business functions

Identify critical business functions (prioritized activities) and essential Team Members. Entities should consider the following:

- a. Follow Corporate Security Pandemic Protocol
- b. Alternate work schedules will be utilized as necessary.
- c. Identify and Cross-train Team Members in critical positions and establish deputies to minimize disruptions.

- d. Educate Team Members on infection control and good personal hygiene practices by following Universal Precautions.
- e. Develop plans related to visitor and Team Member screening.
- f. Monitor closely the Pandemic Disease related developments and follow travel and health advisories from all available resources.
- g. MBUSI Team Members are encouraged to take precautionary steps based on current advisories.

When traveling, Team Members should adopt the following precautions at all times:

- Avoid contact with animals including poultry and birds, and consumption of raw and undercooked meats
- Avoid crowded places and close contact with people in affected areas
- Observe good personal hygiene
- Ensure adequate supply of appropriate Personal Protection Equipment (PPE)
- Clean and disinfect company premises and equipment using approved guidelines.

Supplier and customer management

Identify essential suppliers and service providers, and discuss continuity issues with them such as understanding and implementation of their Business Contingency Plan.

Identify essential customers and ensure that plans are in place to meet customer needs

Develop a plan on how and when to activate:

- Alternative suppliers
- Alternative delivery means to customers

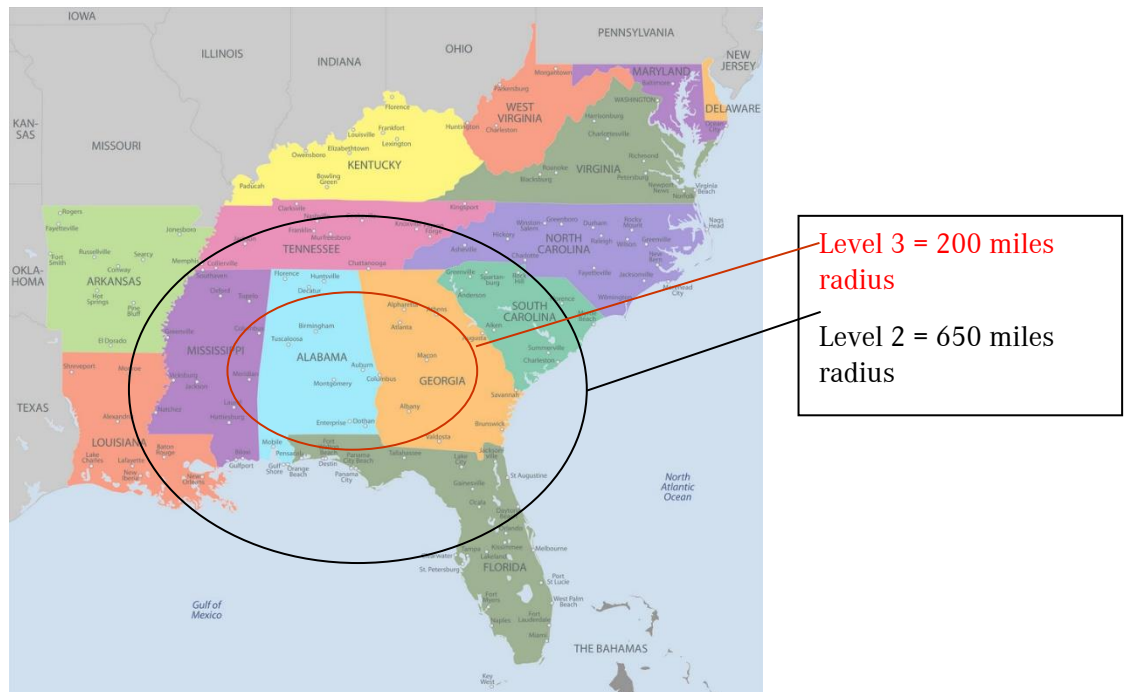
Communications

Please refer to the MBUSI Crisis Communication Plan.

Pandemic Proximity Escalation Plan

- **Level 1:** The outbreak or spread of the disease has taken place at a location outside the continent in which the entity has a location.

- **Level 2:** The outbreak or spread of the disease has taken place at a location within the continent (or country) in which the entity has a location within a radius of less than 650 miles.
- **Level 3:** The outbreak or spread of the disease has taken place within the entity's region within a radius of less than 200 miles.
- **Return to Normality:** A return to normality is effected after the abatement of the infectious disease.



Annexes

Mercedes-Benz U.S. International, Inc. Crisis Communications Plan Pandemic Checklist

Weather Decision

Mercedes-Benz Fire Department (FDMB) will monitor StormGeo for severe weather threats within a 75-mile radius of MBUSI and escalate weather conditions to MBUSI Crisis Management Team (CMT).

Potential Risk Color Codes

- Slight (Yellow)
- Moderate (Orange)
- High (Red)
- Extreme (Purple)

Escalation to Crisis Management Team

When StormGeo forecasts a Yellow or Orange color code condition within 75 miles of MBUSI, operations will continue to run as normal and the FDMB will continue to monitor current weather conditions. If tornadic activity approaches within a 10-mile radius of MBUSI, internal weather sirens will be activated and Team Members will go to assigned storm shelters until an all clear is sounded.

When StormGeo forecasts a Red or Purple color code condition within 75 miles of MBUSI, the CMT will be contacted. A recommendation will be made to the CMT to cancel operations during the affected time and the CMT will decide when business operations will resume. When operations have been cancelled, a reschedule of the day is scheduled to the earliest possible weekend, potentially being the current week on any shift. The CMT will make the final decision regarding operations.

Crisis Communication Plan

- Execute decisions made by the CMT regarding Operations plan
- Use MBUSI's communication tools to inform Team Members and Suppliers as required for any shift schedules changes.

Scrap Vehicle Training

The procedure defines the responsibility of the Training Coordinator for a scrap vehicle with a valid scrap tag issued by MBUSI Finance Department.

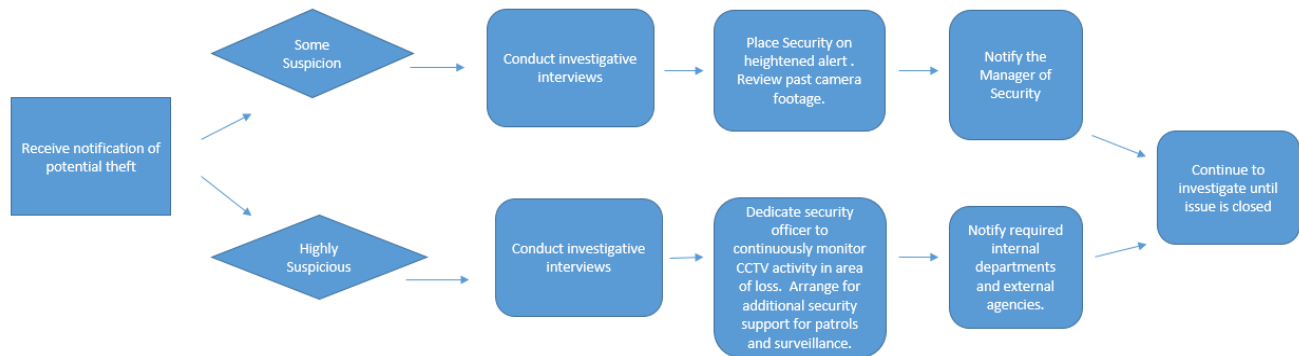
Responsibility of Training Coordinator

- A. Contact MBUSI Safety Department with written training proposal detailing objective for use of vehicle and person(s) attending training. Include all participants (Mercedes-Benz and non-Mercedes-Benz).
- B. Contact MBUSI Finance Department FMC/ONC with vehicle identification number and request permission to obtain access to the scrapped vehicle.
- C. Once permission has been granted from the Finance Department, a Scrap Car Training Release Form must be completed and signed by all department representatives listed on the form.
- D. A safety briefing must be conducted to participants and a Job Safety Analysis (JSA) form must be completed and retained.
- E. Communicate and ensure all Foreign Trade Zone (FTZ) rules are followed by participants.
- F. Non-Mercedes-Benz participants must complete a Liability Waiver Form prior to start of the training.

- G. Verify that each participant's Personal Protective Equipment (PPE) is available and in good operating condition.
- H. The post-training checklist must be completed on the Scrap Car Training Release Form and submitted to the Safety Department for review.

Part Theft Escalation Procedure

Suspicion of Part Theft



No Suspicion:

1. Security will operate as normal with no additional instruction.

Some suspicion:

1. Security will request additional information from the cycle counter as well as the responsible person in the shop where loss is expected. Conduct area Team Member interviews.
2. Security will review camera footage located at area of concern.
3. Cameras associated with catalytic converter storage areas highlighted for high alert viewing at the emergency operations center. High alert viewing requires a dedicated Officer.
4. Communicate to Security Officers so they are on heightened alert while conducting security patrols and performing vehicle inspections.
5. Conduct daily update and follow-up with Logistics, Internal Customs, and Security.
6. Notify Manager of Safety and Security

Highly Suspicious:

1. Hold security briefing with Security Chief with focused discussion for mitigation of loss.
2. Formulate the appropriate protective/surveillance measures for specific incident and communicate to security staff.

3. Arrange additional support for security activities. To include increased CCTV viewing, security patrols, both personal, and vehicle inspections, etc. Assign dedicated camera viewing Officer.
4. Coordinate surveillance activity by use of people, patrols and cameras.
5. Conduct area Team Member interviews.
6. Conduct daily update and follow-up with Logistics, Internal Customs, and Security.
7. Make formal notifications to required internal departments and external agencies.

Management's Safety Commitment Plan

To define Management's Safety Commitment for Mercedes-Benz U.S. International, Inc. (MBUSI).

- A. Providing a plan statement acknowledging the priority of safety and health.
- B. Outlining basic safety principles of MBUSI.
- C. Outlining safety responsibilities.

General Safety Policy

MBUSI has adopted an operating policy to conduct business in a manner that would protect the safety and health of all TMs. The highest priority is placed on establishing and maintaining a safe and healthful work environment for the elimination of work-related injuries and to comply with all applicable federal, state, and local safety regulations and ordinances.

It is MBUSI's policy to implement proactive procedures, systems, equipment, and practices necessary to control conditions and situations adversely affecting a safe work environment. Safety is considered the main foundation for establishing an environment where TMs can make the maximum contribution. In addition, TM involvement and participation is integrated into planning, developing, and implementing an effective and meaningful safety process.

Basic Principles

- 1. All accidents are considered preventable.
- 2. Safety is carried out as good business, not as compliance to programs.
- 3. Safety is the responsibility of all TMs.
- 4. Safety training is integral and ongoing.
- 5. Safety is given the same emphasis as production, quality, and cost control.
- 6. Accidents are considered deficiencies in processes and practices.
- 7. The right way to do a job can only be the safe way.
- 8. Safety is a front-end process, not a back end program.
- 9. TMs have "ownership" and responsibility for the safety of their work areas and equipment.

10. The true safety focus is for 100% of TMs to work safely 100% of the time.

Human Resources/Safety Department

- a. Develop and implement an overall strategic direction consistent with MBUSI's business goals and objectives.
- b. Develop and coordinate safety policies, plans, standards, programs and procedures to meet MBUSI needs and ensure regulatory compliance.
- c. Serve as the primary internal source of safety, technical and regulatory guidance and training about compliance issues.
- d. Provide technical assistance for determining needs, feasibility, and selection of safety equipment, controls and practices.
- e. Assist departments and groups in safety evaluations through audits, inspections and appropriate follow-up reports.
- f. Evaluate the safety impact of proposed capital projects.
- g. Promote understanding and awareness of safety issues at all levels of the MBUSI.

Contractor/Supplier Responsibilities

a. MBUSI issuance of safety, security, and general work rules and requirements shall in no way be interpreted as the assumption of responsibility by Mercedes-Benz U.S. International, Inc. The following safety rules and requirements are basic, general in nature, and are not intended to be all-inclusive:

- 1. Contractor/supplier work will be governed by the Occupational Safety and Health Administration (OSHA), and other applicable federal, state, and local laws and policies. Contractors'/Suppliers' compliance to the specific safety regulations, as herein outlined, does not, therefore, release the Contractor/Supplier from their responsibility to comply with any other programs, rules, training, or recordkeeping requirements that might apply and that are not otherwise specifically required by MBUSI.
- 2. It is the Contractor's/Supplier's responsibility to be aware of and follow any safety rules specific to their business specialty, service, or trade. All construction personnel entering/working within MBUSI must comply

with the prevailing PPE standard. Contract personnel conducting any work activities within or that may affect MBUSI production areas, must obtain an approved Safe Work Permit from the affected MBUSI maintenance group prior to the commencement of such activities.

3. Contractors and Suppliers are responsible to furnish their own materials/equipment for conducting work activities at MBUSI. Contractors cannot use or otherwise access MBUSI materials, tools, or other equipment unless authorized in advance by the responsible MBUSI management representative and MBUSI Safety Department. The Contractor is responsible to assure that their equipment meets all applicable regulatory standards, as well as conduct any necessary inspections to assure the equipment is safe to use. All inspection and training documentation must be available upon demand.

4. Contractors/Suppliers are responsible for having a designated individual on site at all times during the performance of services who can fluently communicate with MBUSI in English language and also fluently communicate (and interpret where necessary) with all employees of the Contractor/Supplier who are performing services.

5. The Contractor's/Supplier's project manager and/or designee shall be fully responsible to ensure that all employees and subcontractors have been oriented, trained, and supervised in a manner to fully comply with all relevant safety, security, and general work rules and regulations of MBUSI and other applicable governing laws and agencies.

6. Contractors/Suppliers are not allowed to use bulletin boards and other communication methods of MBUSI without written approval from the MBUSI Communication Department.

Contractor/Suppliers are not permitted to use MBUSI equipment without express authorization from MBUSI management.

7. Solicitation by Contractor/Supplier employees and/or distribution of literature is prohibited.

Walking and Working Surfaces Plan (Slips, Trips and Falls)

Description

A. Definitions

Bearer - A horizontal member of a scaffold upon which the platform rests and which may be supported by ledgers.

Brace - A tie that holds one scaffold member in a fixed position with respect to another member.

Cage - A cage is a guard that may be referred to as a cage or basket guard which is an enclosure that is fastened to the side rails of the fixed ladder or to the structure to encircle the climbing space of the ladder for the safety of the person who must climb the ladder.

Coupler - A device for locking together the component parts of a tubular metal scaffold. The material used for the couplers must be of a structural type, such as a drop-forged steel, malleable iron, or structural grade aluminum. The use of gray cast iron is prohibited.

Floor hole - An opening measuring less than 12 inches but more than 1 inch in its least dimension, in any floor, platform, pavement, or yard, through which materials but not persons may fall; such as a belt hole, pipe opening, or slot opening.

Floor opening - An opening measuring 12 inches or more in its least dimension, in any floor, platform, pavement, or yard through which persons may fall; such as a hatchway, stair or ladder opening, pit, or large manhole. Floor openings occupied by elevators, dumb waiters, conveyors, machinery, or containers are excluded from this subpart.

Handrail - A single bar or pipe supported on brackets from a wall or partition, as on a stairway or ramp, to furnish persons with a handhold in case of tripping.

Maximum intended load (Design working load) - The total of all loads including the working load, the weight of the scaffold, and such other loads as may be reasonably anticipated.

Pitch - Pitch is the included angle between the horizontal and a ladder, measured on the opposite side of the ladder from the climbing side.

Platform - An extended step or landing breaking a continuous run of stairs; A working space for persons, elevated above the surrounding floor or ground; such as a balcony or platform for the operation of machinery and equipment.

Rise - The vertical distance from the top of a tread to the top of the next higher tread.

Runway - A passageway for persons elevated above the surrounding floor or ground level, such as a foot walk along shafting or a walkway between buildings.

Side-step ladder - A side-step ladder is one from which a TM getting off at the top must step sideways from the ladder in order to reach the landing.

Stair railing - Must be of construction similar to a standard railing but the vertical height must be not more than 34 inches or less than 30 inches from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.

Standard railing - A vertical barrier erected along exposed edges of a floor opening, wall opening, ramp, platform, or runway to prevent falls of persons. The standard railing must consist of top rail, intermediate rail (1/2 the height of the top rail) and posts and must have a vertical height of 42 inches nominal from upper surface of top rail to floor.

Through ladder - A through ladder is one from which a TM getting off at the top must step through the ladder in order to reach the landing.

Toeboard - A vertical barrier (four (4) inches vertical) at floor level erected along exposed edges of a floor opening, wall opening, platform, runway, or ramp to prevent falls of materials.

Tread - The horizontal member of a step.

Tread run - The horizontal distance from the leading edge of a tread to the leading edge of an adjacent tread.

Wall hole - An opening less than 30 inches but more than 1 inch high, of unrestricted width, in any wall or partition; such as a ventilation hole or drainage scupper.

Wall opening - An opening at least 30 inches high and 18 inches wide, in any wall or partition, through which TMs may fall; such as a yard-arm doorway or chute opening.

Working load - Load imposed by TMs, materials, and equipment.

B. Housekeeping

1. All workspaces, passageways, storerooms, and service rooms must be kept clean, well lit, orderly and in a sanitary condition.

2. The floor of every workspace must be maintained in a clean and, so far as possible, a dry condition. Where wet processes are used, drainage must be maintained and false floors, platforms, mats, or other dry standing places should be provided where practicable.

3. To facilitate cleaning, every floor, working place, and passageway must be kept free from protruding nails, splinters, holes, or loose boards.

C. Aisles and Passageways

1. Where mechanical handling equipment is used, sufficient safe clearances must be allowed for aisles, at loading docks, through doorways and wherever turns or passage must be made. Sufficient safe clearance is based off of what type and size equipment is used as well as what material is being transported. Aisles and passageways must be kept clear and in good repairs, with no obstruction across or in aisles that could create a hazard.

2. Designated aisles and passageways must be appropriately marked.

a. Designated walk paths must be a minimum of 28 inches for maintenance and 36 inches for designated production paths.

b. Green colored strips mark designated "Safety pedestrian aisles"

c. Waivers for maintenance paths may be granted down to 22 inches if 28 inches is infeasible (see MBUSI Safety).

3. Covers and/or guardrails must be provided to protect TMs from the hazards of open pits, tanks, vats, ditches, etc.

4. Overhead obstructions less than 84 inches from the working surface shall be minimized and must be padded or otherwise guarded to minimize Team Member injury. Padding must be a minimum of ¾ inch thickness, durable and marked with yellow and black diagonal striping. No overhead obstructions less than 84 inches shall be allowed in an exit path.

D. Floor loading protection

In every building or other structure, all elevated floors must be marked with the approved floor loading capacity. Signage must be securely affixed and in a conspicuous place.

E. Work Surface Friction

Work and floor surfaces must have sufficient coefficients of friction to assure safe travel. The following slip coefficients are the minimum acceptable requirements for MBUSI facilities/work areas:

1. 0.6 for aisles/walk ways
2. 0.8 for ramps
3. 0.5 for general areas

F. Covers and Guardrails

Covers and/or guardrails must be provided to protect TMs/contractors from the hazards of open pits, tanks, vats, ditches, etc.

G. Floor Matting

1. Gaps must not be allowed between floor mats (move mats together, select a larger mat or tape mats together).
2. Floor mats must have tapered edges of contrasting color. (Floor mats with thicknesses > ¼ inch pose a trip hazard).
3. Floors and floor mats must provide a level walking surface.
4. Mats must be selected that fit the floor.
 - a. The floor mat edges must not extend over the edge of the sides of a platform.
 - b. The floor mat must taper at the edges.
5. Floor mats must be secured using tape/screws, bolts, etc., to prevent migration.
6. Floor mats must be free of any gaps, curling, buckling or material defects.

H. Fixed Stairways and Steps

1. Step rises must not exceed 12 inches. For Stairs installed after January 17, 2017 a change of elevation of greater than 12 inches will require a step to be installed and the step rise must not exceed 9.5 inches for each additional step required.

2. All stairs must be uniform in rise and run (angle between 30-50 degrees). Tolerance of +/- 0.25 in.
3. Step treads must be a minimum length of 11 inches for evacuation routes and have a 42 inch width (36 inch width for old construction). All others are to have a minimum tread length of eight (8) inches and a width of 36 inches. Problem areas can have width reduced to 22 inches. For stairs installed after January 17, 2017 minimum tread length of 9.5 inches and a width of 36 inches.
4. There must be a minimum of 30 inches of space in the travel direction at the top and at the bottom of the stairway. This space must be free from obstructions.
5. Hazardous materials storage is prohibited near or around stairways (20 foot minimum) or must have a protective firewall.
6. The stairway length must not exceed 12 feet without a landing.
7. Every flight of stairs having four (4) or more risers must be equipped with standard stair railings or standard handrails.
8. The stair treads and nose-plate must be reasonably slip resistant.
9. Fixed stairways must be designed and constructed to carry a load of five (5) times the normal live load anticipated but never of less strength than to safely carry a moving concentrated load of 1,000 pounds.
10. Stairway platforms must be no less than the width of a stairway and a minimum of 30 inches in length measured in the direction of travel.
11. Stair landings must have a minimum of 36" x 36" unobstructed clearance.
12. Where doors or gates open directly on a stairway, a platform must be provided, and the swing of the door must not reduce the effective width to less than 20 inches. For stairs installed after January 17, 2017 the door swing must not reduce the effective width to less than 22 inches.
13. Vertical clearance above any stair tread to an overhead obstruction must be at least seven (7) feet measured from the leading edge of the tread.
14. Maintenance stair and ladder access points to the overhead must have restrictive signage approved by the Safety Department.

15. Where stairs or stairways exit directly into any area where vehicles may be operated, adequate barriers and warnings must be provided to prevent TMs from stepping into the path of traffic.

16. A catch pan shall be installed under all stairs which run above areas where personnel work or rest.

17. Handrail placement and specifications:

- a. On stairways less than 44 inches wide having both sides enclosed, at least one handrail, preferably on the right side descending.
- b. On stairways less than 44 inches wide having one side open, at least one stair railing on the open side.
- c. On stairways less than 44 inches wide having both sides open, one stair railing on each side.
- d. On stairways more than 44 inches wide but less than 88 inches wide, one handrail on each enclosed side and one stair railing on each open side.
- e. On stairways 88 or more inches wide, one handrail on each enclosed side, one stair railing on each open side, and one intermediate stair railing located approximately midway of the width.
- f. Handrails must have a top rail between 30" and 34" from the upper surface of the stair rail system to the surface of the tread and must also have a mid-rail or other similar protective barrier.
- g. Handrail is to be 1.5 - 2 inches in diameter, of round configuration, and strong enough to support 200 lbs of force applied in any direction.

I. Guarding floor and wall openings and holes

1. Every ladder way floor opening or platform must be guarded by a standard railing with standard toe board on all exposed sides (except at the entrance to the opening), with the passage through the railing either provided with a swinging gate or so offset that a TM cannot walk directly into the opening.

2. Every stairway floor opening must be guarded by a standard railing. The railing must be provided on all exposed sides (except at the entrance to the stairway).

3. Every hatchway and chute floor opening must be guarded by one of the following:

a. Hinged floor opening cover of standard strength and construction equipped with standard railings or permanently attached so as to leave only one exposed side. When the opening is not in use, the cover must be closed or the exposed side must be guarded at both top and intermediate positions by removable standard railings.

b. A removable railing with toeboard on not more than two (2) sides of the opening and fixed standard railings with toeboards on all other exposed sides. The removable railings must be kept in place when the opening is not in use.

c. Where operating conditions necessitate the feeding of material into any hatchway or chute opening, protection must be provided to prevent a TM from falling through the opening.

d. Every pit, trapdoor or floor opening must be guarded by a floor opening cover of standard strength and construction. While the cover is not in place, the pit or trap opening must be constantly attended by someone or must be protected on all exposed sides by removable standard railings.

4. Every floor hole which TMs are exposed to must be protected by a cover that leaves no openings more than 1 inch wide. The cover must be securely held in place to prevent tools or materials from falling through.

5. Every wall opening, where the bottom of the opening is less than three (3) feet above the floor, from which there is a drop of more than four (4) feet, must be guarded.

6. Where there is a hazard of materials falling through a wall hole and the lower edge of the hole is less than four (4) inches above the floor, and the next lower level is more than five (5) feet, the hole must be protected by a standard toeboard.

J. Work deck/Platforms

1. Elevation changes – Controls must be implemented to safeguard changes in elevation 2 feet or more to prevent fall hazards. Safeguards

must be selected that are appropriate to the hazard, with the following guidelines:

- a. Distance – Can be used if a 3 foot buffer exists between the hazard and the Team Member's work envelope.
- b. Line side elevation changes < 4 feet – Equipment/dunnage can be used as an administrative control to alert Team Members of the elevation change. Standard railing should be used as needed.
- c. Elevation changes > 4 feet – Standard rails must be used wherever possible. Exception: When rack/dunnage must be used at the station. Opening can be left. Chains, swing gate or drop down bar must be used to close/protect opening when dunnage/rack is moved.

2. Work deck/Platform Surface

- a. Work decks/platforms are to be kept dry, if not, then a slip resistant surface must be installed.
- b. The walking surface must be stable and level and uniform to prevent trips. Any raised edges greater than ¼ inch is considered a trip hazard.
- c. The working surface must have no unprotected openings of more than one (1) inch.
- d. Where grating is used, there must be no more than one-quarter (¼) inch of movement.

3. Work deck/Platform Elevation Change

- a. Elevated work deck/platforms more than 12 inches from the floor must have a protective/warning barrier of yellow 3 inch wide stripes to mark the changes in the elevation.
- b. Stairs or walk ways on work deck/platforms
 - 1. Must be a minimum of 28 inches (evacuation path from work area must be 42 inches wide minimum. Old construction must be 36 inches minimum).
- c. Walking ramps can be no more than a 15 degree angle.

d. Equipment/work processes must be designed to prevent TMs from working on ramps.

e. Work deck/platforms four (4) feet or higher must have a protective barrier or guardrail.

f. The work floor slope (for drainage) can be no more than a two (2) degree angle.

g. All protective rails must be:

1. Rail to be 1.5 - 2 inches in diameter.

2. Round configuration.

3. Must have a mid rail.

4. Strong enough to support 200 lbs of lateral force.

5. No pinch points between the railing and other structures.

6. Must have a minimum 20 inches between the vehicle (moving parts) and fixed rails (if not, a safeguard must be installed.)

7. No gaps between the rail systems may be greater than 4 inches.

8. For pipe railing, posts must be spaced not more than eight (8) feet on centers.

9. For wood railings, the posts must be of at least 2x4 inch stock spaced not to exceed six (6) feet; the top and intermediate rails must be of at least 2 x 4 inch stock. If top rail is made of two right-angle pieces of 1x4 inch stock, posts may be spaced on eight (8) foot centers, with 2x4 inch intermediate rail.

10. All handrails and railings must be provided with a clearance of not less than three (3) inches between the handrail or railing and any other object.

4. Work deck/Platform Work Space

a. TMs must have a horizontal minimum of:

1. 28 inches of room for working.
2. 48 inches if materials must be carried. (Additional space may be required for parts larger than 24 inches).

5. Overhead Conveyors and Designated Overhead Maintenance Areas

- a. Grating can be used for overhead conveyors provided that the parts being transported are larger than the smallest grate opening.
- b. A solid surface such as diamond plate steel must be used for all designated overhead maintenance areas.

K. Portable Ladders

1. Care and maintenance

- a. Ladders must be maintained in good usable condition at all times.
- b. If a ladder is involved in any of the following, immediate inspection is necessary:
 1. If a ladder tips over, inspect the ladder for side rail dents or bends, or excessively dented runs; check all rung-to-side-rail connections; check hardware connections; check rivets for shear.
 2. If ladders are exposed to oil and grease, they should be cleaned of oil, grease or slippery materials. This can be done with a solvent or steam cleaning.
- c. Ladders having defects are to be marked and taken out of service until repaired by either maintenance or the manufacturer.
- d. Metal ladders must be painted or otherwise treated to resist corrosion and rusting where its placement requires such treatment.

2. Use of ladders

- a. A ladder placed at the proper angle shall have its base a distance from the vertical wall equal to one-fourth ($1/4$) the working length of the ladder.
- b. Portable ladders are designed to hold one person at a time.

c. When ascending or descending, the climber must face the ladder.

d. Ladders should not be used for any other purpose than that for which they were intended, unless specifically recommended for use by the manufacturer.

e. Workers climbing a ladder shall maintain three points of contact with the ladder.

L. Construction of fixed ladders

1. The clearance in back of the ladder from the centerline of rungs, cleats or steps to the nearest permanent object in the back of the ladder must not be less than seven (7) inches, except that the clearance for an elevator pit ladder must be 4.5 inches.

2. The distance of at least three (3) feet in front of the base of the ladder must be kept clear of objects.

3. The step-across distance from the nearest edge of the ladder to the nearest edge of equipment, structures or platform must not be more than 12 inches or less than 2 ½ inches.

4. A fixed (metal) ladder shall be installed with a pitch from 75 to 90 degrees (from horizontal measured from the backside of the ladder) and the distance between rungs/steps shall not exceed 12 inches.

5. A fixed ladder rung shall be of non-slip design (corrugated, knurled, dimpled or coated/treated with skid-resistant material) and have a diameter of not less than ¾ inch. Slick round bar or re-bar material shall not be used as ladder rungs.

6. Rungs of individual rung/step ladders must be shaped to prevent slipping off the end of the rungs.

7. Fixed ladders must be able to support at least two loads of 250 pounds each, concentrated between any two consecutive attachments.

8. Each step or rung of a fixed ladder must be able to support a load of at least 250 pounds applied in the middle of the step or rung.

9. Fixed ladders also must support added anticipated loads caused by ice buildup, winds, rigging and impact loads resulting from using ladder safety devices.

10. The minimum width of a fixed ladder shall be 16 inches. Minimum perpendicular clearance between the centerline of fixed ladder rungs, cleats and steeps, and any obstruction on the climbing side of the ladder must be 30 inches. If obstructions are unavoidable, clearance may be reduced to 24 inches, provided a deflection device is installed to guide workers around the obstruction.

11. Minimum clear distances between the sides of individual rung/step ladders and between the side-rails of other fixed ladders must be 16 inches.

12. A fixed ladder shall extend a minimum of 42 inches above parapets and landings either by continuation of rung spacing as horizontal grab bars or by providing vertical grab bars that must have the same lateral spacing as the vertical legs of the ladder rails.

13. The ladder opening at the top of a platform shall have a self-closing safety gate installed. Chains are not acceptable.

14. Ladder bases must have a minimum of 36" x 36" unobstructed clearances.

15. Fixed ladders without cages or wells must have at least a 15 inch clearance width to the nearest permanent object on each side of the centerline of the ladder.

16. Ladders must have a landing or rest platform provided at maximum intervals of 50 feet.

17. Cages or basket requirements

a. Must be provided on ladders of more than 20 feet to a maximum unbroken length of 30 feet.

b. Cages must extend a minimum of 42 inches above the top of the landing, unless other acceptable protection is provided.

c. Cages must extend down the ladder to a point not less than seven (7) feet or more than eight (8) feet above the base of the ladder.

d. Cages must not extend less than 27 or more than 30 inches from the centerline of the step or rung and must not be less than 27 inches wide.

e. Horizontal bands must be fastened to the side rails of rail ladders or directly to the structure, building or equipment for individual-rung ladders.

f. The insides of the cages must be clear of projections.

g. Horizontal bands must be spaced at intervals not more than 4 feet apart measured from centerline to centerline.

h. Vertical bars must be spaced at intervals not more than 9.5 inches measured centerline to centerline and must be on the inside of the horizontal bands and must be fastened to them.

i. The bottom of the cage must be flared not less than 4 inches between the bottom horizontal band and the next higher band.

18. New Fixed Ladders installed after November 19, 2018 that are greater than 20 feet shall be equipped with a personal fall arrest system or ladder safety system. The personal fall arrest system or ladder safety system must provide protection throughout the entire vertical distance of the ladder including all ladder sections; and be approved by the Safety Department prior to the installation of the ladder.

19. All existing ladders greater than 24 feet are allowed to use cage systems until November 18, 2036 at which time the cage system must be replaced with a personal fall protection system or ladder safety system.

M. Wells for Fixed Ladders

1. Wells must completely encircle the ladder.

2. Wells must be free of projections.

3. Inside faces of wells on the climbing side of the ladder must extend between 27 inches and 30 inches from the centerline of the step or rung.

4. Inside widths of wells must be at least 30 inches.

5. Bottoms of wells above the point of access to the bottom of the ladder must be between 7 feet and 8 feet.

N. Other Ladders

1. Ladders formed by individual metal rungs imbedded in concrete, which serve as access to pits and to other areas under floors, are frequently located in an atmosphere that causes corrosion and rusting. To increase

rung life, individual metal rungs must have a minimum diameter of one (1) inch or must be painted or otherwise treated to resist corrosion and rusting.

O. Landing Platforms and Balconies

1. When ladders are used to ascend to heights exceeding 24 feet (except on chimneys) or 30 feet with a cage guard, landing platforms must be provided for each 50 feet of height.
2. All landing platforms shall be equipped with standard railings and toe boards (42" top rail, mid-rail and 4 inch toe board), so arranged and free of obstructions to give safe access to the ladder. Platforms shall not be less than 24 inches in width and 30 inches in length.
3. The side rails of through or side-step ladder extensions must extend 3 ½ feet above parapets and landings.
4. One rung of any section of ladder shall be located at the level of the landing laterally served by the ladder. Where access to the landing is through the ladder, the same rung spacing as used on the ladder shall be used from the landing platform to the first rung below the landing.
5. All drip pans on balconies shall be connected to a common drain line (3/4" min) with a 90 degree ball shut-off at its end and be accessible from floor level without entering safety gated area.
6. Balcony floor shall be made of grip strut material.
7. Live load rating shall be displayed on the side of the structure and must be visible from the floor.
8. Balcony hole cutouts shall have 1" x 1" x 1/8" angle guarding, with the vertical leg facing down.
9. Designated maintenance platforms shall have a diamond plate walking/working surface.
10. Balconies or platforms longer than 50 feet require a minimum second route of egress. Egress routes to be at opposable ends of the platforms. The maximum distance from the location on the platform to an exit door shall be 450 feet.

P. Dock boards (bridge plates)

1. Dock boards must be designed and constructed in accordance with OSHA requirements.

Q. Scaffolds

1. The footing and anchorage of scaffolds must be sound, rigid and capable of carrying the maximum intended load without settling or displacement. Unstable objects such as barrels, boxes, loose brick or concrete blocks must not be used to support scaffolds or planks.
2. Scaffolds and their components must be capable of supporting without failure at least four (4) times the maximum intended load.
3. Scaffolds shall not be altered or moved horizontally while in use or occupied.
4. The poles, legs or uprights of scaffolds must be plumb, and secured and rigidly braced to prevent swaying and displacement.
5. The use of shore or lean-to scaffolds is prohibited.
6. Scaffold planks must be secured and extend over their end supports not less than six (6) inches or more than 18 inches.
7. Scaffolds must be provided with a screen between the toeboard and the guardrail, extending along the entire opening, consisting of No. 18 gauge U.S. Standard Wire $\frac{1}{2}$ inch mesh or the equivalent, where TMs/Contractors are required to work or pass under the scaffolds.
8. All scaffolds must be erected by competent and experienced personnel.
9. Guardrails not less than 2x4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail of 1x4 inch lumber or equivalent, and the toeboards, must be installed at all open sides on all scaffolds more than 6 feet above the ground or floor. Toeboards must be a minimum of 4 inches in height.
10. Daily inspections must be made of scaffolds and accessories. Any maintenance, including painting, or minor corrections authorized by the manufacturer, must be made before further use.
11. Frames and accessories for scaffolds shall be maintained in good repair and every defect, unsafe condition or noncompliance with this section must be immediately corrected before further use of the scaffold. Any broken, bent, excessively rusted, altered or otherwise structurally damaged frames or accessories must not be used.

12. Scaffolds must have inspection tags clearly visible and signed off by a competent person.

Contractors/Suppliers

1. Contractors/Suppliers and subcontractors must comply with 29 CFR 1926.1053 (Ladders) and 1926.1060 (Ladder Training Requirements). The Contractor/Supplier will ensure that a competent person provides training and inspection.
 2. All ladders and scaffolds erected by the Contractor/Supplier shall meet or exceed OSHA standards. Fall protection at a minimum shall be required whenever:
 - a. Working 4 feet above ground on a platform without adequate railing.
 - b. Working in an adjustable personnel platform.
 - c. Building or dismantling scaffolding above 4 feet.
 - d. Working in pipe racks above 4 feet.
 - e. Working from a ladder with ladder feet above 10 feet.
 3. All scaffolds shall be adequately designed to carry, without failure, four (4) times the maximum intended load. At no time shall any scaffold be overloaded.
 4. Inspect all ladders and scaffolds before use.
 5. Straight ladders must be tied off or held at base by another worker
 6. Stepladders must be fully opened, locked and set level. Employees using step ladders are not required to wear fall protection provided:
 - a. Step ladder < 10 feet in height.
or
 - b. Ladder is located no closer than 10 feet from an area/edge that has a fall hazard greater than 4 feet. Example: Ladder located within 2 feet of the railing of a 6 foot high mezzanine would require fall protection.
- NOTE: Always face the ladder and use both hands when ascending/descending.
7. Portable metal and wood ladders are prohibited.
 8. The top of an extension ladder must extend at least three feet beyond the supporting object when the ladder is used for access to an elevated work area.
 9. Use the 4:1 slope placement ratio.
 10. Riding on a rolling scaffold is prohibited.
 11. Scaffolds wheels must be locked when the scaffold is in use.

12. Do not use the scaffold rails or braces for climbing. Use the provided ladder access. Climbs over 10' will use fall protection.

13. All scaffolds must be erected level and placed on a firm base.

14. All pits and leading edges greater than 4' must be protected by guardrail or other hardened barricade that is complaint with OSHA and MBUSI standards. Roofs and areas only accessible by lift may use other forms of fall protection. Pits and leading edges less than 4' and more than 12" required guarding.

15. Temporary guardrails shall be two inches by four inches (2" x 4") or the equivalent, approximately 42" high with a 21" high mid-rail. Supports shall be at intervals not to exceed 8 feet. Toe-boards shall be a minimum of 4" in height. Planking shall be cleated or otherwise secured to prevent displacement. Scaffolds must be braced and tied- off, both horizontally and vertically, at intervals specified in the pertinent regulations.

16. Do not alter any scaffolding member by welding, burning, cutting, drilling, bending, etc.

17. Scaffolding planks must extend over their support end between 6" and 12" or are secured.

18. Never place ladders or scaffolds in front of doors unless doors are blocked, locked or guarded.

19. All scaffolding must be provided with positive identification that it has been erected, dismantled and altered under the supervision of a competent person.

19. Contractors/Suppliers and subcontractors must designate in writing the name of the competent person responsible for the erection of scaffolds.

20. All scaffolds must be tagged denoting their status, whether complete or incomplete.

21. The competent person must sign inspection tags prior to use on each shift.

22. The side rails and cleats or rungs on ladders must be kept clean and free of lines, hoses, cables, wires, oil, grease and debris.

23. A double cleat ladder shall be installed if the ladder is to provide the only means of access or exit from a working area for 25 or more employees, or simultaneous two-way traffic is expected.

24. Ladders with broken or missing rungs, steps that are broken or have split side rails or are otherwise faulty shall not be used.
25. Portable ladders shall be equipped with non-slipping bases, or otherwise secured to prevent displacement.
26. Persons shall not work off of the top two rungs of a stepladder or sit on the top of the ladder.
27. Step rises must not exceed 12" and all stairs must be uniform in rise and run.
28. Step treads must be a minimum of 11" for evacuation routes and have a 36" width. All others are to have a minimum tread length of 8" and a width of 22".
29. Every flight of stairs having 4 or more risers must be equipped with a standard stair railings or standard handrails.
30. Vertical clearance above any stair tread to an overhead obstruction must be at least 7 feet measured from the leading edge of the tread.

MBUSI EMERGENCY ACTION PLAN

In all emergencies, the following priorities must be observed:

- A. Safety of Plant personnel and the public
- B. Protection of Plant property
- C. Protection of the environment
- D. Restoration of normal operations.

The Emergency Action Plan is to ensure Team Members are made aware and able to identify potential safety, environmental, emergencies, as well as procedures and response actions to emergencies during the course of MBUSI operations.

This plan must be used to delineate responsibilities and safety measures for Team Members before, during and after emergency conditions, also in restoring operations to normal settings as safely and expeditiously as possible after the emergency.

DEFINITIONS AND SPECIFIC RESPONSIBILITIES

Area Maintenance Group Leaders must identify and designate trained Team Members (TMs) to remain to shut down some or all of the critical operations, where it is safe and possible to do so during an evacuation. All designated TMs remaining behind to shut down critical systems or utilities must be capable of recognizing when to abandon the

operation or task and evacuate the area. These Team Members must be restricted to the actions that are consistent with their training level.

Emergency Action Plan Implementation - The Emergency Services Coordinator (ESC) implements the Emergency Action Plan (EAP). Specific answers to questions or further explanation about elements of the plan should be directed to the MBUSI Safety Department.

Emergency Action Team - Firefighting professionals (Red Shirts) and other personnel trained in the core knowledge and skills to function in a capacity to provide assistance for which they are qualified.

Emergency Gathering Focal Point - One of the Emergency Gathering Points that has been designated a Focal Point. The words "Focal Point" are indicated on designated numbered Emergency Gathering Point green signs.

Emergency Gathering Point - Predetermined locations designated by a numbered sign signifying Emergency Gathering Point.

Emergency Gathering Point Head Count Coordinator - Team Member designated for taking a head count of Team Members at their designated Gathering Point.

Emergency Information Coordinator - Authorized Specialist, or member of management authorized to act or appoint a spokesperson to speak on behalf of the Company to the media. The Emergency Information Coordinator is the Manager of the Communications Department.

Emergency Medical Response Incident - An onsite incident where a person is injured requiring medical aid and assistance.

Emergency Services Coordinator (ESC) - The individual in the MBUSI Safety, Security and Medical Department responsible for the organization, management, and function of the fire and rescue organization. The ESC must view the Emergency Action Plan document annually. The ESC, or their delegate, is authorized to order an evacuation or shutdown of the operations. The ESC must coordinate the annual drills for evacuation and shelter. The ESC must act as liaison to MBUSI management to keep them informed of developing situations and relay pertinent information.

Evacuation/Shelter Coordinator - The designated Team Member(s) assigned to assist occupants (including those with disabilities or non-English speaking) and ensure complete evacuation of area, department or shop. They must check conference rooms, equipment rooms, restrooms, etc. to ensure a complete evacuation of the buildings. They must not endanger themselves by entering hazardous areas.

First Action Team Members - The designated Team Members assigned to respond and provide assistance for which they are qualified. They must commence search and rescue operations for missing Team Members if conditions allow, and if the Incident Coordinator determines a search can be conducted safely.

Focal Point Head Count Coordinator – The Emergency Gathering Point Head Count Coordinator at one of the Emergency Gathering Points that has been designated a Focal Point. The Focal Point Head Count Coordinator collects the assigned Emergency Gathering Point Head Count Coordinators' paperwork to resolve any discrepancies about who is accounted for and who is not. All headcount discrepancies must be forwarded to Security via 205-507-1111.

Hazardous Material Release – The release or spill of any substance, item, agent or material (i.e. biological, chemical, explosives, flammable and combustible substances, poisons, and radioactive materials) that is hazardous and could adversely affect the safety of humans or the environment.

Incident Coordinator (IC) – The incident coordinator conducting operations in connection with the extinguishment and control of any fire, explosion, hazardous materials incident, natural disaster, rescue, and/or other emergency must have authority to direct all operations of fire extinguishment, mitigation of a hazardous materials incident, natural disaster, rescue, and/or control and to take necessary precautions to save life, protect property, and prevent further injury or damage.

Incident Investigation Team – Team Members assigned to determine an incident's cause and develop possible countermeasures.

Medical Service Providers – The medical professionals who provide initial care in the on-site medical clinics and act as gatekeepers to control access to other medical services.

Pre-Determined Emergency Gathering Point Coordinator – The designated personnel responsible for completing the paperwork of who is present and who is not from the other Evacuation Coordinators arriving at the Emergency Gathering Point. The Pre-Determined Emergency Gathering Point Coordinator assigns a courier to deliver the paperwork to the assigned Emergency Gathering Focal Point.

Security Dispatcher – The designated personnel available 24 hours a day, 7 days a week, receives the in-Plant emergency phone number calls and responsible for notifying the appropriate personnel via a call list.

Shelter – Severe weather shelters designated to provide secure, safe enclosures for protection against natural disasters such as tornados, and storms. Shelters have visible signs.

Shop Safety Department Representative – Designated Team Member contact in the various production operations in the MBUSI facility. They are the source of information regarding the Emergency Action Plan or associated duties under the Emergency Action Plan.

Spill or Incident – Is an occurrence where a hazardous material is spilled, or its container is damaged to such an extent that the contents can be expected to be released with the potential to cause injury to people or harm the environment.

DESCRIPTION

A. Risk Identification and Prevention

1. New Equipment and Processes

All new facility additions, new equipment, materials and new or modified processes must be reviewed by the Safety Department and the Environmental Engineering Department. The review must include an assessment of new risks to the safety of Plant personnel and the public, protection of the environment, and protection of Plant property. Appropriate controls must be implemented to prevent or minimize these risks. Foreseeable control failures must be anticipated/considered for emergency contingency planning purposes.

2. Shop Walk-Throughs

The MBUSI Safety Department (or their contract service supplier) must walk-through the Plant, looking for potential hazardous conditions or practices. Any issues must be resolved and documented.

3. Environmental Site Inspections

In addition to the Safety Department walk-throughs, the Environmental Engineering Department performs several Best Management Practice (BMP) site inspections. The purpose of these BMP's is to look for potentially hazardous conditions from an environmental perspective or circumstances where the environment could be impacted negatively. For additional information, see the Environmental Engineering Department work instruction procedures.

B. Emergency Reporting Procedures

1. Informing the appropriate personnel of the presence of an emergency is one of the first and most important aspects of the Emergency Action Plan. Notification of emergencies may be made by telephone. Emergency reporting must be as follows:

<u>Extension # / Cellular Phone</u>	<u>User</u>
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All Emergencies	1111 205-507-1111
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Calls go to the Security Dispatcher. The Security Dispatcher must then notify the proper personnel depending on the nature of the emergency.

2. Upon being notified of an incident, the Security Dispatcher must classify the incident using the table listed below and notify the appropriate Emergency Action Team Members and the ESC, or if the ESC is not available, the IC, using the following safety guidelines:

Level	Fire/ Explosion	Chemical Spill	Transportation	Medical
1	<u>Very minor</u> - Small amount of flammable liquid spilled.	<u>Minor spill</u> 1-10 gallon size or low potential for hazardous exposure.	wreck/ derail - no leak	<i>Not life threatening</i> - first aid, superficial cut, twisted ankle, etc.
2	<u>Minor</u> - Up to one gallon of flammable liquid spilled.	<u>Moderate spill</u> 10-55 gallons or hazardous exposure possible.	Leaking RR car or truck - minor leak	<i>not life threatening but immediate response needed</i> - bleeding, head injury, person conscious,
3	<u>Major</u> - One gallon or more of flammable liquid spilled.	<u>Large spill</u> - greater than 55 gallons or possible danger to life and health.	Overtaken truck or rail car, vehicle, etc.	<i>life threatening</i> - cardiac arrest, amputation, profuse bleeding, unconsciousness, or fatality.

Color Code	Action
Red	Plant wide - <i>all</i> Emergency Action Team Members are needed immediately at site of emergency.

Yellow	Need additional help – available personnel respond if not otherwise involved.
Green	Only local emergency action personnel needed - all others standby.

C. Emergency Alarms

1. The means of reporting and notifying of emergencies for MBUSI will normally be by telephone.
2. The emergency telephone number (extension 1111 or 205-507-1111) is posted in conspicuous locations on or near telephones.
3. The plant alarm system must be used to notify Team Members if evacuation or taking shelter is necessary.
4. Different alarm sounds are used to represent a particular situation. There is alarm sound for:
 - a. Evacuation – Ex: Fire Emergency
 - b. Shelter – Ex: Weather Emergency
 - c. “All Clear”

D. Emergency Evacuation

1. Exiting the buildings
 - a. Once an evacuation order is made by the ESC, or if the ESC is not available, the IC, the emergency alarm system is activated and Team Members should exit the building using the closest exit to their location.
 - b. If an exit is blocked or inaccessible, use a safe alternate exit route.
 - c. Team Members should walk when evacuating unless they are in the path of immediate danger.
 - d. Team Members should proceed directly to their assigned emergency gathering point and report to the emergency gathering point head count coordinator.
2. Evacuation Coordinators
 - a. Assigned to assist and ensure a complete evacuation.
 - b. Administration, Production Operations, and external buildings department management must designate Team Members to act as Evacuation Coordinators, to ensure all occupants have exited the area and to notify the Gathering Point Coordinators of their safe exit from the facility.
 - c. Team Members, who are hosting visitors, are responsible for ensuring their guests have exited the area and notifying the Gathering Point Coordinators of their safe exit from the facility.

- d. Area Maintenance Group Leaders must assign which of their designated Team Members must stay to shut down critical operations, where safe and possible to do so, during an evacuation.
- e. Team Members must remain at the gathering point until the ESC, or the IC, has given the order for the “All Clear” alarm to be sounded.
- f. Contractor/Suppliers are responsible for developing an emergency action plan, the plan should include designating a gathering point location for their personnel, shelter in place locations, also for reporting any head count discrepancies to MBUSI Security/Safety Office.

E. Emergencies

1. Medical Emergency

- a. Team Members observing or being made aware of a medical emergency, must first call the Security Dispatcher at extension number 1111 or 205-507-1111 giving specific information as to the situation and exact location of the emergency.
- b. The Security Dispatcher will announce on the Security Channel the appropriate level and code for First Action Team Members to respond.
- c. First Action Team Members must respond and provide assistance for which they are qualified.
- d. Medical Service Providers must provide medical services and/or decide if outside medical services are required. If so, they must inform Security of transportation requirements.
- e. Transportation assistance, such as ambulance transport, advanced life support, etc., must be summoned, as needed, by Security.
- f. Security personnel must direct/escort incoming emergency personnel and vehicles to the scene by the most efficient route.

2. Contagious Disease Emergency

- a. If a Team Member is at the facility and has symptoms of a contagious disease, MBUSI Medical Department must follow the Centers for Disease Control and Prevention’s (CDC) protocol.

1) If there is a confirmed contagious disease case, the MBUSI Communications Department would activate their Crisis Communications Plan.

b. If the Team Member is not at the Plant and reports symptoms of a contagious disease, the Team Member is called at home with the recommendation to see their family physician and instructions to not return to the Plant without a full documented medical release.

3. Fire/Explosion Emergency

a. All fires, regardless of severity, must be reported to the Dispatcher by calling number 1111 or 205-507-1111 by cell phone.

b. Team Members trained in incipient fire response should attempt to extinguish incipient fires. (Compressed gas fires should not be extinguished with a fire extinguisher or water.)

c. The ESC, or IC, must determine the extent of an evacuation (shop specific or facility wide) as necessary.

4. Hazardous Materials Emergency

a. Team Members observing or being made aware of a hazardous material release, must notify their area Group Leader/Team Leader, giving specific information as to the situation and exact location of the incident.

b. If the Group/Team Leader decides the incident meets the following criteria, the situation is designated as an emergency and they should call the Security Dispatcher:

1) Cannot be safely cleaned up locally by trained personnel.

c. Typical hazardous materials are:

1) Acids, bases, compressed gases, or isocyanates.

2) Flammable liquids.

3) Chemicals exhibiting unusual behavior (fuming, smoking, giving off heat).

4) Chemical cannot be identified.

5) Situations that may be deemed immediately dangerous to life, health, the property or the environment.

Note: Action should be avoided until the product is identified and hazards known. No action should be taken if product cannot be identified and/or personnel cannot perform control action safely.

d. If a hazardous material release has occurred, the Team Member(s) should retreat to a safe distance (uphill and upwind) and maintain perimeter control, if possible, until relieved by a First Action Team Member.

e. If necessary, the ESC or IC must arrange for First Action Team Members to assist with containment.

f. Security is responsible for maintaining perimeter control over the hazardous material release area.

g. The ESC, or IC, must contact the Security Dispatcher who will contact Environmental/Facilities. Environmental/Facilities will arrange for the prompt response of the environmental services provider.

5. Severe Weather/Natural Emergency

a. Security Department monitors weather conditions through subscription services, the National Weather Service and the Tuscaloosa County Emergency Management Agency weather alert service. Security must contact the ESC, or IC, if severe weather is approaching.

1) Tornado

If a tornado watch is announced one person is assigned to watch the approaching storm system. If a tornado is spotted and/or a tornado warning is designated, Security will sound the shelter alarm.

2) Flash Flooding

If flash flooding is predicted and Team Members are not asked to stay home, the ESC, or if the ESC is not available the IC, must decide if the flooding is too dangerous to send Team Members home due to the water depth and/or current.

3) Earthquake/hurricane

In this area of Alabama, earthquakes and hurricanes are unpredictable. If we experience these events, it is important that all Team Members take cover (Ex. desks, benches or other protective horizontal surfaces) from falling objects.

6. Criminal Activity Emergency

a. Upon observation, threat, or notification of possible criminal activity on- site, Team Members should immediately call Security

at extension 1111 or 205-507-1111 by cell phone (or extension 2177 for non-urgent situations) giving nature of circumstance and exact location of the incident. This may include physical violence, verbal threats, witnessed theft, etc.

1) Types of Criminal Activity

(a) Bomb Threat

The Team Member who receives outside phone calls should be trained in receiving bomb threats and notify the Security Dispatcher. Security must send an officer to question the responding Team Member using the bomb threat checklist. The Security Dispatcher must also notify the appropriate personnel regarding the threat. The MBUSI Emergency Services Coordinator, or IC, must determine the extent of the evacuation necessary.

Workplace Violence

(1) MBUSI is committed to working with Team Members to maintain a work environment free from violence, threats of violence, harassment, intimidation, and other disruptive behavior. MBUSI understands that predicting an outbreak of workplace violence is difficult. As a result, preparation by management and cooperation of all Team Members is essential.

(2) Weapons

Weapons are not permitted on MBUSI's properties, in MBUSI vehicles or at MBUSI sponsored functions off-site unless they are an integral part of a specific job involving Security and approved by the CEO and President or unless otherwise permitted by state law. If a Team Member or visitor appears to violate that weapons regulation, Security must be promptly notified. Security must immediately call the City of Tuscaloosa Police Department as appropriate.

a. A weapon is defined by MBUSI as any device designed specifically to inflict harm. It includes but is not limited to:

1. Any firearm
2. Any knife with a locking blade over 3.5 inches long.
3. Any club filled with dense material (Billy club, pipe filed with lead)
4. Any explosive material

b. Having a current State of Alabama Pistol Permit does not authorize carrying a firearm concealed or open on MBUSI property.

c. Bringing a firearm onto MBUSI property for the purpose of selling is not authorized.

d. A disassembled firearm, which could be reassembled, is considered a weapon and prohibited on MBUSI property.

e. Only the CEO and President can authorize a person involved with Security to carry a concealed weapon. Authorization can only be given upon proof of valid, current permit from the County Sheriff Department.

f. Signs prohibiting weapons must be posted at entrances to the property (i.e. parking lot, building, etc.)

g. Facility searches

1. MBUSI reserves the right to conduct investigations, which may include searches of Team Members and their personal effects when it reasonably suspects the presence of weapons. Entry upon Company property shall constitute consent to searches and inspections.

2. Failure by a Team Member to cooperate fully in any aspect of an MBUSI sanctioned search may result in discipline up to and including termination of employment.

3. All personal items such as pockets, packages, bags, brief cases, lunch boxes, purses, tool boxes, or other belongings or items being brought onto or being removed from MBUSI premises are subject to inspection by MBUSI or its authorized agents at any time.

4. Likewise, all MBUSI assigned property such as motor vehicles, lockers, desks, etc., is subject to inspection by MBUSI at any time.

5. Team Member's vehicles are subject to search while on MBUSI premises or when entering or leaving MBUSI's premises subject to applicable state laws.

6. Access - Any access to areas of this facility not considered public (parking lot, lobby, etc.) must be sponsored by a member of management.

a) Any Team Member entering the facility during a scheduled shift is considered sponsored by his or her Supervisor. Access outside of scheduled times must have specific approval by a member of management.

b) Vendors, contractors, service personnel, etc. must have a sponsor to gain access to the facility.

c) Any Team Member is authorized and encouraged to courteously question the identity of someone in their area whom they do not recognize or appears unauthorized. If the Team Member remains suspicious, he or she should immediately inform their Supervisor, if not available,

another member of management. The Team Member should never attempt to remove an unauthorized person.

Violent behavior

Any unwelcomed physical contact between two people, regardless of their employment status, which is intended to incite anger, fear and intimidation, actually inflicts harm or results in causing injury or illness is considered an act of violence and a violation.

- a. If two or more people are involved in an altercation and one person's actions were clearly aggressive while all others were clearly defensive, the aggressor would be in violation.
- b. If two or more people are involved in a physical altercation, defense cannot be claimed by a Team Member if he or she had a reasonable belief that previous actions by the aggressor predicted an act of violence and those actions were not reported to the Supervisor.
- c. Horseplay, which could or does result in injury or illness to another person may be considered an act of violence.
- d. Any acts of violence, harassment or intimidation must be promptly reported to a Supervisor or other member of management.
- e. Any information which would help MBUSI prepare for a violent episode from an outside source (such as an abusive spouse of a Team Member or an ex-Team Member who has made threats) must be reported to a Supervisor or other member of management immediately.
- f. Any person displaying violent tendencies or acts must be reported to a supervisor or other member of management. If time permits, the police or the most qualified person on site should be involved. All issues other than personal safety and security must be secondary during a potential violence episode.

Follow up - If a workplace violence incident has occurred, the following steps should be taken:

- a. TMs need to contact the Security Dispatcher, who notifies the ESC and must dispatch security to the scene.
- b. Security must respond promptly to immediate dangers to personnel and the workplace.
- c. The security officer must investigate threats and other reported incidents.

- d. Take threats and threatening behavior seriously. TMs may not step forward with their concerns if they think that their concerns will be dismissed.
- e. Deal with the issue of what may appear to be frivolous allegations (and concerns based on misunderstandings) by responding to each report seriously and objectively.
- f. If necessary, the investigator or officer must notify the Security Dispatcher if additional security personnel and/or First Action Team members are required at the scene or outside responders are required.
 - 1) The security officers are to secure the area, maintain crowd and traffic control, preserve evidence and conduct interviews.
- g. First Action Team Members, Supervisors and/or Human Resources must support victims and other affected workers after an incident.
- h. Supervisors must attempt to bring the work environment back to normal after the incident.

Confined Space Rescue Emergency

- a. The precautions and procedures outlined in our written Confined Space Entry program are designed to ensure our Team Members are safe while working in permit spaces. Under no circumstances do we expect our Team Members to enter a permit space where hazards have not been eliminated or effectively controlled.
- b. Additionally, we recognize that unexpected situations might arise that prevent entrants from self-rescue. If the entrant cannot self-rescue, the Confined Space Attendant notifies the Security Dispatcher.
- c. Any immediately dangerous to life or health atmosphere must require an emergency rescue team at the permit required confined space. The rescue team must be a minimum of a four-person team.
- d. Emergency rescue procedures must be planned before entering a confined space.
- e. Medical Service Providers and Fire Safety must also be available and certified in first aid and CPR to perform medical services outside the permit-required confined space.
- f. The required personal protective equipment and rescue equipment must be provided and available at the confined space entry point.
- g. Simulated rescue operation training must be conducted every 12 months using mannequins or persons from the actual or representative permit spaces.
- h. To facilitate non-entry rescue, retrieval systems or methods must be used whenever an authorized entrant enters a permit required confined

space, unless the equipment would increase the risk of entry or would not contribute to the rescue of the entrant. Retrieval systems must meet the following requirements.

- 1) Each authorized entrant must use a full body harness with a retrieval line attached at the center of the back near shoulder level.
- 2) The other end of the retrieval line must be attached to a mechanical device or fixed point outside the space capable of supporting the intended load. The retrieval line may be omitted if the Entry Supervisor determines that the retrieval line may pose a safety hazard.
- 3) A mechanical retrieval device must be used to retrieve persons from vertical spaces more than 5 feet deep.

Civil Disorder (Riot) Emergency

- a. In the event of civil disorder emergency, TMs are to report the incident to the Security Dispatcher at extension # 1111 or by cell phone at 205-507-1111.
- b. Additional assistance, such as medical, fire department, law enforcement, etc., must be summoned as needed by the ESC or IC.

Environmental Release to Air/Ground/Biohazard Threat/ Radiological Emergency

- a. In the event of an accidental environmental release TMs are to report the incident to the Security Dispatcher at extension # 1111 or cell phone at 205-507-1111.
- b. Additional assistance, such as medical, fire department, law enforcement, etc., must be summoned as needed by the ESC or IC.

Fall Rescue Emergency

- a. First Action Team rescuers must be trained and authorized to act in the event of a fall rescue emergency.
- b. Rescue equipment and plans must be immediately available for this location (ladders, aerial devices, elevating work platforms, tripods, additional harnesses, controlled descent devices, winches, pulleys, etc.)
- c. Rescue should be within 15 minutes of the occurrence of a fall to minimize the risk of further injury or death due to suspension trauma.
- d. The suspended worker must use a means of communication such as cell phone, verbal or physical communication with the rescue team.

Utilities Emergency

- a. Electrical loss of power
 - 1) In the event of an electrical loss of power the ESC, or IC, must determine if there is a need to evacuate, take shelter

or remain in the building. Most power losses are short term and Team Members are safer if they remain in place. If the power outage is expected to exceed the capabilities of emergency lighting, then the Team Members must be evacuated.

2) After power is restored, the ESC, or IC must direct the “All Clear” signal. The ESC or IC must direct the systematic start-up of process/equipment per operating procedures. TM(s) involved in the incident must document their activities and ensure all emergency equipment is restored to readiness state.

b. Natural gas leaks

1) In the event of a natural gas leak, TMs are to report the incident to the Security Dispatcher at extension # 1111 or cell phone at 205-507-1111.

2) Additional assistance, such as medical, fire department, law enforcement, etc., must be summoned as needed by the ESC or IC.

c. Water/Sewer line incident

1) In the event of a water/sewer line incident, TMs are to report the incident to the Security Dispatcher at extension # 1111 or cell phone at 205- 507-1111.

2) Additional assistance, such as medical, fire department, law enforcement, etc., must be summoned as needed by the ESC or IC.

12. Transportation Incidents

a. Railroad

1) In the event of a railroad incident, TMs are to report the incident to the Security Dispatcher at extension # 1111 or cell phone at 205-507-1111.

2) Additional assistance, such as medical, fire department, law enforcement, etc., must be summoned as needed by the ESC or IC.

b. Highway

1) In the event of highway incident, TMs are to report the incident to the Security Dispatcher at extension # 1111 or cell phone at 205-507-1111. The Dispatcher must then notify the proper personnel of this emergency.

2) Additional assistance, such as medical, fire department, law enforcement, etc., must be summoned as needed by the ESC or IC.

F. Post Emergency Site Assessment

Prior to Team Members being allowed to the site or in a specific building after an emergency, a safety and/or environmental assessment must be made of the affected areas to determine overall safety and/or environmental conditions. The assessment team must be comprised of representatives from the Safety Department, the Engineering Department, the Environmental Department and MBUSI Senior Management. Security must sound the "All Clear" signal per instructions from the ESC, or the IC. In the aftermath of a tornado or severe weather, Security must conduct a visual inspection of the Plant's exterior to assess any damage that may have occurred.

G. Post Action Review

Prior to leaving the scene of a Level I occurrence, a post-action review of individual actions and significant factors concerning the incident should be conducted by the ESC with the IC and First Action Team Members. For Level II and Level III incidents, it may be more appropriate to conduct this review away from the scene.

H. Post Action Reports

1. After the incident has been stabilized, an incident report must be completed. An Incident Investigation Team must be assigned to determine the incident's cause and develop possible countermeasures.

2. A Level III incident requires complete documentation of all circumstances and photographs of incident aftermath may be necessary. Engineering, Production, Maintenance and Safety must establish a joint investigative team. The investigative team must review all evidence and circumstances of the incident and complete an official report.

3. All investigative reports must be submitted to the Safety Manager.

a. Level I and II reports are due on the next business day after the incident.

b. Level III reports are due within 1 week.

c. If the reports cannot be submitted within the time period, that which is available shall be submitted and a request for more time shall be made.

I. Training

1. Emergency Action Teams

Emergency Action Team Members must be familiar with the MBUSI Emergency Action Plan and have trained to implement the plan should an emergency condition occur.

2. Team Members

All MBUSI Team Members are trained on emergency procedures during new hire orientation and as required thereafter. annually thereafter.

3. Supervisors

All Supervisors and other select management personnel must receive training on workplace security strategies.

4. Drills

Safety and Security Manager coordinates evacuation drills annually.

5. Generalized training in the EAP must be given to address the changes in the layout or design of the MBUSI facility that affect evacuation routes, or when new types of hazards are introduced that require special action (new equipment, new hazardous materials, new processes).

J. Release of Information to the Media

1. Coordination between the MBUSI Safety Department, Environmental and the Communications Departments, regarding the release of information to the public and media, is essential.

2. All information to the public and media must pass through and be cleared by the Emergency Information Coordinator.

3. Misinformation or failure to consider all factors before commenting to the public or media could adversely affect the emergency mitigating activities proceeding at the scene of the emergency, as well as the long-term interests of MBUSI. See the MBUSI Crisis Communication Plan (MBUSI Confidential) for additional information.

K. Emergency/Plant Operations Announcements

1. When emergency conditions may jeopardize the safety of Team Members, the MBUSI Management Team must consider a Plant closing. MBUSI should also utilize a dedicated telephone number that should give specific information about the Plant closing.

2. The emergency/plant operations announcement can be accessed by dialing 877-698-3261 or by accessing the website - www.mbusi.com/teamzone.

3. In circumstances where adverse weather conditions may cause dangerous conditions to homeward bound Team Members, information must be distributed through management to notify all Team Members of such conditions.

4. TMs must be responsible to inform their respective Supervisor of their unavailability for work due to weather conditions as far in advance as possible. Should prior notice not be possible (e.g. inoperable phone system), TMs must make notification as soon as possible after communications systems have been restored.

5. Reopening of Plant operations will be decided by the MBUSI Management Team and will be communicated via emergency announcements.

Fire Prevention Plan

Roles and Responsibility

A. Management

Management determines the MBUSI fire prevention plan and protection regulations and policies. Management will provide adequate controls to provide a safe workplace and will provide adequate resources and appropriate fire safety training to its Team Members (TMs) to encourage fire prevention and the safest possible response in the event of a fire emergency. Notification must be sent to the Safety Department when changes in operations will potentially increase the risk of fire.

B. Plan Administrator

The Safety Department shall manage the Fire Prevention Plan for MBUSI and shall maintain all records pertaining to the plan. The Plan Administrator shall also:

1. Develop and administer the MBUSI fire prevention training.
2. Ensure that fire control equipment and systems are properly maintained.
3. Control fuel source hazards.
4. Conduct fire risk surveys and make recommendations.

Plan Implementation

A. Good Housekeeping

To limit the risk of fires, TMs shall take the following precautions:

1. Minimize the storage of combustible materials.

2. Make sure that door, hallways, stairs and other exit routes are kept free of obstructions.
3. Dispose of combustible waste in covered, airtight, metal containers.
4. Use and store flammable materials in well-ventilated areas away from ignition sources.
5. Use only nonflammable cleaning products.
6. Keep incompatible (i.e. chemically reactive) substances away from each other.
7. Perform hot work in controlled and well-ventilated areas.
8. Keep equipment in good working order (inspect electrical wiring and keep motors and machine tools free of dust and grease).
9. Ensure that heating units are safeguarded.
10. Report all gas leaks immediately. The Facility Maintenance Department shall ensure that all gas leaks are repaired immediately upon notification.
11. Notify Security so that flammable liquid leaks can be repaired and cleaned up.
12. Keep work areas free of dust, lint, scraps and similar material.
13. Do not rely on extension cords if wiring improvements are needed and take care not to overload circuits with multiple pieces of equipment.
14. Ensure that required hot work permits are obtained.
15. Turn off electrical equipment when not in use.

B. Maintenance

The respective shop maintenance departments will ensure that equipment is maintained according to manufacturers' specifications. MBUSI will also comply with requirements of the National Fire Protection Association (NFPA) codes for specific equipment. Only properly trained individuals shall perform maintenance work.

The following equipment is subject to the maintenance, inspection and test procedures:

1. Equipment installed to detect fuel leaks, control heating and control pressurized systems;

2. Portable fire extinguishers, automatic sprinkler systems and fixed extinguishing systems;
3. Detection systems for smoke, heat or flame;
4. Fire alarm systems;
5. Emergency backup systems and the equipment they support.

Types of Hazards

The following sections address the major workplace fire hazards at MBUSI's facilities and the procedures for controlling the hazards.

A. Electrical Fire Hazards

Electrical system failures and the misuse of electrical equipment are leading causes of workplace fires. Fires can result from unsecured ground connections, wiring with frayed insulation or overloaded fuses, circuits, motors or outlets.

To prevent electrical fires, TMs shall:

1. Make sure that worn wires are replaced.
2. Use only appropriately rated fuses.
3. Never use extension cords as substitutes for wiring improvements.
4. Use only approved extension cords (ex: Underwriters Laboratory).
5. Check wiring in hazardous locations where the risk of fire is especially high.
6. Check electrical equipment to ensure that it is either properly grounded or double insulated.

B. Portable Heaters

Portable electric heaters shall have tip-over protection that automatically shuts off the unit when it has overturned. There shall be adequate clearance between the heater and combustible furnishings or other materials at all times.

C. Office Fire Hazards

Fire risks are not limited to MBUSI's industrial facilities. Fires in offices have become more likely because of the increased use of electrical equipment, such as computers and copy machines. To prevent office fires, TMs shall:

1. Avoid overloading circuits with office equipment.
2. Turn off nonessential electrical equipment at the end of each workday.
3. Keep storage areas clear of flammable material.

4. Ensure that extension cords are not placed under carpets.
5. Ensure that area is 5S condition.

D. Cutting, Welding and Open Flame Work

The responsible maintenance department will ensure the following:

1. All necessary hot work permits have been obtained prior to work beginning.
2. Cutting and welding are done by authorized personnel in designated cutting and welding areas whenever possible.
3. Adequate ventilation is provided.
4. Torches, regulators, pressure-reducing valves and manifolds are UL listed or Factory Mutual (FM) approved.
5. Oxygen-fuel gas systems are equipped with listed and/or approved backflow valves and pressure-relief devices.
6. Cutters, welders and helpers are wearing eye protection and protective clothing as appropriate.
7. Cutting or welding is prohibited if sprinkler protection is out of service.
8. Cutting or welding is prohibited on metal walls, ceilings or roofs build of combustible sandwich-type panel construction or having combustible covering.
9. Cutting or welding is prohibited where explosive atmospheres of gases, vapors or dusts could develop from residues or accumulations in confined spaces.
10. Confined spaces such as tanks are tested to ensure that the atmosphere is not over ten percent (10%) of the lower flammable limit (LFL) before cutting or welding in or on the tank.
11. Small tanks, piping or containers that cannot be entered are cleaned, purged and tested before cutting or welding on them begins.
12. Fire watch has been established.

E. Flammable and Combustible Materials

Certain types of substances can ignite at relatively low temperatures or pose a risk of catastrophic explosion if ignited. Such substances obviously require special care and handling.

1. Class A combustibles

These include common combustible materials (wood, paper, cloth, rubber and plastics) that can act as fuel and are found in non-specialized areas such as offices.

To handle Class A combustibles safely:

- a. Dispose of waste daily;
- b. Keep trash in metal-lined receptacles with tight-fitting covers (metal wastebaskets that are emptied every day do not need to be covered).
- c. Keep work areas clean and free of fuel paths that could allow a fire to spread.
- d. Keep combustibles away from accidental ignition sources, such as hot plates, soldering irons or other heat of spark producing devices.
- e. Store paper stock in metal cabinets.
- f. Store rags in metal bins with self-closing lids.
- g. Do not order excessive amounts of combustibles.
- h. Make frequent inspections to anticipate fires before they start.

Water, multi-purpose dry chemical (ABC), and Halon 1211 are approved fire extinguishing agents for Class A combustibles.

2. Class B combustibles

These include flammable and combustible liquids (oils, greases, tars, oil-based paints and lacquers), flammable gases and flammable aerosols.

To handle Class B combustibles safely:

- a. Use only approved pumps, taking suction from the top, to dispense liquids from tanks, drums, barrels or similar containers (or use approved self-closing valves or faucets).
- b. Do not dispense Class B flammable liquids into containers unless the nozzle and container are electrically interconnected by contact or by a bonding wire. Either the tank or container must be grounded.
- c. Valve stem must be detached from aerosol can before disposal.
- d. Store, handle and use Class B combustibles only in approved locations where vapors are prevented from reaching ignition

sources such as heating or electric equipment, open flames or mechanical or electric sparks.

e. Do not use a flammable liquid as a cleaning agent inside a building (the only exception is in a closed machine approved for cleaning with flammable liquids).

f. Do not use, handle or store Class B combustibles near exits, stairs or any other areas normally used as exits.

g. Do not weld, cut, grind or use unsafe electrical appliances or equipment near Class B combustibles.

h. Do not generate heat, allow an open flame or smoke near Class B combustibles.

i. Know the location and how to use the nearest portable fire extinguisher rated for Class B fire.

Water should not be used to extinguish Class B fires caused by flammable liquids. Water can cause the burning liquid to spread, making the fire worse. To extinguish a fire caused by flammable liquids, exclude the air around the burning liquid. The following fire extinguishing agents are approved for Class B combustibles: carbon dioxide, multi-purpose dry chemical (ABC), halon 1301 and halon 1211. (NOTE: Halon has been determined to be an ozone-depleting substance and is no longer being manufactured. Existing systems using halon can be kept in place.)

3. Class C Electrical Fires

Class C fire extinguishers are only to be used for fighting fires caused by electrical equipment including appliances, outlets, wiring and circuit breakers. It is essential to remember that water must not be utilized as the risk of an electric shock is great.

F. Smoking

Smoking is prohibited in all MBUSI buildings and unauthorized areas. Designated smoking areas provided on property and are labeled as such for use.

G. Storage of Flammable Liquids

To limit the risk of fires, TMs should take the following precautions:

1. Minimize the storage of flammable liquids outside approved flammable cabinets to the approximate amount > or equal to 1 day of production. Five (5) gallon containers can be stored outside approved storage cabinets as long as they are not stored on line.

2. Make sure any materials with a 2 or greater in the flammable section of the HMIS label or the flammable pictogram per the Globally Harmonized System (GHS) Standard and in excess of the 1 day usage amount, is stored in an approved/grounded flammable storage cabinet(s).
3. Maintain flammable chemicals in closed and labeled containers, either line side or in flammable storage cabinets.
4. Use and store flammable materials in well-ventilated areas away from ignition sources.
5. Keep incompatible (i.e. chemically reactive) substances away from each other.
6. Perform hot work in controlled and well-ventilated areas.

Training

A. The Safety Department shall present basic fire prevention training to all TMs upon employment, and documentation shall be maintained of the training, which includes:

1. Types of fires, types of fire suppression equipment and their location. Identify limitations and proper care and maintenance of fire suppression equipment.
2. Review of Emergency Action Plan, including how it can be accessed;
3. This Fire Prevention Plan, including how it can be accessed;
4. Good housekeeping practices;
5. Proper response and notification in the event of a fire;
6. Recognition of potential fire hazards.

B. Group Leaders shall train TMs about the fire hazards associated with the specific materials and processes to which they are exposed and appropriate self-protection. TMs will receive this training:

1. At their initial assignment;
2. When changes in work processes necessitate additional training.

C. Contractors/Suppliers will furnish their own UL/FM approved pressurized/charged portable fire extinguishers meeting NFPA 10 inspection requirements.

- Fire Prevention/Reporting
 - a. Flammable liquids brought on the site must be in an approved safety can. A safety can has a spring-closing lid and a spout cover that is designed to relieve internal pressure. A protective wire mesh is required to prevent flashback.

- b. All flammable liquids such as fuels, paint thinner, solvents, etc. must be stored in an area approved by MBUSI Safety.
- c. Do not smoke, use open flames or use spark producing tools/equipment around flammable or combustible materials.
- d. All flammable and combustible liquid containers shall be grounded and, when dispensing, the containers must be bonded.
- e. Do not block or obstruct fire response equipment (extinguishers, hoses, manual pull alarms, sprinklers, control valves, etc.).
- f. Impairments to or work activities conducted on and may affect fire protection systems must be approved prior to starting work activities.
 - 1. MBUSI Safety/Security must be notified.
 - 2. Safe-Work Permit and a Facilities impairment tag must be completed
- g. Explosion proof motors/equipment and non-sparking tools are required in hazardous locations (paint mix, paint spray booths, hazardous materials storage, tank farm, vehicle fueling station, etc.) unless an MBUSI Hot Work Permit is obtained and conditions of the Permit are maintained.
- h. Do not prop open fire-rated doors.

Contractors/Suppliers Welding and Cutting Safety

- 1. Do not run hoses and weld leads through doorways.
- 2. Protective clothing required for welding and cutting must be worn as required.
- 3. All work must have a separate and an adequate grounding.
- 4. Do not leave the rod in the electrode holder when not in use.
- 5. Do not exceed 15 PSI on the torch side of the gauge when using acetylene.
- 6. Do not use matches or cigarettes to light a torch.

7. Flashback arrestors shall be installed on all fuel gas cylinders or built into the regulators.
8. Welding screens will be placed and secured to prevent exposing adjacent workers to the arc.
9. Work areas may require barricading to prevent personnel from exposure to sparks or slag.
10. Appropriate eye protection/shields/shaded lenses must be worn for cutting or welding operations.
11. Ensure all combustibles are at least 35ft from the hot work area or covered by a fire blanket. Fire blankets cannot contain asbestos materials.
12. The work area must be under fire watch surveillance for 30 minutes after the job is completed, or longer if so determined by MBUSI Safety/Security.
13. A Hot Work Permit must be obtained and clearly posted at the area of welding, burning, etc. This Permit requires that the nearest fire hose, extinguisher, fire alarm and telephone locations are known.
14. Do not start welding or burning without the proper Hot Work Permit. Failure to do so will result in immediate removal from the site.
15. The Hot Work Permit is good for one shift not to exceed 12 hours.
16. Propane fueled welding machines may not be used indoors unless special permission is obtained from MBUSI Safety.

MANAGED FALL PROTECTION

Team Members and contractors engaged in outdoor or indoor work activities and duties that expose them to potential falls from elevations of four (4) feet or more to a surface below in inspection and maintenance situations; six (6) feet or more in construction or construction-related activities; or to dangerous machinery/areas from any height.

Plan Description

A. DEFINITIONS

Anchorage - a secure point of attachment for lanyards or deceleration devices. Must be capable of supporting at least 5000 pounds or designed by a Qualified Professional Engineer for the intended load and usage. Lifelines anchor connections must be designed by a Qualified Professional Engineer.

Authorized Person - A person assigned by the employer to perform duties at a location where the person will be exposed to a fall hazard.

Body harness - a strap that is secured about a TM in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

Buckle - any device for holding the body belt or body harness closed around the TM's body.

Carabiner - metal loop with a spring-hinged side that can quickly and reversibly connect components in safety-critical systems. A climber carabiner is different from those used in fall protection.

Clearance - the distance required to prevent a TM from striking the next level or any other obstruction below.

Competent person - means a person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as in their application and use with related equipment.

Connector - a device which is used to couple (connect) parts of the personal fall arrest system and positioning device systems together. It may be an independent component of the system, such as a carabiner, or it may be an integral component of part of the system (such as a buckle or D-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

Controlled access zone (CAZ) - an area in which certain work may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems and access to the zone is controlled.

Dangerous equipment - equipment (such as corrosive tanks, degreasing units, machinery, electrical equipment and other units) which, as a result of form or function, may be hazardous to TMs who fall onto or into such equipment.

Deceleration device - any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on a TM during fall arrest.

Deceleration distance - the additional vertical distance a falling TM travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of the TM's body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the TM comes to a full stop.

Failure - means load refusal, breakage or separation of component parts. Load refusal is the point where the ultimate strength is exceeded.

Fall Protection Plan - Employers engaged in leading edge work and/or precast concrete construction work who can demonstrate that it is infeasible or creates a greater hazard to use conventional fall protection systems should develop and follow a Fall Protection Plan.

Floor Hole - a gap less than 12" but more than 1" in its least dimension.

Free fall - means the act of falling before a personal fall arrest system begins to apply force to arrest the fall.

Free fall distance - the vertical displacement of the fall arrest attachment point on the TM's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur. Free fall distance must not exceed six (6) feet. Any free fall of six feet or greater requires a Qualified Person to review the plan.

Guardrail system - a barrier erected to prevent TMs from falling to lower levels. This system includes a toeboard, midrail and top rail able to withstand 200 pounds of force applied in any direction.

Infeasible - means that it is impossible to perform the work using a conventional fall protection system (i.e., guardrail system, safety net system, or personal fall arrest system) or that it is technologically impossible to use any one of these systems to provide fall protection.

Lanyard - a flexible line of rope, wire rope or strap which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline or anchorage.

Leading edge - the edge of a floor, roof or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional

floor, roof, decking or formwork sections are placed, formed or constructed. A leading edge is considered to be an "unprotected side and edge."

Lifeline - a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline) and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Lower levels - those areas or surfaces to which a TM can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures or portions thereof.

Mechanically-aided rescue - A strategy or procedure, planned in advance, to retrieve safely a TM who has fallen from an elevated work surface using mechanical means.

Mechanical equipment - means all motor or human propelled wheeled equipment used for roofing work.

Opening - a gap or voids 30 inches (76 cm) or higher and 18 inches (48 cm) or more wide, in a wall or partition, through which TMs can fall to a lower level.

Personal fall arrest system - a system used to arrest a TM in a fall from a working level. It consists of an anchorage, connectors, or body harness and may include a lanyard, deceleration device, lifeline or suitable combinations of these. The maximum arrest force experienced by each TM using a fall arrest system shall not exceed 1,800 lbs.

Positioning device system - a body harness system rigged to allow a TM to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.

Rescue Plan - A strategy or procedure, planned in advance, to retrieve safely a TM who has fallen from an elevated work surface and is suspended in a full body harness, to include self-rescue or mechanically aided rescue.

Rope grab - a deceleration device which travels on a lifeline and automatically, by friction, engages the lifeline and locks so as to arrest the fall of a TM. A rope grab usually employs the principle of inertial locking, cam/level locking or both.

Roof - the exterior surface on the top of a building.

Safety-monitoring system - a safety system in which a Competent Person is responsible for recognizing and warning TMs of fall hazards.

Self-retracting lifeline/lanyard - a deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal TM movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

Snap-hook - a connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook

to receive an object and, when released, automatically closes to retain the object. Snap-hooks are generally one of two types:

1. The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection; or
2. The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection. **The use of a non-locking snap-hook as part of personal fall arrest systems and positioning device systems is prohibited at MBUSI.**

Toeboard - a low protective barrier that will prevent the fall of materials and equipment to lower levels and provide protection from falls for TMs, usually 4 inches or greater in height (3.5 inches in construction).

Unprotected sides and edges - any side or edge (except at entrances to points of access) of a walking/working surface, e.g.: floor, roof, ramp, or runway, where there is no wall or guardrail system at least 42 inches high.

Walking/working surface - any surface, whether horizontal or vertical on which a TM walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which TMs must be located in order to perform their job duties.

Warning line system - a barrier erected on a roof to warn TMs that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of guardrail or safety systems to protect TMs in the area.

Work area - that portion of a walking/working surface where job duties are being performed.

DUTIES

1. Competent Person

- a. The Competent Person shall be responsible for the immediate supervision, implementation and monitoring of a Fall Protection Plan. The Competent person shall verify that Authorized Persons who work at heights are trained and authorized to do so and shall review with the Authorized Persons before work begins the fall protection and rescue procedures for the workplace activities.
- b. The Competent Person shall prepare, update, review and approve written Fall Protection Plans.
- c. The Competent Person shall establish the clearance requirements for each fall protection system and verify that available clearance is adequate before Authorized Persons are permitted in the workplace.

- d. The Competent Person shall have the authority to stop the work immediately if it is determined that it is unsafe
- e. The Competent Person shall participate in the investigation of all incidents related to falls from heights.
- f. The Competent Person shall immediately remove from service all personal fall arrest systems and components that are damaged or subjected to forces of arresting a fallen person.
- g. The Competent Person shall periodically inspect all fall protection equipment at the frequency required by the manufacturer and applicable regulations.

2. Authorized Person

- a. The Authorized Person shall properly use, inspect, maintain, store and care for their fall protection equipment and systems.
- b. Prior, to each use, the Authorized Person shall inspect all fall protection equipment they use for defects or damage; shall notify the Competent Person of those defects and damage and shall avoid using such equipment.

C. FALL PROTECTION PROCEDURES

1. General Requirements

Written fall protection procedures should be required whenever one or more Authorized Persons are routinely exposed to any fall hazard that is protected by active fall protection systems.

2. Fall Protection Locations

Fall protection is required wherever the potential to fall four (4) or more feet to the ground or to the next lower level during the course of normal work duties or a fall of six (6) or more feet to the ground or to the next lower level when working on construction-related activity.

D. ELIMINATING AND CONTROLLING FALL HAZARDS

1. Fall Protection Hierarchy

The following hierarchy or preferred order of control shall be used to choose methods to eliminate or control fall hazards. The fall protection hierarchy shall be considered when designing fall protection solutions for both existing and new facilities. The methods listed below are in decreasing order of preference.

- 1. Elimination or Substitution. Removing the hazard or hazardous work practices such as:
 - 1) Engineered systems that bring the work down to the TM.
 - 2) Installing stairs and guardrails early in a construction project.
 - 3) Tool extensions that allow TMs to perform work from the ground.

4) Building objects on the ground then raising them into position.

2. Passive Fall Protection. Isolating or separating the hazard or hazardous work practice from TMs or others such as: guardrails, handrails, walls, covers, scaffolding, railings, vertical netting and fencing.

- c. Fall Restraint. Securing the Authorized Person to an anchorage using a lanyard short enough to prevent the person's center of gravity from reaching the fall hazard. Fall restraint is a form of active fall protection.
- d. Fall Arrest. A system designed to stop an Authorized Person after a fall has begun and decelerate and prevent the TM from hitting a lower level surface. Fall arrest is a form of active fall protection.
- e. Administrative Controls. Work practices or procedures that signal or warn an Authorized Person to avoid a fall hazard such as: training, warning lines, signs, lights, sounds and monitoring.

2. General Requirements for Fall Protection Systems

- a. All components used in a fall protection or rescue system shall be (re-) certified (within a time period not to exceed five (5) years) and be used in a way that is consistent with the manufacturer's / professional engineer's instructions.

1) For components not addressed by a manufacturer's inspection requirements, the components shall be visually inspected, as a minimum, in a manner and frequency specified by the engineer designing the active fall protection system. The frequency of inspection shall not exceed one year.

2) The recertification process shall include a review of the original documents prepared for the system and their continued applicability. At a minimum, the following criteria shall be considered:

- a) Changes in the hazards and tasks that are addressed by the active fall protection system.
- b) Changes in regulations, standards or other factors affecting the active fall protection system.
- c) Feedback from a representative sample of the Competent Persons and Authorized Persons of the fall

b. Types of Fall Protection Systems

- 1) Articulating man lifts – This system is provided with a restraint system and full body harness to anchor point below the waist, preferably at the floor level.

- 2) Guardrails - This system includes a toeboard, midrail and toprail able to withstand 200 pounds of force applied in any direction.
- 3) Personal fall arrest systems.
 - a) Anchor points rated at 5,000 pounds, 3,600 pounds if engineered/certified by a Qualified Person.
 - b) Full body harness
 - c) Restraint system or lanyard
 - d) Shock absorbing lanyard
 - e) Retractable lifeline
 - f) Rope grabs with vertical lifelines
 - g) Connectors (self-locking snap-hooks and carabineers)
- 4) Horizontal Lifeline Systems.
 - a) Horizontal lifeline systems must be designed and approved by a Qualified Professional Engineer.
 - b) Horizontal lifeline systems must be engineered to have appropriate anchorages and line strength.
 - c) The systems must be designed to hold the number of individuals that will be connected to it and clearance must be considered within the design of the system to ensure it will be effective.
 - d) Durability to hold a fallen person suspended until rescue can occur must also be a consideration within the design of the system.
 - e) Must meet all ANSI Fall Protection and OSHA requirements whichever is most stringent.
 - f) Must be approved by MBUSI Safety before use.
- 5) Red curtain Silhouettes
 - a) For elevated areas with an open edge that cannot be guarded because of pinch point issues, 4 feet or greater, red curtain silhouettes are required to be installed a minimum of 6 feet from an unguarded edge.

- b) Fall arrest anchors or Fall restraint anchors must be installed for fall protection without the worker entering the red curtained zone.
- c) “Fall Protection Required” sign or icon is required.
- d) Silhouette must be installed on walking surface unless infeasible. If infeasible, a significantly different walking surface must be installed to warn personnel they have entered a fall protection zone.

6) Controlled Access Zones (CAZ)/Safety Monitors.

- a) CAZ and warning line systems are to be used when other fall protection methods create a greater hazard or the area is too large for AND **MUST BE AUTHORIZED BY MBUSI SAFETY.**
- b) If a CAZ or warning line system is used it must comply with the following:
 - (1) A safety monitor will be used.
 - (2) All leading edge work will require 100% tie off.
 - (3) All work outside of the CAZ or a warning line system that is exposed to a fall will require 100% fall protection.
- c) The Safety Monitor:
 - TMs that perform the duties of Safety Monitor must comply with the following guidelines:
 - (1) Be competent to recognize fall hazards and proper fall protection equipment usage.
 - (2) Warn the TM when it appears the TM is unaware of a fall hazard or is acting in an unsafe manner.
 - (3) Be on the same walking/working surface and within visual vicinity distance of the TM being monitored.
 - (4) Be close enough to communicate orally with the TM.

- (5) Not have other responsibilities that could take the Safety Monitor's attention from the monitoring function.
- (6) Verify that mechanical equipment is not used or stored in areas where safety monitoring systems are being used to monitor
- (7) TMs engaged in roofing operations will always require a safety monitor.

c. Inspection of Fall Protection Systems

Fall protection and fall rescue equipment shall be inspected on a regular basis not to exceed one (1) year by a competent Person. The following criteria will be utilized to maintain all equipment in good working condition:

1) Full Body Harnesses:

a) Inspect before each use.

- (1) Closely examine all of the nylon webbing to ensure there are no burn marks, which could weaken the material.
- (2) Verify there are no torn, frayed, broken fibers, pulled stitches, or frayed edges anywhere on the harness.
- (3) Examine D-ring for excessive wear, pits, deterioration or cracks.
- (4) Verify that buckles are not deformed, cracked and will operate correctly.
- (5) Check to see that all grommets (if present) are secure and not deformed from abuse or a fall.
- (6) Harness should not have additional punched holes.
- (7) All rivets should be tight, not deformed.
- (8) Check tongue/straps for excessive wear from repeated buckling.
- (9) Check for absence or illegibility of markings or tags.
- (10) Check for any other condition that calls to question the suitability of the equipment for its intended purpose.

- b) Annual inspection of all harnesses will be completed by a Competent Person and documentation will be maintained on file.
- c) Storage of harnesses will be in a manner that will prevent damage. Damaged hardware or in need of maintenance should not be stored in the same area as usable equipment and must have a red "DO NOT USE" tag attached to the buckle.
- d) All harnesses that are involved in a fall will be destroyed.

2) Lanyards/Shock Absorbing Lanyards

- a) Inspect before each use.
 - (1) Check lanyard material for cuts, burns, abrasions, kinks, knots, broken stitches and excessive wear.
 - (2) Inspect the snap hooks for hook, lock and eye distortion.
 - (3) Check carabineer for excessive wear, distortion and lock operation.
 - (4) Ensure that all locking mechanisms seat and lock properly.
 - (5) Once locked, locking mechanism should prevent hook from opening.
 - (6) Visually inspect shock absorber for any signs of damage, paying close attention to where the shock absorber attaches to the lanyard.
 - (7) Verify that the points where the lanyard attaches to the snap hooks are free of defects.
 - (8) Check for absence or illegibility of markings or tags.
 - (9) Check for any other condition that calls to question the suitability of the equipment for its intended purpose.
- b) Annual inspection of all lanyards will be completed by a Competent Person and documentation will be maintained on file.
- c) Storage will consist of storing in a manner to prevent from damage. Damaged hardware or in need of maintenance should not be stored in the same area as usable equipment.

- d) All lanyards that are involved in a fall will be taken out of service.
- e) Free fall distance should be limited to six (6) feet or less.

3) Self-Retracting Lanyards

- a) Inspect before each use.
 - (1) Visually inspect the lanyard and unit to ensure there is no physical damage or any other condition that calls to question the suitability of the equipment for its intended purpose.
 - (2) Make sure all back nuts or rivets are tight.
 - (3) Make sure the entire length of nylon strap is free of any cuts, burns, abrasions, kinks, knots, broken stitches and excessive wear and retracts freely.
 - (4) Test the unit by pulling sharply on the lanyard to verify that the lock mechanism is operating correctly.
 - (5) If manufacturer requires, make certain the retractable lanyard is returned to the manufacturer for scheduled annual inspections.
- b) Annual inspection will be conducted by a Competent Person with documentation maintained on file.
- c) Service per manufacturer specifications.
- d) Inspect for proper function after every fall.

4) Tie-off Adaptors/Anchorages

- a) Inspect for integrity and attachment to solid surface.
- b) The finish of all hardware shall be clean and free of scale, rust and deposits of foreign matter.
- c) Annual inspection of all tie-offs and anchorages by a Competent Person and documentation maintained on file.
- d) All tie-offs and anchorages will be destroyed and replaced after a fall.
- e) Anchorages should be located directly above a TM to eliminate swing falls, wherever it is

reasonably practical to do so. Where it is not reasonably practical to prevent swing falls, the swing-drop distance shall not exceed 4 feet; the free fall distance should be limited to six (6) feet or less.

- 5) Horizontal Lifelines
 - a) Inspect before each use for structural integrity of line and anchors.
 - b) Annual inspection by Competent Person.
 - c) Permanent Systems – Annual structural inspection will be completed by a Competent Person with future frequency defined on condition and controls present.
- 6) Guardrails
 - a) Temporary systems – Daily visual inspections will be completed by a Competent Person.
 - b) Temporary systems – Weekly, a complete structural inspection will be completed by a Competent Person.
- 7) Storage and Maintenance of Fall Protection Equipment
 - a) Personal fall arrest equipment shall not be stored in the bottom of tool boxes or exposed to weather elements.
 - b) Hang equipment in a cool dry location in a way that retains its shape.
 - c) Always follow manufacturer recommendations for inspection.
 - d) Clean equipment as per manufacturer recommendations.
 - e) Never dry using heat or sun exposure or use strong detergents in cleaning.
 - f) Never store equipment near heat, chemicals moisture or light.
 - g) Never store equipment in an area with exposures to fumes or corrosive elements.
 - h) Never use the equipment for any purpose other than personal fall arrest.
 - i) Once exposed to a fall, remove equipment from service immediately and secure a “Do Not Use” tag to the equipment.

- j) Damaged hardware or in need of maintenance should not be stored in the same area as usable equipment and must have a red “DO NOT USE” tagged attached.

E. FALL INVESTIGATION

All fall investigations will be conducted by the Safety Department and the competent person with input from Group/Team Leaders.

F. TRAINING AND EVALUATIONS

All components and methods used for fall protection and rescue training shall meet applicable legislation, standards and acceptable engineering practices. Training and evaluations for fall protection and rescue shall be documented and retained per MBUSI standards.

1. Qualified person

- a. Be trained by a Qualified Person trainer or have significant practical experience as determine by MBUSI.
- b. The following areas must be covered in training:
 - 1) Fall hazard elimination and controls methods.
 - 2) Applicable fall protection regulations.
 - 3) Responsibilities of designated persons under this Plan.
 - 4) Inspection of equipment and components.
 - 5) Preparing fall hazard surveys.
 - 6) Selecting fall protection systems.
 - 7) Developing engineering system standards.
 - 8) Determining system clearance requirements.
 - 9) Designing and selecting anchorages.
 - 10) Determining when fall protection systems are infeasible.
 - 11) Designing new and evaluating existing horizontal lifelines.
 - 12) Assessing system component compatibility.
 - 13) Fall protection system assessments and determining when a system is unsafe.
 - 14) Analyzing various anchorages.
 - 15) Developing written fall protection procedures and rescue procedures.
 - 16) Determining fall impact forces.
 - 17) Investigating incidents and near misses.

2. Competent person

a. The following areas must be covered in training:

- 1) Fall hazard elimination and controls methods.
- 2) Applicable fall protection regulations.
- 3) Responsibilities of designated persons under this Plan.
- 4) Inspection of equipment and components.
- 5) Preparing fall hazard surveys.
- 6) Selecting fall protection systems.
- 7) Determining system clearance requirements
- 8) Determining when fall protection systems are infeasible.
- 9) Assessing system component compatibility.
- 10) Fall protection system assessments and determining when a system is unsafe.
- 11) Analyzing various anchorages.
- 12) Investigating incidents and near misses.

3. Authorized Person

a. Be trained by a Competent Person or Qualified Person.

b. The following areas must be covered in training:

- 1) Fall hazard recognition.
- 2) Fall hazard elimination and controls method.
- 3) Applicable fall protection regulations.
- 4) Responsibilities of designated persons under this Plan.
- 5) How to use written fall protection procedures.
- 6) Inspection of equipment components and systems before use.
- 7) Fall protection rescue procedures.

4. Retraining is required when:

- a. There is a change in fall protection requirements.
- b. There is a change in fall protection procedures.
- c. When TM proficiency is in doubt.
- d. When accidents or close calls occur.

G. CONTRACTOR FALL PROTECTION REQUIREMENTS

1. All fall protection must be pre-planned.

2. A competent person or qualified person will plan the fall protection. The fall protection plan should be in the area of the ongoing work for reference. The plan is required for any fall protection that utilizes fall restraint, fall arrest, administrative controls or other non-conventional/passive fall protection. Plans must be submitted and MBUSI safety will need 5 days to review. Dependent on the number of fall protection plans MBUSI may issue permits to be kept in the work area for larger jobs. For jobsites with fewer plans, an email from MBUSI Safety will be sent approving the fall protection plan. MBUSI Safety will choose which method to use for the jobsite.
3. The fall protection plan will include the following:
 - a. Location of job
 - b. Company name
 - c. Date the plan was prepared or modified
 - d. Plan prepared by name
 - e. Plan approved by name
 - f. Plan supervised by (competent or qualified person)
 - g. Document why conventional fall protection cannot be used (elimination, substitution, and passive fall protection)
 - h. Equipment to be used and the owner/user manuals
 - i. Clearance calculation
 - j. Free fall distance
 - k. Anchorage points identified
 - l. Rescue planning (rescue must occur within 15 minutes)
 - m. Connector compatibility (side loading possible)
 - n. Review with the authorized workers of the fall protection plan indicating legibly printed names and signatures
4. Any horizontal lifelines will require approval from MBUSI Safety. Approval will require a copy of the manufacturer's instruction manual. If the system is an engineer designed system, the system will require the qualified person's notes and calculations. Submit all horizontal

lifeline information 5 working days before its intended use to MBUSI Safety.

5. Any free fall over 6' requires a qualified person to approve the system.
6. Contractors/Suppliers working at heights must have fall protection procedures in their safety manual.
7. All fall protection equipment must be inspected monthly by a competent person and before use by any user.
8. Any personal fall protection equipment on-site requires that the manufacturer's documentation be available on-site for review.
9. Calculated Clearances requires the accounting of:
 - a. Connector length
 - b. Deceleration distance (worst case scenario)
 - c. Harness stretch (1 foot min.)
 - d. Personal energy absorber deployment (full deployment)
 - e. Rope stretch
 - f. Deflection of horizontal lifeline systems
 - g. Worker height
 - h. All calculations require 2 additional feet of safety clearance
 - i. Swing fall
 - j. Any other factor that adds to the vertical distance required to prevent the fall protection equipment user from striking the below level or the ground.
10. Fall restraint must prevent the user's center of mass from being exposed to a fall.
11. Anchorage capacity for a fall restraint system must be three times the user's total weight.
12. A full body harness must be used for restraint systems.
13. 100% tie-off is required at the MBUSI site. Any transitions require that the user be tied off properly.
14. A full body harness with a shock absorbing lanyard (lanyards must be secured to an anchor point capable of supporting 5,400 pounds dead weight) will be required to be worn and tied off when working on the following:

- a. Sloping roofs.
 - b. Flat roofs without handrails and within 6 feet at the edge or roof opening.
 - c. Any suspended platform or cage.
 - d. Any scaffold with incomplete handrails or decking.
 - e. Ladders near the edge of roofs and floor openings, or when working off ladders with a fall distance greater than 4 feet when assembling and disassembling scaffolding.
15. Two lanyards are required to assure 100% tie-off during exit/entry of aerial transport devices.
16. All rails, doors, barricades, to lifts, etc. must be closed and properly secured when lifts are occupied and elevated. Barricaded rails or doors require barricade signage and must be taped off.
17. All overhead equipment must be inspected before use and removed from use if found to be defective.

Contractors/Suppliers

1. The following is the preferred hierarchy in order of use to eliminate or control hazards (from most desirable to least desirable):
- a. Elimination or Substitution – Examples: lowering work surface to ground level or changing a process that eliminates the fall hazard.
 - b. Passive Fall Protection – Isolating or separating the hazard or hazardous work practice. Examples: Guardrails, covering floor openings, physical barricades that deny access to hazard.
 - c. Fall Restraint – Securing the authorized person to an anchorage using a lanyard short enough to prevent the person's center of gravity from reaching the fall hazard.
 - d. Fall Arrest – A system designed to stop an authorized person from contacting a lower level.
 - e. Administrative Controls – Signs, training and procedures, light or sounds that warn an authorized person to avoid a fall hazard. Controls must be approved by MBUSI Safety.
2. All fall protection using fall restraint, fall arrest, or administrative controls must be pre-planned. The Fall Protection plan must be approved by MBUSI Safety and may take up to five business days for review.
3. A competent person or qualified person will plan the fall protection. The fall protection plan must be attached to the work hazard analysis. The plan is required

for any fall protection that utilizes fall restraint, fall arrest, administrative controls or other non-conventional fall protection.

4. The fall protection plan will include the following:

- a. Location of job
- b. Company name
- c. Date the plan was prepared or modified
- d. Plan prepared by name
- e. Plan approved by name
- f. Plan supervised by (competent or qualified person)
- g. Document why conventional fall protection cannot be used (elimination, substitution, and passive fall protection)
- h. Equipment to be used
- i. Clearance calculation
- j. Free fall distance
- k. Anchorage points identified
- l. Rescue planning (rescue must occur within 15 minutes)
- m. Connector compatibility (side loading possible)
- n. Review with the authorized workers of the fall protection plan indicating legibly printed names and signatures

5. Any horizontal lifelines will require approval from MBUSI Safety. Approval will require a copy of the manufacturer's instruction manual. If the system is an engineer designed system, the system will require the qualified person's notes and calculations. Submit all horizontal lifeline information 5 working days before its intended use to MBUSI Safety.

6. Any free fall over 6 feet requires a qualified person to approve the system.

7. Contractors/Suppliers working at heights must have fall protection procedures in their safety manual.

8. All fall protection equipment must be inspected monthly by a competent person and before use by any user.
9. Any personal fall protection equipment on-site requires that the manufacturer's documentation be available on-site for review.
10. Calculated Clearances requires the accounting of:
 - a. Connector length
 - b. Deceleration distance (worst case scenario)
 - c. Harness stretch (1 foot min.)
 - d. Personal energy absorber deployment (full deployment)
 - e. Rope stretch
 - f. Deflection of horizontal lifeline systems
 - g. Worker height
 - h. All calculations require 2 additional feet of safety clearance
 - i. Any other factor that adds to the vertical distance required to prevent the fall protection equipment user from striking the below level or the ground.
11. Fall restraint must prevent the user's center of mass from being exposed to a fall.
12. Anchorage capacity for a fall restraint system must be three times the user's total weight.
13. A full body harness must be used for restraint systems.
14. 100% tie-off is required at the MBUSI site. Any transitions require that the user be tied off properly.
15. A full body harness with a shock absorbing lanyard (lanyards must be secured to an anchor point capable of supporting 5,400 pounds dead weight) will be required to be worn and tied off when working on the following:
 - a. Sloping roofs.
 - b. Flat roofs without handrails and within 6 feet at the edge or roof opening.

c. Any suspended platform or cage.

d. Any scaffold with incomplete handrails or decking.

e. Ladders near the edge of roofs and floor openings, or when working off ladders with a fall distance greater than 4 feet when assembling and disassembling scaffolding.

16. Two lanyards are required to assure 100% tie-off during exit/entry of aerial transport devices.

17. Under work areas, red barricades shall be placed on all sides to warn and control pedestrian approach. Flashing lights will be required in areas devoid of good illumination.

18. All rails, doors, barricades, to lifts, etc. must be closed and properly secured when lifts are occupied and elevated. Barricaded rails or doors require barricade signage and must be taped off.

19. All overhead equipment must be inspected before use and removed from use if found to be defective.

20. All operators of JLG's, skylifts, etc. must be trained and authorized in their use.

21. A minimum of 15 feet of clearance must be maintained from overhead power lines.

Hearing Conservation Program (29 CFR 1910.95 Noise Exposure)

This procedure covers all TMs that may be exposed to noise levels equal to or greater than 85 decibels (A scale, slow response, eight-hour time weighted average).

Responsibility

- The Hearing Conservation Program will be administered by the MBUSI Medical Department and the Safety Department.
- Each department is responsible for supervising the hearing conservation program and will do the scheduling of audiograms that are deemed necessary.
- MBUSI production management will enforce the wearing of hearing protectors by all TMs where required.
- Violations of this procedure will be handled according to MBUSI Corrective Action Procedure.

Program Definitions

Definitions

Sound - The rate of these oscillations are measured in cycles per second (Hertz); one hertz equals one cycle per second (cps). The pitch of a sound depends upon the frequency of a sound and the response of the human ear. Sound is a pressure or energy wave through a medium, such as air, caused by the vibration of a surface.

Baseline Audiogram - The first audiogram of the TM. Within six (6) months of a TM's first exposure at or above 85 dBA, a valid baseline audiogram must be obtained. The audiogram provides a baseline against which changes, if any, can be measured. It also serves to identify individuals with existing hearing problems, which may be amenable to correction by medical treatment or which may become aggravated, if neglected, and result in the loss of trained workers or in litigation. The initial audiogram can also identify those with good hearing required for particular jobs. Exception: Baseline audiogram must be obtained within one (1) year where mobile testing vans are used.

Testing Frequencies - Audiometric tests shall be pure tone, air conduction, hearing threshold examinations with test frequencies as a minimum to include 500, 1000, 1000, 3000, 4000 and 6000 Hertz (Hz). Tests at 8000 Hz are also recommended if the audiometer is so equipped.

Audiometer Calibration - Calibration performed per the ANSI Specification for Audiometers S3.6 or equivalent.

Time of Test - An individual's hearing threshold can be temporarily reduced by exposure to high noise levels including off-the-job exposure. This temporary threshold shift can adversely affect audiometric test results unless a sufficient interval of time has occurred to allow recovery between the last high noise exposure and the test. This interval is generally recognized to be no less than 14 hours. The most accurate results would be obtained on the first day back to work after 2-day off (weekend), provided the employee has not had high noise exposure during this period (hunting, mowing the lawn with a power mower, listening to loud music, etc.). It is essential that the test be given before the employee enters any high noise area during the work shift.

Recording Test Results - Audiograms are to be recorded and filed in the employee's personal medical folder.

Audiometer Specification - Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) which meet the American National Standard (ANS) Specification for Audiometers, S3.6 or equivalent.

Noise - is classically used to describe unwanted or annoying sounds. The use of the term 'noise' is most frequently used to express opinions regarding certain kinds of music or sounds which are extremely loud by anyone's standards. For the purposes of this document, noise will be sound levels considered to pose a hazard to hearing, communication, and an annoyance to the nearby community.

Standard Threshold Shift (STS) – A change in the hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000 and 4000 Hz in either ear.

Hearing Loss - a reduction in measurable hearing sensitivity.

Noise-Induced Hearing Loss - a reduction in hearing sensitivity, either temporary or permanent, caused by exposure to loud noise.

Temporary Hearing Loss - a recoverable hearing loss due to sensory fatigue as a result of exposure to loud noise. Sometimes referred to as a temporary threshold shift (TTS) in hearing sensitivity.

Permanent Hearing Loss - an irreversible hearing loss.

Permissible exposure limit - for noise for an 8-hour shift, per OSHA, is 90 dBA. When exposure is more or less than 8 hours, the permissible exposure limits are adjusted accordingly.

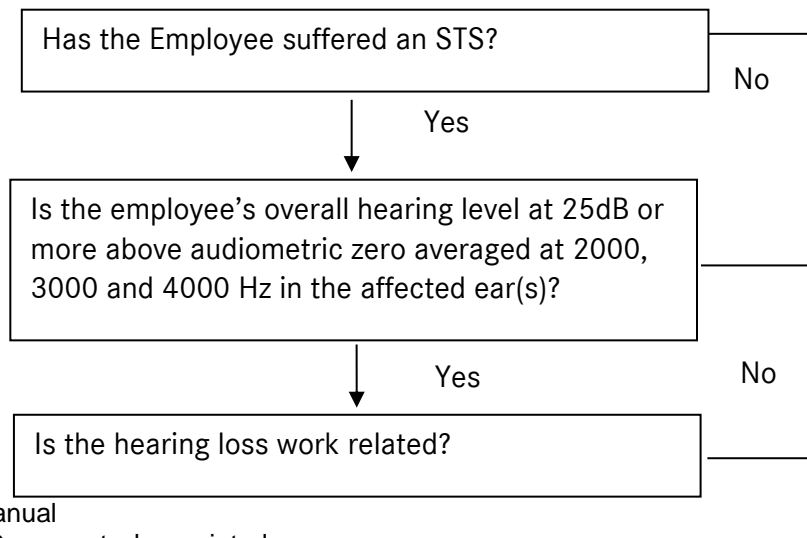
Occupational Hearing Loss - a loss in hearing sensitivity, either temporary or permanent, caused by exposure to noise in the workplace. This is in contrast to non-occupational hearing loss caused by hobbies such as hunting, motorcycling, and listening to loud music.

Presbycusis - a reduction in hearing sensitivity due to aging. The rate of hearing loss can be estimated only. An allowance is made for this naturally occurring process when determining threshold shifts.

Action level - an 8 hour time weighted average of noise exposure equal to or greater than 85 decibels measured on the A scale, slow response. If noise exposure is at the action level, the following conservation provisions apply:

- Providing hearing protection,
- Training in the use of protectors,
- Providing annual audiometric testing for all potentially exposed team members

OSHA Recordkeeping – Decision tree for recordable STS





Standard Threshold Shift (STS) - A change in the hearing threshold relative to the baseline audiogram of an average of 10dB or more at the 2000, 3000, and 4000 Hz in either ear.

PROCEDURES

Noise Surveys

After an initial plant wide noise survey is conducted, area noise surveys will be conducted by an industrial hygienist under the following conditions;

- New equipment installation or modification of existing equipment that may alter existing noise levels.
- Every three years

TM Monitoring

TM monitoring will be conducted, at a minimum, when information indicates an exposure may equal or exceed the action level. The purpose of the monitoring is to identify a TM or groups of TMs in a job category for inclusion in the hearing conservation program. Once included in the hearing conservation program, follow-up monitoring will be done whenever a change in production, process, equipment or controls changes noise exposures.

Engineering and Administrative Controls

- Engineering controls
 - Engineering controls is the primary means to reduce noise exposures. MBUSI has a philosophy to use engineering controls to minimize the addition of equipment capable of generating noise.
 - Hearing protection is prescribed as an interim control before engineering changes are made or on a permanent basis when engineering is not feasible.
 - All new equipment must not elevate existing noise levels. For new processes, area and/or operator work zone cannot exceed 80 dBA as measured at worker location as well as any other areas where personnel may be present (Maintenance zones, dedicated aisles, etc.)
 - The scope of MBUSI noise reduction requirements shall be applied against industry norms. In the event where a vendor/supplier will install equipment/processes where noise

control is infeasible, the vendor/supplier shall notify MBUSI Engineering and MBUSI Safety for review and waiver approval.

- Administrative controls
 - If engineering controls are not adequate to reduce noise levels below the permissible exposure limit, then administrative controls are considered. When feasible, high noise exposures will be rotated among several TMs to reduce the exposure of any one TM.
 - If engineering controls and administrative controls cannot reduce the noise exposures below 85 dBA, then hearing protection must be used. If all 3 cannot reduce the exposures below 85 dBA, then additional engineering controls and/or administrative controls must be used.

Hearing Protectors

- Selection and Use of Hearing Protectors

When the combination of engineering controls and administrative controls are not adequate to reduce the permissible TM exposure limit, the use of hearing protection must be used.

 - Hearing protectors are required at all times in designated areas. It is the responsibility of each TM to wear the appropriate level of protection. It is the responsibility of all supervisory personnel to ensure the hearing protectors are being properly worn.
 - Various types of hearing protectors are available at Central Stores. The two basic types provided include muffs and insert-type plugs.
 - Certain tasks not in designated areas require hearing protection. The following outlines general conditions under which hearing protectors shall be worn:
 - When a TM is exposed to an eight-hour time weighted average of 85 dBA or greater.
 - As a rule of thumb, if a TM has to raise their voice talking to someone at an arm's length away and the TM is in this condition for 8 hours, the TM is probably overexposed and should wear hearing protection.
- Noise Reduction Rating
 - All approved hearing protectors have a noise reduction rating (NRR). Knowing the NRR and the workplace noise level, proper selection can be made using the following rule of thumb:
 - $\text{Actual Noise Reduction} = (\text{NRR} - 7) / 2$
 - If quantitative analysis of hearing protection is available, the NRR can be used.
 - Using the above method, the hearing protection must attenuate TM exposure to a time-weighted average of 85 dBA or less.

Subtract the ANR from a noise exposure to calculate the Actual Noise Exposure.

If the Actual Noise Exposure with hearing protectors is above 85dBA, better or additional protection such as earmuffs must be used. As a rule of thumb, earmuffs can only subtract an additional 5dBA from the Actual Noise Exposure regardless of the NRR.

- Noise Hazard Warnings
 - Signs and Posting
 - At MBUSI, hearing protection areas are posted with placards indicating the mandatory use of hearing protection by anyone entering the area.
- Program Audits and Self-Inspection
 - The Safety Department will inspect various areas for compliance with the MBUSI Hearing Conservation Program.

Audiometric Testing

- Audiometric Testers
 - Audiograms must be performed according to OSHA standards.
 - Audiometric equipment calibration must be checked acoustically at least annually and exhaustively calibrated at least every 2 years.
 - Audiometric testers must be certified if they are to perform a manual Audiogram.
- Noise exposed TMs
 - All persons must receive pre-employment audiometric tests to establish baseline audiograms.
 - All TMs exposed to an eight- (8) hour time-weighted average (TWA) noise level of 85 dBA or greater regardless of protection must receive pre-placement and annual audiograms.
 - If TMs routinely work longer than 8 hr. shifts, then the TWA needs to be calculated to see if it exceeds 85 dBA.
 - TMs who routinely work in areas where noise may exceed 115 dBA or 140 dB impact shall receive pre-placement and annual audiometric tests regardless of their TWA.
 - NOTE 1 -Pre-placement tests are only required if an audiogram has not been performed within one (1) year. However, annual tests must be within a year of the last test.
 - Audiograms must be performed annually.
 - The Medical Department is responsible for supervising the hearing conservation program and will do the scheduling of audiograms that are deemed necessary.
 - The program will be provided at no cost to the TM.
 - Information on hobbies or outside employment which may contribute to noise exposure and any activities during the day or days preceding the test which could have high noise levels should be noted on an

audiometric questionnaire. The questionnaire is completed by the TM, prior to the audiometric test.

Interpretation of Audiograms

- Pre-employment Audiogram
 - Any applicant for employment in high noise level areas whose audiogram shows an average hearing loss at 500, 1000, 2000, and 3000 Hz greater than 25 dB should be evaluated by an otologist before being employed.
 - Consultation with the specialist will be at the expense of the applicant. Such referral may also be advisable for applicants whose audiograms show any unusual irregularity, particularly an abrupt loss of 40 dB or more at 2000 Hz and above.
 - In such cases, the otologist should establish the cause for this loss and indicate whether it is advisable for the applicant to work in noise levels above 85 dBA. If the otological examination cannot be obtained, the above degree of hearing loss may disqualify the applicant from employment in a high noise level environment.
 - Medical Rating - Final medical hearing impairment rating of an applicant referred to a specialist should not be made until the findings and recommendations of the specialist have been reviewed by the physician responsible for reviewing the pre-employment physical examination. Before a person with significant hearing loss is hired to work in a noisy area (levels above 85 dBA), the following points should be considered:
 - That MBUSI adequately document the pre-existing conditions for any potential future litigation.
 - That the applicant's hearing loss is not progressive nerve deafness. Only an ear specialist can usually determine this.
 - That the applicant, if hired, will have to wear adequate ear protection at all times in noisy areas to prevent additional loss.
 - That the applicant, if hired, will not create a safety hazard in noisy areas due to their inability to hear warning signals. If these points are satisfactorily resolved and the applicant is hired, the applicant should be given an appropriate hearing impairment numerical rating with the following comments: "Has significant hearing loss and must use adequate ear protection in noisy areas."
 - If an applicant with a significant hearing loss is being considered for a job that will not expose them to high noise levels, the applicant should be given a medical hearing impairment rating of '2' - "Has significant

hearing loss. Acceptable for position for which the applicant is being considered.”

- Evaluation of Audiogram
 - Each TM's annual audiogram must be compared to the baseline to determine if the audiogram is valid or standard threshold shift has occurred. The physician, audiologist, or otolaryngologist shall review the audiograms and determine if there is a need for further evaluation.
 - If comparison of the annual audiogram to the baseline audiogram indicates an STS, the TM shall be informed in writing within 21 days of the determination. In determining whether an STS has occurred, allowance should be made for the contribution of aging, refer to the OSHA 29 CFR 1910.95: Appendix F - “Calculations and Application of Age Corrections to Audiograms.”
 - In comparison to the baseline, if a TM's follow-up audiogram or repeat shows a downward shift of:
 - 10 dB or more at 2000, 3000, or 4000 Hz, in either ear
 - If a standard threshold shift has been determined, steps should be taken to conserve the TM's hearing. These steps are outlined in the Follow-up Procedures.
 - MBUSI may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.
 - The Audiogram Report
 - The physician records their interpretation of the test results and recommends further steps which should be taken to prevent significant hearing loss.
 - Temporary Threshold Shift
 - A significant hearing loss pattern on an audiogram may be a temporary threshold shift resulting from recent exposure to high noise levels.
 - If it is suspected that a progression in hearing loss might be due to a recent on-the-job noise exposure, the TM should be advised to have a repeat audiogram after being away from excessive noise levels for at least 14 hours.
 - If the repeat audiogram shows the same loss, steps should be taken to investigate the cause.
- Follow-up Procedures

An effective counseling and information program is an integral part of the hearing conservation program. It is important that the process of data release to the TM be carefully planned so that the notification is timely, the data is accurate, and the effect is positive. Furthermore, the appropriate management personnel must be advised to ensure that steps are taken to conserve TM hearing.

TM Notification - The TM must be informed in writing within 21 days of an STS determination. Unless a physician determines that the STS is not

work related or aggravated by occupational noise exposure, MBUSI must ensure that the following steps are taken:

- Conduct a noise evaluation of the worksite if not already available. If noise levels exceed 85 dBA, engineering and administrative controls should be considered to determine if practical and feasible.
- Require that TMs not using hearing protection be fitted and trained in their use.
- Require that TMs already using hearing protection be refitted and retrained in the use of the equipment. TMs may have to be provided with hearing protection, which offers greater attenuation and be retrained in the use thereof.
- The TM's Group Leader will receive a copy of the STS notification to insure the TM is re-trained and is using hearing protectors properly.
- Referral of a TM for a clinical audiological evaluation or otological examination, as appropriate, if additional testing is necessary or if MBUSI suspects that a medical pathology of the ear is caused or aggravated by the wearing of hearing protection.
- Inform the TM of the need for an otological examination if a medical pathology of the ear which is unrelated to the use of hearing protection is suspected.
- **Progressive Hearing Loss**
If progressive hearing loss in the speech range (500 to 3000 Hz) is found, local management should be advised regarding the possible transfer of a TM to a less noisy area.
- **Revised Baseline**
An annual audiogram may be substituted by the physician for the baseline audiogram when:
 - The STS is persistent or
 - The hearing threshold indicates significant improvement.

TM Training

- Affected TMs are given annual training in the Hearing Conservation Program. The training includes at least the following:
 - The effects of noise on hearing.
 - The purpose and use of hearing protection with the emphasis on the advantages of using hearing protection, attenuation, instructions on selection, fitting, use and care of hearing protection.
 - The purpose of audiometric testing.

Recordkeeping and TM Access to Records

- **Audiograms** - Audiograms are to be retained for the duration of employment.

Training Documentation

- Training records for each TM under the Hearing Conservation Program shall be retained for 3 years.

TM Exposure Monitoring Results

- TM noise exposure measurements must be retained for a minimum of 2 years.
- Copies of the OSHA standard must be made available to the TMs and a copy of the standard must be posted in the workplace.

Construction, Contractors, Suppliers Hearing Protection

1. Hearing Protection

- a. Hearing Protection must be used for all employees working within 20 feet of high noise activities (sawing, drills, jackhammers, etc.) and in all hearing protection posted areas. Any jobs/activities lasting more than 10 minutes in any one hour must be barricaded with yellow tape and posted with signage that states "Hearing Protection is Required." Contractors/Suppliers that conduct work activities that may expose MBUSI Team Members to noise levels exceeding 85 dBA must institute engineering controls.
- b. Face Shields are required when working with tar pots, molten lead, acids, grinding, power saws, etc.

Compressed Gas Safety Practices Program (29 CFR 1910)

Safe handling procedures for compressed gases

- 1.1. **Filling** - Containers shall not be filled except by the supplier of the cylinder or with the supplier's consent. Where filling is authorized, it shall be accomplished in accordance with Department of Transportation (DOT), Occupational Safety and Health Administration (OSHA), and Compressed Gas Association (CGA) regulations.
- 1.2. **Content identification**
 - 1.2.1. **Warning labels** - All TMs, whose work operations are or may be in an area where compressed gas may be utilized, shall be instructed in the recognition and use of warning labels. Warning labels are essentially warning devices and must be legible at all times. The following shall be addressed as a minimum:
 - 1.2.2. **Removal** - When a warning label is attached to a compressed gas cylinder, it is not to be removed without authorization of the person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.
 - 1.2.3. **Legibility** - In order to be effective, warning labels must be legible and understandable by all TM's and contractors. TMs whose work operations are or may be in the area. Non-legible or missing labels shall be reported to the Safety Department immediately.

- 1.2.4.** Durability - Labels and their means of attachment must be made of materials which shall withstand the environmental conditions encountered in the workplace.
- 1.2.5.** Labels may evoke a false sense of security, and their meaning needs to be understood as part of the overall Compressed Gas Safety Practices Program.
- 1.2.6.** Labels must be securely attached to cylinders so that they cannot be inadvertently or accidentally detached during use.
- 1.2.7.** Labeling - Each container shall bear the proper label for the compressed gas contained, in accordance with DOT requirements or those of the applicable regulatory agency along with the internal Material Safety Code (MSC) label and #.

2. Maintenance

- 2.1.** Authorization - Containers used by MBUSI shall be maintained only by the container supplier or authorized representative.
- 2.2.** Changing prescribed markings - The prescribed markings, supplier/owner markings or symbols stamped into containers shall not be removed or changed unless in accordance with pertinent regulations.
- 2.3.** Changing content markings - No TM shall deface or remove any markings, labels, decals, tags or stencil marks applied by the supplier and used for the identification of content. Like markings may be affixed if the original becomes illegible or detached.
- 2.4.** Pressure relief devices - No TM shall change, modify, tamper with, obstruct, or repair pressure relief devices in container valves or in containers.
- 2.5.** Painting
 - 2.5.1.** TMs shall not paint containers or do paint touch up - If a container shows signs of corrosion, it shall be removed from service and returned to the supplier.
 - 2.5.2.** Cylinder color - All TMs should be aware that containers may only be painted by the supplier for the purpose of recognition and segregation.
 - 2.5.3.** Should MBUSI change suppliers of compressed gas, the color coding could also change.
 - 2.5.4.** Always double-check to ensure the correct cylinder for the intended use.
 - 2.5.5.** Never rely solely on the cylinder color for identification.
 - 2.5.6.** Contamination or improper contents - Any container found suspected to be contaminated or having its contents suspect shall be immediately removed from service and reported to Central Stores. Central stores will be responsible for notifying the supplier.
 - 2.5.7.** Leaking containers - follow emergency reporting guidelines found in the MBUSI Emergency Action Plan (EAP), document # 1910.38.
 - 2.5.8.** Defective Containers - Group Leaders ensure that all of their TMs understand that if they discover a defective or corroded container, they should attempt to take the following actions:
 - 2.5.9.** Notify the Group Leader of the department where the container was discovered.
 - 2.5.10.** If the container could contain a hazardous material, refer to the Emergency Action Plan, 1910.38, for guidance.

3. Container usage requirements

- 3.1. Content Identification - Where MBUSI TMs are responsible to handle and connect the container for use, the operation shall not proceed unless the contents can be verified by legible markings and labels.
- 3.2. Container caps, valve outlet caps, and plugs:
 - 3.2.1. Container caps - Where removable caps are provided by the gas supplier for valve protection, MBUSI TMs shall keep such caps on containers at all times except when containers are connected to dispensing equipment.
 - 3.2.2. Valve outlet caps and plugs - Where valve outlet caps and plugs are provided by the supplier, TMs shall keep such devices on the containers and valve outlets at all times except when containers are empty, being processed or connected for use.
 - 3.2.3. Misuse - No container shall be used for anything other than its intended purpose.
 - 3.2.3.1. Containers shall not be used as rollers, supports or for any purpose other than to contain the content as received.
 - 3.2.3.2. No TM shall allow an unsafe condition such as this to occur without notifying their Group Leader.
 - 3.2.3.3. Containers not in use - When containers are not being used, the valves shall remain closed at all times except when operational constraints apply.

4. Movement of Compressed Gas Containers

- 4.1. Trucks
 - 4.1.1. Containers shall not be rolled, dragged, or slid.
 - 4.1.2. A suitable hand truck, fork truck, roll platform, or similar device shall be used to move containers.
 - 4.1.3. Cylinders must be secured and transferred in an upright manner and should have the safety caps on them.
 - 4.1.4. For vehicles, stop the engine while loading or unloading flammable compressed gases.
 - 4.1.5. Don't drive a vehicle hauling liquefied hydrogen through a tunnel.
 - 4.1.6. Rough handling - Containers shall not be dropped or permitted to strike violently against each other or other surfaces.
 - 4.1.7. Lifting requirements
 - 4.1.7.1. Container caps - Container caps shall not be used for lifting containers except for the use of hand trucks which grip the container cap for lifting on to the hand truck. In any case, the container shall not be lifted higher than six inches above the operating surface.
 - 4.1.7.2. Magnetic lifting devices - Magnetic lifting devices are prohibited from use with compressed gas containers.
 - 4.1.7.3. Ropes, chains, or slings - Ropes, chains, or slings are prohibited from use with compressed gas containers unless lugs or lifting attachments are provided by the manufacturer.
 - 4.1.7.4. Cradles or platforms - Where approved lifting attachments have been provided by the manufacturer, cradles or platforms are authorized for use.

5. Container storage requirements

- 5.1. Posting requirements

- 5.1.1. No Smoking – “No Smoking” signs shall be posted in the storage area.
- 5.1.2. Gas Type - Signs designating the gas type stored in the area shall be posted.
- 5.2. Grouping requirements - Where different types of gases are stored in the same general area the following apply:
 - 5.2.1. Like gases - Gases shall be stored with like gases and segregated from dissimilar gases.
 - 5.2.2. Oxygen cylinders should be kept at least 25 feet away from fuel gas cylinders or combustibles, or separated by a non-combustible barrier (wall) with a fire rating of at least 1 hour.
- 5.3. Stock rotation - Stock shall be rotated so that the oldest material shall be the first to be used. The storage layout shall be such that old stock can be removed first with a minimum handling of other containers.
- 5.4. Storage rooms - Storage rooms used by MBUSI shall be well ventilated and dry. Room temperature shall not exceed 125 degrees F. Storage in subsurface location shall be avoided.
- 5.5. Compressed gas containers, cylinders and tanks shall not be placed near elevators, unprotected platform ledges or other areas where compressed gas containers cylinders or tanks could fall distances exceeding one-half the height of the container, cylinder, or tank.
- 5.6. Compressed gas containers, cylinders, and tanks shall not be placed in areas where they are capable of being damaged by falling objects.
- 5.7. Separation from combustibles - Containers shall not be stored near readily ignitable substances, such as gasoline or waste, or near combustibles in bulk, including oil.
- 5.8. External corrosion requirements
 - 5.8.1. Containers shall not be exposed to continuous dampness and should not be stored near salt or other corrosive chemicals or fumes. Corrosion may damage the containers and may cause the valve protection caps to stick.
 - 5.8.2. Bottoms of containers, cylinders, and tanks shall be protected from direct contact with soil or surfaces where water might accumulate.
- 5.9. Mechanical damage requirements
 - 5.9.1. Containers shall be protected from any object that shall produce a harmful cut or other abrasion in the surface of the metal. Guard posts or other approved means shall be provided to protect storage, piping, dispensing and use areas against physical damage.
 - 5.9.2. Containers shall not be stored near elevators, gangways, and unprotected platform edges or in locations where heavy moving objects may strike or fall on them.
- 5.10. Storage and use requirements
 - 5.10.1. Store upright - All compressed gas containers in service or in storage shall be stored standing upright where they are not likely to be knocked over unless the containers have a capacity of 1.3 gal (5L) or less or the containers, cylinders and tanks are designed for use in a horizontal position.
 - 5.10.2. Restrain - All compressed gas containers in use shall be restrained using chains or cables above the midpoint to prevent accidental fall-over of the container.
 - 5.10.3. Never secure cylinders to conduit carrying electrical wiring.

- 5.10.4. Gas containers with a water volume up to 305 cu. in. (5.0 L) may be stored in a horizontal position.
- 5.10.5. Container valve end up - Liquefied gas containers except those designed for use in a horizontal position on tow motors, etc., shall be stored and used valve end up. Acetylene containers shall be stored and used valve end up. Storage of acetylene containers valve end up shall minimize the possibility of solvent being discharged. Note: Valve end up includes conditions where the container axis is inclined as much as 45 degrees from the vertical.
- 5.10.6. Gas cylinders cannot be stored on main travel paths.
- 5.10.7. Oxidizers and flammables cannot be stored within 25 feet of exit doors.
- 5.10.8. Outdoor storage - Containers may be stored in the open but shall be stored on a clean dry surface to prevent corrosion to the bottom of the container.
- 5.10.9. Sunlight - Containers may be stored in direct sunlight, except in locations where extreme temperatures prevail (above 125 degrees F). If the gas supplier recommends storage in the shade for a particular gas, this recommendation shall be observed.
- 5.10.10. Interference with egress - Containers stored inside shall not be located near exits, stairways or in areas normally used or intended for the safe exit of Team Members.

6. Connecting containers and withdrawing content

- 6.1. Trained personnel - Compressed gases shall be handled and used only by properly trained TMs. TMs must have had initial training in order to handle and use compressed gases.
- 6.2. Content identification
 - 6.2.1. TMs shall verify that a label exists and review the label before beginning operations with a compressed gas.
 - 6.2.2. Unmarked containers shall not be used. Such containers shall be reported to Central Stores.
 - 6.2.2.1. The container color shall never be relied upon for identification of a container.
 - 6.2.3. Container caps - Caps shall be retained and not removed until the container is placed into service.
 - 6.2.4. Secure containers - MBUSI TMs shall ensure that compressed gases shall be secured above the midpoint to prevent them from being knocked over.
 - 6.2.5. Pressure regulator - A suitable pressure regulating device in good condition shall be used where gas is admitted to a system of lower pressure rating than the supply pressure, and where, due to the gas capacity of the supply source, the system rating may be exceeded.
 - 6.2.6. Pressure relief device - A suitable pressure relief device in good condition shall be used to protect a system using a compressed gas where the system has a pressure rating less than the compressed gas supply source and where, due to the gas capacity of the supply source, the system pressure rating may be exceeded.

- 6.2.7. Connection requirements - Connections that do not fit shall not be forced. Threads on regulator connections or other auxiliary equipment shall match those on container valve outlets.
- 6.2.8. Manifold - Where compressed gas containers are connected to a manifold, the manifold, and its related equipment shall be of proper design and in good condition for the product, they are to contain at the appropriate temperatures, pressures, and flows.
- 6.2.9. Equipment compatibility - Regulators, gauges, hoses and other appliances provided for use with a particular gas or group of gases or designed for specific containers, shall not be used on containers containing gases having different chemical properties unless information obtained from the supplier indicates that this can be done safely.
- 6.2.10. Container valve requirements
 - 6.2.10.1. Container valves shall be opened slowly and pointed away from personnel and sources of ignition.
 - 6.2.10.2. For valves having no hand wheel, the wrench provided by or recommended by the supplier shall be used. On a valve containing a hand wheel, wrenches shall not be used.
 - 6.2.10.3. Valves shall never be forced open or closed. A hammer shall not be used to open or close valves. If valves become frozen for whatever reason, the supplier shall be contacted to provide instructions.
- 6.2.11. Residual empty container pressure - When withdrawing a non-liquefied compressed gas from a container, the internal pressure should not be reduced to below 20 psig so as to preclude the backflow of atmospheric air or other contaminants into the container. The container valve should be closed tightly to retain this residual pressure.
- 6.2.12. Check valves - Compressed gases shall not be used where the container may be contaminated by the feedback of process materials unless protected by suitable traps or check valves.
- 6.2.13. Gas tightness - Connections to piping, regulators and other appliances shall be kept tight to prevent leakage. Where hose is used, it shall be kept in good condition.
- 6.2.14. Removing pressure regulator - Before a regulator is removed from a container, the container valve shall be closed and the regulator drained of gas pressure.

7. General safety rules for specific types of gases

7.1. Flammable gases

- 7.1.1. Adjoining exposures - Provisions shall be made to protect flammable gases from hazardous exposure to and against hazardous exposure from adjoining buildings, equipment, property, and concentrations of people.
- 7.1.2. Heating requirements - Where storage areas are heated, the source shall be by steam, hot water or other indirect means. Heating by flames or fire is prohibited.
- 7.1.3. Electrical equipment requirements - Shall conform to the provisions of (National Fire Protection Association (NFPA) 70, National Electrical Code, article 501, for Class 1 Division 2 locations.

- 7.1.4. Special hot works permit procedures will be followed in flammable gas atmosphere.
- 7.1.5. Storage buildings shall be well ventilated.
- 7.1.6. Combustibles and ignition sources - Flammable gas containers stored inside of buildings with other occupancies shall be kept at least 25 feet from combustibles or ignitions sources.
- 7.1.7. Capacity limitations - Flammable gas containers stored inside industrial buildings on MBUSI property except those in use or those attached for use are limited to a total gas capacity of 2500 cubic feet of acetylene or non-liquefied flammable gas, or a total container content water capacity of 735 pounds for liquefied petroleum gas or stabilized methylacetylene-propadiene.
- 7.1.8. Fire protection requirements
 - 7.1.8.1. Fire extinguishers - Adequate portable fire extinguishers of carbon dioxide or dry chemical types shall be made available for fire emergencies at storage locations.
 - 7.1.8.2. Compressed gas fires should not be extinguished with a fire extinguisher or water. Explosive re-ignition may occur. The source of the compressed gas must be eliminated by shutting off the supply to extinguish the fire. Adjacent exposures can be kept cool with water.)
 - 7.1.8.3. No smoking signs - Signs shall be posted around the storage area of buildings or at the entrance to storage rooms.
 - 7.1.8.4. Leak testing - A flame or other ignition source shall not be used for detection of flammable gas leaks. Use either a flammable gas leak detector, soapy water or other suitable solution.
- 7.2. Oxygen (Including oxidizing gases)
 - 7.2.1. Cleanliness - Oxygen containers, valves, regulators, hose and other oxygen apparatus shall be kept free at all times from oil or grease and shall not be handled with oily hands, oily gloves/clothing or with greasy equipment.
 - 7.2.2. Separation of oxygen from combustibles - Oxygen containers in storage shall be separated from flammable gas containers or combustible materials (especially oil and grease) a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire resistance rating of at least one-half hour.
 - 7.2.3. Oxygen-rich atmospheres - The oxygen content in work areas must not exceed 23 percent by volume.
 - 7.2.4. Compatibility of materials - Any materials used by MBUSI that come into contact with oxygen in valves, piping, fittings, regulators, and utilization equipment must be suitable for use with oxygen, and at the pressures and conditions involved at the specific use point of material. The handling and use of oxygen above 3000 psi may involve greater fire potential; adequate safety systems analysis needs to be made.
- 7.3. Acid and alkaline gases - **Forbidden except with MBUSI Management Team Permission**
- 7.4. Highly toxic gases - **Forbidden except with MBUSI Management Team Permission**
- 7.5. Cryogenic liquefied gases - **Forbidden except with MBUSI Safety's Permission**
- 7.6. Products containing carcinogens - **Forbidden except with MBUSI Safety's Permission**

- 7.7. Products containing silicone - **Forbidden except with MBUSI Management Team Permission**
- 7.8. The use of asbestos or asbestos containing material - **Forbidden except with MBUSI Management Team Permission**
- 7.9. Any form or product of polychlorinated biphenyls (PCBs) - **Forbidden except with MBUSI Management Team Permission**

Other Materials that require preapproval by MBUSI Safety, Environmental, and Part Quality Management Departments includes: Lead, Chromium and Nickel.

8. Visual inspection of compressed gas cylinders

- 8.1. Team Members shall use the following for general inspection of compressed gas cylinders. Our supplier has the first responsibility for inspection of cylinders used by MBUSI in accordance with CGA and NFPA guidelines. Only the following inspection criteria shall be followed by TMs:

Inspect for:

- Dents
- Cuts, gouges or digs
- Corrosion
- Pitting
- Crevice corrosion
- Bulges
- Neck defects
- ARC/Torch burns
- Valve ease-of-movement
- Valve thread serviceability

Possible result:

- Weakening of cylinder wall
- Decrease in wall thickness
- Decrease in wall thickness
- Decrease in wall thickness
- Weakening of cylinder wall
- Weakening of cylinder wall
- Leak or cylinder explosion
- Weakening of cylinder wall
- Corrosion leading to leak
- Leak during operation

Suspect cylinders - Cylinders that are suspected to be deficient in any manner shall be removed from service. The supplier shall then be notified and a representative of the supplier shall be asked to inspect the cylinder. TMs discovering a cylinder suspected to be deficient in any manner should notify their supervisor who will contact central stores for further direction.

9. General MBUSI safety rules for use of compressed gas

9.1. Pre-operation safety rules:

- 9.1.1. Read the Safety Data Sheet before use.
- 9.1.2. Inspect cylinder for damage before use.
- 9.1.3. Ensure "In use" label is present.
- 9.1.4. Ensure all labels/warnings are readable.
- 9.1.5. Place upright on stable dry surface.
- 9.1.6. Ensure cylinder is restrained above mid-point.
- 9.1.7. Keep heat, flame, and electrical sources from gas.
- 9.1.8. Operate in accordance with established procedures.

9.2. Post-operation safety rules:

- 9.2.1. Ensure "empty" or like label is present.
- 9.2.2. Remove from operation using established procedures.

- 9.2.3. Close valve completely and cap cylinder.
- 9.2.4. Transport cylinder using hand truck.
- 9.3. Full cylinder storage rules:
 - 9.3.1. Read the Safety Data Sheet before use.
 - 9.3.2. Do not smoke.
 - 9.3.3. Ensure stock is properly rotated.
 - 9.3.4. Use oldest stock first.
 - 9.3.5. Inspect cylinder for damage before storage.
 - 9.3.6. Store with like kind of gas.
 - 9.3.7. Ensure all labels are readable.
 - 9.3.8. Ensure valve assembly is tightly capped.
 - 9.3.9. Ensure cylinder is restrained above midpoint.
 - 9.3.10. Store upright on stable dry surface.
 - 9.3.11. Keep electrical devices away from gas.
 - 9.3.12. Keep combustible materials away from gas.
 - 9.3.13. Keep heat and flame away from gas.
- 9.4. Empty cylinder storage rules:
 - 9.4.1. Do not smoke.
 - 9.4.2. Ensure valve assembly closed tightly.
 - 9.4.3. Ensure valve assembly capped tightly.
 - 9.4.4. Inspect cylinder for damage before storage.
 - 9.4.5. Store with like kind of gas cylinders.
 - 9.4.6. Ensure all labels are readable.
 - 9.4.7. Ensure cylinder is restrained above midpoint.
 - 9.4.8. Store upright on stable dry surface.
 - 9.4.9. Keep electrical devices away from gas.
 - 9.4.10. Keep combustible materials away from gas.
 - 9.4.11. Keep heat and flame away from gas.
- 9.5. Dusting clothing, cleaning work areas. Compressed gas (or air) shall not be used to dust off clothing or clean work areas of debris. This may cause serious injury to the eyes, body or create a fire hazard.

Contractors/Suppliers

Compressed Gas Cylinders/Bottles

- 1. Cylinders must never be taken inside tanks, vessels or confined spaces.
- 2. Cylinders must be stored 35 feet away from buildings and not stored in frequent traffic areas or near building exits. Special permission from MBUSI Facilities Maintenance and MBUSI Safety must be obtained to store cylinders in the building.
- 3. Regulator fittings must be kept free of oil or grease.
- 4. Cylinders must be turned off and caps must be at least hand tight when not in use.
- 5. Cylinders must be stored upright and must be secured while in storage or when moved on a wheeled cart by a chain, wire or suitable rack.

6. Storage of oxidizers and flammables must be separated by 20 feet or greater, or by a wall with fire rating of one-half hour or greater.
7. Cylinders shall be transported in an upright position which provides cylinder support, protection and stability.
8. Cylinders must be maintained in good repair with appropriate pressure relief, hydrostatic testing and valve assembly.
9. The bulk storage of flammable and/or combustible liquids is prohibited on MBUSI premises, with the exception of propane. Propane tanks must be stored outside of the buildings at least 35 feet away.
10. Propane must be stored in accordance with applicable OSHA standards.
11. OSHA compliant safety cans must be used for the handling of flammable or combustible liquids. Safety cans must be appropriately labeled as to their contents.
12. Back flow check valves must be installed at the hose to gauge connection point.
13. Hoses, valves and gauge connections shall be properly installed and inspected.

Personal Protective Equipment Plan

Definitions

Personal Protective Equipment Basic Protection

1. MBUSI will provide Personal Protective Equipment (PPE) to all TMs required to use such equipment as a result of an evaluation of exposure to basic hazards. Typical hazards for which PPE provides protection are: impact, penetration, compression (roll-over), chemical, heat/cold, harmful dust, light (optical) radiation, and biologic hazards which cannot practically be eliminated.
2. TMs are not permitted to bring in their own PPE where MBUSI has deemed PPE unnecessary.
3. MBUSI will provide without cost to TMs all PPE required to be used in the workplace.
4. MBUSI will provide replacement PPE, but at its discretion, not to pay in instances where the TM has lost or intentionally damaged their PPE.
5. The Safety Department will determine the minimum quality of such equipment to insure proper protection of TMs.
6. No Group Leader (GL) shall perform, ask or permit a TM to perform an activity without the required PPE and consistently enforcing its effective use.

7. All TMs must wear approved steel-toe safety shoes while in the shops, unless they are in the green pedestrian aisles, designated break or meeting areas.
8. All TMs must wear approved safety glasses with side shields or wrap-around style while in the shops, unless they are in designated break or meeting areas.
9. Unless authorized for welding or burning operations, tinted safety glasses are not permitted while inside any buildings at MBUSI.
10. TMs must wear hearing protection where required. See the Hearing Conservation Program for specific requirements.
11. TMs must wear hand protection, where required, when handling steel, exposed to hazardous chemicals, or electrical hazards.
12. Visitors and administration personnel are exempt from the steel-toe shoes and hearing protection requirements in the office areas or if they are not exposed to foot hazards or to high noise areas for over several hours, respectively.

Task Specific PPE requirements

1. Bump caps are required:
 - a. For working in areas with overhead obstructions (pits, under vehicle, parts, etc.)
 - b. While working more than 6 feet off the ground.
 - c. While crossing underneath a vehicle.
 - d. Inside the Body Shop unless they are in the green pedestrian aisles, designated break or meeting areas.
2. Hard hats are required:
 - a. In all construction areas.
 - b. When on a manlift.
 - c. While working in areas where there is a possible danger of head injury from impact, falling or flying objects, or electrical shock and burns. (OSHA 1926.100)
3. Safety vests
 - a. TMs must wear safety reflective vests in logistics/conveyance /construction or other designated areas.
 - b. High visibility team wear can also be worn in place of the vests.
4. Arm protection
 - a. Long sleeved Teamwear of cotton fiber is required in designated areas.
 - b. Cut-resistant sleeves of a minimum 14" long are required in designated areas.
5. Fresh air supplied hoods/Powered Air Purifying Respirators (PAPR)

TMs are required to wear fresh air supplied hoods/PAPR's in designated grinding booths and during spraying operations.

6. Splash goggles/face shields

Chemical splash goggles and face shields must be worn anytime a task causes an acceleration of particles such as grinding, wire brushing, blowing with air hose, working in extremely windy conditions or working with powdered or liquid toxic, caustic or irritant chemicals.

7. Chemical protective clothing/equipment

Chemical protective clothing/equipment shields isolate TMs from the chemical, physical and biological hazards that may be encountered during operations that involve hazardous substances. Examples of clothing include: protective suits, coveralls, hoods, cooling system, inner and outer garments.

8. Welding clothing

Welders must wear fire resistant clothing (generally made of cotton – never synthetic fiber) and leather gloves. Leather sleeves or jacket may also be required if sparks are directed at the welder.

9. PPE involving bloodborne pathogens

Refer to the Bloodborne Pathogens Exposure Control Plan for the specific PPE required.

10. Gloves

a. Handling material with sharp edges/points

Cut and puncture resistant gloves are required for activities to prevent injury.

b. Handling hot material

Heat-resistant gloves are required for activities to prevent burns.

c. Handling hazardous chemicals

1. Rubber gloves are required to protect hands while working with the chemical bath or solvents.

2. Nitrile gloves are required to protect hands while working with petroleum-based products.

3. For all other hazardous chemicals, consult the MBUSI Safety Department.

d. Electrical gloves

Dielectric tested insulating gloves, which conform to the OSHA standards, are to be used on all power line work and where there is possible contact with energized circuits. Refer to the Electrical Safe Work Practices Procedure for the specific PPE required.

Prescription Safety Glasses

Prescription Safety Glasses - Corrective safety eyewear that meet the Standard as regular safety glasses.

1. TMs who require prescription eye wear must comply with one of the following:

a. Wear prescription contact lenses under approved safety glasses.

b. Wear approved prescription safety glasses. MBUSI will provide prescription safety glasses. Only clip-on side shields, installed by the glass wear supplier, are allowed. Flexible side shields are not allowed.

2. New Hire Orientation Process

MBUSI will provide prescription safety glasses for new hires that require corrective lenses.

3. Current Prescription

TMs that are required/request to wear prescription safety glasses must have a current prescription not exceeding 1 year old.

4. Tinted Lenses

If tinted lenses are required for TMs involved in welding or burning operations (or those working near these operations), tinted lenses must be approved.

Anyone with duties both indoors and outside may change to approved tinted lenses when outdoors, but must wear clear lenses indoors.

Hearing Protection

Refer to the Hearing Conservation Program for specific PPE requirements.

Weld Shields

1. MBUSI shall ensure that each affected TM uses equipment with filter lenses that have a shade number that provides appropriate protection from injurious light radiation. Requirements for weld shields must meet *29 CFR 1915.153*.

2. Weld shields must not have any defects which would allow welding arc light to enter the welder's eyes.

3. Weld shields may require a gasket if the welder is exposed to ambient welding to prevent arc flash from entering from behind the welder.

Safety Shoes

MBUSI will provide standard steel-toe shoes that meet OSHA 1910.136 and have an ESD rating for the assembly areas.

Fall Protection

Refer to the Managed Fall Protection document for specific PPE requirements.

Respiratory Protection

Refer to the Respiratory Protection Program for specific PPE requirements.

Electrical Hazards

Refer to the Electrical Safe Work Practices Procedure for the specific PPE required.

Training

1. Training is provided to each TM required to use PPE. TMs shall be re-trained if they have not retained or possess the requisite understanding or skill to properly use the PPE that they were initially trained to use. TMs shall also be trained whenever there are relevant changes in the PPE requirements for work to be performed.
2. All PPE training will include at least the following:
 - a. When PPE is necessary.
 - b. What PPE is required.
 - c. How to properly put on, take off, adjust and wear PPE.
 - d. The limitations of the PPE.
 - e. The proper care, maintenance, useful life and disposal of the PPE.

Contractors/Suppliers Clothing and Personal Protective Equipment

1. MBUSI identification card must be carried at all times when on MBUSI property. Failure to have an MBUSI ID card may result in removal from site.
2. All MBUSI Suppliers will be required to wear uniforms or other type team wear. The color “red” will not be permitted to be worn by any Supplier unless special permission is obtained from the MBUSI Vice President of Human Resources. This color is reserved for MBUSI emergency response personnel.
3. Team wear/uniforms shall meet all safety requirements and must display the Supplier’s company name and the name of the individual. All company clothing must be uniform in color and design. Alterations or variations of the team wear/uniform will not be permitted.
4. Employees not meeting the team wear standard will be required to display their badge until they can obtain the proper team wear/uniform.
5. Trousers or pants shall be at ankle length.
6. Shirts must be worn at all times and have minimum 4” sleeves.
7. Shirttails should be tucked into pants or long enough to prevent skin exposure when bending or squatting.
8. Clothing that is suggestive, offensive or that otherwise promotes specific ideologies, etc. that may be disruptive to the work environment will not be allowed.

9. OSHA rated clear lens (unless job-related tinting is required) safety glasses with side shields will be required in aisles, working areas and as otherwise posted. Tinted and shaded safety glasses are allowed outside the building.
10. OSHA compliant safety toe shoes (ESD rated depending on the location/task) will be required in working areas and as otherwise posted.
11. All equipment and clothing must be in good repair.

Respiratory Protection Program

Definitions

Air-purifying respirator - a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

Assigned Protection Factor (APF) - the workplace level of respiratory protection that a respirator or a class of respirator is expected to provide to TMs when the Company implements a continuing, effective respiratory protection program as specified by this program.

Atmosphere-supplying respirator - a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.

Canister or cartridge - a container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.

TM exposure - vulnerability to a concentration of an airborne contaminant that would occur if the TM were not using respiratory protection.

Filter or air purifying element - a component used in respirators to remove solid or liquid aerosols from the inspired air.

Filtering face piece (dust mask) - a negative pressure particulate respirator with a filter as an integral part of the face piece or with the entire face piece composed of the filtering medium.

Fit factor - a quantitative estimate of the fit of a particular respirator to a specific TM, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

Fit test - the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on a TM. (See also Qualitative Fit Test (QLFT) and Quantitative Fit Test (QNFT).)

High efficiency particulate air (HEPA) filter - a filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The

equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

Immediately dangerous to life or health (IDLH) - an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair a TM's ability to escape from a dangerous atmosphere.

Loose-fitting face piece - a respiratory inlet covering that is designed to form a partial seal with the face.

Maximum use concentration (MUC) - the maximum atmospheric concentration of a hazardous substance from which a TM can be expected to be protected when wearing a respirator and is determined by the assigned protection factor of the respirator or class of respirators and the exposure limit of the hazardous substance. The MUC can be determined mathematically by multiplying the assigned protection factor specified for a respirator by the required OSHA permissible exposure limit, short-term exposure limit, or ceiling limit. When no OSHA exposure limit is available for a hazardous substance, MBUSI could determine a MUC on the basis of relevant available information and informed professional judgment.

Negative pressure respirator (tight fitting) - a respirator in which the air pressure inside the face piece is negative during inhalation with respect to the ambient air pressure outside the respirator.

Oxygen deficient atmosphere - an atmosphere with an oxygen content below 19.5% by volume.

Physician or other licensed health care professional (PLHCP) - a person whose legally permitted scope of practice (i.e., license, registration, or certification) allows them to independently provide, or be delegated the responsibility to provide, some or all of the health care services required.

Positive pressure respirator - a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

Powered air-purifying respirator (PAPR) - an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Qualitative fit test (QLFT) - a pass/fail fit test to assess the adequacy of respirator fit that relies on the TM's response to the test agent.

Quantitative fit test (QNFT) - an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Self-contained breathing apparatus - the period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer.

Supplied-air respirator (SAR) or Airline respirator - an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

Tight-fitting face piece - a respiratory inlet covering that forms a complete seal with the face.

Responsibility

- Team Members (TMs)
 - Must be responsible for wearing only the respirator for which they have been fit tested.
 - Must comply with all appropriate sections of this respiratory protection program.
 - Must notify their immediate Team Leader (TL) of any malfunctioning respiratory protection equipment.
 - Must sanitize the respirator as required.
 - Must discard the respirator when it is no longer functional.
 - Maintain a clean shaven status, per OSHA regulations.
- Group Leaders (GLs)
 - Assures that all TMs within their group comply with this procedure.
 - Must notify the Safety Department of any respiratory protection problems.
- Central Stores
 - Must issue only appropriate, functional respiratory protection equipment.
- Respiratory Protection Program Administrator (RPPA)
 - A Safety Engineer will be designated as the Respiratory Protection Program Administrator who will oversee the various aspects of the program.
- Contractors, Suppliers, Construction
 - All Contractors/Suppliers shall comply with OSHA regulations regarding respirator usage. Contractors/Suppliers shall provide the appropriate respiratory equipment and shall ensure that all affected employees have been fit tested, trained, be medically capable of wearing the respirator and wear it.

Medical Evaluation

- For those TMs that use tight fitting face piece respirators or air hoods, medical questionnaires and examinations must be administered confidentially during the TM's normal working hours. It is important to note that these records are subject to HIPPA regulations and are maintained in the medical department where their accessibility is extremely limited.
- The TM may discuss the questionnaire and examination results with the PLHCP.
- The following information will be provided to the PLHCP before the PLHCP makes a recommendation concerning a TM's ability to use a respirator:

- The type and weight of the respirator to be used by the TM.
 - The duration and frequency of respirator use.
 - The expected physical work effort.
 - Additional protective clothing and equipment to be worn.
 - Temperature and humidity extremes that may be encountered.
- MBUSI will provide the PLHCP with a copy of the written Respiratory Protection Program.
 - Any TM who must use a tight fitting face piece respirator must receive a respirator physical prior to use. TM's will be directed to the MBUSI medical provider for this examination.
 - The follow-up medical examination must include any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make a final determination.
 - In determining the TM's eligibility to use a respirator, MBUSI must obtain a positive written recommendation regarding the TM's eligibility to use the respirator from the PLHCP. The recommendation must provide only the following information:
 - Any limitations on respirator use related to the medical condition of the TM, or relating to the workplace conditions in which the respirator will be used, including whether or not the TM is medically able to use the respirator.
 - The need, if any, for follow-up medical evaluations.
 - A statement that the PLHCP has provided the TM with a copy of the PLHCP's written recommendation.
 - A pulmonary function test must be conducted yearly for individuals wearing a respirator.

Fit Testing

- Before a TM uses any respirator with a tight-fitting face piece, the TM must be fit tested and pass using the same make, model, style, and size of respirator. TMs using a tight-fitting face piece respirator must pass an appropriate qualitative fit test (QLFT – utilizing irritant smoke) or quantitative fit test (QNFT).
- TMs using a tight-fitting face piece respirator will be fit tested prior to initial use of the respirator, whenever a different respirator face piece (size, style, model or make) is used, and annually thereafter. Fit testing cannot be performed when there is facial hair in the respirator sealing surface or facial hair that interferes with respirator valve function.
- Additional fit tests must be performed if TM's physical condition changes (i.e. facial scarring, dental changes, cosmetic surgery, significant body

weight change, etc.) as noticed or reported by the TM, the physician, the supervisor or the program administrator.

- If after passing a qualitative fit test, the TM reports that the respirator fit is unacceptable, the TM must be given an opportunity to select a different respirator (size, style, model or make) and be retested.
- The fit test must be performed using the procedures of Appendix A-1 of this Program.
- The fit test described in Appendix A-1 is only acceptable for testing fit factors of 100 or less. There is no anticipated paint usage that would exceed a fit factor of 10. Should a substance ever call for a fit factor of over 100, quantitative fit testing would be required which is not addressed in this written procedure.
- During a QLTF fit test, the TM's respirator must be equipped with high efficiency particulate air (HEPA) filters. A respirator of identical size, style, model and make and equipped with HEPA filters may also be used for testing if the TM does not have theirs available for the fit testing process. If the TM's face piece was altered for the fit test, the HEPA filters must be replaced by the original filters and/or cartridges.
- Fit testing records will be maintained by the Safety Department and must include:
 - The name or identification of the TM tested.
 - Type of fit test performed.
 - Specific make, model, style, and size of respirator tested.
 - Date of test.
 - The pass/fail results.
 - Fit test records must be retained for respirator users until the next fit test is administered.

Limitations

- Air purifying respirators must only be used in atmospheres containing a minimum of 19.5% oxygen.
- The air purifying respirator must only be used areas where contaminant levels are less than 20% of the IDLH.
- High humidity/water and high contaminant concentrations can drastically shorten the life of the respirator's cartridge; therefore cartridges may be changed out more frequently.

Use of Respirators

- TMs with beards, mustaches or side-burns are not permitted to wear tight-fitting face piece respirators if the facial hair interferes with the seal of the respirator against the face. Only mustaches that do not extend past the corners of the mouth will be accepted for fit testing. Shaving must occur daily.
- Face piece seal protection:

- Respirators may not be worn by TMs who have facial hair at the respirator sealing surface or facial hair that interferes with respirator valve function.
- Corrective glasses, safety glasses, goggles, head socks and other head gear must not interfere with the face piece seal of the user.
- TMs must perform a user seal check each time they put on a respirator. The seal check procedures are detailed in Appendix B-1.
- Continuing respirator effectiveness:
 - TMs must leave respirator use area to wash their faces and respirator face pieces as necessary to prevent eye or skin irritation associated with respirator use.
 - TMs must leave respirator use area if they detect vapor or gas breakthrough from their cartridges, changes in breathing resistance or face piece leakage.
 - TMs must leave respirator use area to replace cartridge or filter elements.
 - Any defective respirators, cartridges or filters must be replaced or repaired before allowing TM to return to respirator use area.

Inspection before Respirator Use

- Examine the face piece for:
 - Debris on face piece.
 - Cracks, tears, holes, or distortion.
 - Cracked or badly scratched lenses in full face piece.
 - Cracked or broken cartridge holders and missing cartridge gaskets.
 - Inhalation and exhalation valves for debris, distortion or damage that would prevent the proper seating of the valve.
- Examine head straps for:
 - Breaks, dry rot or loss of elasticity.
 - Damaged buckles and attachments.
- Examine air purifying respirator cartridges for:
 - Incorrect cartridge or filter for the hazard.
 - Incorrect installations, loose connections, or cross threading of the cartridge in the holder.
 - Expired shelf life of the cartridge.
 - Report any respirator malfunction to TL or GL.
- Cleaning, Disinfecting, Storing and Discarding of Used Respirators:
 - TMs using respiratory protection are required to sanitize their own respirator using germicidal wipes.
 - When the respirator becomes un-cleanable or otherwise defective, the respirator must be discarded and replaced with a new respirator (same size and model).
 - When respirators are not being used, they must be stored in a clean, sealed bag (to protect them from damage, contamination,

dust, sunlight, extreme temperatures, excessive moisture and damaging chemicals) specified for that purpose.

Cartridge Replacement

- Cartridges must be changed when:
 - Specific expiration date is reached.
 - TM tastes or smells contaminant while using the respirator.
 - The TM experiences an increased breathing resistance.*
 - Incoming air becomes much warmer for no apparent reason. (Chemical reaction may be occurring)
 - Cartridge becomes damaged or wet.
 - Cartridge has been used continuously for 8 hours (i.e. robot backup spraying).
 - All other uses, 30 days after installation on the respirator.

*Note: During spray paint operations, a paint pre-filter is placed on top of the organic filter to prevent the filter from becoming clogged from paint mists. Only the pre-filter needs to be changed until other above mentioned criteria effects the usage of the respirator.

- Approved Respirators
Only those respirators approved by the National Institute for Occupational Safety and Health Administration (NIOSH) must be used at MBUSI.

Respirators must only be used in atmospheres for which they are intended.

Supplied Air Systems

- Annual tests are conducted on the systems to assure they are supplying grade D breathing air.
- All compressors are oil filled and are equipped with CO monitors.
- If the monitors were to “alarm” due to a presence of carbon monoxide, the TMs are to disengage their air supply and notify their GL immediately. The GL will notify maintenance and the Safety Department of the condition and the status of the equipment will be promptly evaluated. The monitor should be calibrated monthly or more frequently according to the manufacturer’s recommendation.

Training

- Annual respirator training will be coordinated and overseen by the RPPA in conjunction with the MBUSI Medical Department.
- Respirator training will cover the respiratory hazards to which TMs are potentially exposed to during routine and emergency situations.
- TMs are trained: in a manner that is understandable to them, in the proper use of respirators, including putting on and removing them, any limitations on their use and their maintenance.
- Trainers will ensure that each TM can demonstrate knowledge of:
 - Why the respirator is necessary.

- How improper fit, usage or maintenance can compromise the protective effect of the respirator.
- What the limitations and capabilities of the respirator are.
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions.
- How to inspect, put on, remove and check the seals of the respirator.
- What the procedures are for maintenance and storage of the respirator.
- How to recognize the medical signs and symptoms that may limit or prevent the effective use of respirators.

Non-mandatory Use of Respirators

- TMs are not permitted to voluntarily bring in their own respirator where MBUSI has deemed one unnecessary. However, voluntary usage of filtering face pieces (dust masks) are allowed. Team Members who chose to wear these masks must read and sign a copy of Appendix D from OSHA's website (MBUSI internal form).

Appendix A -1

Fit Testing Procedures (Mandatory).

1.0 Accepted Fit Test Protocols

1.1 Fit Testing Procedures – General Requirements

1.1.1 The following fit test procedures may be used. The requirements in this appendix apply to all OSHA-accepted fit test methods, both qualitative (QLFT) and quantitative (QNFT).

1.1.1.1 The test subject is allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

1.1.1.2 Prior to the selection process, the test subject must be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit. A mirror must be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.

1.1.1.3 The test subject must be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.

1.1.1.4 The test subject must be instructed to hold each chosen face piece up to the face and eliminate those that obviously do not give an acceptable fit.

1.1.1.5 The more acceptable face pieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following

item 1.1.1.6. If the test subject is not familiar with using a particular respirator, the test subject must be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

1.1.1.6 Assessment of comfort must include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:

1.1.1.6.1 Position of the mask on the nose

1.1.1.6.2 Room for eye protection

1.1.1.6.3 Room to talk

1.1.1.6.4 Position of mask on face and cheeks

1.1.1.7 The following criteria must be used to help determine the adequacy of the respirator fit:

1.1.1.7.1 Chin properly placed;

1.1.1.7.2 Adequate strap tension, not overly tightened;

1.1.1.7.3 Fit across nose bridge;

1.1.1.7.4 Respirator of proper size to span distance from nose to chin;

1.1.1.7.5 Tendency of respirator to slip;

1.1.1.7.6 Self-observation in mirror to evaluate fit and respirator position.

1.1.1.8 The test subject must conduct a user seal check, either the negative and positive pressure seal checks described in Appendix B-1 of this section or those recommended by the respirator manufacturer which provide equivalent protection to the procedures in Appendix B-1. Before conducting the negative and positive pressure checks, the subject must be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another face piece must be selected and retested if the test subject fails the user seal check tests.

1.1.1.9 The test must not be conducted if there is any hair growth between the skin and the face piece sealing surface, such as stubble beard growth, beard, mustache or sideburns that cross the respirator sealing surface.

1.1.1.10 Any type of apparel which interferes with a satisfactory fit must be altered or removed.

1.1.1.11 If a test subject exhibits difficulty in breathing during the tests, she or he must be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing her or his duties.

1.1.1.12 If the TM finds the fit of the respirator unacceptable, the test subject must be given the opportunity to select a different respirator and to be retested.

1.1.1.13 Exercise regimen. Prior to the commencement of the fit test, the test subject must be given a description of the fit test and the test subject's responsibilities during the test

procedure. The description of the process must include a description of the test exercises that the subject will be performing. The respirator to be tested must be worn for at least 5 minutes before the start of the fit test.

1.1.1.14 The fit test must be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.

1.1.1.15 Test Exercises

1.1.1.15.1 The following test exercises are to be performed for all fit testing methods prescribed in this appendix, except for the CNP method. A separate fit testing exercise regimen is contained in the CNP protocol. The test subject must perform exercises, in the test environment, in the following manner:

1.1.1.15.1.1 Normal breathing. In a normal standing position, without talking, the subject must breathe normally.

1.1.1.15.1.2 Deep breathing. In a normal standing position, the subject must breathe slowly and deeply, taking caution so as not to hyperventilate.

1.1.1.15.1.3 Turning head side to side. Standing in place, the subject must slowly turn his/her head from side to side between the extreme positions on each side. The head must be held at each extreme momentarily so the subject can inhale at each side.

1.1.1.15.1.4 Moving head up and down. Standing in place, the subject must slowly move his/her head up and down. The subject must be instructed to inhale in the up position (i.e., when looking toward the ceiling).

1.1.1.15.1.5 Talking. The subject must talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

1.1.1.15.1.5.1 Rainbow Passage

“When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow. “

1.1.1.15.1.6 Grimace. The test subject must grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT)

1.1.1.15.1.7 Bending over. The test subject must bend at the waist as if he/she were to touch his/her toes. Jogging in place must be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

1.1.1.15.1.8 Normal breathing. Same as exercise 1.1.1.15.1.1.

1.1.1.15.2 Each test exercise must be performed for one minute except for the grimace exercise which must be performed for 15 seconds. The test subject must be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator must be tried. The respirator must not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

2.0 Qualitative Fit Test (QLFT) Protocols

2.1 General

2.1.1 The persons administering QLFT are able to perform tests properly, recognize invalid tests, and ensure that test equipment (if applicable) is in proper working order.

2.1.2 The employer must ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

2.2 The following protocols are permitted:

2.2.1 Isoamyl Acetate Protocol

2.2.2 Saccharin Solution Aerosol Protocol

2.2.3 Bitrex Solution Aerosol Protocol

2.2.4 Irritant Smoke (Stannic Chloride) Protocol

2.2.5 Quantitative Fit Test (QNFT) Protocols

2.2.6 Controlled negative pressure (CNP) quantitative fit testing protocol.

2.3 Irritant Smoke Protocol

2.3.1 Irritant smoke protocol was chosen for its simplicity of required equipment and for the general inability of the test subject to be able to mask the effects of a leaking respirator.

2.3.2 This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

2.3.3 General Requirements and Precautions

2.3.3.1 The respirator to be tested must be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).

2.3.3.2 Only stannic chloride smoke tubes must be used for this protocol.

2.3.3.3 No form of test enclosure or hood for the test subject must be used.

2.3.3.4 The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor must take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care must be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.

2.3.3.5 The fit test must be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

2.3.3.5.1 Sensitivity Screening Check

2.3.3.5.1.1 The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

2.3.3.5.1.2 The test operator must break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator must cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

2.3.3.5.1.3 The test operator must advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.

2.3.3.5.1.4 The test subject must be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator must carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

2.4 Irritant Smoke Fit Test Procedure

2.4.1 The person being fit tested must don the respirator without assistance and perform the required user seal check(s).

2.4.2 The test subject must be instructed to keep his/her eyes closed.

2.4.3 The test operator must direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The test operator must begin at least 12 inches from the face piece and move the smoke stream around

the whole perimeter of the mask. The operator must gradually make two more passes around the perimeter of the mask, moving to within six inches of the respirator.

2.4.4 If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.

2.4.5 The exercises identified in section I.A. 14. of this appendix must be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.

2.4.6 If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

2.4.7 Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) must be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response must void the fit test.

2.4.8 If a response is produced during this second sensitivity check, then the fit test is passed.

Appendix B-1

User Seal Check Procedures (Mandatory)

1.0 General Requirements

1.1 The individual who uses a tight-fitting respirator is to perform a user seal check to ensure that an adequate seal is achieved each time the respirator is put on. Either the positive and negative pressure checks listed in this appendix, or the respirator manufacturer's recommended user seal check method shall be used.

1.2 User seal checks are not substitutes for qualitative or quantitative fit tests.

1.3 Face piece Positive and/or Negative Pressure Checks

1.3.1 Positive pressure check.

1.3.1.1 Close off the exhalation valve and exhale gently into the face piece.

1.3.1.2 The face fit is considered satisfactory if a slight positive pressure can be built up inside the face piece without any evidence of outward leakage of air at the seal.

1.3.1.2.1 For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.

1.3.2 Negative pressure check.

1.3.2.1 Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the face piece collapses slightly, and hold the breath for ten seconds.

1.3.2.2 The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the face piece remains in its slightly collapsed condition and no outward leakage of air is detected, the tightness of the respirator is considered satisfactory.

1.4 Manufacturer's Recommended User Seal Check Procedures

1.4.1 The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures provided that the employer demonstrates that the manufacturer's procedures are equally effective.

Appendix B-2

Respirator Cleaning Procedures (Mandatory)

The following procedures are provided for use when cleaning respirators. As an alternative the cleaning recommendations provided by the manufacturer of the respirators may be used by their TMs, provided such procedures are as effective as those listed here in Appendix B- 2.

1.0 Procedures for Cleaning Respirators

1.1 Remove filters, cartridges, or canisters. Disassemble face pieces by removing speaking diaphragms, demand and pressure- demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.

1.2 Wash components in warm (43 deg. C [110 deg. F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.

1.3 Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain.

1.4 When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:

1.4.1 Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43 deg. C (110 deg. F); or,

1.4.2 Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43 deg. C (110 deg. F); or,

1.4.3 Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

1.5 Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on face pieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

1.6 Components should be hand-dried with a clean lint-free cloth or air-dried.

1.7 Reassemble face piece, replacing filters, cartridges, and canisters where necessary.

1.8 Test the respirator to ensure that all components work properly.

MARKING OF PHYSICAL HAZARDS

OSHA CFR 1910.144(a)(3)

Yellow shall be the basic color for designating caution and for marking physical hazards such as: Striking against, stumbling, falling, tripping, and "caught in between."

Any object that can be exposed to striking against, stumbling, falling, tripping or caught in between must be marked yellow for caution or must be protected from such exposure in relation to the risk or hazard.

Any hole or opening greater than 4' drop shall be protected from Team Member exposure by guarding or other equivalent means.

Team Member must be protected from opens pits, tanks, vats, ditches, etc. by guarding or other equivalent means.

Confined Spaces must be protected and identified with signage or other means equivalent from Team Member exposure.

Fire equipment must be protected against damage. Fire equipment will be marked red.

Confined Space Entry Procedure

When entering and working in permit-required confined spaces, MBUSI prefers that all permit confined spaces have sufficient hazard controls that the space can be declassified to a non-permit confined space. If the space cannot be declassified, the hazards should be controlled by using the safety hierarchy of controls in the following order:

- Eliminating the hazard
- Engineering solution
- Administrative solution
- Personal protective equipment

- **Description**

- **Definitions**

- **Acceptable Entry Conditions** - The conditions that must exist in a permit-required confined space to allow entry, to ensure that TMs involved with a permit-required confined space entry can safely enter into and work within the space.
 - **Attendant** - A TM stationed outside one or more permit-required confined spaces that monitor the authorized entrants and who performs all of the attendant's duties assigned in the Confined Space Entry Procedure.
 - **Authorized Entrant** - A TM who has been trained and is authorized by MBUSI to enter a permit-required confined space.
 - **Confined Space** - A space that:
 - Is large enough and so configured that a TM can bodily enter and perform assigned work; and,
 - Has limited or restricted means for entry or exit (examples include tanks, vessels, silos, storage bins, hoppers, vaults, pits, crawl spaces, subfloors, etc.); and,
 - Is not designed for continuous occupancy.
 - **Engulfment** - The surrounding and effective capture of a TM by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on their body to cause death by strangulation, constriction, or crushing.
 - **Entry** - The action, by which a TM passes through an opening into a confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.
 - **Entry Permit** - The document that is provided by MBUSI to allow and control entry into a permit-required confined space.
 - **Entry Supervisor** - An MBUSI Team Member who is responsible for determining if acceptable entry conditions are present at a permit-

required confined space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry.

- **Hazardous Atmosphere** - An atmosphere that may expose TMs to the risk of death, incapacitation, and impairment of ability to self-rescue, injury, or acute illness from one of more of the following causes:
 - Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit.
 - Airborne combustible dust at a concentration that meets or exceeds its lower flammable limit. A good rule of thumb is obscured vision at 5 feet or less.
 - Atmosphere oxygen concentrations below 19.5% or above 23.5%.
 - Concentrations of any substance for which a dose or a permissible exposure limit is published in OSHA's standards and/or those listed on the ACGIH Threshold Limit Values (MBUSI will utilize the more protective limit) and which could result in TM exposure in excess of its dose or permissible exposure limit.
- **Immediately Dangerous to Life or Health (IDLH)** - Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with a TM's ability to escape unaided from a permit space.
- **Construction confined spaces** - These are confined spaces that are controlled by the contractor conducting the work. The same criteria for all types of confined spaces apply, but the difference is that the contractor is responsible for maintaining these spaces while they conduct work.
- **Non-Permit Required Confined Space** - A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.
- **Permit-Required Confined Space** - A confined space that has one or more of the following characteristics:
 - Contains or has the potential to contain a hazardous atmosphere.
 - Contains a material that has the potential for engulfing an entrant.

- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor, which slopes downward and tapers to a smaller cross section.
 - Contains any other recognized serious safety or health hazard.
- **Assessment**
 - All spaces at MBUSI that meet the general definition of a confined space as outlined above shall be assessed using the Confined Space Assessment Form.
 - As a result of the assessments, confined spaces determined to be permit-required confined spaces shall be posted with a “Danger - Permit Required Confined Space Do Not Enter” sign. See Appendix A.
 - If a Permit required confined entry space is declassified, the Confined Space De-Classification Certification must be posted next to the Danger sign.
 - Confined spaces not requiring a permit, should be posted with a “Caution Confined Space – no chemicals or welding allowed without permit. Call Safety at 205-507-2177” or “Caution Confined Space – use lockout & entry procedures prior to entry.” See Appendix A.
 - **Training**
 - Persons assigned to work as confined space entrants, attendants, Group Leaders, Team Leaders, or rescue workers must have had training in their respective roles before being assigned to a confined space entry. Training materials will be promptly updated if there is a permit-required confined space change.
 - Whenever deviations from established Confined Space Entry Procedure has been detected or the TM’s knowledge has been determined to be inadequate, permit required confined space retraining must be initiated.
 - Training shall also be initiated if there is a hazardous change to permit required confined space for which a TM has not been trained or whenever deviations from established procedures and regulations for confined space work are detected.
 - Retraining shall be provided when new or revised entry procedures are introduced.
 - The training will cover the hazards that may be faced during entry, including information on the mode, signs or symptoms, and adverse consequences of exposure.
 - Training must be documented per MBUSI requirements.

- Contractor rescue team training records shall be kept by the contractor.
- Permit required confined space training can include, but not be limited to the following:
 - Multi-gas monitors for atmospheric evaluations.
 - Ventilating equipment
 - Personal protective equipment
 - Mechanical rescue systems
- **Contractors/Suppliers**
 - When MBUSI departments arrange for employees of another company (contractor) to perform work that involves permit required space entry, the following must be conducted by the MBUSI Management TM responsible for the contractor work:
 - Inform the MBUSI Safety Department of the work being conducted.
 - Inform the contractor that the workplace contains permit required confined spaces and that entry is allowed only with a confined space entry permit.
 - Inform the contractor of any procedures that have been implemented for protecting MBUSI TMs working in or near permit required confined spaces.
 - Coordinate with the Safety Department and the entry supervisors of all involved employers that will be working in or near the confined space so that employees of one employer do not endanger the employees of any other employer.
 - Develop a confined space entry plan and present it to MBUSI Safety for approval.
 - Monitoring of actual and potential atmospheric hazards is required in all confined spaces at MBUSI.
 - Debrief the contractor at the conclusion of the entry operation to determine if any unexpected hazards were confronted or created in the permit-required spaces.
 - Contractors must furnish their own confined space safety equipment to enter the space safely and to meet all regulations.
 - The hosting MBUSI TM is responsible for ensuring all MBUSI Safety guidelines are followed by contracted workers. If there are concerns, the hosting TM will stop the work and discuss concerns with the contractor management until the concerns are resolved before the work can be resumed. The hosting TM will discuss concerns with the contractor management, not with the contractor workers.
 - Contractor/Supplier will be required to furnish all necessary equipment, training and personnel to comply with the

requirements of these Guidelines unless otherwise agreed to by MBUSI.

- Contractor/Supplier personnel must meet all OSHA/MBUSI requirements for confined spaces and conduct any necessary air monitoring.
 - All Permit Required and Non-Permit Required Confined Spaces at MBUSI are labeled.
 - Contractors/Suppliers must notify the appropriate MBUSI Maintenance Group prior to working on any equipment within the production areas or those areas that may affect MBUSI processes through the Permit System.
 - Permit violation will result in immediate cessation of work.
 - MBUSI Security/Safety must sign off all Confined Space Permit forms prior to work commencement.
 - Please refer to MBUSI procedure 1910.146 Confined Work Space Entry Procedures for more details.
- Contractors responsible for construction confined spaces and permitted confined spaces are responsible for posting signs.
- **Confined Space Specific Responsibilities**
 - Specific TMs who have training in the active roles in MBUSI permit-required confined space entries and their duties are as follows:
 - Authorized Entrants
 - Know hazards that may be faced during the entry to include mode, signs, symptoms, and consequences of exposure.
 - Properly use equipment.
 - Communicate with the designated attendant to enable the attendant to alert the entrants of the need to evacuate.
 - Alert the attendant if a sign/symptom of an exposure or danger, or prohibited condition is detected.
 - Exit the space immediately after being ordered by the attendant or entry supervisor when the attendant or entry supervisor recognizes an adverse exposure sign or symptom, when a prohibited condition has been detected or when an evacuation alarm has been activated.
 - Attendants
 - There shall be at least one attendant for each permit required confined space being entered. Attendants can only monitor more than one permit space with expressed permission from MBUSI Safety Dept. Attendants must:
 - Know the hazards that may be faced during the entry to include the mode, sign, symptom, and consequences of adverse exposure.

- Know the possible adverse behavioral effects of hazard exposure in the authorized entrants.
 - Continuously maintain an accurate count and identity of the authorized entrants.
 - Remain outside the permit required confined space during entry operations until relieved by another attendant.
 - Only attempt an entry rescue if they have been trained in rescue operation and if they are relieved by another trained attendant.
 - Communicate with the authorized entrants to monitor the entrants' statuses and to order an evacuation if necessary.
 - Monitor activities to include, when necessary, continuous atmospheric testing inside and outside to determine if it is safe for entrants to remain in the permit-required confined space and order immediate evacuation if:
 - The attendant detects a prohibited condition.
 - The attendant detects the adverse behavioral effects of hazard exposure of the entrants.
 - The attendant detects a situation outside the space that could endanger the authorized entrants.
 - The attendant cannot safely and effectively perform all of their duties.
 - Summon rescue and emergency services as soon as they determine that entrants may need assistance to evacuate.
 - Warn unauthorized persons to stay away from the confined space.
 - Advise unauthorized persons to exit immediately if they have entered the permit space.
 - Inform the entrants and entry supervisor if unauthorized persons have entered the permit space.
 - Perform non-entry rescues, if properly trained.
 - Perform no duties that might interfere with the attendant's primary duty to monitor and protect the entrants.
 - Provide testing results to each authorized entrant as requested.
- Entry Supervisor must:
 - Know the hazards that may be faced during the entry, including the mode, signs, symptoms, and consequences of adverse exposure.
 - Verify by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures, signs, and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin.

- Terminate the entry and cancel the permit when entry operations covered by the permit have been completed, or when a condition not allowed under the entry permit arises in or near the space.
 - Verify that rescue services are available and that the means to summon them are operable.
 - Remove unauthorized individuals who enter or who attempt to enter the permit space during entry operations.
 - Determine whether or not conditions have changed whenever there is a transferring of responsibility or at intervals dictated by the confined space permit.
 - Order corrective measures, if necessary.
 - Coordinate the implementation and assurance of acceptable working conditions when MBUSI TMs and contractor employees are working simultaneously in a permit space.
- Permits
 - Permits must be used to outline what measures are to be taken and to ensure completion of these measures before entry is authorized.
 - MBUSI permits shall identify the following:
 - The permit space to enter.
 - The purpose of the entry.
 - The date and authorized duration of the entry permit.
 - The authorized entrants by name to enable the attendant to quickly and accurately determine the identity of the authorized entrants.
 - The attendant's name.
 - The entry supervisor (by name).
 - The Safety Department signature.
 - The hazards of the permit space to be entered.
 - The measures used to isolate and eliminate or to control hazards before entry. (Lockout/tag out, purging, inerting, ventilating, etc.)
 - The acceptable atmospheric entry conditions.
 - The results of initial and periodic atmospheric monitoring, the names or initials of the testers and when the tests were performed.
 - Verification of the communication procedures to maintain contact during entry.
 - The equipment used for the entry (PPE, testing, communications, rescue equipment, etc.).
 - Other information to ensure safety.
 - Additional permits, such as hot work, that is required to work in the space.
 - All permit required confined space permits shall be posted at the space entrance after having been reviewed for completeness and authorized by the entry supervisor.

- The duration of the permit must not exceed the time required to complete the task, but never more than one shift.
- The entry supervisor shall terminate entry and cancel the permit when:
 - The entry operations covered by the permit are complete.
 - A condition not allowed in the permit arises in or near the confined space.
- Security must be called when the permit is cancelled.
- One (1) copy of the completed or cancelled permit must be forwarded to the Safety Department and kept for 1 year to facilitate a program review. Any problems encountered should be noted on the permit and brought to the attention of MBUSI Safety by the contractor encountering the issue.
- Permit Required Confined Space Entry
 - Prior to permit-required confined space entries, entry preparations as follows must be conducted:
 - Implementing measures to prevent unauthorized entry.
 - Evaluating and identifying the specific confined space hazards. (Safety Department should be involved).
 - Performing all relevant control of hazardous energy procedures.
 - Purging, inerting, flushing, or ventilating, as necessary, to eliminate or control atmospheric hazards. Continuous ventilation is required if there exists a potential for the development of a hazardous atmosphere (i.e. development of a hazardous atmosphere resulting from welding activities, sludge cleaning, etc.)
 - Valves shall not be relied on to prevent the flow of material unless a locked and tagged double-block and bleed arrangement is provided.
 - Work on tanks or containers that contain or have contained hazardous substances shall be performed only by trained personnel who understand the associated hazards and who are sufficiently qualified, trained or educated to safely carry out the necessary operations.
 - All discharges or venting of the hazardous atmosphere shall not create a hazard or potential hazard.
 - Providing barriers to protect against falls, dropped objects and vehicles.
 - Atmospheric testing must always be conducted before entry into a permitted confined space
 - Testing of atmospheric conditions to ensure acceptable working conditions are present at the time of entry and are continuously maintained throughout the duration of the work. If the atmospheric conditions are not continuously maintained, all work in and around the confined space shall be stopped immediately until acceptable conditions are re-established. Atmospheric testing includes:
 - Oxygen
 - Combustible gases and vapors
 - Other toxic gases and vapors

- Entry will not be authorized into space with oxygen less than 19.5% or greater than 23.5% or a combustible atmosphere of 10% or more of the lower flammable limit of the gases or vapors. If these conditions are present, forced ventilation must be provided to clear the space of these hazards. Contact the Safety Department for further discussion and plan of action.
 - PPE shall be available.
 - Lighting equipment shall be available to see well enough to work and exit quickly.
 - Ladders shall be provided where needed for safe ingress and egress.
 - Make rescue and emergency equipment available.
 - Making at least one attendant available.
- Alternate procedures and requirements to permit required confined spaces
 - Alternate procedures may be used as follows; but only as specifically approved of by department management and the MBUSI Safety Department.:
 - If it can be demonstrated that the only hazard posed by the permit space is an actual or potential hazardous atmosphere. This means that the space must not have the potential for engulfment or any other serious safety or health hazard.
 - If it can be demonstrated that continuous forced ventilation is sufficient to maintain the space safe for entry.
 - Monitoring and inspection data are developed to support two items above.
 - Data required for above is done initially by permit required confined space procedures.
 - This inspection and monitoring data are documented and made available to relevant TMs via the entry permit.
 - Requirements for alternate procedure entry are as follows:
 - Any condition making it unsafe to remove the cover is eliminated before the cover is removed.
 - When entrance covers are removed, barriers shall be promptly installed to prevent people or things from falling into the space. A risk assessment must be performed to determine hazards and safe countermeasures for those hazards.
 - Atmosphere testing:
 - Oxygen content
 - Flammable gases and vapors
 - Potential toxic air contaminants must be conducted with a direct reading calibrated instrument.
 - There must be no hazardous atmosphere within the confined space when occupied.
 - Continuous forced ventilation must be used as follows:
 - Entry is not allowed until forced air ventilation has eliminated the atmosphere hazard.

- The forced air must be directed as to ventilate the immediate areas where the TM is or will be located.
 - The forced air supply must be from a clean source and must not increase the hazard inside the space.
- The atmosphere within the space must be periodically tested. Forced air ventilation does not constitute elimination of the hazard.
- If a hazardous atmosphere is detected, TMs must exit immediately, the permit is cancelled and the space must be evaluated to determine how the hazardous atmosphere developed and can be corrected. The permit required confined space procedure must start over to verify that the space is safe for re-entry.
- Changes in use or configuration of non-permit spaces that introduce or create hazards (welding/cutting, introduction of toxins, modification of mechanical, electrical devices, etc.) or permanently change the space require the space to be reclassified as a permit required confined space.
- **Permit spaces that pose no actual or potential atmospheric hazards and can be reclassified as a non-permit confined space so long as the non-atmospheric hazards can be eliminated.**
- If it's necessary to enter the permit space to eliminate hazards, entry must be performed using the permit required confined space procedures and permit.
 - Once testing and inspection have demonstrated that all non-atmospheric hazards have been eliminated, a permit space may be re-classified to a non-permit space for as long as the hazards remain eliminated. Approval and documentation of this re-classification must be obtained by using the Confined Space De-Classification Certification.

See Appendix C for hot oven entry and safe stay times.

- Hot Work within a Confined Space
 - If hot work is performed inside a confined space, the Safety Department/Security must be contacted and hot work procedures must be followed. Determination will be made by MBUSI Safety if the space will be considered a confined space or a permitted confined space.
 - The oxygen content shall be at or below 23.5 percent by volume but not lower than 19.5%.
 - Before hot work is started, the lower flammable limit (LFL) within the confined space shall be 0 percent LFL.
 - During the course of the hot work, if the LFL rises to 10 percent, all work shall stop, personnel shall leave the space and ventilation shall continue until the LFL is again at 0 percent.
 - The permit shall then be reissued to continue the hot work.
- Confined Space Entry Procedure Review
 - The Confined Space Entry Procedure must be reviewed and deficiencies corrected when any of the following circumstances occur:
 - Any unauthorized entry of a permit required confined space.

- Detection of a permit required confined space hazard not covered by the permit.
 - The detection of a condition prohibited by the permit.
 - Occurrence of an injury, accident, or near-miss during a permit required confined space entry.
 - TM or contractor complaint about the effectiveness of the Confined Space Entry Procedure.
 - After an annual review of the canceled permits shows a deficiency.
 - Annually.
- Permit required confined space rescue and emergency services
 - Any immediately dangerous to life and health (IDLH) atmosphere permit required confined space entry will require an emergency rescue team at the entry site.
 - Emergency rescue must be planned before implementation. See Appendix B for a planning outline.
 - At least one member of the rescue team will hold current certification in first aid and CPR.
 - The required personal protective equipment and rescue equipment will be provided and available at the permit required confined space entry point.
 - To facilitate non-entry rescue, retrieval systems or methods must be used whenever an authorized entrant enters a permit required confined space, unless the equipment would increase the risk of entry or would not contribute to the rescue of the entrant. Retrieval systems shall meet the following requirements:
 - Each authorized entrant shall use a full body harness. A retrieval line attached at the center of the back near shoulder level or the retrieval line will be attached to the wrist as long as it does not create a greater hazard.
 - The other end of the retrieval line should be attached to a mechanical device or fixed point outside the space in such a manner to begin rescue immediately.
 - A mechanical retrieval device should be used to retrieve persons from vertical permit spaces more than 5 feet deep.
- **Documents/References**
 - Confined Space Assessment Form
 - Confined Space Permit Form
 - Confined Space De-Classification Certification Form

Appendix A

Confined Space Signs



Appendix B

Confined Spaces Entry/Rescue Training Outline

- Overview and purpose of 29CFR 1910.146
- Classifications and Confined Spaces
- Classifications of Hazards
- Purpose of the Confined Space Entry Program
- Duties of Confined Space Entry TMs
- Permit System
- Preparing Entry Permits
- Hot Work Permits
- Atmosphere Testing
- Ventilation
- Rescue Plans
- Emergency Rescue Equipment
- Emergency Rescue Procedures

Appendix C

- Non-Standard Oven Entry
 - To enter hot ovens in accordance with the Heat Stress guidelines, the following steps must be taken;
 - Declassify confined space by;
 - Locking out all hazardous energy (electrical, gas)
 - Cool down ovens in accordance with heat stress table
 - Using Workload heat stress table as the required guidelines for all entrants
 - Provide 8 oz. of electrolyte drinks, water, or another non-caffeinated drink equivalent to entrants every 15-20 minutes (at a minimum).
 - Use wet-bulb globe temperature (WBGT) monitor with sensors 3.5- 4ft off work surface when entering ovens. The data must be compared against the data in the following table to assess the exposure time allowed per team member.
 - A Red Shirt (Fire Safety) or their Designee will be present during the entries to monitor compliance with entry times of all TM's. They will also be observing for signs of heat stress for the entrants (muscle cramps/spasms, headaches, heavy sweating, fatigue, nausea, cool moist skin).

Oven Entry based upon 2007 WBGT tables (rest area must be <87 degrees DB)

Personal Dry bulb/ thermometer reading °F °C		Light work (minutes)	Moderate Work (minutes)	Heavy work (minutes)
140	60	< 13	< 12	<9
138	58.9	<15	<13	<10
134	56.7	<16	<13	<11
130	54.4	<17	<13	<11
127	52.8	<20	<15	<11
116	46.7	<20	<15	<12
114	45.6	<21	<15	<12
111	43.9	<21	<16	<13
107	41.7	<24	<17	<14
104	40	< 27	<18	<15
103	39.4	<29	<20	<15
98	36.7	<32	<22	<17
95	35	<37	<24	<18
93	33.9	<42	<26	<19
91	32.8	<50	<29	<21
87	30.6	100%	<30	<25
85	29.4	No restrictions		

*time based upon a hour – rest must be remainder of hour in cool area (work – 60 minutes)

Light work = occasional walking, easy arm work – toggling switch or inspection of area

Moderate = normal walking - light pushing/pulling

Heavy = fast walk, heavy loads – pushing/pulling

Go/No go criteria

1. Heat tolerance varies from person to person – always ask how the person feels.
Pull if not feeling well.
2. Other condition noted by Medical Surveillance that indicates Health risk

Note: Assure all entry personnel drink water/ replenishing fluids a minimum of 8 oz every 15-20minutes.

Alternative Hazardous Energy Lockout Process

- A. The Control of Hazardous Energy Plan does not apply to service and maintenance of equipment performed during normal production operations as long as:
 1. The safeguarding provisions of OSHA's Machine Guarding and other applicable general industry standards are effective in preventing worker exposure to hazards created by the unexpected energization or startup of machines or equipment, or the release of other forms of energy.
 2. Minor tool changes, adjustments, and other minor servicing activities that take place during normal production operations which are routine, repetitive, and integral to the use of that production equipment, as long as workers are effectively protected by alternative measures which provide effective machine safeguarding protection.
 3. Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energization or start-up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the TM performing the servicing or maintenance.
- B. It does apply when a TM is required to remove or bypass guards or safety devices, or when the TM is required to be in or place any part of their body into an area or a machine where work is being performed or material processed where an energy release hazard exists during the equipment operation.
- C. Application:
 1. Specific alternative plans must be approved by the department management and MBUSI Safety (if available), and the training documented for participating TMs. In

such cases, the Alternative Hazardous Energy Lockout Process (AHELP) work instruction is mandatory.

2. The AHELP work instruction is mandatory for hot tap operations, involving transmission and distribution systems for substances such as gas, steam, water, or petroleum products when they are performed on pressurized pipelines, if continuity of service is essential and shutdown of the system is impractical. All special equipment must be reviewed to ensure it provides proper protection, understand proper usage, and hazards. The AHELP documented must be followed and monitored by the MBUSI host.
3. AHELP cannot be used if the activity can be completed with Lockout Tagout Test.
4. AHELP Format

- a. To address OSHA requirements and assure TM safety, alternate safeguard measures must be developed, approved and implemented where lock and tag out cannot be conducted due to the nature of the work activity (trouble shooting, chain tension adjustments, etc.). The format for the AHELP work instruction shall include the following sections that must be addressed:

- 1) Purpose – Justification of why LOTO cannot occur for the Task.

- 2) Tasks – Defines the activities to be conducted.

- 3) TM Requirements – Defines how many TMs are required, their roles, and responsibilities.

- 4) Task Specific Procedures – Define the procedures to follow.

- 5) Hazards Identified – All hazards of the task must be identified by involving TM's that have knowledge of the system and the TM's performing the task. Look at each procedure of the task and identify hazards of those task.

- 6) Hazard Avoidance - Define the specific countermeasure to prevent TMs being exposed to a hazard.

Such alternative safeguarding measures may include devices such as, but not limited to, two-hand trip or control devices, restraint devices that prevent the employee from entering the zone of danger, video cameras that would allow remote observation, and plexi-glass barriers that allow for close inspection of the operation, yet prevent introduction of the employee's body into the machine hazard area. It must be emphasized that every employee performing these inspection tasks must be protected from exposure to hazardous energy.

- 7) Emergency Action – Define the actions to take in case of an emergency.

- 8) Review plan with involved TMs with a role in Task. Make changes as needed to plan based on TMs comments in review. TMs sign off that they agree with plan.

- b. Upon completion of the AHELP work instruction, it must be signed by the responsible departments' management representative and Safety, or their designees. Any changes must be reviewed with the TMs involved in the task. Once all requirements have been satisfactorily reviewed with the work team,

and signed by all TMs involved, the work activity may commence. The AHELP Work Instruction is kept available at the work activity site. Once AHELP is completed, it should be sent to Safety for review.

Note: Only TMs that have undergone Hazardous Energy training and are knowledgeable in the normal plan can participate in alternative plans.

Contractors/Suppliers

1. During servicing and maintenance activities, lockout/tagout is required to ensure equipment cannot be operated. Locks and tags must be used by all personnel. The basic lockout/tagout steps are as follows:

- a. Locate and identify all energy sources and isolating devices.
- b. Alert the people in the area of the lockout.
- c. Shut down equipment by the normal stopping procedure.
- d. De-energize all energy sources (electrical, hydraulic, pneumatic, steam, gravity, thermal, gravitational, etc.).
- e. Physically place locks with tags or restraints on energy isolating devices.
- f. Verify a zero energy state and verify by attempting start-up the equipment.
- g. Perform the work.
- h. Make sure area is clean of tools, parts and personnel.
- i. Remove the locks, tags and restraints.
- j. Alert the necessary personnel that the equipment will be online.
- k. Restore the energy and resume normal operations.

2. Lockout locks and tags shall not be used for purposes other than lockout activities.

3. Lockout locks must be RED in color and the tag must have the person's name, phone number and the employing company's name on it or have a tag attached to the lock with that information. Red colored locks can only be used for lock out tag out.

4. MBUSI Security must be notified if a Contractor/Supplier lock and tag must be removed by someone other than the person who placed the lock/tag.

5. The Contractor/Supplier must notify the appropriate Project Manager as well as MBUSI Maintenance Group prior working on any equipment within the production areas or those areas that may affect any MBUSI process through the Safe Work Permit system.

6. Contractor/Supplier management must ensure that their employees and subcontractors have locks and tags as necessary and document proof of the lockout/tagout procedure compliance.

a. Lock Removal

1. Any person who removes a lock/tag belonging to another person or overrides a lock/tag in any way, shall be permanently banned from site.
2. When a lock/tag has been left on a piece of equipment and the person has left the site, the Contractor/Supplier will contact MBUSI Security at (205) 507-2177. The area will be walked back by MBUSI Safety/Security and the Contractor/Supplier supervision to ensure the area is safe.

All Electrically energized equipment shall be verified to be de-energized, by an electrically qualified individual. (Arc Flash trained).

Definitions

A. Definitions

Affected TMs - A TM whose job requires him/her to operate or use a machine or equipment on which service or maintenance is being performed under Hazardous Energy plans, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Alternative Hazardous Energy Lockout Process (AHELP) – MBUSI’s plan used to address OSHA’s alternate plan requirements in situations where the work activity cannot be conducted with 100% energy removal or isolation. Production needs or convenience is not a basis for avoiding Hazardous Energy requirements.

Authorized TMs - A TM who uses Hazardous Energy procedures on machines or equipment in order to perform the necessary service or maintenance on those machines or equipment.

Capable of Being Locked Out - An energy isolating device is capable of being locked out, if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it, which physically prevents the device from being operated when a lock is attached.

Designated “Lead” - The TM given the responsibility for the specific work activity requiring Hazardous Energy control procedures. The Designated “Lead” TM shall be the first to apply their lock and tag and the last to remove their lock and tag from their group.

Emergency stop buttons – a red mushroom headed button that, when activated, will immediately start the emergency stop sequence which is designed to stop devices to enable actual or impending danger to be averted. It must be placed so that it is easily accessible and should be located/oriented to prevent accidental activation.

Energized - Connected to an energy source or containing residual or stored energy.

Energy Isolating Device - A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following:

1. A manually operated electrical circuit breaker.
2. A disconnect switch.
3. A manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors; and, in addition, no pole can be operated independently.
4. A line valve, a block, and any similar device used to block or isolate energy.
5. Control devices that are control reliable and built to applicable safety circuit standards (i.e. Pilz safety circuits).

Note: Standard push buttons, selector switches, and other control circuit type devices are not energy isolating devices and do not provide protection under the Control of Hazardous Energy plan.

Energy Source - Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, radiation, and/or gravity.

Hazardous Energy - The energy inherent in a system or equipment that has the potential to cause injury.

Hazardous Energy Control Procedure - Lockout Tagout Test placards posted on the main panels of equipment.

Hot Tap - A plan used in the repair, maintenance, and service activity which involves welding on a piece of equipment (pipelines, vessels, or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Lockout - The placement of a lockout device to isolate Hazardous Energy, in accordance with the established procedure, ensuring that the Hazardous Energy is safeguarded and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout Device - A device that utilizes a positive means such as a lock, to physically hold an energy isolating device in a safe position and prevent the energizing of a machine or equipment. Included are: blank flanges and bolted slip blinds for piping systems.

Multi-TM (or Contractor) Lockouts - A multi-lock hasp/group lockout boxes may be used when more than one lock is installed on a device. Each TM performing work on equipment must place their lock on the multi-lock hasp/group lockout box.

Normal Production Operations - The utilization of a machine or equipment to perform its intended production function.

Servicing and/or Maintenance - Preventive and corrective maintenance are included as activities that require Hazardous Energy Lockout procedures before

the work (constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment) can be initiated.

Tagout – The placement of a Tagout Device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the Tagout Device is removed.

Tagout Device - A prominent warning device, such as a Tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the Tagout Device is removed.

B. Periodic Inspection

1. An annual inspection of the Hazardous Energy Control Procedure must be conducted to ensure that the requirements of the OSHA standard are being followed.
2. The inspection must be performed by an authorized TM other than the ones utilizing the energy control procedure being inspected.
3. The inspection shall include a review between the inspector and each authorized TM of that TM's responsibilities under the energy control procedure being inspected.
4. Annual inspections must be conducted. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the TMs included in the inspection and the TM performing the inspection.

C. Training

1. All affected TMs must be trained in the purpose and use of the Control of Hazardous Energy Plan (Lockout Tag out).
2. Authorized TMs must be trained in the recognition of applicable hazardous energy sources, and the type and magnitude of energy available in the workplace. The Group Leader is responsible that all authorized TMs are trained in the methods and means necessary for energy isolation and control.
3. Retraining shall be provided for all authorized and affected TMs whenever there is a change in job assignments, equipment, processes that present a new hazard or when there is a change in energy control procedures. Refresher training for authorized TMs is once every two (2) years.
4. Additional retraining shall be conducted whenever annual or periodic lockout inspections reveal that lockout procedures are not being followed.
5. All Hazardous Energy training shall be documented, including the TM's name and dates of training, with AIDT.

D. Equipment

1. MBUSI will issue authorized TMs the locks, tags, and other lockout devices in sufficient quantity to be able to physically lock and tag all equipment energy sources. Locks or keys may not be shared or loaned to other TMs.

2. Lockout Locks

- a. Lockout locks are issued to TMs that are standardized by the color red to identify it as a “lockout lock”. The Safety Department is responsible for the issuing of the lockout locks.
- b. Lockout locks may not be used for any other locking purposes.
- c. To ensure the personal protection of each TM, there must only be one key per lockout lock (or set of locks) issued to the individual TM.
- d. Only Red Locks are to be used for Lockout/Tagout. No particular brand of lock is required. The key should remain trapped in the lock when the hasp of the lock is in the open position.

3. Lockout Tags/Labels

- a. MBUSI lockout tags/labels are standardized Company wide, have red and white stripes and have the words “DANGER” and “DO NOT OPERATE”.
- b. All tags/labels must identify the owner.
- c. Tagout without a lockout lock is not allowed for the Control of Hazardous Energy at MBUSI except in the case of gravitational control. If a tag must be used instead of a lock, a written plan must be developed and the Safety Representative of the shop must give written approval.

4. Multi-lockout hasps

Can be used when more than one TM is involved in the Hazardous Energy work.

5. Group lockout boxes

Can be used when more than one lock is installed on a device. Each TM performing work on equipment must place their lock on the group lockout box.

6. Other lockout devices

Other lockout devices such as blanking blinds, valve lockouts, electrical switch lockouts, circuit breaker lockouts, etc., can be used as needed.

E. Sequence of Hazardous Energy Control

1. Preparation

Before work begins on any machinery or equipment, the Hazardous Energy Control Procedure will be reviewed by the authorized TMs. Locks, tags, and lockout devices shall be identified and obtained in sufficient quantity for all energy sources and for each TM. The Designated “Lead”

TM shall notify the affected TM(s) that the Hazardous Energy Control Procedure will be used and why.

2. Shutdown

If the equipment is operating, it must be powered down by the normal stopping procedure. (Turn off switches, depress the “OFF” button, open toggle switch, etc.)

3. Isolate

Isolate the equipment from external energy sources by pulling the disconnect, opening the circuit breaker, closing the valve, etc.

4. Lockout

Lock out all of the isolating devices listed in **step 3** above.

If equipment is incapable of being locked out, consult with the Safety Department before proceeding.

5. Stored energy

Release, restrain, or dissipate any stored energy in the equipment. As applicable:

- a. Perform a visual inspection of all moving parts to verify all have stopped.
- b. Dissipate air, gas, steam, water pressure as appropriate.
- c. Install ground wires to discharge static or stored electricity.
- d. Release the tension on compressed springs or block the movement of any spring driven parts.
- e. Block or support elevated equipment that could fall on TMs from the force of gravity.
- f. Block machine parts that could operate or fall from a loss of hydraulic or pneumatic pressure, bleed the lines, and leave all vent valves in the open position.
- g. Drain process piping systems and close all valves to prevent the flow of hazardous chemicals/materials.
- h. Dissipate hazardous chemical/material energy by flushing or purging vessels and process lines.
- i. Dissipate hazardous thermal energy.
- j. Discharge capacitors according to the equipment manufacturer’s directions.

6. Verify

After ensuring that no TMs are exposed, confirm (test) and verify that the equipment will not operate.

- a. Test the lockout at the main disconnects. Try activating the disconnect switch, circuit breaker or opening a valve to ensure it cannot be moved to the “ON” position.
- b. Follow the test procedures as directed on the Lockout Tagout Test placard.
- c. Depress the start button or other activating controls on the equipment to ensure the equipment will not start.

- d. Return start switches/control devices to the “Off” position or otherwise neutral position that does not permit automatic start-up of the equipment.

F. Sequence of Restoring Machinery and Equipment to Normal Production Operations

1. The Designated “Lead” TMs shall notify affected TMs of the intent to restore the machinery/equipment to Normal Production Operations.
2. After service/maintenance activities are complete, the equipment and the area is checked that:
 - a. All tools and parts have been removed.
 - b. All guards, covers, and safety devices have been re-installed.
 - c. All personnel are clear of the equipment.
3. Remove locks, tags, and lockout devices.
4. Restore energy and insure the equipment is working properly.
5. If the operator(s) are available, or at the request of the Group/Team Leader, then the machine power may be left on. Otherwise, shut off the power to the equipment if it is not immediately needed.

G. Special Procedures

1. Group Lockouts

In cases where lockout is in effect for activities involving several groups or crews, extra precautions must be taken to insure proper coordination. For such work the Designated “Lead” is responsible to ensure all TMs in the group have applied and removed locks and tags as they begin and complete the work. The Designated “Lead” TM shall be the first to apply their lock and tag and the last to remove their lock and tag from their group.

2. Contractor Lockouts

Outside personnel or contractors involved in lockout of equipment or machinery must have and implement a written Control of Hazardous Energy Plan, which meets all of the requirements of the OSHA and the MBUSI Control of Hazardous Energy (Lockout Tagout Test) standards. MBUSI affected and authorized TMs must be briefed and informed of the contractor lockout work. In order to protect MBUSI TMs, the contractor’s work area will be isolated and access will be restricted whenever possible. If this is not possible, the MBUSI project coordinator will ensure the contractor Hazardous Energy program complies with all provisions of the OSHA Control of Hazardous Energy standard and this document. Contractors must supply their own locks, tags, and other lockout devices.

3. Shift Changes

Shift changes with Hazardous Energy procedures must be coordinated by the Designated “Lead” TM with the oncoming shift and will ensure the following, that:

- a. A review of the Hazardous Energy work is conducted.

- b. A review of the energy sources and lockouts in effect is conducted.
- c. Notification of start-up and testing to be performed is conducted.
- d. Any change in the job scope that affects Hazardous Energy is communicated.
- e. An orderly exchange of locks and tags is conducted. If possible, the TM taking over from the next shift puts their lock on before the last shift's TM's lock is taken off, otherwise the last shift's TM lock is immediately replaced by the next shift's TM lock.
- f. For equipment servicing that will be conducted on a non-consecutive shift, and where the group conducting initial lockout of the equipment will not be available for turnover, a lock that is specifically identified as a "Supervisor" lock can be used to lock out the equipment until the team actually conducting the work comes on shift. A tag must accompany the supervisor lock that describes any pertinent hazards/ information associated with the equipment that may occur if the system is energized. (i.e. loose wires, removed guards, etc.) The shift log must identify any "out of standard" conditions that may apply to the equipment. When the team that has been designated to work on the equipment comes on shift, the shift supervisor shall read the shift log for any pertinent details regarding the equipment and inform their team of any issues as necessary. Each team member that conducts the work shall assure all proper lock out steps have been conducted and then apply their personal locks. After the personal locks have been applied, the Designated "Lead" team members shall remove the "Supervisor" lock.

4. Emergency Removal of Locks

- a. Except in an emergency, locks and tags may only be removed by the TM who originally applied the lock and tag. This TM is called and asked to come back to the lock and remove it. If a lock must be removed because its owner is not available, the following procedure must be followed:
 - 1) Complete the Lock Removal Form.
 - 2) Contact the management representative and Security for review and approval.
 - 3) A visual check of the equipment and the area makes sure that:
 - (a) All tools and parts have been removed.
 - (b) All guards, covers, and safety devices have been re-installed.
 - (c) All personnel are clear of the equipment.

- 4) Assign an appropriate number of TMs as lookouts to assure the affected area remains clear when the lockout lock is removed and equipment will be restarted.
- 5) If possible, restore power very carefully by jogging through a few cycles, cracking open valves slowly, etc.

Lockout/Tagout Placard Specifications

A. Definitions

Project Engineer - The MBUSI engineer responsible for the project.

Project - Scope of work that may affect the lock/tag out procedures of MBUSI property/ systems

Placard - schematic of the specific equipment/system's lock and tag out protocols on.

Contractor - The contractor that was awarded the purchase order/ bid for the installation of new equipment or charged to make modification to existing equipment that would/ may alter the lock/tag out procedure for said equipment.

B. Responsibility

The MBUSI Safety, Purchasing, and Engineering groups are responsible for implementing and assuring adherence to these specifications. Detailed responsibilities are itemized below.

1. MBUSI Safety is responsible for:

- a. Reviewing proposed lock and tag protocols prior to the Yellow (substantial completion phase) – see MBUSI Equipment Buy-off procedure.
- b. Approving final lock and tag procedure and posting prior to Green (final acceptance) of Equipment buy-off procedure.
- c. Assist MBUSI engineering and contractor in complying with this procedure.

2. Engineering is responsible for:

- a. Assuring adherence to this specification.
- b. Assuring the contractor meets all MBUSI requirements for lock and tag out protocols.
- c. Assuring that the contractor that is awarded the purchase order/successful bid package is aware of these requirements and specifications.
- d. Assuring LOTO placard is correct.

3. Purchasing is responsible for:

Assuring that the contractor that is awarded the purchase order/successful bid package is aware of these requirements and specifications.

C. Description

1. Deliverables

The lockout placards and procedures shall be provided, by the installing contractor, for all new MBUSI equipment installation as well as any modifications to existing equipment that affects current MBUSI lock and tag out procedures. These placards are to be completed and attached to the equipment as detailed in this procedure prior to substantial completion of the MBUSI equipment buyoff procedure. Any deviation from the below criteria requires prior approval from the safety department.

a. Deliverable Items – items that must be supplied by the supplier prior to substantial completion.

- 1) Electronic copy of all lock/tag out placards.
- 2) One map placard and one procedure placard must be developed for each lockout procedure
- 3) Draft copy of all placards submitted to the project engineer for mark-up and approval. The vendor/contractor shall be responsible for any changes or corrections that are required by MBUSI.
- 4) Two hard copies of the final lock out placards, as specified herein, shall be submitted prior to Final acceptance of the MBUSI buy-off procedure. Lock out placards must be printed portrait 14 x 8.5 inch backing with 1-inch borders. If the size or complexity of the procedure cannot be clearly represented on the 14 x 8.5-inch paper, then, 11" x 17' inch (0.5-inch border) is permitted. All graphics and fonts must be legible from a minimum distance of 2 feet. Procedure holders must have a length 1.5 inches greater than the procedure/map and have a width 2 inches greater than the procedure to allow for a 20 mm edging for mounting plus a 0.5 inch thumb notch to allow for procedure removal. Lock out placard size can changed with MBUSI Maintenance and MBUSI Safety approval.
 - (a) One copy of the placards must be installed on the equipment main electrical panel as close to the disconnect location as possible.
 - (b) The second copy shall be electronically delivered to the MBUSI document control Library.
- 5) Specific Lock out point placards shall be 2.5 inches x 2 5/8 inch in size or rough approximation of these dimensions.
- 6) Upon final approval of the procedure, the vendor/contractor shall mount the approved procedure to the piece of equipment prior to final acceptance of the buy-off procedure.

b. Placard locations

The placards shall be installed upon all equipment on the main electrical panel and shall contain all of the information required to bring the equipment to safe energy state. Systems or zone placards shall be required showing all lock out points associated that are affecting the equipment. Specific lock out point placards must be located at the equipment point to be locked out whenever possible. MBUSI Safety will give final approval of location points for placards and icons.

MBUSI Safety and the affected shop maintenance group leader shall be responsible to designate the location for placard placement.

2. General Information

Lock out placards consist of four general sections:

- Header
- Graphic
- Information Table, and
- Footer

This information must be placed on one page whenever possible. If the system/equipment is too complex to fit on one page, the graphic must be placed on the first page and the information table placed on the second page. The header and the footer must be placed on all pages/placards.

a. The Header must display:

- The maximum number of locks that are required for safe lock out of all associated energy sources and displayed in the upper right corner.
- “Mercedes-Benz”
“Lock – Tag – Test Procedure”
Must be placed in the center of the placard with name of the affected structures/ equipment identified underneath (see example)
- Also, the legend of “BEFORE SERVICING THIS MACHINE, NOTIFY AFFECTED TEAM MEMBERS” shall be centered underneath the equipment location.

b. Graphics

Below the header, the graphic representation of the equipment/ system is placed on the placard. The graphic must be 2 dimensional. All colors of the graphic must meet the color codes listed in this procedure. The graphic must identify, as appropriate, the following:

- Hydraulic tanks
- Electrical panels
- Pneumatics shutoffs
- Other energy sources

- All lock out points
- Any isolation and control devices (i.e. block and pin)
- Any special energy source information.
- “YOU ARE HERE” symbol (yellow circle)
- FLOW ARROW ICON
- Column icon. If column location cannot be drawn to scale. Note: Column not to scale must accompany drawing. Must be at least one column identified on drawing.

The general LOCK-TAG-TEST - 8 step procedure must be included at the bottom right hand area of the graphics section.

Note:

The left margin must include:

“FOLLOW SHUTDOWN PROCEDURES” written vertically.

The right margin must include:

“FOLLOW START-UP PROCEDURES” written vertically.

c. Information Table (lock out procedure description)

Below the graphic, or on a separate placard, the lockout information table must be positioned. The table is designed in columns with the following headers [size 14 font (Times New Roman) ALL CAPS]:

ENERGY SOURCE	LOCKOUT LOCATION	PROCEDURE FOR LOCKING OUT AND/OR/DEENERGIZING	TEST PROCEDURE
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Each column shall contain the pertinent information specific to locking, tagging and testing the equipment.

1) The energy source column must list all types of energy associated with the equipment and a brief description. All energy sources needing to be locked out must be marked with the appropriate “lock” icon and/or “release energy” designation using the following color codes and match the colors printed in this procedure:

- Electric - red
- Pneumatic - cobalt blue
- Water - light blue
- Gas - pink
- Chemical - yellow
- Hydraulic - burgundy
- Steam - light grey
- Gravity - orange
- Rotation - green

- Thermal - dark blue

2) The location column must identify the direction of the energy isolation device or disconnects in relation to the column. (i.e. south of G- 32).

3) The procedure column must identify the actions the person performing the lockout must take to de-energize and/or bring the system/equipment to a “safe” state.

4) The Test procedure column must identify the test procedure steps, which must be performed to ensure that the energy sources all appropriately secured and neutralized.

5) Below the information table, an approval section must be included with signature lines for:

- Production
- Engineering
- Maintenance
- Safety

6) The manufacturer, equipment number, drawing number and department must also be listed.

7) The MBUSI Safety Slogan: “Our goal is for 100% of our Team Members working safely 100% of the time” must be included to the right of the signature block

Note: The left margin must include:

“FOLLOW SHUTDOWN PROCEDURES” written vertically.

The right margin must include:

“FOLLOW START-UP PROCEDURES” written vertically.

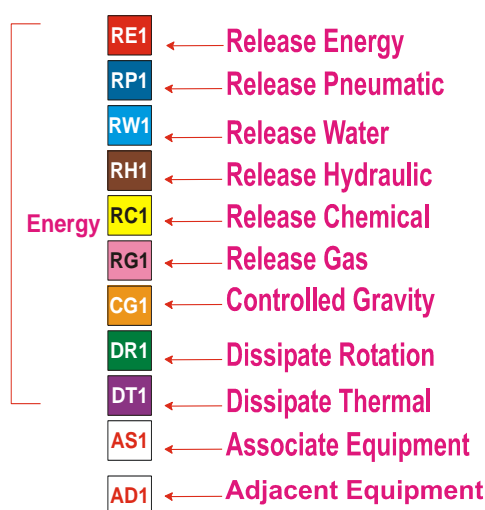
d. The footer

The footer section must be green and identify the following:

- File name
- Drawing date
- Revised date
- The logo “IF LOCKOUT ENERGY CONTROL CANNOT BE PERFORMED/ VERIFIED – STOP AND NOTIFY YOUR GROUP LEADER” must be centered within the footer. To include “stop” sign.
- Subtitle of “FOR REPAIR OR REPLACEMENT, PLEASE CALL MBUSI SAFETY DEPARTMENT”

Note: All colors and font sizes/caps must match the samples listed.

3. Color chart



Energy Source	Primary	Secondary
Electrical	E1	E1.2
Safety PLC – Robot Cell Gate Boxes	F1	F1
Pneumatic	P1	P1.1
Water	W1	W1.1
Gas	G1	G1.1
Chemical	C1	C1.1
Hydraulic	H1	H1.1
Gravity	G1	G1.1
Steam	S1	S1.1

Forklift, Tugger, and Powered Industrial Cart Operating Procedures

A. Definition

Powered Industrial Truck (PIT) – Forklift or Tugger - used to carry, push, pull, lift, or stack materials. Powered industrial trucks can be ridden by an operator in an upright or sit down position. PIT classes are defined by OSHA

Powered Industrial Cart - Any mobile power-propelled equipment that is used for transportation, carrying material, or pulling a single dolly. Carts are not used for direct line support.

B. Operating Procedures and Rules

1. The maximum speed limit for mobile equipment is 5.8 mph.
2. If the equipment is provided with seat belts, the seat belt must be worn anytime the PIT is in motion.
3. All safety systems and devices built into the PITs must be used as intended and removal of any safety equipment is not permitted.
4. Horseplay and stunt driving are not permitted.
5. Only trained personnel are permitted to operate mobile equipment.
6. Horns must be used when going through blind turns, doors, when approaching other equipment, when vehicle starts from a stop, and other locations where vision is obstructed.
7. MBUSI PITs must not be loaned to contractors, visitors, etc. Exception is provided where special permission is granted to a contractor for on-site use by the Safety Department and the owning department.

8. Lift truck operators must point loaded forks uphill when traveling on a ramp. A ramp is any surface with a 10 percent or greater incline. Inclines must be ascended or descended slowly.

9. PITs must travel at 25 feet behind when following another piece of equipment.

10. Operators must know the load limits of their equipment and observe maximum load limits.

11. To ensure that the trailer cannot move during forklift traffic, one of the two methods must be observed:

a. The dock lock is operating properly and is set

b. Two chocks, one on each side, are placed at the trailer tires

Any deviation must be approved by safety.

12. When operators must be away from the vehicle for more than 25 feet or out of sight, the PIT must have forks lowered to the ground level, the emergency brakes set, and engine shut off. The PIT should not be parked on an incline.

13. A safe distance must be maintained from the edge of ramps or platforms while on any elevated dock, platform or freight car.

14. When operators are away from the vehicle less than 25 feet and within view, the PIT must have forks lowered and the emergency brakes set. The PIT should not be parked on an incline.

15. Operators must enter elevators slowly and squarely. Once inside, PIT controls must be neutralized, brakes set, and power shut off.

16. All PITs must bear a legible label identifying approval of the testing laboratory, weight capacities, approved attachments, etc.

17. High lift rider trucks must be equipped with an overhead guard.

18. Pedestrians may not stand or pass under elevated portions of the PIT.

19. PITs must not be driven up to anyone standing in front of a bench or other fixed object.

20. Operators must look in the direction of travel and obey all traffic signs and warning signals such as vehicle crossovers.

21. Operators are required to keep arms and legs within the driver's compartment of the PIT and both hands on steering wheel and controls.

22. Operator must avoid bumps, holes, slick spots, and loose materials that may cause the PIT to swerve or tip.

23. Operators must not turn while any wheel is on a ramp.

24. Sudden stops and starts should be avoided.

25. Operators must slow down for wet or slippery floors.

26. Loads may not be raised or lowered in route.

27. PITs must not be used for opening or closing freight doors.

28. The right-of-way must be yielded to pedestrians and emergency vehicles.

29. Operators are required to wear all Personal Protective Equipment (PPE) for the areas they will enter. Exception is provided in Body Shop

where forklift operators are not required to wear bump caps while operating the PIT.

30. PITs must not block access for fire aisles, stairways or fire equipment.

31. Railroad tracks and other ridges must be crossed diagonally whenever possible. Parking closer than 8 feet from the center of railroad tracks is prohibited.

C. Loading/Unloading Operations

1. The forks must be placed under the load as far as possible.

2. The mast must be carefully tilted backward to stabilize the load.

3. Dock plates must be set in place prior to boarding the trailer to be loaded/unloaded.

4. Loads must only be lifted and carried 4-6 inches above the travel surface. If an obstruction requires raising the forks, traveling must be extremely slow until the obstruction is cleared and/or the forks are lowered.

5. Backward travel is required when forward view is functionally obstructed.

6. The operator is responsible for securing all loads, including locking pins on dollies and loose parts on the back of carts. Any damage to the parts associated with the transportation of the part(s) is the responsibility of the PIT operator.

7. Loads must be distributed evenly (weight/height) to avoid the potential for tip-over hazards.

8. Loads must be handled in a safe and stable manner.

D. Operation of PITs in Hazardous Locations

1. Only PITs designated for the specific use and location must be permitted in hazardous atmospheric locations. Specific safeguard use is indicated by the last letter of the type code "S." (Example: DS is a diesel with additional safeguards to the exhaust, fuel and electric systems.)

E. Incident Reporting

1. In the event of an incident associated with the use of PITs (property damage, near miss), call Security at 2177. In the event of an injury, call Security at ext. 1111 or from a cellular phone 205-507-1111.

2. All TMs involved in the incident will be taken to Medical immediately by the responsible GLs for medical review. After medical attention is completed, a drug and alcohol screen may be conducted for accidents that could have arisen out of and in the course of a person's employment which results in personal injury, injury to others or property damage where the person is reasonably suspected to be under the influence of drugs or alcohol.

3. The GL(s) of the TM(s) involved in the incident is(are) responsible for completing a problem solving sheet before they leave the property, and providing copies to Shop Management and Safety.

4. TM(s) involved in the incident must fill out an Incident Written Statement and if possible the equipment should not be moved until Safety/Security has taken pictures of the scene.

F. Training, Performance Evaluation and Licensure

1. Pre-Qualification for Forklift/Tugger (PIT) Training

TMs must meet the following basic requirements prior to starting initial or refresher training for forklift/tugger:

- a. No adverse vision problems that cannot be corrected by glasses or contacts;
- b. No adverse hearing loss that cannot be corrected with hearing aids;
- c. No physical impairments that would jeopardize safe operation of the PIT;
- d. No neurological disorders that affect balance or consciousness; and
- e. Not taking any medication that affects perception, vision, or physical abilities.

2. Training

a. Powered Industrial Cart Training. Before operating an Industrial cart, the operator must attend Powered Industrial Cart Training.

b. Forklift/Tugger (PIT) Training. The training, which is approximately four hours, is comprised of classroom time and practical hands-on operation of the equipment. Training must cover:

- 1. The differences between the truck and the automobile.
- 2. Truck controls and instrumentation.
- 3. Engine or motor operation.
- 4. Steering and maneuvering.
- 5. Visibility.
- 6. Fork and attachment adaptation, operation, and use limitations.
- 7. Vehicle capacity.
- 8. Vehicle stability.
- 9. Vehicle inspection.
- 10. Refueling or charging.

11. Operating limitations.
 12. Instructions, warnings or precautions listed in the operator's manual for the types of vehicle that the TM is being trained to operate.
- c. All TM operator training must be conducted by a level four (4) licensed operator.
 - d. During training, PIT operators must be continuously observed by a level four (4) licensed operator.
 - e. At the conclusion of training, a Training Roster and a Powered Industrial Vehicle Evaluation form must be completed and forwarded to Alabama Industrial Development Training (AIDT) for proper documentation and credit.
 - f. Only TMs who have been trained, licensed, and certified in the process through AIDT will be permitted to operate PITs. Upon successful completion of the training, TMs will be issued a PIT operator's license. License type is determined according to specific PIT training and hands on evaluation. Once issued, the license is required to be on their person or accessible for immediate retrieval while operating PITs.
 1. Forklift/Tugger (PIT) License. TMs holding a valid PIT license issued by MBUSI are authorized to operate any class of PIT named on the license. This license is all-inclusive; no other license is required to operate the PIT named on the license.
 2. Powered Industrial Cart Training. TMs that receive this training can operate a powered industrial cart in the plant. Completion of this training is designated by a License Sticker affixed to the TM's badge.
 - g. Forklift/Tugger (PIT) operator's licenses are valid for three years from the date of issue. Refresher training must be completed to renew PITs operator licenses. GLs are required to plan for the training needs of their TMs and to schedule refresher training.
 - h. Powered Industrial Cart training is initial training for cart operation. Refresher training is only required in the event of an accident or unsafe behavior.
 - i. Retraining Forklift/Tugger (PIT)
 1. In event of:
 - A. An accident or observation of unsafe behavior.
 - B. The TM is assigned to drive a different type of PIT.
 - C. A condition in the workplace changes in a manner that could affect safe operation of the PIT.
 2. Shall comply with:

A. TM shall not operate any PIT until the retraining is completed.

B. Group Leader shall complete *Post PIT Incident/Near Miss Training* form prior to allowing TM to operate a PIT.

G. Inspections and Maintenance

1. PITs must be inspected by the operator at the beginning of each work period using the Powered Industrial Truck Inspection Checklist. Current checklists must be kept on the PIT in clear view. If a repair is needed, the operator must contact their GL and report the needed repair.
2. Completed Powered Industrial Truck Inspection Checklists are to be forwarded to the TM's GL where it will be kept, in the Team Center, per the Records Retention Schedule.
3. Trucks determined to be defective to the extent that would render them unsafe, should be immediately "tagged out of service", until repairs can be made and should be quarantined in such a manner that the vehicle cannot be used by anyone.
4. Only authorized personnel, as determined by MBUSI, will be permitted to make repairs.
5. Repairs must not be made in hazardous locations (Class I - flammable gases or vapors are present in quantities to produce explosive or ignitable mixtures, Class II-presence of combustible dust, Class III - presence of ignitable fibers sufficient to ignite.)
6. Trucks in need of repairs to the electrical system must have the battery disconnected prior to such repairs.
7. When the temperature of any part of the PIT is found to be in excess of its normal operating temperature, thus creating a hazardous condition, the PIT must be removed from service and not returned to service until the cause for such overheating has been eliminated.
8. All identifying nameplates, markings, load capacities, approvals by testing laboratories, etc. must be maintained in a legible condition.
9. Modifications and additions, which effect the capacity and safe operation, must not be made without first obtaining written approval from the manufacturer and approval from the Safety Department. A revised data plate must be acquired from the manufacturer and attached in place of the current data plate.

H. Skirting for Powered Industrial Carts

The AGVs in the plant scan a few inches above the floor. Most of the carts, wagons, and dollies have areas that sit above the scanner. Only the wheels will be detected by the AGV. This situation means that the AGV may not see the mobile equipment and increase the risk of a collision. In order to prevent this situation from occurring the following shall be done: All powered industrial carts and wagons must have skirting to make the vehicle detectable by the AGVs. The skirting shall be no higher than 3 inches above the floor and must be securely fastened to all sides of the

vehicle. For durability purpose the skirting shall be made from black conveyor belt.

I. Annual Inspections and Licensing (Labeling and Identification)

1. All Powered Industrial Carts must be permitted through Safety/Security for identification purposes. Carts are to be inspected annually by Safety/Security personnel. Upon successful inspection, the Carts will be issued a Mobile Equipment Permit (MEP) bearing the permit number, owners name, telephone number, and responsible department also a flag will be issued. The MEP and a flag are to be affixed to the cart. The MBUSI flags are yellow and have the MEP number on them.

2. PITs owned by contractors are subject to and governed by the provisions in the Contractor/Supplier Safety & Security Standards. Contractor carts must also comply with the rules in this section. However, contractor flags are orange with a C preceding the number (Example: C1).

J. Disciplinary Measures

Team Members who violate operating procedures set forth herein and rules for safe operations of a PIT are subject to a corrective performance review.

Additionally, contractors who violate operating procedures detailed herein are subject to disciplinary measures set forth in the MBUSI Contractor/Supplier Safety & Security Standards.

K. Rights

MBUSI reserves the right to terminate or cancel the authorization of any TM or contractor to operate Powered Industrial Trucks.

Machinery and Machine Guarding

Machinery and machine guarding includes definitions, general requirements, and different kinds of machinery requirements.

Machine Guarding for Mercedes-Benz U.S. International, Inc. (MBUSI) Team Members (TMs) meeting the OSHA requirements of 29 CFR 1910.211-219 and Safety Consensus Standards.

General Industry ([29 CFR 1910](#))

- [1910 Subpart O](#), Machinery and machine guarding. Includes definitions, general requirements, and different kinds of machinery requirements.
 - [1910.211](#), Definitions
 - [1910.212](#), General requirements for all machines
 - [1910.213](#), Woodworking machinery requirements
 - [1910.215](#), Abrasive wheel machinery
 - [1910.216](#), Mills and calendars in the rubber and plastics industries
 - [1910.217](#), Mechanical power presses. Includes general requirements in addition to specific requirements for construction, safeguarding, dies, inspection, maintenance, modification, operation, injury reporting, and presence sensing device initiation (PSDI).

- [Appendix A](#), Mandatory requirements for certification/validation of safety systems for presence sensing device initiation of mechanical power presses
- [Appendix B](#), Nonmandatory guidelines for certification/validation of safety systems for presence sensing device initiation of mechanical power presses
- [Appendix C](#), Mandatory requirements for OSHA recognition of third-party validation organizations for the PSDI standard
- [Appendix D](#), Nonmandatory supplementary information
- [1910.218](#), Forging machines
- [1910.219](#), Mechanical power-transmission apparatus
- A risk assessment must be performed by the installer for any machine being installed at MBUSI. The MBUSI project lead will ensure that the MBUSI Safety Department receives this assessment for review. The risk assessment shall conform to ISO 12100 Safety of machinery – General principles for design – Risk assessment and risk reduction and meet the requirements of OSHA and relevant consensus standards.

Specifications

1) Risk Assessment

- (a) A risk assessment is required that meets the requirements of ISO 12100 Safety of machinery-General principles for design- Risk assessment and risk reduction. The risk assessment must be reviewed and approved by an MBUSI Safety TM. The risk assessment will cover all phases of the machine life.
- (b) The risk assessment due dates should be planned in the project timeline/schedule.
- (c) A commissioning plan is required as part of the risk assessment. The commissioning plan shall be approved by the MBSUI Safety Department engineer assigned to the project or shop. The plan should be divided into the following sections:
 - (i) Phase 1 – Power On commissioning covers connecting energy to the system and the initial non-hazardous motion checks.
 - (ii) Phase 2 – Commissioning covers manually driven hazardous motion but does not allow the system to run in automatic.
 - (iii) Phase 3 – Commissioning that allows systems to run in automatic and/or high-speed modes.
- (d) Information shall be provided to the user about the intended use of the machine, taking into account all of its operating modes. The information shall contain all directions required to ensure safe and correct use of the machine/system. An “Information for Use” booklet will be prepared for each machine or system. The “Information for Use” booklet will meet the requirements of ISO 12100.

- (e) When determining protective measures OSHA, ISO, ANSI, NFPA and other consensus standards shall be used to determine the proper protective measures. Failure to have an approved risk assessment can result in delays of the approval process.

2) Machine Guarding

One or more methods of machine guarding shall be provided to protect the operator and other TMs in the machine area from hazards such as:

- (a) Those created by point of operation – which is the area of the machine where the machine performs work.
- (b) Ingoing nip points, rotating parts – which are part of the power-transmission apparatus (flywheels, pulleys, belts, connecting rods, couplings, cams, spindles, chains, cranks, gears).
- (c) Other moving parts – which are all of the parts of the machine which move while the machine is operating (reciprocating, rotating and transverse moving parts as well as lead mechanisms and auxiliary parts of the machine), cutting, punching, shearing, and bending, or any other moving part that creates a hazard
- (d) For a list of potential hazards and associated processes –see *Appendix A*.

3) Basic methods used to safeguard machines – guards and devices

- (a) Guards provide physical barriers that prevent access to danger areas and ensure the hazard cannot be reached by going over, under, around or through the barrier guard.
- (b) Devices function by interrupting the machine's operating cycle to prevent TMs from reaching or entering the danger area while the machine is cycling.

Examples of guarding and device methods are:

- Barrier guards
- Two-hand tripping devices
- PLS Scanners, Light Curtains, presence-sensing mats, and pressure switches.
- Interlocks

4) General requirements for machine guards

- (a) Do not remove a guard for any reason while operating any piece of equipment or machinery.
- (b) Guards should avoid interfering with the normal operation of the machine by not obstructing the TMs view or preventing the TM from doing a job.
- (c) Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guards should not be easy to remove or alter (requiring tools, not flat-head screwdriver style). Guards and safety devices should be made of durable material that will withstand the conditions of normal use.
- (d) The guard shall be such that it does not cause a hazard in itself. The guard should not have jagged edges, burrs, sharp edges, a shear point or an

unfinished surface, which can cause lacerations. The edges of guards, for instance, should be rolled or bolted in such a way that they eliminate sharp edges.

- (e) The guard must prevent hands, arms or any part of the body or clothing from making contact with dangerous moving parts.
- (f) Checking for placement of the guards shall be part of machine start-up checklists.
- (g) Guards must be ergonomically designed.
- (h) Guards should allow for safe lubrication and maintenance.

5) Point of operation guarding

- (a) Point of operation is the area on a machine where work is actually performed upon the material being processed.
- (b) The guarding device shall be in conformity with any appropriate standards therefore, or, in the absence of applicable specific standards, shall be so designed, and constructed as to prevent the TM from having any part of their body in the danger zone during the operating cycle.

6) Presence sensing device

- (a) The device will initiate an immediate stop command to the control system if it detects the presence of an individual.
- (b) Must meet the safe distance calculation
- (c) Once stopped, the guarding device shall require a manual reset, outside of the area, before hazardous motion can reoccur.
- (d) The reset device shall be located outside of the safeguarded area such that it cannot be reached from within the safeguarded area.

7) Special Hand Tools

- (a) Special hand tools for placing and removing material shall be used such as to permit easy handling of material without the operator placing a hand in the danger zone.
- (b) Such tools shall not be in lieu of other guarding required by this section, but can only be used to supplement protection provided.
- (c) The materials used in the design and construction of hand tools shall not shatter in the event of involvement with the machine or its tooling.

8) Pressure Sensitive Sensing Edge

- (a) Safety edge devices shall be designed and constructed to detect the presence of individuals through the application of a pressure or force by the individual along its sensing surface.
- (b) Typically, these devices respond to a manual force in the range of 1 to 15 ft./lbs. that is applied to the safety edge. Anything over 15 ft./lbs. of force must be approved by the MBUSI Safety Department.
- (c) The safety edge device shall incorporate visual means to indicate that the device is detecting the actuation of its sensing surface.
- (d) These devices should ensure that an injury cannot occur.

9) Guarding by location

- (a) Guarding by location is not the preferred method of machine guarding. Guarding by location requires MBUSI Safety's approval.
- (b) Safeguarding the location involves positioning or designing a machine so that the hazardous parts are away from areas where TMs work or walk, or alternatively, installing enclosure walls or fences that restrict access to machines but do not stop hazardous motion.
- (c) Guarding by location means that TMs will not be exposed to the hazardous condition.

10) Barrels, containers, and drums

- (a) Revolving drums, barrels, and containers shall be guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place.

11) Fan Guarding

- (a) When the periphery of the blades of a fan is less than eight (8) feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one-half inch.

12) Anchoring fixed machinery

- (a) Machines designed for a fixed location shall be securely anchored to prevent walking or moving.

13) Single control safeguarding devices

- (a) Actuating controls to complete the hazardous portion of the machine cycle shall be located at a safe distance, such that the TM cannot reach the hazard before the cessation of hazardous motion, and be designed and constructed to protect against unintended or inadvertent actuation.
- (b) Control circuitry shall incorporate anti-repeat/anti-tie down features.
- (c) Each TM exposed to a hazard, must have a reset or control button (e-stop).

14) Two hand control systems

- (a) Shall be designed to prevent accidental or unintentional operation.
- (b) Will require the use of two hands by designed control separation.
- (c) A stop signal shall be issued if one or both hands are removed from the controls during the hazardous portion of the machine cycle.
- (d) Control circuitry shall incorporate anti-repeat/anti-tie down consideration.

15) Awareness signals

- (a) Awareness signals shall be designed, constructed and installed to provide a recognizable audible or visual signal of an approaching or present hazard. Awareness signals are not a safety solution but an enhancement to the safety in the area.

16) Maintenance

- (a) Maintenance instructions, recommendations and procedures to maintenance personnel for all safeguarding used to protect individuals from the hazards associated with the machine shall be provided.
- (b) When safeguarding is removed or disabled for maintenance, alternate safeguarding (such as Control of Hazardous Energy – Lockout-Tagout-Test) shall be provided to protect maintenance, operating personnel or other individuals.
- (c) The reset of the machine control to production mode shall be located outside of the hazard area such that it cannot be reached from within the hazard area. Reset of the machine control shall not occur until verification that the hazard area is clear of individuals.

17) Pinch points

Pinch points differ according to the dimensions of the human body. Pinch points not otherwise covered by OSHA are described below. If the hazard cannot be prevented using distance, appropriate countermeasures must be utilized to mitigate the hazard.

- (a) Finger pinch point – distance to hazard < 1.5 inches
- (b) Hand pinch point – distance to hazard < 3 inches
- (c) Arm Pinch point – distance to hazard < 4 inches (100mm)
- (d) Body pinch point – distance to hazard < 20 inches (0.45m)
- (e) Foot pinch point – distance to hazard < 4 inches (Where hazard is to side of foot)

Note: Above applies only where speeds do not exceed 0.2 m/s (0.65ft/sec).

18) Fencing/barriers

- (a) Must be designed, constructed, attached and maintained to ensure that TMs cannot reach over, under, around or through undetected and reach the hazard.
- (b) If (a) above cannot be maintained or a “part” can be thrown/fall over fence, then the fence must extend to the point the hazard is prevented or other means of guarding must be provided.

- (c) Bottom of fence to be 7 inches or lower from floor unless hazard exists within 3feet of opening. In such case the fence must extend downward to prevent hazard.
- (d) Roll down doors must be equipped with a safety bar that retracts the doors in the event of contact. A sensing pressure switch or a photo eye/ light screen must also be used to prevent doors from contacting TMs or equipment if they enter into the sensing field. Automatic doors must have a bump bar and a photo eye/light screen.
- (e) Process openings that allow parts or other items to pass into controlled areas must be equipped with a silhouette to minimize gap openings. Gap openings must meet OSHA 29 CFR 1910.217
- (f) For fixed barriers, a minimum of 20 inches is required to prevent a body pinch point.
- (g) Fencing/barriers should avoid interfering with the normal operation of the machine by not obstructing the TM's view or preventing the TM from doing a job.
- (h) Fencing/barriers should not be easy to remove (requiring tools, not flat head screwdriver) or alter (tamper-resistant). Fencing/barriers should be made of durable material that will withstand the conditions of normal use.
- (i) Fencing/barriers must be rigidly braced (secured) every three (3) feet or fractional part of their height to some fixed part of machinery, post or building structure.
- (j) Fencing/barriers shall be such that it does not offer an accident hazard in itself. Fencing/barriers should not have jagged edges, burrs, sharp edges, a shear point or an unfinished surface which can cause lacerations.

19) Interlocking safeguarding devices

An interlock is a safety device that disables or prevents a machine startup. An interlock:

- (a) Shall have a key, plug or actuating device, which is supervisory controlled and shall not be easily duplicated.
- (b) Shall be tamper resistant and not be defeated intentionally without tools.
- (c) Shall provide a means for secure attachment.
- (d) The interlocked section of an interlocked barrier guard shall be prevented from opening until hazardous motion has ceased, or shall be located so that an individual cannot reach the hazard before cessation of the hazardous motion when the interlocked section is open.
- (e) Shall be provided with documentation stating the standards that the product meets, the standards that the product is independently certified to meet and their safety circuit performance.

20) Safety light curtains/screens

Safety light curtain/screens shall be marked/labeled with:

- (a) Maximum response time.
- (b) Maximum angle of divergence/acceptance at maximum gain.
- (c) Minimum object sensitivity.
- (d) Protected height.

- (e) Shall indicate if blanking is being used.
- (f) Shall provide a method to prevent or detect unwanted reflections (optical short circuits).

21)Area scanning safeguarding devices

Shall be marked/labeled with:

- (a) Maximum response time.
- (b) Maximum safeguarding range.
- (c) Maximum field of view in degrees.
- (d) Range (linear and angular) and response time for an object sensitivity of 70 mm (2.75 inches).
- (e) Shall not present a hazard (eye safety).
- (f) Shall be tested to ensure that the device is able to detect all objects and personnel entering the detection area.
- (g) Shall have the detection area verified upon installation, replacement or changes within the detection area for proper size and coverage before the device will allow the hazardous motion to start or restart.
- (h) Shall meet safe distance requirements. (see Appendix B)

22)Safety mat systems

Safety mat systems shall:

- (a) Be of sufficient size and geometry to detect intrusion from all places of access.
- (b) Be installed to minimize tripping hazards.
- (c) Not exceed minimum object sensitivity where multiple mats are installed together to form a single sensing surface.
- (d) Have a maximum response time which is less than 100 ms over the system operating temperature range (so that a person cannot step lightly and quickly over the mat's sensing surface without being detected).
- (e) Have a construction suitable for the application and environment.
- (f) Be routinely inspected and function tested per manufacturer's recommendations.
- (g) Be installed and arranged such that reset of the safety function requires removal of the obstruction from the sensing surface followed by a separate and deliberate action outside of the sensing surface, when used as the sole means of safeguarding.
- (h) Be installed at a safe distance such that the edge of the safety mat sensing surface which is furthest from the hazard is at or beyond the safety distance from the hazard. *(see appendix B)*

23)Overhead protection

- (a) Overhead structures must have a means of secondary securement (i.e. Wire rope, secondary clamps, chains, etc. – in addition to primary supports.)
- (b) All overhead structures must be designed to prevent loosening of support materials.
- (c) Overhead balancer/trolleys

1. The trolley/balancers must be of a double fail safe design.
2. Nut-style, locking D-rings should be used as the primary connection between the balancer and the trolley unless the balancer has a built-in attachment.
3. Anti-backing nut configuration must be used for all attachment points for elevated structures/equipment.
4. Tools shall all be attached to balancer cable with a Nut-style D ring or other securement means that offers increased or fall protection.

24) Abrasive wheel machinery

- (a) The safety guard shall cover the spindle end, nut and flange projections.
- (b) The safety guard shall be mounted so as to maintain proper alignment with the wheel and the strength of the fastenings shall exceed the strength of the guard.
- (c) TMs using grinding tools and/or are exposed to the hazards of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, or vapors shall be provided with, and compelled to use, the appropriate personal protective equipment necessary to protect them from the hazard. This equipment includes eye and face, respiratory, hearing, and hand protection and shall be properly maintained to meet all applicable standards.
- (d) All power grinding tools shall be maintained in a safe condition. When these tools are designed to accommodate guards, they shall be in place when the tool is in use. Safety guards shall be strong enough to retain flying fragments and withstand the effects of a bursting wheel.
- (e) All abrasive wheels shall be carefully inspected and “ring-tested” before mounting to ensure that they are free from cracks or defects.
 1. To perform a sound or ring test, wheels should be tapped gently with a light, non-metallic instrument.
 2. If they sound cracked or dead, they could fly apart during operations and should be discarded.
 3. An intact, undamaged wheel will give a clear metallic tone or “ring.”

25) Guarding of portable powered tools

- (a) All portable, power-driven circular saws having a blade diameter greater than 2 inches shall be equipped with guards above and below the base plate or shoe.
- (b) Portable belt sanding machines shall be provided with guards at each nip point where the sanding belt runs onto a pulley. The unused run of the sanding belt shall be guarded against accidental contact.
- (c) The muzzle end of an explosive-actuated fastening tool shall have a protective shield or guard at least 3 ½ inches in diameter, mounted perpendicular (tilted less than 8 degrees from contact with the work surface) to and concentric with the barrel designed to confine any flying fragments or particles. If the

standard shield or guard cannot be used or covers all particle escape avenues, a shield, guard, fixture or jig designed and built by the manufacturer of the tool shall be used as a substitute. The tool shall be so designed that it cannot be fired unless it is equipped with the standard shield or guard, or the substitutes.

- (d) All rotating shafts and sockets greater than 3 inches in length must be guarded. (For power transmission; projecting shaft ends shall present a smooth edge and end and shall not project more than one-half the diameter of the shaft unless guarded by non-rotating caps or safety sleeves.)
 - 1. No mutilation tape must be placed on spinning shafts.
 - 2. Rotating shafts/sockets less than 3 inches are recommended to have protective covers/guarded.

26) Training

- (a) Under no circumstances shall a TM operate a piece of machinery or equipment by themselves until they have successfully completed training. This includes all new operators or users of machinery and equipment, regardless of claimed previous experience.
- (b) Thorough operator training should involve instruction or hands-on training in the following:
 - 1. A description and identification of the hazards associated with particular machines.
 - 2. Types of safeguarding devices.
 - 3. The safeguards themselves, how they provide protection, capabilities/options and the hazards for which they are intended.
 - 4. How to use the safeguards and why.
 - 5. How and under what circumstances safeguards can be removed, and by whom.
 - 6. Functional testing of the safeguarding.
 - 7. Limitations of the safeguarding.
 - 8. Abnormal or unexpected operation of the safeguarding.
 - 9. What to do if a safeguard is damaged, missing or unable to provide adequate protection.
- (c) Thorough maintenance TM training should involve instruction or hands-on training in the following:
 - 1. Preventive maintenance/calibrations.
 - 2. Troubleshooting.
 - 3. Repair.
 - 4. Operational checks.
 - 5. Failed safety devices.
 - 6. Emergency operations.
- (e) Retraining
Retraining shall be provided to include system changes and to ensure safe operation.

APPENDIX A

The groups of potential hazards listed below are associated with tasks performed during the design, construction, maintenance and use of the safeguarding and do not include those hazards associated with the design, construction, maintenance and use of the machine.

1. Hazards associated with the design and construction of safeguarding (guards, safeguarding devices, awareness devices, safeguarding methods and safe working procedures) include, but are not limited to the following (each of these hazards refer to the safeguarding)
 - a. Pinch, shear, cutting, entanglement, impact, trapping or crushing.
 - b. Loosening or fracturing of bolts, fasteners or other components.
 - c. Loss or disturbances of external power sources.
 - d. Failure of electrical, pneumatic or hydraulic components.
 - e. Hazardous energy.
 - f. Interferences
 - i. Electromagnetic emissions and immunity
 - ii. Electrostatic discharge.
 - g. Shock, vibration, stability.
 - h. Humidity, contaminated air, ambient noise, light, temperature, liquids.
 - i. Human factors.
 - j. Electrical shock/contact with live parts.
 - k. Human error/misinterpretation of information.
2. Hazards associated with the installation of the safeguarding include, but are not limited to:
 - a. Hazards associated with the work area.
 - b. Hazardous energy
 - c. Work surfaces.
 - d. Housekeeping.
 - e. Accessibility, space limitations.
3. Hazards associated with the integration and start-up of the safeguarding include, but are not limited to:
 - a. Pinch, shear or crush points between the safeguarding and the machine.
 - b. Improper (re-)mounting and (re-)positioning.
 - c. Improper selection and connection of power sources.
 - d. Improper interfacing to the machine control.

- e. Machine motion.
 - f. Electrical shock.
 - g. Hazards associated with the validation process.
 - h. Interaction between the safeguarding and the machine and its auxiliary equipment.
 - i. Human factors.
 - j. Unexpected start-up.
 - k. The effect of failure in the control system.
4. Hazards associated with the use of the safeguarding include, but are not limited to:
- a. Improper set-up and adjustment of the safeguarding.
 - b. Safeguarding functionality.
 - c. Inadequate safeguarding.
 - d. Interference between the safeguarding and tote boxes, work holding devices tables, workpieces, etc.
 - e. Housekeeping.
 - f. Human factors.
 - g. Unexpected start-up.
 - h. The effect of failure in the control system.
5. Hazards associated with the maintenance of the safeguarding include, but are not limited to:
- a. Motion.
 - b. Stored energy.
 - c. Inadequate testing procedures or improper testing and verification.
 - d. Work procedures.
 - e. Housekeeping.
 - f. Human factors.
 - g. Unexpected start-up.
 - h. The effect of failure in the control system.

Appendix B – Safety Distance

The safeguarding devices listed below do not prevent an individual from reaching into a hazard area. In order for these devices to be effective, they must either prevent the start of, or stop hazardous motion (or situation) when an individual is exposed to the hazard. For the devices to accomplish this requirement, they must be located at a distance from the hazard such that hazardous motion (or situation) is prevented, completed or stopped before the individual can be harmed.

Devices that require location at a safety distance include, but are not limited to:

- a. Interlocked barrier guards.
- b. Two hand control devices.
- c. Two hand trip devices.
- d. Single control safeguarding devices.
- e. Electro-optical presence-sensing devices.
- f. RF presence-sensing devices.
- g. Safety mat devices.
- h. Safety edge devices.

The first four devices protect individuals by positioning the individual at or beyond the safety distance before hazardous motion can be initiated, or by maintaining the individual's position at the safety distance after hazardous motion has been initiated. The remaining four devices protect individuals by detecting an individual entering (or their presence within) a hazard area at or within the safety distance.

The safety distance may be calculated using the following equation: **$D_s = [K(T_s + T_c + T_r)]D_{pf}$**

Where: D_s = the safety distance

K = the maximum speed that an individual can approach the hazard

T_s = worst stopping time of the machine/equipment

T_c = worst stopping time of the control system

T_r = response time of the safeguarded device including its interface

NOTE – T_r for interlocked barrier may include a delay due to actuation. This may result in T_r being a deduct (negative number)

D_{pf} = Additional distance which varies depending on the smallest detectable target size of the light curtain.

The factor K is the speed constant and includes hand and body movements of an individual approaching hazard area. One of the accepted values for K is the hand speed constant (it is usually considered as the horizontal motion of the hand and arm while seated). Its common value is 1.6 m/s (63 in/s) although other greater values are also used (2.5 m/s (100 in/s for bodily entry)).

Hot Work Procedure

A. Definitions

Blanking or blinding: The absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Combustible: A combustible liquid is a liquid having a flash point equal to or greater than 100 degrees Fahrenheit.

Conduction: Conduction is the transmission or conveying of heat through a medium such as a steel structural member, pipe or duct.

Convection: Convection is the transmission or conveying of heat by circulating with a gaseous or liquid medium such as a fan moving air within a room.

Critical process: Critical process is an operation that could severely impair or stop production or distribution of vehicles and/or parts. This process could be sole source component, manufacturing, transfer equipment, or computer room operations, etc.

Cutting: (See Hot Work)

Final check: Procedure conducted 30-minutes after completion of Hot Work operations. In hazardous areas, a temperature survey may be utilized to complete the Final Check.

Flammable liquid: A flammable liquid is a liquid having a flash point less than 100 degrees Fahrenheit.

Flammable or explosive range: The amount of vapors, in air, necessary for combustion to occur. This will vary from one vapor to another. Limits of the range are indicated by LFL – Lower Flammable Limit and UFL – Upper Flammable Limit or LEL – Lower Explosive Limit and UEL – Upper Explosive Limit. This range is measured by a combustible gas detector.

Flash point: The minimum temperature at which a liquid vaporizes sufficiently to form an ignitable mixture with air with a competent ignition source, to produce a flash of flame across the fuel's surface.

Fuel: Fuel is commonly referred to as flammable or combustible materials. Fuel must be present in a gaseous state to burn. A solid or liquid must undergo physical changes to become a gas before combustion can take place.

Grinding: (See Hot Work)

Hazardous areas: A hazardous area or operation is any area with an operation that presents a significant fire, explosion, health or safety hazard. An incident

involving these operations could cause death, injury, property damage and/or business interruption. Hazardous areas at MBUSI include the paint shops and paint mix rooms, Hazmat Building, Tank Farm, Emissions Lab, within 3 feet of any roof or building walls and special storage.

Heat (Ignition source): Heat is the energy source necessary to increase the temperature of the fuel to produce vaporization. Heat is also the form of energy that will cause ignition. It can be produced in any one of four ways: chemical, mechanical, electrical and nuclear. The principal hazard from Hot Work is the introduction of ignition sources with heat sufficient to start fires or ignite explosive materials.

Heat transfer: Heat transfer allows heat energy to spread or pass from one place to another. This may occur by conduction, convection or radiation or combination of.

Hot Work: Any welding, oxyacetylene cutting, hot riveting, grinding, soldering and any other activity that produces sparks or uses flame.

Hot Work Permit: Written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

Inerting: The displacement of the atmosphere by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

Oxidizer: Oxidizers are any material that readily yields oxygen or other oxidizing gas, or that readily reacts to promote or initiate combustion of combustible materials.

Oxygen: This chemical element essential to life processes and for combustion. Most fuels need at least 16% oxygen to support combustion. However, certain fuels will burn in less than 16%. Wood needs only 8% oxygen and acetylene will burn in less than 4% oxygen.

Prohibited condition: Any condition in a permit space that is not allowed by the permit during the period when entry is authorized

Requestor: Person requesting the Hot Work Permit.

Radiation: Radiation is the transfer of heat energy from a hot surface to a cooler surface by electromagnetic waves without an intervening medium. For example, the heat energy from the sun is radiated to earth through the vacuum of space. Radiant heat can be transferred only by line of sight and will be reduced or blocked by intervening materials.

Safety: A safety representative or safety engineer is a member of the Safety Department or a fire safety inspector.

Security (EOC): Security (Emergency Operations Center)

Special handling instructions: Site-specific procedures for the issuing of Hot Work Permits for Critical Processes and Hazardous Areas/Operations in the plant or on the plant property.

Welding: (See Hot Work)

B. Hot Work site preparation

1. All exposed flammable or combustible materials shall be relocated, if practical, to an area outside of a 35-foot radius from the Hot Work operations. This radius may have to be increased and/or additional precautions taken if Hot Work is to be conducted at an elevation above the floor level or materials in adjacent areas are easily ignitable.
2. Where relocation is not practical, metal shields and/or fire resistant curtains or covers shall be used to protect flammable or combustibles materials. In using this approach, the following conditions must be met:
 - a. Ordinary tarpaulins **shall not** be used. Covers shall be approved welding tarpaulin or an equivalent fire-resistive material.
 - b. Guards, shields, curtains or covers shall be placed in such a manner to prevent sparks, slag or open flame from coming in contact with the combustible materials. This shall include ensuring that the material provides complete coverage and is tight to prevent sparks from getting over, under or through.
 - c. When using metal shields, care shall be taken to prevent conduction of heat from the Hot Work process.
 - d. Where Hot Work is performed within three feet of walls, partitions, ceilings or roofs of combustible construction, fire resistant shields or guards shall be provided to prevent ignition or the permit is to be denied. A thermal imaging camera shall be used after the 30-minute watch to confirm a safe or normal condition before the fire watch is terminated.
 - e. All holes, cracks, or openings in walls or floors within the 35-foot radius of the operation, shall be covered with a non-combustible material to prevent sparks, slag, etc. from passing through.
 - f. Wherever there are floor openings or cracks in the flooring that cannot be closed, precautions shall be taken so that no readily combustible materials on the floor below will be exposed to sparks that might drop through the floor. The same precautions shall be observed concerning cracks or holes in walls, open doorways and open or broken windows. Additional Fire Watches may be required.

- g. Suitable fire extinguishing equipment shall be maintained in a state of readiness for instant use. Such equipment may consist of pails of water, buckets of sand, fire hose or approved portable extinguishers depending upon the nature and quantity of the combustible material exposed.
- h. Shutting down (impairing) a sprinkler system **is not** acceptable to prevent accidental operation. When Hot Work is done in close proximity to a sprinkler head, a wet rag shall be laid over the head to prevent accidental discharge. After the Hot Work is completed, the wet rag is to be removed.
- i. Precautions shall be taken to avoid accidental operation of automatic fire detection or suppression systems, including those in adjacent rooms or areas.
- j. Areas protected with special fixed fire suppression systems may require that they be taken out of service temporarily. Hot Work in these areas will require a Fire Watch in this area independent of the Hot Work fire watch. This Fire Watch will be provided for by the Fire Safety Representative in that area. Portable extinguishers and fire hose shall be available at the site.
- k. Ventilation, exhaust, dust collection and similar systems with intake points within 35 feet of the Hot Work operations shall be shut down so that sparks cannot be pulled into the systems to ignite dust, mists, residues, etc.
- l. Where atmospheric testing and/or monitoring is required, it shall be made with a properly calibrated detector listed or approved for the specific purpose intended and shall be conducted by a person properly trained in its operation.
- m. Acetylene and oxygen cylinders are not to be located within permit-required confined spaces as per MBUSI Confined Workspace Entry Procedure.
- n. Lockout/Tagout procedures shall be followed in shutting down systems and equipment as per MBUSI's Control of Hazardous Energy Plan (Lockout-Tagout-Test).
- o. No welding, cutting, or other Hot Work shall be performed on used drums, barrels, tanks or other containers until they have been cleaned so thoroughly as to make absolutely certain that there are no flammable materials present or any substances such as greases, tars, acids, or other materials which when subjected to heat, might produce flammable or toxic vapors. All pipe lines or connections to the drum or vessel shall be disconnected, blanked or blinded.
- p. All hollow spaces, cavities or containers shall be vented to permit the escape of air or gases before preheating, cutting or welding. Purging with inert gas is recommended.

Tanks, containers or piping shall:

1. Have oxygen content at or below 23.5 percent by volume.
2. Have an LFL of 0 percent. If the LFL rises to 10 percent, all work shall stop and ventilation shall continue until the LFL is again at 0 percent.

C. Hot Work Permit Procedure

1. The MBUSI Hot Work Permit shall be initiated by an MBUSI Group/Team Leader, TM or contractor by requesting an MBUSI Hot Work Permit from the Safety Department through Security (EOC).
2. Security (EOC) will record the name of the permit requestor, time of the request, the company requesting the permit (MBUSI/contractor) and the hot work site location (Column Number) in the Hot Work Log and notify a Fire Safety Representative.
3. Security (EOC) will record the unit number of the Fire Safety Representative responding to the location in the Hot Work Log and assign a permit number.
4. The Fire Safety Representative will record the permit number on the Hot Work permit.
5. The Security (EOC) will verify if there are any fire protection impairments in the request area by contacting the Energy Center (Facilities) and then notifying the Fire Safety Representative.
6. Security (EOC) will list any impairment(s) on the Impairment Board in the (EOC).
7. A Fire Safety Representative will be dispatched to the area by Security (EOC) and meet with the requestor for the Hot Work Permit and inspect the area and Hot Work equipment.
8. If fire protection system impairment exists in the area, the Fire Safety Representative will confer with the Group/Team Leader to determine if denial of a Hot Work process affects a critical process.
 - a. If there is fire protection impairment in the area and this is not a critical process, the permit request will be denied until the fire protection impairment is restored. Security will enter "Permit Denied" under the Comments Section of the Hot Work Log. Hot Work in these areas will require a fire watch in this area independent of the Hot Work fire watch. Portable extinguishers and fire hose shall be available at the site.

9. If it is determined that this is a hazardous area, the Fire Safety Representative will consult with the Group/Team Leader and MBUSI Safety Representative for additional fire safety evaluation.
10. The Group /Team Leader will evaluate work and inspect Hot Work equipment, determines whether or not alternate methods have been evaluated and are feasible.
11. If the Fire Safety Representative and the Group/Team Leader determine that the work can be performed safely, the Group/Team Leader will instruct the requestor on special handling instructions that must be performed.
12. If the Hot Work cannot be performed safely or other methods are not feasible or not all precautions are in place, the permit request will be denied. Security (EOC) will log the Hot Work request denial in the Hot Work Log under the Comments Section.
13. If the area has been properly prepared, the permit requestor, person performing the work and the Fire Watch will be briefed on the location of fire protection equipment and methods to notify Security in the event of an emergency and the 30-minute fire watch requirement that commences at the end of the Hot Work project.
14. The Hot Work Permit will be completed in digital format by the Fire Safety Representative, Maintenance, the Person doing the Hot Work and the Fire Watch, and the Fire Safety Representative must be present to complete the Hot Work Permit.
15. A Placard for a Hot Work Permit will be given to the Fire Watch to be prominently displayed at the site. The placard is to be posted at a permanent site and not attached to a welding cart or portable extinguisher. A Fire Watch Record Sheet will also be given to the Fire Watch to record 30 minute fire watch times through-out the Hot Work.
16. The Fire Safety Representative will notify Security of the time that the permit expires or the end of the requestor's shift.
17. Security will log "Permit Expires" time into the Hot Work Log.
18. When the Hot Work Permit information is completed; it will be saved in digital format with Fire Safety.
19. The Fire Watch will notify Security at the completion of the Hot Work signaling the onset of the 30-minute fire watch. Security) will log the actual completion time of the Hot Work into the Hot Work Log and notify the Fire Safety Representative to perform the Final Check.

20. The Fire Safety Representative will inspect the Hot Work area at the end of the 30-minute fire watch. A thermal temperature will be taken to ensure that a safe or normal condition exists, in hazardous areas.

21. If Security is not contacted at the end of the work shift or when the permit expires, Security (EOC) will contact the Fire Safety Representative to inspect the Hot Work Permit area.

22. The Fire Watch will complete the 30 minute Fire Watch Form to note that the area was monitored for 30 minutes after the completion of the Hot Work. The Fire Safety Representative will insert the Fire Watch Form into the digital system on the completion of the Hot Work. Security (EOC) will record the data into the Hot Work Log in the *Time of Final Check* column.

23. The Fire Safety Representative will secure both Hot Work Permit Placard and Fire Watch Record from the Fire Watch. The Fire Safety Representative will complete and save the Hot Work Permit entry in digital format. Upon completion of the Hot Work, the Fire Safety Officer will enter the information onto his daily report. Fire Safety will maintain Hot Work Permit data for the year of record, plus one year.

D. Non-Production Hot Work Areas

1. As a minimum, non-production Hot Work areas, which are permanent in nature, shall require an annual permit. These areas must meet all of the following conditions:

a. Be specifically identified.

b. Be free of exposed flammable or combustible materials within 35 feet of the Hot Work zone.

c. Have no unprotected openings in walls or floors to adjacent areas that may contain exposed flammable or combustible materials.

d. Have the annual permit clearly posted.

e. Be inspected by a Fire Safety Representative at least quarterly for compliance with these and other applicable requirements of MBUSI.

f. It is the responsibility of the Group/Team Leader to ensure that these conditions are met and maintained.

2. Production Hot Work Areas

Production Hot Work areas (i.e., Body Shop) may be treated as no-permit required areas if all requirements for annual permit areas except posting of the annual permit, are met.

E. Responsibilities

1. Management shall:

- a. Recognize its responsibility for the safe usage of cutting and welding equipment on its property.
- b. Based on fire potentials of plant facilities, establish areas for cutting and welding, and establish procedures for cutting and welding, in other areas.
- c. Designate an individual responsible for authorizing cutting and welding operations in areas not specifically designed for such processes.
- d. Cutters or welders and their supervisor shall be suitably trained in the safe operation of their equipment and the safe use of the process.
- e. Advise all contractors about flammable materials or hazardous conditions of which that may not be aware.

2. Person performing work:

- a. Will be responsible for the safe handling of the cutting or welding equipment and the safe use of the cutting or welding process.
- b. Physically inspect the area where the work is to be performed to determine the necessary precautions to be taken.
- c. Will determine if combustible materials and hazardous areas are present or likely to be present in the work location.
- d. Shall protect combustibles from ignition by the following:
 1. Have the work moved to a location free from dangerous combustibles.
 2. If the work cannot be moved, have the combustibles moved to a safe distance from the work.
 3. Have the combustibles properly shielded against ignition.
- e. See that cutting and welding are so scheduled that plant operations that might expose combustibles to ignition are not started during cutting or welding. LOTO & JSA
- f. Secure authorization for the cutting or welding operations from the designated management safety representative.

g. Discuss with the welder, the scope of the work and explain that the permit is only valid for the work discussed, location described, the length of the TMs' shift and the conditions found when the permit was issued. If conditions change, all work shall stop and the Safety Representative shall be contacted to inspect and determine whether to cancel the permit, or to issue a new Hot Work Permit.

h. Determines that the cutter or welder secures his/her approval that conditions are safe before going ahead.

i. Determines that fire protection extinguishing equipment is properly located at the site.

j. Ensures that fire watches are properly trained in the use of portable fire extinguishers and methods used to notify Security in the event of a fire.

k. Discuss emergency procedures including emergency phone numbers, location of the nearest fire pull stations, fire hose, fire extinguishers and other pertinent information.

F. Fire Watch shall:

1. Remain in the immediate area and be attentive to the job being performed to watch for outbreak of fire or other safety hazards.

2. Be familiar with facilities and procedures for sounding an alarm in the event of a fire.

3. Have fire extinguisher equipment readily available and be trained in its use.

4. In the event of a fire, sound the alarm and then attempt to extinguish the fire if it is safe to do so.

5. Contact Security when Hot Work operations have been completed.

6. Maintain the fire watch for at least 30-minutes after completion of Hot Work operations.

7. In some cases, additional Fire Watch personnel may be required (impairments to the fire protection systems). The responsibilities listed above apply to these personnel except they may not be in the immediate area of Hot Work.

G. Security (EOC) Console Operator will:

1. Verify that there are no fire protection impairments in the area of the Hot Work.

2. Relay all necessary information to the Safety Representative.
3. Record the appropriate information in the Hot Work Log.
4. Review the Hot Work Permit Log to have knowledge of on-going and denied permits.

H. Safety (Fire Safety Representative) will:

1. Respond to the Hot Work site to review and approve the permit and area in which the Hot Work is to be performed. The requestor/supervisor should assure that all applicable permit requirements/restrictions have been met and are in place prior to contacting Security (EOC) for a Hot Work permit. Hot Work permits shall not be approved until all applicable requirements are in place.
2. Determine whether or not proposed work requested is in a hazardous area. If proposed work is in a hazardous area, the Group/Team Leader will be contacted to evaluate work. If the Group/Team Leader and Safety do not determine that the requested work can be performed in a safe manner the permit request will be denied.
3. Ascertain whether or not fire suppression impairments exist for that area.
4. Deny a Hot Work permit if impairments to the fire protection system exist. If the permit is critical to production, MBUSI Safety will evaluate alternate methods and instruct the requestor on additional steps that are needed to prepare the critical process area for work before permit can be issued (i.e., an additional fire watch or safety representative utilizing a standpipe fire hose to protect the area).
5. Complete and approve the Hot Work Permit. The Hot Work Permit Placard shall be posted in the area and shall be valid only for the duration of the approved work (Maximum 12 Hours), or until the end of the operator's shift, whichever is shorter. Hot Work that continues beyond the maximum time allowed, or the operator's shift, shall require a new permit.
6. Periodically monitors the permitted site to ensure compliance with the Hot Work Permit requirements.
7. Conduct a Final Check of the Hot Work area, including adjacent exposed areas, 30-minutes after the work is completed. If notification is not received that the Hot Work is completed, they shall complete the Final Check approximately 30-minutes after the scheduled expiration of the permit. An investigation shall be conducted by Fire Safety to determine

why Fire Safety was not informed of the completion of the Hot Work activity.

I. Termination of Hot Work Permits

Hot Work Permits are void:

1. If the work is not started within 30-minutes of issuance.
2. At the end of the specified work or end of requestor's shift.
3. If a fire alarm/weather warning sounds.
4. If changes in the surrounding area occurs which increase the chance of a fire/explosion (introduction of flammable/combustible materials, chemical spill, etc.).
5. Permit violation occurs will result in immediate activity cessation.

J. Training

All Fire Safety Personnel will receive training on Hot Work Permit Procedures annually. Training will be documented per MBUSI procedures or Contract service provider procedure for external safety representatives.

APPENDIX A

Guidelines for Hot Work Equipment Inspection

Hot Work equipment to be used shall be in satisfactory operating condition and in good repair. Management, contractors, safety representatives, the fire watches, area supervisor and the person performing the Hot Work shall recognize their mutual responsibility for safety in Hot Work operations.

Oxy-fuel Gas Equipment:

Compressed gas cylinders (full or empty):

- Compressed gas cylinders shall be kept in a vertical position and shall be chained, or otherwise secured, to prevent falling.
- Cylinders on wheeled carts must be secured.
- Never open the fuel cylinder valve more than one complete turn. The cylinder wrench, if one is required, must be present on the cylinder valve to allow for quick shut-off if necessary.
- At no time shall acetylene gas be utilized at a pressure greater than 15 psig.
- Use of compressed gas cylinders on any roof, in pits, or in trenching should be avoided. If used in any of these areas, cylinders shall not be stored there and shall be removed immediately after completion of the work.

Regulators:

- Oxygen and fuel gas pressure regulators are attached to the cylinders and function to reduce high cylinder pressure to low working pressures for cutting or welding operations. High pressure gases shall never be used directly from the cylinder without a pressure reducing regulator. Regulators shall be used only for gases for which they are intended.
- Regulators contain two gauges that must be in good condition:
- High pressure gauges indicate the cylinder or supply pressure entering the regulator.
- Low pressure gauges indicate the delivery pressure from the regulator to the hose and torch.
- Oil or grease shall not be used on the regulator, the cylinder, or on any hose connections supplying oxygen. The welder's clothing and protective apparel shall be free of oil or grease.

Hoses:

- Gases are separately carried to the torch handle by two hoses. Only approved hose for welding shall be used. Hose shall be inspected and replaced when it shows signs of burns, leaks, worn places or other defects that may cause it to fail. **TAPED REPAIRS AND NON-FACTORY CRIMPS ARE UNACCEPTABLE.**
- Hose shall be correctly color coded - red hose for fuel, green hose for oxygen, black hose for inert gas or air.
- Backflow prevention and flashback protective devices are required for all torch setups.

Storage of Cylinders:

- Cylinders shall be stored in an approved storage area, preferably outdoors, but not near a building exit.
- Cylinder storage at the site of the Hot Work shall be limited to not more than one day's consumption of each gas used.
- Storage of oxygen cylinders and fuel gas cylinders shall be separated from each other and combustible materials (especially oil or grease) by a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet (1.5 m) high having a fire-resistance rating of at least ½ hour.
- Cylinders shall be protected from physical damage, tampering, and excess heat (125°F).

Electrically Powered Equipment

- Welding machines shall be located in a CLEAN and DRY area.
- Pipes carrying gases, flammable liquids or electrical conduit shall not be used for a ground return conductor. This also applies to sprinkler piping. Ground points shall be located as close to the work area as possible.
- Arc flash guards or fire resistant curtains shall be used where needed.
- Gasoline powered welders shall not be operated in hazardous areas.
- Compressed gas cylinders of argon, carbon dioxide or mixtures involving these gases with additions of helium or oxygen, shall be properly secured in such a way that they cannot be knocked over accidentally, and precautions must be taken that they are not electrically grounded.

- Cables shall be inspected for wear and damage and, when necessary, properly repaired or replaced.
- All 120 volt non-welding electrical equipment must have ground fault protection.

APPENDIX B

Instructions for the Completion of the Hot Work Permit

The following instructions are for the completion of the MBUSI Hot Work Permit. Although the permit has been designed to be self-explanatory, these instructions have been provided for further clarification.

Indicate the date the permit is issued.

List the Company (MBUSI/Contractor) to whom the permit will be issued.

Note the location of the Hot Work. Be as specific as possible. Plant and column locations should be the minimum location requirements.

Describe the work being done. Be as specific and detailed as possible. If permit is denied, reason(s) may be indicated here. Attach an additional sheet if needed. Retain all denied permits.

Check the precautions on the Hot Work Checklist. Verify that each of the measures indicated have been completed (or are not applicable by not checking the appropriate box) and check the appropriate box. Guidelines for Hot Work equipment inspections can be found in Appendix A of the Hot Work Procedure. Guidelines for Hot Work involving piping, air moving, ductwork, flammable/combustible liquid and paint spray operations can be found in Appendix C. Guidelines for Hot Work equipment inspections can be found in Appendix A of the Hot Work Procedure.

A fire extinguisher should be located at the site. Contractors must provide their own extinguishers. If possible, note the location of the nearest plant phone. Multipurpose extinguishers shall not be used in the Paint Shops.

Have the Fire Watch(es) confirm that he or she understands the responsibilities and confirm that they know how to request for emergency assistance via phone/fire alarm box.

The Fire Safety Representative, person doing the Hot Work, the Fire Watch and the maintenance representative will sign the Hot Work Permit acknowledging that all precautions have been met.

Obtain the Permit Number from Security (EOC).

Indicate the time the Hot Work is to begin. Normally this time should be close to the time of issuance, but should not be more than 30-minutes. If more than 30-minutes elapse since the issuance of the permit the permit is cancelled.

Indicate the expected time the Hot Work permit will expire. This time cannot extend past end of requester's (person performing the work) shift.

Before the Hot Work Worker leaves the site, the Fire Watch should be reminded to communicate to Security (EOC) that the Hot Work is terminated. If the Hot Work is completed before the estimated completion time, the Fire Watch is to inform Security (EOC). The 30-minute fire watch starts at that time. After 30-minutes, a Fire Safety Representative will return to the site and secure the Hot Work Permit Placard.

Post the Hot Work Permit Placard in a conspicuous location, at a permanent location. Do not attach the permit to a fire extinguisher or welding cart.

APPENDIX C

Guidelines for Special Handling Instructions

Piping Systems:

- 1) For work with the piping system de-energized:
 - a. Determine the contents of the system and the potential hazards involved. Plan the work accordingly.
 - b. De-energize the system (shut down pumps, close valves, etc.). Use Lockout-Tagout-Test procedures.
 - c. Drain all liquids/gases from the system. This must be completed in a manner that will not create a fire/explosion, health, safety or environmental hazard. Contact Environmental Engineering Group if issues arise.
 - d. Purge the system with an inert gas (air may be acceptable in some cases) to remove any remaining vapors. To determine the effectiveness of the purge, reduce the purge pressure to approximately 4 psi and test with a calibrated combustible gas meter. A "0" reading must be obtained prior to Hot Work.
 - e. Examine the interior of the pipe and remove any combustible residue.
 - f. Disconnect and/or isolate (with valves, blank flanges, non-combustible plugs, etc.) the section of pipe to be worked on.
- 2) Hot taps (work with the piping system energized):
 - a. Hot taps on piping shall only be performed in accordance with recognized standards (National Fire Protection Association, American Welding Society, American National Standards Institute, etc.). If site-specific policies and procedures are not available, contact the Safety Department for further guidance.
 - b. Determine the contents of the system and the potential hazards involved. Plan the work accordingly.
 - c. **Hot taps on pressurized air lines or compressed air systems shall not be authorized.** Where Hot Work is required, the steps for work on de-energized systems (listed above) shall be followed.
 - d. Planning:
 - i. Confirm that a hot tap is necessary. Shut down, purge, isolation and cleaning the line are preferred.

- ii. Obtain a copy of the Safe Operating Procedure established by the group planning this operation. The Safety department should be involved in this planning process.
- iii. Plan the work for a time when the area will not be occupied for normal operations (off-shift, weekend, holiday, etc.)
- iv. Preplan for an emergency (major leak) to include prior notification of plant management, plans for emergency shutdown, and preparations for emergency shutdown (pre-test valves, ensure valve accessibility during the work, persons to stand-by the valves with direct two-way communications, etc.)
- e. Tools/equipment shall be listed or approved for the proposed use.
- f. Persons performing the work must be properly trained in safe hot tap procedures and proper operation of the equipment to be used.
- g. Test the pipe wall thickness prior to beginning work.
- h. Inspect and test the weld on the thread-o-let before connecting the hot tap tool.
- i. Leak test the tap, valve, etc. after installation is complete.

Collection Systems, Air Moving Systems, and Ductwork:

- 1) Hot Work shall not be performed on any portion of any collection system (mist, dust, fume, etc.), air moving system (heating, ventilating, air conditioning, etc.), or ductwork while it is in operation.
- 2) Determine the contents of the system and the potential hazards involved. Plan the work accordingly.
- 3) Shut down and/or isolate the portion of the system to be worked on. This may include one or both of the following:
 - a. Shutting down and locking out fans/blowers. This is required for any Hot Work on a mist collection or dust collection system.
 - b. Physically disconnecting the ductwork or equipment from the remainder of the system. Depending on the specific system/operation, this may leave an open end or it may be necessary to install a cap or blank flange. For any Hot Work on a mist collection or dust collection system, it is required that the collector be separated from the ductwork or machines and blanked off.
- 4) Thoroughly examine the interior and exterior of the system and remove any residue, filter media or other flammable/combustible materials.
- 5) Test the atmosphere within the system for flammable vapors. Hot Work shall not be conducted if vapor concentration of 5% of the LEL or greater is detected.

Containers:

- 1) Hot Work on “empty” drums or barrels shall be **PROHIBITED**.
- 2) Hot Work on tanks or other containers **shall be AVOIDED**. Where Hot Work is absolutely necessary, it shall only be performed in accordance with recognized standards including National Fire Protection Association 326, *Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning or Repair (See General Requirement)*.
- 3) Determine the contents of the tank/container and the potential hazards involved. Plan the work accordingly.
- 4) The tank/container shall be emptied, purged and cleaned to remove hazardous materials.

- 5) The tank/container should be completely filled with water, sand or another inert material. If using an inert gas, such as carbon dioxide or nitrogen, the concentration shall be checked prior to beginning the work and shall be monitored throughout the operation.
- 6) If filling with an inert material is not feasible, the atmosphere within the tank/container shall be tested before the Hot Work begins and continuously monitored until after the work is completed to ensure that a hazardous atmosphere is not present. Hot Work shall not be conducted if vapor concentration of 5% of the LEL or greater is detected.
- 7) A means shall be provided to vent pressure created from the Hot Work operations.
- 8) Special care is required with jacketed containers to ensure that all confined air has been sufficiently vented. Any metal part suspiciously light for its size may be hollow inside and should be drilled before heating to reduce the potential for an explosion.

Roofing Operations:

- 1) No Hot Work operations shall take place on the roof of any building over an area where the sprinkler system is impaired. If the building is **not** covered by a suppression system then, appropriate alternative means of protection shall be provided, such as a multiple fire watches (both on the roof and inside the building) with charged hose lines and portable fire extinguishers.
- 2) **Open flame torch systems ARE NOT** to be used on the roof of any MBUSI facility for roofing application, roof drying, or similar operations.
Use of a listed or approved indirect heating device such as the “wand” may be an acceptable alternative. The “wand” has the flame contained inside a tube and uses a fan to blow the heat onto the materials. Another possible alternative for sealing seams is an electrical heating device. Consult with a Safety Representative for approval prior to use of any of these devices.
- 3) There shall be no smoking on the roof at any time.
- 4) There shall be at least (2) two 20 lb. ABC rated (minimum) extinguishers on the roof within 30 feet of the operation.
- 5) There shall be a covered metal trash can on the roof for disposal of miscellaneous materials. This trash can shall be emptied as needed. The trash can, debris, or used mops shall not be left on the roof overnight. If employees leave their clothing at the site, it must be left in a metal container that is stored at ground level.
- 6) Materials shall not be dropped off of the roof. Materials shall be lowered by a hoist or emptied into a closed chute.
- 7) Any gasoline used on site must be stored in approved safety cans on the ground. If gasoline powered equipment is to be used on the roof, it should be re-fueled only on the ground while the equipment is cool. If it is necessary to fuel on the roof, a sand box shall be constructed on the roof for re-fueling and at least one 20 lb. BC dry chemical extinguisher shall be available within 20 ft of this operation.
- 8) Tar Kettles:
 - a. Tar kettle setup is to be approved by Fire Safety. Tar kettles shall be located on flat, solid ground, outside and a minimum of 25 feet away from any building, pipe truss, or other important structure.

- b. An attendant shall remain on the ground and in close proximity of the tar kettle during operations.
- c. Building air intakes should be turned off.
- d. It is recommended that the area under the fill pipe should be diked and filled with at least 6 inches of sand. There should be a minimum of 2 inches of sand beneath the remainder of the tar kettle.
- e. Tight fitting steel covers shall be provided on the kettle and shall be in good condition.
- f. The tar kettle unit should be cleaned periodically to remove hanging pitch or asphalt.
- g. All kettles shall have a visible and functioning temperature gauge showing the temperature of the liquid being heated.
- h. The vertical run of the hot material line from the kettle to the roof shall be secured to the building at not more than 20 ft intervals.
- i. All openings in the building's wall behind the kettle's hot lines must be covered with fire retardant canvas or other non-combustible material for no less than 20 feet on each side of the hot line.
- j. Liquefied Petroleum Gas (i.e. Propane) tanks/piping:
 - i. Shall be located at least 50 feet from the kettle and buildings or other important structures.
 - ii. The piping or hose shall be approved and adequately protected from physical damage.
 - iii. There shall be a minimum of 10 feet of rigid piping from the burner to the base of the flexible piping to the tank.
 - iv. All bottled gas must be adequately secured at all times.
 - v. Caps or covers must be on the tanks when not in use.
 - vi. There shall be not more than 300 gallons of propane on site and no more than eight (8) smaller tanks.
- k. There shall be a minimum of two fully charged 20 lb. BC rated portable fire extinguishers within 30 feet (9.2 m) of each tar kettle while the kettle is on site.

Flammable or Combustible Liquid Storage, Dispensing, or Operations:

Before a permit is issued for these areas/operations, the following steps are required:

- 1) Planning:
 - a. Alternatives to Hot Work must be explored in the early planning stages for the project.
 - b. Obtain a copy of the safe Operating Procedure established by the group planning this operation. Safety should be involved in the planning process.
 - c. All Hot Work in these areas should be discussed with the Safety Representative in the early planning stages.
 - d. Plan the work for a time when the area will not be occupied for normal operations (off shift, weekends, holiday, etc.)
- 2) Operations shall be shut down if discrepancy found.
- 3) Flammable and combustible liquids shall be removed from the area.

- 4) Equipment and the area shall be cleaned and purged of flammable vapors and/or residue.
- 5) Test the atmosphere for flammable vapors, including all pit areas (if applicable), in Fluid Fill areas. Hot Work shall not be conducted if vapor concentration of 5% of the LEL or greater is detected.
- 6) Ventilation supply air to be left on in the flammable/combustible liquid storage, dispensing, and mixing rooms. Doors to room to be left open.
- 7) Ventilation supply air to be left on in fluid fill dispensing area.
- 8) A charged hose line of adequate length for the Fire Watch standby should be laid for use. Make sure the Fire Watch is positioned advantageously, at the work activity location, within the hazard area. Ensure at least (2) two – 20 lb. ABC dry chemical fire extinguishers are located at the work site and an additional 150 lb. wheeled dry chemical extinguisher is positioned nearby. Fire Watch personnel shall be trained in the use of fire extinguishing equipment. Check all fire equipment to ensure it is ready for use.
- 9) Do Not allow Hot Work activities to start until all precautions, fire equipment and Fire Watch personnel are in place.

Paint Spray Operations:

- 1) These procedures are to be applied for work inside, above or near spray booths.
- 2) Planning:
 - a. Alternatives to Hot Work must be explored in the early planning stages for the project.
 - b. Obtain a copy of the Safe Operating Procedure established by the group planning this operation. The Safety Department should be involved in this planning process.
 - c. All Hot Work in these areas should be discussed with the Safety Representative assigned to the group early in the planning stages.
 - d. Plan the work for a time when the area will not be occupied for normal operations (off-shift, weekend, holiday, etc.).
- 3) Thoroughly clean the spray booth prior to any Hot Work activity. If the Hot Work activity involves working below the booth grates and the sludge water is off, the eliminator area of the booth shall also be cleaned. Post an additional Fire Watch at this location as well and wet down the area periodically.
- 4) Paint lines and solvent lines shall be drained, isolated and covered if they are in the area of the work.
- 5) Paint/solvent pumping systems shall be shut down, at least while the work is going on. If paint needs to be re-circulated in the system to prevent separation of the paint material, schedule breaks in the Hot Work activities to allow this to be done. After the break, the Hot Work permit must be reissued following all procedures in case there was a leak of material.
- 6) Make sure booth air supply and sludge water are on and the exhaust air is shutoff. There may be a need on some occasions for downdraft booths, that the sludge water is shut off depending upon the work activity location in the booth. When sludge water is shutoff additional precautions such as cleaning of the eliminator section, “foaming” of the

eliminator section, opening up the eliminator section and posting a fire watch with a charged hose line may need to be done.

- 7) Perform atmospheric testing of the interior of the booth, ductwork, plenum, etc. to ensure air quality and absence of flammable vapors. This shall be performed prior to and throughout the work. If the water wash is shut down due to the nature of the work, the water wash pan area and the eliminator section shall also be tested.
- 8) The infrared detection system in the panel should be bypassed to prevent accidental deluge sprinkler discharge. A standby person to operate the manual deluge pull switch shall be provided.
- 9) Depending on the work activity, cover the bell cabinets, loose paint lines and robots with approved fire resistant tarps and by-pass the deluge system as may be necessary. A person to actuate the manual discharge shall be available during the Hot Work operation.
- 10) A charged hose line of adequate length for Fire Watch standby should be laid out. Make sure the Fire Watch is located advantageously, at the work activity location, within the spray booth. Also, have at least (2) two, 20 lb. BC dry chemical extinguishers located at the work site and a 150 lb. dry chemical wheeled unit close at hand. Fire Watch personnel should be trained in the use of all this equipment. Check all equipment to ensure it is in the "ready for action" state and it is of the appropriate type for the hazards involved.
- 11) In addition to the Fire Watches required above, the Safety Department shall provide an experienced Fire Safety Representative to perform Fire Watch.
- 12) Ensure proper two-way communications with the Security EOC are available.
- 13) Ensure all individuals involved understand actions to take (i.e.: location of manual discharge releases and fire alarm pull stations, notification of emergency services, etc.), in the event of a fire.
- 14) It is extremely important **not to allow the Hot Work activity to start until all equipment, precautions, and Fire Watches are in place.**

Hydraulic Systems:

- 1) Hot Work on or near hydraulically operated equipment or hydraulic lines shall only be performed with the power locked out to the equipment and the hydraulic fluid pressure relieved.

Contractors/Suppliers

Contractors/Suppliers will be required to furnish their own fire extinguishing equipment for Hot Work. Paint Shops require CO₂ fire extinguishing agents.

1. Hot Work Permit

a. A signed MBUSI Hot Work Permit is required before any cutting, welding and/or spark producing work is performed outside of areas specifically designed for such work.

b. Hot Work Permits will be issued only if:

1. There is no other feasible means to do the job.
2. The job cannot be moved outside or to a designated shop area.
3. The automatic fire protection systems are in service.

c. The Hot Work Procedure and Permit are designed to ensure the following precautions:

1. Fire protection systems, services and personnel are available and in service.
2. There are no flammable/combustible materials in the area.
3. Fire reporting methods are known and operational.
4. Hot work will not be permitted without MBUSI Safety/Security and MBUSI Maintenance signatures.
5. Fire Watch must report to Security all fires regardless of size or severity.

d. The following areas require prior coordination and a Special Hot Work Permit with MBUSI Maintenance Group and MBUSI Safety/Security before issuance of a permit:

1. Paint Mix Room
2. Within 3 feet of truss space
3. Paint Spray Booths
4. Assembly Tank Farm
5. Logistics Hazardous Materials Storage
6. Assembly Fuel Dispensing Area
7. Piping that contains or has contained flammable liquids or gases.
8. Ventilation ducts that have the potential to contain flammables/combustibles. (All paint shop booth exhaust systems).

e. Contractors/Suppliers must notify the appropriate MBUSI Maintenance Group prior to working on any equipment within the production areas or those areas that may affect MBUSI processes through the Hot Work Permit System.

2. Fire Watch

a. A fire-watch person shall have fire-extinguishing equipment readily available and will have been trained in its use.

1. They shall be familiar with facilities for sounding an alarm in the event of a fire.
2. They shall watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available or otherwise sound the fire alarm.
3. A fire watch person shall be maintained for at least a half-hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires.
4. A fire watch persons may need to be on different levels and possibly in other rooms depending on the configuration of the building.

5. Fire watchers shall be required whenever welding or cutting is performed in locations where other than a minor fire might develop, or any of the following conditions exist:
 - a. Appreciable combustible material, in building construction or contents, closer than 35 feet to the point of operation.
 - b. Appreciable combustibles are more than 35 feet away but are easily ignited by sparks.
 - c. Wall or floor openings within a 35-foot radius expose combustible material in adjacent areas including concealed spaces in walls or floors.
 - d. Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings or roofs and are likely to be ignited by conduction or radiation.
 - e. Fire watchers shall have fire extinguishing equipment readily available and be trained in its use.
 - f. Fire watchers shall be familiar with the facilities in order to call/pull the alarm in the event of a fire.
 - g. Fire watchers shall watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available or otherwise call/pull the alarm.
 - h. A fire watch shall be maintained for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires.

3. Welding and Cutting

- a. The welder/cutter/grinder shall wear proper Personal Protective Equipment, i.e.:
 1. Long sleeve shirts
 2. Cutting goggles/welding hood
 3. Gloves/aprons/capes
 4. Clothing without frays or rips
 5. Hard hats
 6. Respirators
 7. Other equipment based on the exposed hazard
- b. If grinding or chipping is done, a face shield shall be worn in addition to safety glasses.
- c. At a minimum, employees that are working with welders shall wear long-sleeve shirts and appropriately tinted glasses with side shields or welding eye goggles.

4. Inspection

- a. Arc-welding and cutting equipment shall be industrial rated, in good condition and meet local governing authority requirements regarding application, installation and operation.
 1. Trained and qualified people shall make a complete preventive maintenance inspection at least annually.
 2. The last inspection date shall be marked on the equipment.

- b. Before each use, the following items shall be inspected:
 - 1. All leads for broken or cut insulation.
 - 2. Electrode holders for broken insulators or worn holders.
 - 3. Oil and fuels on gas or diesel-powered units.
 - 4. Covers are in place where leads attach to welding machines.
 - 5. All connections have no exposed current-carrying parts.
- 5. Electric Shock Hazard
 - a. Operating voltages listed on the nameplates should not exceed 100 volts DC or 80 volts AC.
 - b. Be certain:
 - 1. Not to use any equipment that is either wet or has been recently drenched.
 - 2. Those welding units that are powered by AC shall be adequately grounded.
 - 3. The unit is shut down before changing polarity.
 - 4. That electrodes are never changed with bare hands or wet gloves or when standing on a wet floor or grounded surface.
 - 5. That when cables become worn enough to present a hazard that they are replaced immediately.
 - 6. To keep welding cables away from power supply cables and high voltage wires.
 - 7. Not dip hot electrode holders in water to quickly cool them.
 - c. GFCIs shall **not** be used on welding machines with DC current outlets for cord plugs. They do not function properly in this application.
- 6. Ventilation Requirements
 - a. Welding, Cutting and Heating In Enclosed Spaces
 - 1. General mechanical or local exhaust ventilation shall be provided whenever welding, cutting or heating is performed in areas with inadequate ventilation and in enclosed spaces where there is:
 - a. less than 10,000 cubic feet of space per welder.
 - b. less than 2,000 feet/min of air supplied per welder.
 - 2. The ventilation shall be of sufficient capacity and so arranged so as to produce the number of air changes necessary to maintain welding fumes and smoke within safe limits. (Levels below OSHA PELs and/or TLVs will be considered to be “safe limits” as described above. In some cases OSHA Action Levels, excursion limits and STELs may be substituted as “safe limits”). The adequacy of the ventilation shall be determined by air monitoring and/or ventilation measurements.
 - a. When sufficient ventilation, as described above, cannot be obtained, the Contractor/Supplier employees shall be protected by appropriate respiratory protection.
 - b. Oxygen shall never be used to ventilate an area.
 - c. Contractor/Supplier employees performing welding and/or cutting operations on the materials listed below in enclosed spaces shall use local exhaust ventilation or the

employees will be protected with airline respirators. Airline respirators shall also protect other people working in the immediate area. (Confined Space Procedures will also apply.)

1. Cadmium bearing or cadmium coated materials.
2. Metals coated with mercury-bearing materials.
3. Beryllium-containing base or filler metals (because of its high toxicity, work involving beryllium shall be done with both local exhaust ventilation and air-supplied respirators).

d. Employees performing welding and/or cutting operations on the materials listed below in the open air shall be protected by air-purifying respirators (filter type). Air-purifying respirators shall also protect other employees working in the immediate area. The materials are:

1. Cadmium bearing filler materials.
2. Chromium bearing metals or metals coated with chromium-bearing materials.
3. Metals coated with mercury-bearing materials, beryllium-containing base or filler metals. (Because of its high toxicity, work involving beryllium shall be done with both local exhaust ventilation and air-supplied respirators.)

e. Inert-gas metal arc welding

1. The use of chlorinated solvents (example: Tap-free) shall be kept at least 200 feet away from any inert-gas metal arc welding unless the solvents are shielded from the exposed arc.
2. Surfaces prepared with chlorinated solvents shall be thoroughly dry before welding is permitted on such surfaces.
3. Welders and other employees who are exposed to welding flash shall be protected so that their skin is covered completely to prevent burns and other exposure to ultraviolet radiation.

4. When inert-gas metal-arc welding is performed on stainless steel, either local ventilation or air-supplied respirators shall be utilized. The local ventilation shall be of sufficient capacity and so arranged as to maintain nitrogen dioxide levels at or below the current TLV for nitrogen dioxide (3ppm).

f. Welding, cutting and heating – paints and coatings

1. Before welding, cutting or heating any surface covered by a coating, the coatings shall be ground off to bare metal.

g. Flame-Resistant Welding Curtains

1. The use of welding curtains is required during welding and grinding operations to limit the exposure of others to welding flash or sparks.
2. Use translucent, flame-resistant welding curtains that filter ultraviolet radiation. These provide sufficient protection while permitting adequate light to the work area.
3. Welding curtains, drop cloths and other materials used to protect people, products, materials or equipment shall be flame-resistant.
4. Polyethylene or other plastic welding curtains and drop cloths shall be made of flame-resistant materials and shall have a flame spread classification of 0-25 rating. Examples of flame-resistant fabrics include Nomex[®], Kevlar[®] and flame-retardant treated (FRT) cotton.

Electrical Safe Work Practices

Responsibility

- A.** The Safety Department is responsible for developing and maintaining this document.
- B.** Production and Maintenance supervision is responsible for implementation and enforcing this document.

(Group Leaders and above for MBUSI)

- Ensure personnel comply with all provisions of this document.
- Ensure personnel receive training appropriate to their assigned electrical tasks. Coordinate training with AIDT and document all training.
- Receive/Signs Energized Electrical Work Permits, and routes permits for approval (management signature section of permit).
- Evaluate work being performed to determine compliance with this program.

- C.** Violations of this plan will be handled according to MBUSI HR One Regulation.

Description

A. GENERAL REQUIREMENTS

The information contained in this standard outlines MBUSI's requirements for developing electrically safe work conditions for all personnel on-site. MBUSI Team Members and Contractors performing work must be trained in this procedure, or like procedures and qualified to conduct electrical work.

1. Personal Protective Equipment (PPE)

MBUSI Team Members and Contractors/Subcontractors.

Proper PPE must be worn whenever there is exposure to live parts or during switching operations. Exposed live parts are considered energized until proven otherwise. Each shop shall have available and maintain a 40 calorie level Arc Flash Suit. Team Members will wear hearing protection whenever working within the Arc Flash Boundary. Panels will have PPE requirements on the Arc-Flash stickers. Please follow the PPE requirements on the labels. Below are the requirements from OSHA, for items without PPE requirement labels.

PPE (1.2 - 12 cal/cm²)

- Arc-rated - long sleeved shirt and long pants, or coveralls, or arc flash suit rated for greater than or equal to the estimated incident energy.
- Hard Hat (E or G rated) Blue or Black for electrical workers in MBUSI (except construction contracts)
- Safety glasses or safety goggles
- Arc flash rated face shield and balaclava or arc flash suit hood
- Hearing protection (inserts)
- Voltage rated gloves
- Arc-rated leather gloves
- Leather safety footwear

PPE (12 cal/cm² and greater)

- Arc-rated - long sleeved shirt and long pants (or) coveralls, or arc flash suit, rated for greater than or equal to the estimated incident energy.
- Hard Hat (E rated) Blue or Black for electrical workers in MBUSI (except construction contracts)
- Safety glasses or safety goggles
- Arc flash rated suit hood
- Hearing protection (inserts)
- Voltage rated gloves
- Arc-rated leather gloves

■ Leather safety footwear

Electrical Rated Hard Hat Usage

Electrically Rated Hard Hats must be less than 5 years old.

- E class hats are rated for 20,000 volts (Blue/Black for Electrical workers).
- G class hats are rated for 2,200 volts (Blue/Black for Electrical workers).

Note:

- Bump caps are not rated and thus cannot be used while performing electrical work.
- Hard hats cannot be modified in any way.
- Team Members and on site contractors are responsible to make sure they are using the correctly rated hard hat for the voltage they are working with.
- Workers must be aware of un-switched power sources and work in relation to these sources! OSHA 1910. The employer shall ensure that a protective helmet designed to reduce electrical shock hazard is *worn* by each such affected Team Member when near exposed electrical conductors which could contact the head.

Contactors must abide by this procedure when working onsite.

All construction personnel entering/working on MBUSI properties, must wear ANSI/OSHA approved hard-hat, reflective vest, safety glasses with side shields, (long sleeves if in the body shop) and steel-toe safety shoes at all times.

Electrical Arc/Shock Rated Glove Usage

- Glove Classification by Maximum Voltage Use:

Class 00 500 volts

Class 0 1,000 volts

Class 1 7,500 volts

Class 2 17,000 volts

Class 3 26,500 volts

Class 4 36,000 volts

- Electrically rated gloves are available in Central Stores.
- MBUSI Team Members must follow the glove color rotation. Gloves must be replaced after every 6 months of use. Inspect gloves before

each use. Use specific rated arc flash Leather Protectors with Electrically Insulating Gloves.

Maintenance personnel are required to have their Arc/Shock rated gloves nearby during the work day. The gloves will be used when within 12 inches of any voltage over 150v for shock protection within the restricted approach boundary. (Most panels have live un-switched 480vac in proximity of lower voltages.)

Gloves are also required when working within the arc flash boundary.

2. Clothing

- MBUSI is not responsible for providing under layers.
 - Meltable fabrics such as acetate, nylon, polyester, polypropylene, and spandex shall not be permitted in fabric underlayers.
 - Exception: An incidental amount of elastic used on non-melting fabric underwear or socks shall be permitted.
 - Base layers must be non-melting fabrics.
- Coverage. Clothing shall cover potentially exposed areas as completely as possible. Shirt and coverall sleeves shall be fastened at the wrists, shirts shall be tucked into pants, and shirts, coveralls, and jackets shall be closed at the neck.
- Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, metal headgear, or metal frame glasses) will not be worn within the restrictive approach boundary or where they present an electrical contact hazard with exposed energized electrical conductors or circuit parts.

3. Procedures

The Team Member will verify equipment being worked on is in an electrically safe work condition. Refer to MBUSI energized/de-energize work instructions. See below.

Energized Work Permit

Any work on energized equipment requires an Energized Electrical Work Permit. If live parts are not placed in an electrically safe condition, work to be performed shall be considered energized electrical work and will be performed by written permit only. Care must be taken with regards to accidental contact with adjacent live circuitry. Insulated tools and gloves must be worn when working in the restricted approach boundary. MBUSI Energized Electrical Work Permit must be filled out and approved before

work can begin. Identify the hazards using a Job Briefing and Planning Checklist (NFPA 70E Annex I)

NOTE: Energized Electrical Work Permit is not required for current or voltage testing, or for trouble shooting equipment.

Job Briefing

Supervisors must fill out a JSA (Job safety analysis), review work procedures and PPE required before work begins. Troubleshooting is exempted from this requirement. ALL Mercedes Team Members and contractors/sub-contractors operating on-site shall file the JSA with the Safety Department before work begins.

Preventing Electrical Shock

- Turn equipment off – lock it out.
- Stay outside the limited approach boundary unless working on the equipment.
- Maintain your grounding system.
- Keep the panel door closed whenever not working on the equipment.
- Handle electrical conductors with respect. Always treat them as live for safety.
- Wear appropriate PPE.
- Use proper electrical rated tools.
- Have rescue hook available for work on higher energy systems.
- Care must be taken with regards to accidental contact with adjacent live circuitry. Insulated tools and gloves must be worn when working in the restricted approach boundary.

De-Energize Steps

- Determine all sources of electrical energy (drawings).
- Put on appropriate PPE (check arc flash label).
- After removing high loads current, open disconnect (facing away).
- LOTO (lock out tag out).
- Visually verify, if possible, that blades are fully open.
- Visually inspect instrument for defects (nicks, cracks in wire, and has proper rating).
- Verify meter is operational on a known good voltage source.
- Test phase to phase (6 tests) for zero energy (includes testing load side of contactor).

- Test phase to ground (6 tests) for zero energy (includes testing load side of contactor) - (test is for back fed voltage).
- Test meter on known good voltage source energy (to make sure meter didn't fail).
- Ground conductors, where induced voltages or stored electrical energy could exist.

Energize Steps

- Close and Latch the door
- Must be wearing appropriate PPE (Check Arc Flash Label)
- Stand to the side of the panel where the disconnect is located
- Stand away from the door and face away from the panel
- Turn on the disconnect

Electrical Work from Manlifts

Electrical work performed from man lifts/elevated work platforms, that could subject a Team Member to an arc flash/shock hazard, requires a second qualified person present on the ground that is capable of lowering the man lift by utilizing the ground/emergency descent controls and initiate a rescue if needed. Electrical workers performing elevated work within the arc flash boundary must utilize an arc flash rated fall protection harness.

Procedure to Change a Fuse in a Bus Plug

- Obtain an Energized Work Permit (Required for energized electrical work)
- Use a hook stick to turn off the bus plug disconnect from a safe distance. (Floor or mezzanine level). No special PPE required.
- Put on a 40 CAL rated arc flash suit and arc flash rated fall protection. Maneuver man lift up to the bus plug.
- Still wearing the 40 CAL suit, verify that the disconnect is in the off position, open disconnect cover, and use a meter to verify the voltage is zero. After verification of zero voltage, replace fuse(s) as needed. Close the cover, lower the man lift. 40 CAL arc flash suit may now be removed
- Use a hook stick to re-energize the plug from a safe distance (floor or mezzanine level).

4. Tools

Insulated Tools

Team Members shall use properly rated insulated tools when working inside the restricted approach boundaries.

Rescue Hook

Each shop with electrical workers shall keep in each Team Center 1 electrical rescue hook.

Safety Department will keep 1 rescue hook on each response wagon.

Rescue hooks shall also be located in locations such as remote equipment rooms with no team center in reasonable distance.

Group Leader/Team Leader will verify hook is in place monthly.

This hook must be located in a **HIGHLY** visible location near the Team Center entrance/exit.

Group Leaders must inform every electrically qualified Team Member as to the location and use of the device.

Facilities and Shop Maintenance must have the hook with them in the immediate work area when working on higher energy systems.

NOTE: rescue hook will be staged at location of any Energized Electrical Work Permit.

5. Electrical Freezing

TM's must be trained on electrical freezing procedures annually. In case of electrical freezing, call Security at 1111 and remove individual from electrical source using a Rescue Hook (See Appendix A for rescue hook usage.)

6. Electrical Panel Doors

Panel Doors are required to be kept closed. If the door has to be kept open temporarily, inform the maintenance group leader immediately. Erect a barricade with hazard (red tape) at a greater distance than largest distance indicated on the door label (Arc Flash or Limited approach boundaries). TL's are tasked with daily observation in their area, and report to GL immediately if doors cannot be closed. Panels in which barricades have been erected must be repaired on a first priority basis.

7. Clear Spaces

Clear working space required by other codes and standards shall not be used for storage. This space shall be kept clear to permit safe operation and maintenance of electrical equipment. (Electrical cabinet doors must not be blocked.)

8. Confined Spaces

Only those authorized and qualified are permitted to enter confined spaces. Individuals must contact safety/security for a confined space permit.

9. Maintenance of Electrical Equipment

Site owner is responsible for maintenance of electrical equipment. Worn or non-operational door latches, disconnect rods, disconnects must be maintained.

10. Periodic Testing of Safety Systems

The user shall establish and follow a program of periodic and regular inspection and maintenance to ensure that all parts, auxiliary machinery, and risk reduction measures are in a state of safe operating condition, adjustment and repair in accordance with the supplier information for operation and maintenance.

11. Training

Team Members must demonstrate their skills and be signed off as being qualified according to NFPA requirements. Un-qualified people are not allowed to enter beyond the limited approach boundary. Unqualified people can never enter the restricted approach boundary.

- Each person (using proper PPE) must demonstrate with a meter how to verify a safe electrical work condition (voltage off). This training must be yearly and must be entered into the training record. In addition yearly e-learning refresher training must be completed.
- All electrical contractors working on site must have proof of training and qualifications from their Company. In addition, electrical contractors that work on-site continuously will have to take an onsite electrical training/orientation.

12. Contractors/Suppliers

Safety programs used by contractors on MBUSI Property must meet or exceed all applicable guidelines of this Safety Program. Contractors will be required to comply with applicable Safety and Health regulations such as OSHA 1910 and NFPA 70E. Contractors may be required to submit copies of their Safety Program to the MBUSI Safety Department upon request. Contractors are expected to provide the appropriate PPE to their personnel. Depending on the hazard category of the work being performed the contractor may be required to have up to a 40 Arc Flash Suits or a layering system of Flame Resistant coveralls.

1. MBUSI Electrical Safety Program:

- a. The MBUSI Electrical Safety Program is founded on the principle of avoiding energized work unless it is absolutely necessary.
- b. Live parts are to be de-energized in accordance with the MBUSI policies and references noted below:

1. NFPA 70E Standard for Electrical Safety in the Workplace
 2. OSHA 29CFR1910.331 through 1910.335 Subpart S
 3. MBUSI Control of Hazardous Energy Plan included in the Safety One Manual.
 4. MBUSI Electrical Safe Work Practices.
-
2. Live parts will be de-energized before a Contractor/Supplier works on or near them. Any deviation from this standard requires approval from the Safety Manager and the Facilities Manager.
 3. Treat all equipment and parts as if they are energized unless it has been determined and verified by qualified personnel testing, to be otherwise.
 4. Electrically powered tools must be grounded or double insulated.
 5. Electrical equipment shall be supplemented with ground fault circuit interrupters (GFCI).
 6. Only qualified and authorized electricians are allowed to work on or near exposed energized parts, and then only while utilizing safe work procedures and personal protective equipment.
 7. All disconnects for motors, branch circuits, service feeders, etc. must be marked as to what they control.
 8. At least a 20-foot minimum clearance distance must be maintained for overhead power lines.
 9. Extension cords must be designed for hard or extra hard usage (14 gauge or larger and of the 3-wire type).
 10. Do not use conductive ladders when working on areas having live electrical equipment.
 11. Do not alter electrical plugs and receptacles to prevent grounding.
 12. Electrical equipment used in hazardous locations must be rated and approved for those locations.
 13. Safety signs, barricades, and attendants shall be required to prevent accidental contact with live electrical parts and equipment.

14. Live parts operating at 50 volts or more shall be covered or guarded.
15. Do not run extension cords through doors, windows, walls and over metal objects such as conduct, pipes and racks.
16. All electrical tools and equipment must be inspected monthly and provided with labels, tags or color coding to indicate that an inspection has been conducted.
17. Do not block or obstruct electrical panels, breakers, switches, etc. (three foot minimum access space is required).
18. Minimum PPE requirements can be identified by referencing the Arc Flash Warning Labels on MBUSI Buss Plugs and/or equipment.
19. In the absence of an Arc Flash Warning Label, Contractors/Suppliers are required to reference the NFPA 70E Standard for Electrical Safety in the Workplace (Arc Flash) reference.

13. Laser Safety and Hybrid Battery Safety

Laser Safety and Hybrid Safety are covered in separate safety procedures. Work on these systems will require additional training in the procedures listed below.

- SHSPR27 – Laser Safety Procedure
- SHSPR32 – Lithium-Ion Hybrid Safety Procedure

14. Records/Audits

An annual audit of field work is required with respect to the electrical safety program procedures. Procedures will be re-evaluated annually based on field observations.

MBUSI Team Members observed not following procedures correctly must be re-trained on the proper procedures before being allowed to continue electrical work. This re-training will be entered into the Team Member's training record. Group Leaders as well as the Safety Department is tasked with enforcing Plant PPE requirements and the Safety plan. AIDT will archive/log training records according to the MBUSI records retention schedule.

Annual hands on demonstrative training must be done by all Team Members. This refresher shall be taught by a qualified instructor and logged into the training record.

Incident Investigations. The electrical safety program shall include elements to investigate electrical incidents.

Informational Note: Electrical incidents include events or occurrences that result in or could have resulted in a fatality, an injury or damage to health. Incidents that do not result in fatality, injury or damage to health are commonly referred to as a “close call” or “near miss.”

ELECTRICAL EQUIPMENT EXPOSED TO PHYSICAL DAMAGE SHALL BE PROTECTED

OSHA CFR 1910.303(g)(2)(ii)

In locations where electric equipment is likely to be exposed to physical damage, enclosures or guards shall be so arranged and of such strength as to prevent such damage.

Electrical live parts must be protected from exposure to physical damage at/on the edges as not to impede the 3' rule of access to said electrical panel.

Electrical Power Distribution and other Utilities shall be protected against damage or TM exposure.

APPENDIX A

ELECTRICAL RESCUE POLE

A. Electrical Rescue Pole

- Electrical Rescue Pole is a rescue device, not a safety device.
- Electrical Rescue Pole is not a substitution for safely powering down the equipment.
- Any use of the pole must be reported to the safety department.
- Electrical Rescue Pole is for emergency use only.
- Use of the rescue pole for anything but emergency rescue or emergency rescue training will result in disciplinary action up to and including dismissal.

B. Inspection

- The group leader will inspect the electrical rescue pole every three months.
- The pole and hook shall be free of structural damage.
- The signage for the pole is visible and in good repair.
- The mounts for the pole function properly.
- The end of the pole is still capped.
- The rescue hook is free of defects and is not malformed.

C. Usage

- Do not touch person with any part of your body. They can conduct electricity.
- Hold pole by the end with hands 1 to 2 feet apart.
- In general, try to hook the person around their center (navel area).
- Avoid hooking around the neck area.
- Use your body weight to pull on the pole not your upper body.

1. TM is Standing/Sitting

- Hook TM around the waist and pull.
- Keep arms close to your side while gripping pole.
- Pull with your legs with your weight thrusting behind you.
- Only touch the person with Rescue Pole.

2. TM is Prone

- Watch for TM's leg. They can conduct electricity.
- First Choice - Hook TM around waist.
- Second Choice - Hook into waistband of TMs pants (Do not hook through belt).
- Keep arms close to your side while gripping pole.
- Pull with your legs with your weight thrusting behind you.

1.

Bloodborne Pathogens Exposure Control Plan

A. Definitions

Blood – human blood, human blood components, and products made from human blood.

Bloodborne Pathogens – pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Contaminated – the presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.

Contaminated Sharps – any contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes and exposed ends of dental wires.

Decontamination – the use of physical or chemical means to remove, inactivate or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use or disposal.

Exposure Determination – is made without regard to the use of Personal Protective Equipment (PPE) (i.e. TMs are considered to be exposed even if they are wearing PPE). This exposure determination is required to list all job classifications in which all TMs may be expected to incur such occupational exposure, regardless of frequency. At MBUSI the following job classifications are in this category:

1. Registered and/or Licensed health care providers
2. Medical Technicians
3. First Responders

Exposure Incident – a specific eye, mouth, other mucus membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of a TM's duties.

Occupational Exposure – reasonably anticipated skin, eye, mucous membrane or parenteral contact with blood or other potentially infectious materials that may result from the performance of a TM's duties.

Parenteral – piercing mucous membranes or the skin barrier through such events as needle sticks, human bites, cuts and abrasions.

Regulated Waste – liquid or semi-liquid blood or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; items that are

caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling; contaminated sharps; and pathological and microbiological wastes containing blood or other potentially infectious materials.

Sterilize – the use of a physical or chemical procedure to destroy all microbial life including highly resistant bacterial endospores.

Universal Precautions – an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV and other bloodborne pathogens.

Work Practice Controls – controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles by a two-handed technique).

B. Methods of Implementation and Exposure Control Plan

1. Universal precautions must be observed at MBUSI in order to prevent contact with blood or other potentially infectious materials. All blood or other potentially infectious material must be considered infectious regardless of the perceived status of the source individual.

2. All contaminated surfaces must be disinfected with soap and water, then sprayed with a 10% chlorine bleach solution (or other effective substitute product) and wiped dry. Gloves must be worn during decontamination.

3. Eating, drinking, handling of contact lenses, applying cosmetics, etc. is not permitted in an area where exposure is likely.

4.. Engineering and Work Practice Controls

- a. Engineering and work practice controls must be utilized to eliminate or minimize exposure to TMs at MBUSI. Where occupational exposure remains after institution of these controls, PPE must also be utilized. At MBUSI the following engineering and work practice controls must be utilized:

1. Proper use of sharps container.

2. Designated disposal container for potentially infectious materials.

3. Use of disposable trash bags in all rest room trash containers.

- b. The Medical Department, and any other non-managerial TMs responsible for direct patient care who are potentially exposed to injuries, will review the above controls and will be solicited for input on effective engineering and work practice controls on an annual basis.
- c. Hand washing facilities are also available to the TMs who incur exposure to blood or other potentially infectious materials. At MBUSI hand washing facilities are in all restrooms and each medical office
- d. After removal of personal protective gloves, TMs must wash hands and any other potentially contaminated skin area immediately or as soon as feasible with soap and water.
- e. If TMs incur exposure to their skin or mucus membranes, then those areas must be washed or flushed with water as appropriate as soon as feasible following contact. Antiseptic hand cleaner in conjunction with clean cloth/paper towels or antiseptic towelettes can be used until soap and running water are available.

5. Needles

- a. Contaminated needles and other contaminated sharps will not be bent, recapped, removed, sheared or purposely broken. OSHA allows an exception to this if the procedure would require that the contaminated needle be recapped or removed and no alternative is feasible and the action is required by the medical procedure. If such action is required then the recapping or removal of the needle must be done by the use of a mechanical device or a one-handed technique. At MBUSI recapping of contaminated sharps is not permitted.

6. Container for Sharps

- a. Contaminated sharps are to be placed immediately, or as soon as possible, after use into appropriate sharps container.

7. Contaminated Equipment

- a. Equipment which has become contaminated with blood or other potentially infectious materials must be examined prior to servicing or shipping and must be decontaminated as necessary unless the decontamination of the equipment is not feasible.

8. Personal Protective Equipment (PPE)

a. All PPE used at MBUSI for bloodborne pathogen protection will be provided without cost to the TMs. PPE will be chosen based on the anticipated exposure to blood or other potentially infectious materials. The protective gloves will be considered appropriate only if it does not permit blood or other potentially infectious materials to pass through or reach the TMs hands under normal conditions of use for the duration of time which the protective gloves will be used. PPE will be provided to TMs in the following manner:

1. Nitrile gloves - Used to prevent any potential contact with the body fluids while rendering medical service or first aid.
2. Utility Gloves - Used while servicing toilet and lavatory fixtures and disposing of unbagged trash.
3. Gowns - Gowns, aprons, or lab coats may be used when splashes to skin or clothing will likely occur.
4. Mask & Eye Protectors - Masks and protective wear or face shields are required when contamination of mucosal membranes with body fluids such as splashes or aerosolization of material is likely to occur.
5. Resuscitation Equipment - Pocket masks, resuscitation bags, or other ventilation devices are provided in the Medical Department.

b. All personal protective gloves will be cleaned or disposed of by MBUSI at no cost to TMs.

c. All blood or body fluid contaminated garments and PPE must be removed as soon as possible.

d. All contaminated work surfaces will be decontaminated immediately or as soon as feasible. MBUSI has a contracted company which is responsible for such clean-ups.

e. Any broken contaminated glassware will not be picked up directly with the hands. The following procedure will be used:

1. A broom and dust pan will be used to clean up broken or contaminated glass and disposed of in the sharps container. The broom and dust pan must be decontaminated after use.

9. Regulated Waste Disposal

- a. All contaminated sharps must be discarded as soon as feasible in sharps containers.
- b. Regulated waste other than sharps must be placed in appropriate biohazard labeled containers and closed prior to removal to prevent spillage or protrusion. Red bags or red containers may be substituted for labels.
- c. Regulated waste must be transported, treated and disposed of by an approved contractor. Regulated waste may not be placed in trash dumpsters or other receptacles whose ultimate destination is not furnace-permitted for the destruction of bio-hazardous waste.
- d. Abnormal generations of medical waste will be retained at the Haz-Mat building in properly labeled container(s) for the type of waste generated. This medical waste will be removed with regularly scheduled shipments or as required.

10. Hepatitis B Vaccine

- a. All TMs who have been identified as having exposure to blood or other potentially infectious materials will be offered the Hepatitis B vaccine, at no cost to the TM. The vaccine will be offered within 10 working days of their initial assignment to work involving the potential for occupational exposure to blood or other potentially infectious materials unless the TM has previously had the vaccine or who wishes to submit to antibody testing which shows the TMs who have sufficient immunity.
- b. TMs who decline the Hepatitis B vaccine will sign a waiver.
- c. TMs who initially decline the vaccine but who later wish to have it may then have the vaccine provided at no cost. The Medical Department is responsible for offering the vaccine, getting signed waivers, and making arrangements to administer the vaccine.

11. Interaction with Health Care Professionals

- a. A written opinion must be obtained from the Medical Department physician for the TMs. Written opinions will be obtained in the following instances:
 - 1. When the TM is sent to obtain the Hepatitis B vaccine.
 - 2. Whenever the TM is sent to another health care professional following an exposure incident.
- b. Health care professionals must be instructed to limit their written opinions to:

1. Whether the Hepatitis B vaccine is indicated and if the TM has received the vaccine, or for evaluation following an incident.
2. That the TM has been informed of the results of the evaluation.
3. That the TM has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials. (Note that the written opinion to the TM is not to reference any personal medical information.)
4. A copy of this Plan will be available for the Medical Department anytime following a revision.

C. Post-Exposure Evaluation and Follow-Up

1. When a TM incurs an exposure incident, it should be reported to the Group Leader who will forward the information to the Medical Department.
2. All TMs who incur an exposure incident will be offered post-exposure evaluation and follow-up in accordance with OSHA standard 29CFR1910.1030. The follow up will include the following:
 - a. Documentation of the route of exposure and the circumstances related to the incident.
 - b. The source individual's blood shall be tested as soon as feasible and after consent is obtained in order to determine HBV and HIV infectivity. If consent is not obtained, the employer shall establish that legally required consent cannot be obtained. When the source individual's consent is not required by law, the source individual's blood, if available, shall be tested and the results documented.
 - c. Results of testing of the sources individual testing shall be made available to the exposed TM, and the TM shall be informed of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual.
 - d. The TM will be offered the option of having their blood collected for testing of the TM's HIV/HBV serological status. The blood sample will be preserved for at least 90 days to allow the TM to decide if the blood should be tested for HIV serological status. However, if the TM decides prior to that time testing will be conducted, then the appropriate action can be taken and the blood sample discarded.

- e. The TM will be offered post exposure prophylaxis in accordance with the current recommendations of the U.S. Public Health Service. This will include a physician evaluation.
- f. The TM will be given appropriate counseling by Medical Department physician concerning precautions to take during the period after the exposure incident. The TM will also be given information on what potential illness to be alert for and to report any related experiences to appropriate personnel.
- g. The Medical Department has been designated to assure that the plan outlined here is effectively carried out and records are maintained.

D. Training

1. Training for all exposed TMs will be conducted prior to initial assignment to tasks where occupational exposure may occur. Training will include:
 - a. The OSHA standard for Bloodborne Pathogens.
 - b. Epidemiology and symptomology of bloodborne diseases.
 - c. Modes of transmission of Bloodborne Pathogens.
 - d. This Bloodborne Pathogens Exposure Control Plan (i.e. points of the Plan, lines of responsibility, how the Plan will be implemented, etc.)
 - e. Procedures which might cause exposure to blood or potentially infectious materials at MBUSI.
 - f. Control methods which will be used at MBUSI to control exposure to blood or other potentially infectious materials.
 - g. PPE available at MBUSI and who should be contacted concerning its use.
 - h. Post exposure evaluation and follow-up.
 - i. Signs and labels used at MBUSI.
 - j. Hepatitis B vaccine program at MBUSI.
2. Alabama Industrial Development Training (AIDT) at the Mercedes-Benz Training Center will be used to conduct and make training materials available. All exposed TMs will receive refresher training within one year of the TM's previous training. Additional training will also be provided

when changes such as new tasks or procedures affect the TM's occupational exposure.

Hazardous Chemical/Substance Communication Program

Roles

- o The Safety Department is responsible for developing and maintaining this document.
- o The Parts Quality Management (PQM) department is responsible for assuring all applicable chemicals/substances have been reviewed for paint compatibility.
- o The Environmental Department is responsible for minimizing MBUSI's environmental concerns and assures (Toxic Substances Control Act) TSCA compliance.
- o Each level of management will be responsible for assuring compliance with this Program by all TMs under their direct supervision.
- o Group Leaders are responsible to review with their TM's: The SDS information for the chemicals/substances in their area and making sure the chemical/ substance labels have not been removed or defaced.
- o TM's are responsible to know the location of SDS information, the hazards of the chemical/substance, the proper safe handling procedures, and the use of proper personal protective equipment when handling chemicals/substances.
- o Violations will be handled according to disciplinary action protocols.

Applicability/Program Requirements

- o Chemicals/substances - raw chemical/substances, process chemicals, industrial housekeeping supplies, fuels, or any other chemical/substance (Contractor or MBUSI owned) that MBUSI Team Members may be exposed to in the course of its application. They can be in a variety of physical forms including liquids, solids, gases, vapors, fumes and mists.
- o Chemicals used in construction projects (i.e. roofing material/adhesives/paints) not currently approved will not be required to have a Material Safety Code (MSC) number assigned. The responsible contractor will maintain a binder with a chemical inventory and all applicable SDS's and those products will be removed at the conclusion of the construction project.
- o An MBUSI Chemical/Substance Requisition Form, certification of TSCA approval and manufacturer/supplier SDS, written in English, with full disclosure, shall be submitted by the requestor to the Safety Department whenever:
 - A **new** chemical/substance is to be ordered,
 - A vendor desires to give MBUSI a free sample of the chemical/substance for field test purposes, or

- A new supplier for a chemical/substance is utilized or components change within an approved chemical.
- If the SDS information and TSCA certification are not attached to the request form, it will be returned to the requestor without further processing.
- o PQM, Environmental, and Safety must review and approve all chemical/substance requests. The review will:
 - Evaluate the hazards associated with the handling, storage and utilization of the chemical/substance. MBUSI will rely on the SDS for determining the chemical/substance's associated risks.
 - Compare the compatibility of the new chemical/substance with existing chemicals/substances, environmental conditions, etc. in the user and storage departments.
 - Determine the needed safe work practices, systems and personal protective equipment.
 - Communicate any problems or concerns to the requestor.
 - Compliance with EPA's TSCA.
 - After the chemical/substance is approved, an MSC number will be assigned to the chemical by the Safety Department.
- o Fetal Protection Guidelines – To ensure the work activities of a pregnant Team Member or contractor do not present a danger to the fetus, guidelines are as follows:
 - TM/Contractor may notify MBUSI Medical office of their condition
 - When concerns regarding potential chemical exposure are present, the applicable SDS's for their respective work area will be reviewed and copies provided, if requested. This information can be shared with their personal health care provider.
 - Temporary work assignments to be considered at the request of their personal health care provider.

Vendor Provided Labeling

- o All incoming chemicals/substances (except refueling and other bulk tankers) shall be shipped with a label as required by federal regulations if they contain hazardous substances. Labels shall include at a minimum of the following information:
 - Manufacturer's Name and Address
 - Product or Trade Name
 - Hazards warning label (GHS compliant information)

MBUSI Internal Required Labeling

- o Examples of an MBUSI label:



- o Effort should be made not to deface or cover up the manufacturer's warning labels with the MBUSI label. However, the hazards can be derived from the MBUSI label and/or by referencing the MSC number and/or chemical name from the MBUSI label to obtain the SDS. If the original warning label is destroyed, illegible or removed accidentally, a replacement label must be ordered from the manufacturer or a copy of the SDS must be taped to the container.
- o Containers/packaging having chemical/substances that do not have the MBUSI Material Safety Code or not bearing the required hazards warning label will not be accepted, rather quarantined until it is approved or a decision is made to return the product.
- o Team Members transferring chemical/substances from a labeled container to an unlabeled container (secondary container) are responsible for having a printed label of the chemical/substance on the secondary container before it leaves their possession.

Hazardous Chemical/Substance Inventory

- o MBUSI Safety Department shall maintain an inventory of all chemicals/substances in the plant.
- o All applicable SDS information must be readily available to all Team Members without having to ask an intermediary for it. SDS's are available for Team Members to review electronically at the Kiosk's located in each Plant atrium (SiteHawk).

Training

- o The Globally Harmonized System is presented to all Team Members during New Hire Orientation.

Training includes:

- Explanation and requirements of the MBUSI Hazardous Chemical/Substance Communication Program.
- Location of the written MBUSI Hazardous Chemical/Substance Communication Program.
- How to read and where to locate the SDS's.
- Labeling requirements for hazardous chemicals and substances and how to read the labeling system developed by MBUSI.
- Hazard recognition methods and observations to detect the presence or release of chemical/substance such as by visual appearance or odor.

- The physical and health hazards of chemicals/substances in the work area.
- Exposure monitoring and proper work practices and personal protective equipment TMs use to protect themselves from chemical/substance exposure during the course of their work activities.
- The Globally Harmonized System refresher training should be conducted when new hazards are introduced into the workplace. Refresher training may be accomplished with intranet access via AIDT e-learning online, as required.

Contract/Supplier Employees

- Where contractor employees are to perform a job where exposure to a chemical/substance is possible:
- The MBUSI Team Member responsible for the project/work must inform the contractor safety representative of the hazard(s) and how to avoid or minimize the exposures.
- MBUSI requires all contractors/suppliers to:
 - Maintain a master index of all chemicals/substances in their possession.
 - Keep the index in the contractor/supplier SDS binder and resubmit with necessary updates during the month of March on an annual basis.
 - Keep the SDS information in a book form.
 - Submit the copy prior to the time the hazardous chemical/substance is actually brought onto the site.
 - The contractor/supplier must remove all chemicals/substances from MBUSI once work is completed, unless prior approval is obtained from the MBUSI Safety and Environmental Departments.
- The Contractor/Supplier must remove all chemicals/substances from MBUSI once work is completed, unless prior approval is obtained from the MBUSI Safety and Environmental Departments.
- All Contractors/Suppliers utilizing chemicals at MBUSI are exempt from a Material Safety Code (MSC) designation provided that the chemical/substance remains in the sole possession of the Contractor and MBUSI personnel will not be exposed during its use. If MBUSI personnel may be exposed to a chemical/substance, the chemical / substance must be given a MSC.
- Refer to the MBUSI OSHA 3143 Industrial Hygiene Plan for further information when Team Members are potentially exposed to hazardous chemicals, biological, and physical agents.

Chemicals/ Substances in Pipes

- Chemicals/Substances in pipes must be identified.

Records

- o All approved chemicals/substances along with their assigned MSC numbers are kept in a database. The database is accessible via the Social Intranet.
- o A master hard copy of the chemical/substance inventory and a master hard copy of all the current SDS's shall be maintained by MBUSI Safety Department.

ALUMINUM DUST GUIDELINES

To ensure compliance with all applicable regulations/consensus standards relating to the safe processing, storage and handling of combustible aluminum dust. The applicable regulations or consensus standards shall include, but are not necessarily limited to; NFPA 484; NFPA 70; NFPA 505; NFPA 68; NFPA 69; NFPA 654; ANSI Z9.2; and ANSI Z33.1

Dust

1.1. Dust Control

1.2. General Requirements for Aluminum Dust Producing Areas

- 1.2.1. Machines that produce fine particles of aluminum shall be provided with hoods, capture devices or enclosures that are connected to a dust collection system having suction and capture velocity to collect and transport all the dust produced.
- 1.2.2. Grinders, buffers and associated equipment shall be electrically bonded and grounded with dust collectors utilized for processing aluminum.
- 1.2.3. Grinding operations shall not be served by the same dust collection system as buffing and polishing operations.
- 1.2.4. Dust collection systems shall be dedicated to the collection of aluminum or aluminum alloy dust only.
- 1.2.5. Sealing shall minimize the escape of dust from process equipment or ventilation systems.
- 1.2.6. All walls shall have a smooth finish and be sealed. Surfaces shall be utilized that minimize dust accumulation and facilitate cleaning.
- 1.2.7. Access shall be provided to all hidden areas to permit inspection. Hidden areas shall be sealed if inaccessible to housekeeping.
- 1.2.8. All doors in interior fire-rated partitions shall be listed self-closing fire doors.
- 1.2.9. Housekeeping is an area of vital importance in preventing initial and secondary (more powerful) explosions due to accumulations of dust becoming shook loose and airborne from accumulations on rafters, floors and other flat surfaces.
 - 1.2.9.1. Floors, elevated platforms, balconies and gratings shall be hard surfaced and shall be installed with a minimum number of joints in which aluminum powder or dust can collect.
 - 1.2.9.2. Roofs of buildings that house combustible aluminum dust-producing operations shall be supported on girders or structural members designed to minimize surfaces on which dust can collect and shall be watertight.

- 1.2.9.3. Where surfaces on which dust can collect are unavoidably present, they shall be covered by a smooth concrete, plaster or noncombustible mastic filler having a minimum slope of 55 degrees to the horizontal.
- 1.2.9.4. Inspect for dust residues in open and hidden areas, at regular intervals. Hidden areas shall be sealed if inaccessible to housekeeping.
- 1.2.9.5. Clean dust residues at regular intervals.
- 1.2.9.6. Use cleaning methods that do not generate dust clouds.
- 1.2.9.7. Only use vacuum cleaners approved for dust collection.
- 1.2.9.8. Likely areas of dust accumulations within the plant are:
 - Structural members
 - Conduit and pipe racks
 - Cable trays
 - Floors
 - Above ceiling
 - On and around equipment (leaks around dust collectors and ductwork.)
 - Overhead light fixtures
- 1.2.9.9. Locate relief valves away from dust hazard areas.
- 1.2.9.10. The interior of hoods and ducts shall be regularly cleaned wherever there is the possibility of buildup of wax, lint, aluminum fines (dust, particles) or other combustible material.

2. Dust Collectors

2.1. Construction Requirements

- 2.1.1. The entire dust collection system/filters shall be constructed to allow dissipation of static electricity with proper grounding, bonding, venting and explosion relief provisions.
- 2.1.2. Systems that handle combustible particulate solids shall be designed by and installed under the supervision of qualified engineers who are knowledgeable of these systems and their associated hazards.
- 2.1.3. Deflagration vents through a listed dust retention and flame arresting device shall have the capacity to safely release the pressure and be positioned so that a potential blast is not directed toward any combustible or frangible structure and shall be properly maintained.
- 2.1.4. Dust collection container should be outside the machining area, having an explosion-proof design, be appropriately labeled and provided with barriers or other means for protection of personnel.
- 2.1.5. Dry-type collectors shall be equipped with instruments for recording the surface temperature. An overheating audible or visual alarm or warning device shall be included at normally attended locations.
- 2.1.6. Recycling of air-material separator exhaust from dust collectors into buildings shall not be permitted unless the system is designed to prevent both return of dust with an efficiency of 99.9 percent at 10 microns and transmission of energy from a fire or explosion to the building.
- 2.1.7. Recycling of air-material separator exhaust from dust collectors into buildings shall not be permitted under any circumstances when combustible gases or vapors

or hybrid mixtures are involved or if the concentration of oxygen would be reduced below 19.5 volume percent in the work area.

- 2.1.8. Collector filter medium made from synthetic fabrics that accumulate static electric charges shall not be used.
- 2.1.9. Collection containers shall be kept free of contact with water or moisture.
- 2.1.10. The collection containers shall be of fire-resistive, noncombustible or limited-combustible construction.
- 2.1.11. Dust shall be removed, avoiding dust clouds, from collectors at least once each day and at more frequent intervals if conditions warrant.

2.2. Repairs

- 2.2.1. Where repairs are necessary, the collectors shall be emptied and residual accumulations of dust thoroughly removed.
- 2.2.2. Ductwork leading into the collector shall be disconnected and blanked off before repair work shall be permitted to be started.

2.3. Dust Collection Ducts and Ductwork

- 2.3.1. The construction, installation, inspection and maintenance of exhaust systems shall conform to the principles and requirements set forth in NFPA 91 Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists and Noncombustible Particulate Solids.
- 2.3.2. The air supply shall be taken from outside or from a location that is free of combustible aluminum dust.
- 2.3.3. Makeup air for the heating or cooling shall have a dew point low enough to ensure that no free moisture can condense at any point where the air is in contact with combustible aluminum dust or powder.
- 2.3.4. Ducts shall be designed to maintain a velocity of not less than 1364 m/min (4500 ft/min) to ensure the transport of both coarse and fine particles and to ensure re-entrainment if, for any reason, the particles can fall out before delivery to the collector (event of a power failure).
- 2.3.5. Ducts shall be as short as possible and shall have as few bends and irregularities as possible, to prevent interference with free airflow.
- 2.3.6. There shall be no unused capped outlets, pockets or other dead-end spaces that might allow accumulations of dust.
- 2.3.7. Additional branch ducts shall not be added to the existing system without redesigning of the system.
- 2.3.8. Branch ducts shall not be disconnected nor shall unused portions of the system be blanked off without means being provided to maintain required airflow.
- 2.3.9. Dampers or a suppression system must be placed in a manner in the ductwork so that there is no possible way an initial explosion could propagate a secondary explosion.
- 2.3.10. Deflagration venting, if no suppression system is provided, shall be provided on ductwork. These vents shall relieve to a safe location outdoors.

2.4. Access Doors and Openings

- 2.4.1. Shall be provided to permit inspection cleaning and maintenance.
- 2.4.2. Shall be designed to prevent dust leaks.
- 2.4.3. Shall be properly bonded and grounded.

2.4.4. Those not specifically designed for deflagration venting shall not be considered as providing that function.

2.4.5. Shall be designed to withstand the vented explosion pressure.

2.5. Fan and Blower Construction and Arrangement

2.5.1. Blades and housings of fans used to move air or inert gas in conveying ducts shall be constructed of conductive, non-sparking metal such as bronze, nonmagnetic stainless steel or aluminum.

2.5.2. The design of the fan or blower shall not allow the transported aluminum powder to pass through the fan before entering the final collector, unless the aluminum powder conveying system is inverted (blower located on the clean air side of the collector).

2.5.3. Fans or blowers shall be located outside of all manufacturing buildings and shall be located to minimize entrance of dust into the building from the fan exhaust.

2.5.4. Fans or blowers shall be electrically interlocked so that dust producing tools are shut down if the fan stops.

2.5.5. Fans and blowers should be checked periodically for excessive heat and vibration.

2.6. Ignition Control - General Requirements

2.6.1. Warning placards, signs or alerts shall be provided on equipment or at the entrance to places where explosive atmospheres (combustible dust) may occur.

2.6.2. Use appropriate electrical equipment and wiring methods which are intrinsically safe and approved for the class of location and ignitable and combustible properties of the combustible dust – National Electrical Code NFPA 70.

2.6.3. Control static electricity, including bonding of building steel and equipment to ground.

2.6.4. Control smoking, open flames and sparks (non-sparking tools and equipment).

2.6.5. Control mechanical sparks and friction.

2.6.5.1. Use separator devices to remove foreign materials capable of igniting combustibles from process materials.

2.6.5.2. Equipment shall be located or arranged in a manner that minimizes combustible dust accumulations on hot surfaces.

2.6.5.2.1. Separate heated surfaces from dusts (can include heating coils, friction couplings, brakes, bearings, etc.).

2.6.5.2.2. Separate heating systems from dusts. Heating may be permitted by indirect hot-air heating systems or by bare-pipe heating systems using steam or hot water as the heat transfer medium, or by listed electric heaters.

2.6.6. Fans or blowers used to convey heated or cooled air shall be located in an area that is free of combustible aluminum dust.

2.6.7. Flashlights and other portable electrical equipment shall be listed for the locations where they are used.

2.6.8. Adequate preventive maintenance, inspection and cleaning for all the above equipment shall be commensurate with the environment and conditions.

2.6.9. Automatic sprinkler protection shall not be permitted in areas where dry aluminum powders are produced or handled.

2.6.10. Any hot work performed in the area must have a signed hot work permit with all the proper prevention measures in place.

3. Machine Tools

3.1. Requirements

- 3.1.1. Air-driven machines are used for aluminum processing, with a drive-dependent grinding dust extraction unit.
- 3.1.2. No other materials (e.g. steel, magnesium, etc.) may be machined in the aluminum machining stations.
- 3.1.3. Materials that cause sparks (iron, steel, carbide) shall not be used for machining on machine tools used for aluminum and aluminum alloys, with the exception of those with separate extraction units.
- 3.1.4. In an environment where flying sparks are generated during the production process, shielding shall be in place to protect the grinding stations for aluminum.

4. Protective Equipment

4.1. General Requirements

- 4.1.1. Outer clothing shall be clean, flame retardant, non-static generating and shall be designed to be easily removable.
 - 4.1.1.1. Wool, silk or synthetic fabrics that can accumulate high static electric charges shall not be used.
 - 4.1.1.2. Safety shoes shall be static-dissipating and shall have no exposed metal.
- 4.1.2. Goggles and face shield.
- 4.1.3. Apron
- 4.1.4. Vent hood, partially enclosing, whenever the nature of the work permits, the grinding chamber. (Local exhaust is generally preferred as it can control the emissions of the contaminant at its source, preventing dispersion into the general work area.)
- 4.1.5. Interlocks shall be used to ensure grinding work can only be performed when the ventilation is in operation. Fans shall continue to run after switching off machine tools to avoid deposits in the ventilation pipes.
- 4.1.6. Proper gloves.

5. Exposure Controls

5.1. General Requirements

- 5.1.1. OSHA Permissible Exposure Limit (PEL) for respirable fraction of dust that is aluminum metal is 5 mg/m³.
- 5.1.2. If the exposure limit is exceeded and engineering controls are not feasible, a half face piece particulate respirator (NIOSH type N95 or better filters) may be worn for up to 10 times the exposure limit or the maximum use concentration specified by OSHA or respirator supplier, whichever is lowest.
- 5.1.3. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or maximum use concentration specified by OSHA or respirator supplier, whichever is lowest.

5.2. Personal Hygiene Procedures

- 5.2.1. If aluminum dust contacts the skin, TMs should flush the affected areas with plenty of water, followed by washing with soap and water.
- 5.2.2. Clothing contaminated with aluminum dust should be removed, and provisions should be made for the safe removal of the chemical from the clothing (no cleaning

by blowing it with compressed gas). Persons laundering the clothes should be informed of the hazardous properties of aluminum.

5.2.3. A person who handles aluminum dust should thoroughly wash hands, forearms and face with soap and water before eating, using tobacco products, using toilet facilities, applying cosmetics or taking medication.

5.2.4. TMs should not eat, drink, use tobacco products, apply cosmetics or take medication in areas where aluminum dust is generated.

5.3. Housekeeping

5.3.1. Spills: Preliminary Clean-up

5.3.1.1. Notify Security so that those trained in spill clean-ups can be contacted.

5.3.1.2. Spilled dust should be cleaned up from a collection container so that it does not disperse dust into the air.

5.3.1.3. All sources of heat and ignition should be removed.

5.3.1.4. Conductive, non-sparking tools and equipment and brushes that have natural fiber bristles should be used.

5.3.1.5. Contact with water should be avoided.

5.3.1.6. Pick up spill for recovery or disposal and place back into the closed collection container.

6. Vacuum Cleaning Systems

6.1.1. Vacuum cleaners shall be permitted to be used only for small amounts of residual material remaining after preliminary cleanup: accumulations too small, too dispersed or too inaccessible to be thoroughly removed by hand brushing.

6.1.2. Vacuum cleaning systems shall be effectively bonded and grounded to minimize accumulation of static electric charge.

6.1.3. Portable vacuum cleaners shall be used only if listed or approved for use with combustible aluminum dust (Class II hazardous locations).

6.1.4. Vacuum cleaner hose shall be conductive and nozzles or fittings shall be made of conductive, non-sparking material.

7. Contractors

7.1. All outside contractors working in or on the premises of MBUSI will be required to follow the guidelines of this Aluminum Dust Guidelines document. Contractors in the pre-job meeting will be informed of these requirements as well as the on-site construction rules that apply.

8. Training and Evaluations

8.1. TMs are the first line of defense in preventing and mitigating fires and explosions. TMs closest to the source of the hazard must be trained to recognize and prevent hazards associated with combustible dust, recognizing unsafe conditions, taking preventative action and alerting management.

8.2. All components and methods used for control of aluminum dust shall meet applicable legislation, standards and acceptable engineering practices. Training and evaluations for control of aluminum dust shall be documented and retained for the current and previous training plan.

8.3. Initial and refresher training shall ensure that TMs are knowledgeable about:

8.4. The hazards of the workplace.

8.5. Process description.

- 8.6. Equipment operation, safe start-up and shutdown and response to upset conditions.
- 8.7. The necessity for proper functioning of related fire and explosion protection systems.
- 8.8. Equipment preventative maintenance requirements and practices.
- 8.9. Emergency response plans.
- 8.10. Personal protective equipment.

9. Inspection and Maintenance

- 9.1. Inspection, testing and maintenance shall be implemented to ensure that the fire and explosion protection systems and related process controls and equipment perform as designed.
- 9.2. Records shall be kept of maintenance and repairs performed.

OSHA 3143 Industrial Hygiene Plan

Description

Standards - Industrial hygienists must use the information and the documentation of the OSHA Regulations and the documentation of other standards to evaluate TM exposure to hazardous chemical, biological, and physical agents. Where OSHA permissible exposure limits (PELs) exist, they must be used. Written records of IH evaluations must contain the justifications for any deviations from the non-OSHA standards described below.

National consensus standards - Because consensus standards do not have to undergo the full public comment and response process before use, they are usually more current and reflect the state-of-the-art in the scientific/medical application of health-based exposure standards. MBUSI mandates the use of TLVs when they are more stringent than OSHA regulations or when there is no PEL.

Industrial Hygiene Worksite Assessment - An Industrial Hygiene Worksite Assessment is an essential first step that helps an industrial hygienist determine what jobs and workstations are the sources of potential problems. During the worksite assessment, the industrial hygienist measures and identifies exposures, problem tasks, and risks. The most effective worksite assessments include all jobs, operations, and work activities. The industrial hygienist inspects, researches, or analyzes how the particular chemicals or physical hazards at that worksite affect worker health. If a situation hazardous to health is discovered, the industrial hygienist recommends the appropriate corrective actions. A sampling strategy is developed that includes both recognized qualitative and quantitative protocols to provide statistically significant exposure data. Breathing zone, ventilation and noise measurements, and other appropriate hazard exposure measurements are performed and documented using the sampling strategy. Regardless of the outcome, the Safety/IH Engineer notifies, in writing, the Team Member of the assessment results. The information is also shared with the responsible management of the affected area, if concerns are identified. Copies of the exposure records are provided to the team member upon request.

Recognizing and Controlling Hazards

Industrial hygienists recognize that engineering, work practice, and administrative controls are the primary means of reducing employee exposure to occupational hazards.

1. Engineering Controls - Engineering controls minimize employee exposure by either reducing or removing the hazard at the source or isolating the worker from the hazards. Engineering controls include eliminating toxic chemicals and substituting them with less hazardous ones, enclosing work processes or confining work operations, and installing general and local ventilation systems, barriers or structures that separate or isolate the TMs or the process, or redesigning of the equipment or process.

2. Work Practice and Administrative Controls

a. Work Practice Controls

Work practice controls alter the manner in which a task is performed. Some fundamental and easily implemented work practice controls include:

1. Following proper procedures that minimize exposures while operating production and control equipment.
2. Inspecting and maintaining process and control equipment on a regular basis (PMs).
3. Implementing good housekeeping procedures.
4. Mandating that eating, drinking, smoking, chewing tobacco or gum, and applying cosmetics in regulated areas be prohibited.

b. Administrative Controls/PPE

Administrative controls include controlling employees' exposure by scheduling production and workers' tasks, or both, in ways that minimize exposure levels to the hazard(s)

NOTE: OSHA prohibits the implementation of administrative controls solely to maintain the contaminant exposure of each TM below the PEL.

Personal Protective Equipment

When effective work practices and/or engineering controls are not feasible to achieve the permissible exposure limit, or while such controls are being instituted, and in emergencies, appropriate

respiratory equipment may be required. Affected team members must undergo the proper medical exams along with completing the proper forms (Respiratory Questionnaire – MEDF-017, Respirator Fit Test)

In addition, personal protective equipment such as gloves, safety goggles, helmets, safety shoes, and protective clothing may also be required. To be effective, personal protective equipment must be individually selected, properly fitted and periodically refitted; conscientiously and properly worn; regularly maintained; and replaced as necessary.

Air contaminants

These are commonly classified as either particulate or gas and vapor contaminants.

- i. Particulate contaminates - The most common particulate contaminants include dusts, fumes, mists, aerosols, and fibers. They are usually generated through mechanical processes such as crushing, grinding, drilling, abrading, or blasting.
- ii. Fumes - are formed when material from a volatilized solid condenses in cool air. In most cases, the solid particles resulting from the condensation react with air to form an oxide.
- iii. Mist - The term mist is applied to a finely divided liquid suspended in the atmosphere. Mists are generated by liquids condensing from a vapor back to a liquid or by breaking up a liquid into a dispersed state such as by splashing, foaming or atomizing
- iv. Fibers - Fibers are solid particles whose length is several times greater than their diameter.
- v. Gases - are formless fluids that expand to occupy the space or enclosure in which they are confined.
- vi. Vapors - Liquids change into vapors and mix with the surrounding atmosphere through evaporation. Vapors are the gaseous form of substances, which are normally in the solid or liquid state at room temperature and pressure.

Chemical hazards - Methods of Entry

Harmful chemical compounds in the form of solids, liquids, gases, mists, dusts, fumes, and vapors exert adverse effects by:

- i. inhalation
- ii. absorption
- iii. injection
- iv. ingestion

Chemical hazards exist as concentrations of mists, vapors, gases, fumes, or solids. Some are toxic through inhalation and some of them irritate the skin on contact; some can be toxic by absorption through the skin or through ingestion, and some are corrosive to living tissue.

Biological hazards

These include bacteria, viruses, fungi, and other living organisms that can cause acute and chronic infections by entering the body either directly or through breaks in the skin. Medical personnel can be exposed to biological hazards.

In addition, effective personal hygiene, particularly proper attention to minor cuts and scratches, especially those on the hands and forearms, helps keep worker risks to a minimum.

Physical hazards

Radiation

These include excessive levels of ionizing and non-ionizing electromagnetic radiation, noise, vibration, illumination, and temperature.

In occupations where there is exposure to ionizing radiation, time, distance, and shielding are important tools in ensuring TM safety.

Distance also is a valuable tool in controlling exposure to both ionizing and non-ionizing radiation. Radiation levels from some sources can be estimated by comparing the squares of the distances between the TM and the source.

Shielding also is a way to protect against radiation. The greater the protective mass between a radioactive source and the worker, the lower the radiation exposure.

Non-ionizing radiation also is dealt with by shielding workers from the source. Sometimes limiting exposure times to non-ionizing radiation or increasing the distance is not effective. Laser radiation, for example, cannot be controlled effectively by imposing time limits. An exposure can be hazardous that is faster than the blinking of an eye. Increasing the distance from a laser source may require miles before the energy level reaches a point where the exposure would not be harmful.

Noise

Noise, another significant physical hazard, can be controlled by various measures. Noise can be reduced by installing equipment and systems that have been engineered, designed, and built to operate quietly; by enclosing or shielding noisy equipment; by making certain that equipment is in good repair and properly maintained with all worn or unbalanced parts replaced; by mounting noisy equipment on special mounts to reduce vibration; and by installing silencers, mufflers, or baffles.

It is also possible to reduce noise exposure by increasing the distance between the source and the receiver, by isolating workers in acoustical booths, limiting workers' exposure time to noise, and by providing hearing protection. OSHA requires that workers in noisy surroundings be periodically tested as a precaution against hearing loss.

Radiant Heat

Another physical hazard, radiant heat, is present in paint oven processes, can be controlled by following the quick cool down process for the applicable ovens. The radiant heat is measured by a Quest Temp 36 wet-bulb globe temperature monitor. The amount of time a team member is allowed to work in the ovens depends on the level of activity (light/medium/heavy) and the dry bulb temperature reading from the instrument. The temperature readings are compared to the chart posted at the oven doors to determine the length of exposure.